Is a tax at the pump a good idea? Policy lessons from asymmetric responses to gasoline prices and taxes in Spain

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Abstract

Using monthly data from the Spanish gasoline retail market at the province level, we identify asymmetries in consumers' behavioral responses to changes in prices and taxes. In particular, we show that an increase in gasoline taxes has a more negative impact on the demand than a –similar in magnitude– increase in the "pre-tax" price of gasoline. The results are consistent for the most commonly used fuel types in Spain, namely unleaded gasoline and diesel. For the unleaded gasoline fuels and for diesel fuel used for agricultural purposes the results are also robust to the alternative specifications of the main model that take into account dynamic effects. However, in the dynamic effects model, the results for the regular diesel fuel are non-conclusive. Overall, our finding casts doubt on previous studies that have estimated the effect of gasoline taxes based on the tax-inclusive elasticity of the demand, which may have overestimated the impact on tax revenue and underestimated the effect on pollution and climate change.

Keywords: Gasoline Taxes, Behavioral responses, Demand elasticity, Energy policy.

JEL Classification Numbers: Q4, Q5, H2, H3, L71

1 Introduction

The second half of the 2000s was a tough period for the public finances in several countries in the advanced world. The poor evolution of unemployment, GDP, savings, and/or private consumption –among others economic indicators– seriously compromised both the government revenue as well as the debt-to-GDP ratio of them.

Driven by the need to achieve a better financial situation, many governments decided to raise some of the key taxes in terms of revenue collection; and when the debate is focused on rising taxes

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that are key in terms of revenue collection, it is pretty likely that gasoline is one of the commodities on the table. Indeed, over the last years, and coinciding with the onset of the economic downturn, many of the governments in trouble decided to increase taxes on gasoline. That was true in (among others) Greece in February 2010, where the price of unleaded gasoline increased by 0.12 euro per liter and the price of diesel fuel increased by 0.05 euros a liter[1]; Ireland, which has been experiencing a gasoline tax hike since 2008[2]; the Netherlands, where the excise duty on Liquefied Petroleum Gas (LPG) products went up by 7 cents per liter and the excise duty of diesel by 4 cents per liter in January 2014[3]; Lithuania and Latvia in 2009[4]; Romania, first in 2009[5] and again in 2014, where there was a 7 cents per liter increase[6]; Italy, where the tax incremented by 0.05 euro per liter with the goal of increasing the revenue to mitigate the earthquakes damages in 2012[7]; and twice in Slovenia, first in 2011 and later in 2012.[8]

As the politicians in some of these countries indicated, there were also environmental and climate change objectives behind such policies. However, in most (if not all) of the cases it is no secret that the main goal behind these tax increases was to raise public revenues in a complicated situation for the public treasury.[9]

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 –especially the unemployment, which rose from approximately 10% in 2008 to around 25% in 2014, according to Eurostats. At the same time, the government was running out of money; in fact, while the debt-to-GDP ratio was 40.2% in 2008, it increased to 93.4% by the end of 2013, according to the Bank of Spain. Thus, following the advise of the European institutions and other international bodies[10], and in order to demonstrate fiscal discipline, Spain had to consolidate 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 for that purpose. Indeed the Spanish Council of Ministers approved on June 13, 2009 an increase of 0.029 euro per liter of the excise duties on diesel fuels and unleaded gasoline fuels. In fact the government recognized that the main goal behind such measure was to increase tax collection in a very complicated situation for the Spanish public treasury.[11] But, was this decision a wise one

[1] http://www.ekathimerini.com/4dcgi/_w_articles_wsite1_1_12/07/2012_451874

[2] http://www.theaa.ie/blog/a-breakdown-of-irish-fuel-taxes-and-hikes-in-ireland/

[3] http://www.rijksoverheid.nl/documenten-en-publicaties/vragen-en-antwoorden/belastingtarieven-2014.html

[4] See Box 1: "Overview of the main tax related measures taken in response to the economic and financial crisis" in European Commission (2009)

[5] See previous footnote.

[6] http://www.balkaneu.com/controversial-fuel-tax-force-romania/

[7] http://www.tax-news.com/news/Italy_Increases_Fuel_Tax_To_Pay_For_Earthquake_Relief____55697.html

[8] See European Commission (2012).

[9] As M. Tanner from CATO Institute points out, during the austerity years, "fuel, alcohol, and tobacco were [...] prime tax targets" during the "austerity" years. See http://www.nationalreview.com/articles/299425/europe-s-failed-austerity-michael-tanner

[10] See ECB (2008), ECB (2009) and IMF (2007), among many others.

[11] https://www.boe.es/boe/dias/2009/06/13/pdfs/BOE-A-2009-9836.pdf

in terms of tax collection? Was the Spanish –and the rest of the countries with similar policies– government doing the right thing?

We want to point out that actually a raise in gasoline taxes is not as effective as previous studies have concluded. In particular, in this paper we cast doubt on previous studies that estimated the effect of taxes based on the "overall" (i.e. the tax-inclusive) elasticity of the gasoline demand. For that purpose, using detailed level data from Spain, we estimate consumers' responses to changes in gasoline consumption by taking into account separately both changes in tax-exclusive gasoline prices as well as changes in gasoline taxes. We provide empirical evidence to state that the price elasticity of demand due to changes in gasoline taxes is much higher than the price elasticity of the demand due to changes in the tax-exclusive price of gasoline. 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. We show that the results are robust to alternative specifications that take into account potential dynamic adjustments in the consumption patterns and that they are consistent for the demand of the four most commonly used types of gasoline in Spain for transportation purposes, namely unleaded gasoline (regular and premium) and diesel fuels (regular and agricultural). Only non-conclusive results are obtained in the "partial adjustment" model for the regular diesel fuel.

The study of the price elasticity of gasoline demand is a classic topic in the energy economics literature. Indeed, many authors have previously studied and empirically assessed this elasticity in many different countries, in different periods of time and using all kind of approaches.[12] However, the literature has not explored as deeply the differences that arise when we estimate separately the impact of changes in taxes and in "pre-tax" prices. The most relevant study investigating this issue is by Li et al. (2014), whose paper is closely related to ours. Thus, as they do, we are concerned about the existence of asymmetric behavioral responses in consumption due to changes in prices and taxes, and we seek to reinforce their conclusions. However, our approach differs from theirs in a few ways. First of all, we want to check that this asymmetric effect holds for all the main fuels used for transportation purposes; for that reason we estimate the elasticities not only for unleaded gasoline, but also for premium unleaded gasoline, regular diesel fuel as well as agricultural diesel fuel, which is mainly used by tractors. Second, instead of using annual data, we use monthly data; thus, as Klier and Linn (2010) do, we are able to check that this effect is not only true in the long-run, but also in the short-run.[13] Another closely related work is by Davis and Kilian (2011); in fact, they also explicitly recognize that "the responsiveness of gasoline consumption [due] to a change in tax may differ from the responsiveness of consumption [due] to an average change in price". However, they take this fact into account to perform a different kind of analysis, namely, they explore the potential impact of a carbon tax in carbon emissions.

[12] For instance, Lin and Prince (2013), Lin and Zeng (2013), Ben Sita et al. (2012), Baranzini and Weber (2013) and Crôtte et al. (2010) make up just a small sample of the previous papers that have studied the elasticity of gasoline demand.

[13] Notice that Li et al. (2014) use a monthly model as part of the robustness analysis (see Table 5). However, no control variables are included in such model.

Thus, taking the advantage that almost all the regional governments in Spain implemented several changes in excise duties on gasoline after the crisis –along with the few changes implemented by the central government– we find evidence to support the fact that, at least in Spain, the sensitivity of gasoline consumption to changes in taxes is much greater than the sensitivity of gasoline consumption due to changes in tax-exclusive prices. This finding is true for the main four types of fuels used by Spaniard drivers, i.e. unleaded gasoline 95, unleaded gasoline 98 (premium), diesel A and diesel B (agricultural). As a robustness check, we also perform an analysis taking into account potential dynamics effects, namely, a lagged effect of (agricultural) unemployment on Diesel B consumption[14] as well as the existence of a partial adjustment in the consumption of gasoline. In the later case, mixed results are obtained just for the diesel A consumption.

Previous literature has given (at least) up to three different (and complementary) potential explanations of such asymmetric effect: first of all, following Li et al. (2014) this asymmetric responses may be due to the fact that there is a persistent effect in gasoline consumption. In other words, since cars are durable goods, consumers' responses depend not only on today's price of gasoline, but also in expected future gasoline prices. Thus, if consumers assess that a change in taxes is more persistent than a change in gasoline "pre-tax" prices, they should react by buying less motor vehicles and/or driving less in the former case than in the later.

Second, some other authors –for instance, Chetty et al. (2009) and Rivers and Schaufele (2012) among others– have argued that there is a problem of "salience" with taxes. In other words, it is much more costly to calculate the impact of daily changes in "pre-tax" prices on the gross-of-tax price of gasoline than the impact of a single and publicly observable change in the taxation of gasoline on the gross-of-tax price of gasoline. Therefore, we should expect that a change in taxes has a greater negative impact on the demand –it is more salient– than a similar change in the tax-exclusive price.

A third possible explanation relies on recent and innovative literature on Industrial organization and behavioral economics. Thus, as Spiegler (2011) indicated in the context of gasoline consumption, consumers obtain information about gasoline prices using a "sampling" procedure. In other words, consumers elaborate expectations about gasoline prices using the prices they see in a subset of gas stations that they frequently pass by –gas stations that are close to their homes, those that are on the way to their works, etc.– from time to time. Thus, small daily changes in prices are negligible to them or not taken into account before the sampling procedure is repeated again. On the other hand, since an increase in the excise tax has media diffusion, they can adjust automatically this change in price at the moment the tax is introduced.[15]

There are several implications of these findings in terms of energy policy. First of all, it seems that taxing at the pump is not as effective as previously thought in terms of revenue collection. Thus, when we take into account separately changes in taxes and changes in tax-exclusive prices,

[14] Jimeno and Bentolila (1998) find evidence that the impact of unemployment on wages is lagged. Therefore, we could expect that there is also a lagged effect on gasoline consumption too.

[15] This effect, together with many others, is included in a comprehensive study on Behavioral economics and taxes by Congdon et al. (2009).

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 indeed has been ignored by previous literature, leading to erroneous conclusions of the effect of a tax increase. Therefore, we conjecture 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"[16]; 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[17] 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". Alternatively, if we believe 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 –see Verboven (2002).

Second, and on the other hand, 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.

The rest of the paper is organized as follows. Section 2 provides the baseline empirical model, describes the data, and provides summary statistics for the taxes by fuel type at the regional level. Section 3 includes the main results of our model. Section 4 provides the alternative models that we use to account for potential dynamic effects and the results. Section 5 concludes.

2 The model and data

In this section we provide the model that we use to examine the elasticity of demand due to changes in tax-exclusive prices and taxes. We also give detailed information about the data we use to examine such model; in particular, we provide evidence of the variability of the main variables that we use, namely fuel consumption, "pre-tax" prices and taxes.[18]

2.1 The baseline model

The model that we examine in this paper is very similar to the ones used in previous studies on fuel demand.[19] In our basic set up –as well as in the proposed extensions–, the unit of observation

[16]See Goulder (1994) for a deeper discussion.

[17]Marion and Muehlegger (2011) find that gasoline taxes are indeed fully passed onto consumers and are incorporated fully into the tax-inclusive price, under typical supply and demand conditions.

[18]In addition to that, in the Appendix we provide the summary statistics for the (nominal) taxes per fuel type during the examined period at the regional level due to the potential concern that taxes did not change very often in the examined period (indeed, as we can see, most of the regional governments introduced different changes). Summary statistics (per fuel type, if it is the case) for the rest of the variables can be made available from the author upon request.

[19]See, for instance, Hughes et al. (2008) and Li et al. (2014).

is a province i and month t. In the basic framework, our regression for each type of fuel, G, is given by:

$$\log D_{it}^G = \beta_0 + \beta_1 \log p_{it}^G + \beta_2 \log \tau_{it}^G + \Theta X_{it} + \alpha_i + \alpha_t + \varepsilon_{it}^G \quad (1)$$

where D_{it}^G is the gasoline G consumption in month t in province i; p_{it}^G is the average monthly retail price before tax of gasoline G in euro per liter (€/l) in month t in province i; τ_{it}^G is the average tax of gasoline G in euro per liter (€/l) in month t in province i. The scalars α_i and α_t denote province and month fixed effects, respectively. In addition, as Small and Van Dender (2007) and Li et al. (2014) do, we also include in the model a vector of control variables, X_{it}, 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.[20] In section 4 some other controls that account for potential dynamic effects are also discussed.

One potential concern of this specification is that, unlike Li et al. (2014), Dahl (2012) and Hughes et al. (2008) do, we do not include income in the set of control variables. The main reason is that there is no available monthly data on income at the province level in Spain. However, the potential omitted variable bias is remedied by including two additional control that are expected to be positively correlated with income.

First, we include as a control variable the amount of euros spent (in real terms) in house purchases per province per month. Considering that Spain is a country in which house rental is relatively low[21], there is an extensive literature proving the positive relationship between housing expenditure and income not only in Spain but in many other countries.[22] Moreover, we believe this variable captures the regional differences in economic activities and cost of living –see Martinez and Maza (2003) and Garrido-Yserte et al. (2012)– which are determinants of the income level. Second, we consider monthly data on consumer credits (in real terms) per province and month to measure consumer expenditure which, as expected, proxies consumer disposable income.[23]

Finally, for the case of the agricultural diesel fuel, we also include as a control variable the agricultural unemployment level. By introducing this variable we take into account the impact of changes in agricultural production in the consumption of diesel B.[24]

[20]However, unlike the aforementioned authors, we do not include some other demographic variables, such as the share of population living in rural areas or the number of drivers. The reason is that we expect to see none or little variation of these variables in the monthly data.

[21]As it is indicated by Ortega et al. (211), "One of the most salient feature of the Spanish housing market, compared to other European economies, is its relatively low rental share."

[22]See, among many others, Garcia and Raya (2011), Fernández-Kranz and Hon (2006), Gallin (2006), Martinez and Maza (2003),Lopez et al. (1998).

[23]For the Spanish case, Pardo and Sánchez Santos (2014) provide some evidence of a positive link between household debt level and income after 2005.

[24]Considering that Villaverde and Maza (2009) find robust evidence that Okun's law holds in Spain both at the national level as well as at the regional level, it is possible to think that unemployment should be included as a control for all the other fuels. However, the introduction of this variable for the unleaded fuel cases and for diesel A case yields notorious problems, such as collinearity and potential measurement error bias.

2.2 Data and summary statistics

In our analysis we use Spanish monthly data per province and per type of fuel. Data for fuel prices, consumption of gasoline and taxes is available from January 2011 to October 2014. There are 50 provinces in Spain, plus Ceuta and Melilla, which are considered separated provinces. In all the model specifications we study four types of fuel: diesel A, diesel B, unleaded gasoline 95 RON[25] and unleaded gasoline 98 RON.[26] Diesel A and unleaded gasoline 95 are the two most commonly used fuels for cars, motorcycles and small trucks and vans; diesel B is used by agricultural vehicles (tractors); and unleaded gasoline 98 is the premium brand of unleaded gasoline 95. Consumption data is given in metric tons per month, province and fuel type; however, data for Diesel B (agricultural) consumption is missing for the Canary Islands.

Prices are given in euro per liter (€/l) and are reported as average prices per month, province and fuel type. The data set contains both "pre-tax" prices and "post-tax" prices. Tax-inclusive prices are calculated as the arithmetic average of the taxes of each gas station per province, month and fuel type. Hence, the taxes are obtained as the difference between tax-inclusive prices and tax-exclusive prices. According to the information provided by the *Comisión Nacional de los Mercados y de la Competencia* (CNMC) –which is the source of these variables–, there are three taxes included in the "post-tax" prices:[27] the Value-Added Tax (VAT)[28], the excise tax[29] and the (retail sales) gasoline tax[30] The first one (VAT) is imposed by the central government, so it is actually the same for all the provinces.

Between 2011 and 2014 there was one modification of the VAT: in September 2012, the general[31] rate increased from 18% to 21%. On the other hand, the provinces have different excise tax and gasoline sales tax rates.[32] These rates are actually decided by the governments of the different autonomous communities of Spain.[33,34] During the period of our study, several changes were introduced in most of the autonomous communities. To check this, we include in the Appendix a table that includes the main summary statistics for nominal taxes per type of fuel by autonomous community. Notice that there are just two autonomous communities with no variation in taxes at all: Ceuta and Melilla. The reason is that these regions, due to the fact that they are overseas

[25] Research Octane Number.

[26] Data for other fuels is also available –for instance, biodiesel or "special-purposes diesel" (NGO, or *Nuevos Gasóleos*); however, their consumption is still marginal.

[27] The three of them are directly charged to the consumers.

[28] Impuesto sobre el Valor Añadido (IVA).

[29] Impuesto Especiales (IIEE).

[30] Impuesto de Venta Minorista de Determinados Hidrocarburos (IVMDH).

[31] The general rate is the one applicable to fuel consumption.

[32] As we have indicated in the introduction, there is also a excise duty on gasoline that depends on the central government.

[33] There are 17 autonomous communities plus Ceuta and Melilla, which are considered as two different Autonomous Communities. Nine of these autonomous communities have just one province. Two have two provinces. Three have three provinces. Two have four provinces. One has five provinces. One has eight provinces. And one has nine provinces.

[34] Some small differences are also present in different provinces within an autonomous community; these are due to minor subsidies at the municipal level. However, these policies are infrequent and thus negligible.

territories, have different tax regimes[35], so neither the VAT nor the excise duties are applied there. Hence we remove the observations for Ceuta and Melilla from our dataset.

Furthermore, we use monthly Consumer Price Index (CPI) data per province to express both tax-exclusive prices as well as taxes in real terms, using January 2011 as the base period. To obtain the real values we use the standard formula provided, for instance, by the EIA (Energy Information Administration).[36] Data on CPI is publicly available in the Spanish National Statistics Institute (INE) website.[37]

Both data on consumption and prices per month, province and fuel type were obtained from the aforementioned CNMC, which is a public organization of the Spanish Ministry of Economy and Finance. The data is publicly available.[38] Data on vehicles was obtained from the *Dirección General de Tráfico* (DGT), which is a public organization of the Spanish Ministry of the Interior. In particular, we use the total number of registered vehicles per province, month and type of fuel. The dataset divides the vehicles in the following categories: cars, vans (including Light or Medium Duty Trucks), buses, motorcycles, tractors and other vehicles.[39] The data is available until September 2014 and is publicly available.[40]

Data on both consumer credits and on the amount spent on house purchases was obtained from the Consejo General del Notariado (CGN), which is a public organization of the Spanish Ministry of Justice. The data is available from January 2011 until October 2014 and it is publicly downloadable.[41] Both variable are expressed in real terms (see footnote 36). Finally, data on agricultural unemployment was obtained from the *Servicio Público de Empleo Estatal* (SEPE), which is a public organization of the Spanish Ministry of Employment and Social Security. In particular, we use the total number of registered unemployed in the agricultural sector per province and month. The data is available for the whole period of the study –i.e. from January 2011 to October 2014–, and is publicly available and downloadable.[42]

Table 1 summarizes the extent of data inter and intra-province variation for the main variables. Both the variation of fuel consumption as well as the variation of taxes (except for diesel B) are predominantly between province. However, the tax-exclusive prices variation is mostly within province. This fact might lead us to think that the use of heterogeneous estimators are convenient

[35] For instance, there is not VAT. For more information see http://www.agenciatributaria.es/AEAT.fisterritorial/Inicio_es_ES/_Menu_/Fiscalidad_Autonomica/Ceuta_y_Melilla/Ceuta_y_Melilla.shtml

[36] To obtain the real prices and taxes, we apply the following formula:

$$\text{Real Price}_{i,t} = \text{Nominal Price}_{i,t} \frac{\text{CPI}_{i,\text{January 2011}}}{\text{CPI}_{i,t}}$$

See http://www.eia.gov/forecasts/steo/realprices/

[37] http://www.ine.es/jaxi/menu.do?type=pcaxis&path=%2Ft25/p138&file=inebase&L=0

[38] http://www.cnmc.es/es-es/energ%C3%ADa/hidrocarburosl%C3%ADquidos/estad%C3%ADsticasdelmercado.aspx?p=p3&ti=Productos%20petroliferos

[39] The dataset also contains data on trailers and semi-trailers, but in many provinces the number of trailers and semi-trailers is zero, while in the rest of the provinces the number of trailer is very small and insignificant.

[40] https://sedeapl.dgt.gob.es/IEST2/menu.do?path=/vehiculos/parque/&file=inebase&type=pcaxis&L=0&js=1

[41] http://www.notariado.org/liferay/web/cien/estadisticas-al-completo

[42] http://www.sepe.es/contenidos/que_es_el_sepe/estadisticas/datos_avance/datos/index.html

Table 1: Standard deviation of the main variables ($I = 50$, T =Jan'11-Oct'14)

Pooled sample		ln(cons.)	ln(pre-tax price)	ln(tax)
	Overall	0.7022	0.0486	0.2650
Diesel A	Between	0.6992	0.0216	0.2507
	Within	0.1175	0.0437	0.0929
	Overall	0.5786	0.0469	0.0623
Diesel B	Between	1.0242	0.0198	0.0136
	Within	0.2783	0.0426	0.0608
	Overall	0.8672	0.0599	0.2088
Unleaded 95	Between	0.8626	0.0274	0.2043
	Within	0.1501	0.0534	0.0517
	Overall	1.0672	0.0563	0.2218
Unleaded 98	Between	1.0318	0.0278	0.2181
	Within	0.3086	0.0491	0.0503

to capture the effect of tax-exclusive prices on fuel consumption. However, as it is deeply discussed in Baltagi et al. (2003) in a similar study, the use of heterogeneous models leads to highly variable and unstable estimates. Having this in mind, the following section estimates the (homogeneous parameters) pooled model.

3 Main findings

Tables 2 and 3 present the results of the estimation of equation 1 for the four types of fuel considered. For all of them we estimate the model without control variables, the model controlling for registered vehicles, and the model with the full set of control variables. All the specifications include province fixed effects, month fixed effects, and a test for equal effect of "pre-tax" price and tax on fuel consumption.[43] Robust standard errors are included in parentheses.

Table 2 captures the effect of changes in "pre-tax" prices and taxes on unleaded gasoline consumption. In particular, for unleaded 95 gasoline –columns (1), (2) and (3)–, the "pre-tax" price-elasticity of demand is negative but not significant for the three specifications of the model. On the other hand, the elasticity of the demand for unleaded 95 gasoline due to changes in taxes is negative and significant at the 1% level in all the model specifications: -1.56 in the model with no controls; -1.39 when controlling for vehicle fleet; and -1.33 when including all the control variables.

The results are equally striking for unleaded 98 gasoline, which are included in columns (4), (5) and (6). Indeed, the tax-elasticity of demand is negative and significant at the 1% level in all specifications: -3.90 with no controls, -3.50 when controlling for vehicles and -3.42 when we include all the control variables. The tax-exclusive price elasticity of demand is negative and significant, but the coefficients are approximately seven times smaller than the aforementioned fuel tax coefficients: -0.44 with no control, -0.49 when including both vehicles and the full set of controls.

[43] I.e. we test $\beta_1 = \beta_2$ in all the specifications.

The difference in the parameters that we find as well as the rejections of the proposed test, with p-values equal to 0 in all the specifications, suggest us that the effect of tax changes in unleaded gasoline demand is much greater than the effect of price changes in this fuel demand.

Next, Table 3 reports the results for diesel fuels consumption. First of all, notice that for the case of diesel B (agricultural) –columns (4), (5) and (6)– we control just for tractors, but not for the other types of vehicles. On the other hand, for the diesel A (regular) case –columns (1), (2) and (3)–, we include all types of vehicles as controls, but not tractors. The reason is that in Spain agricultural diesel (diesel B) has a lower tax rate than the regular diesel (diesel A). Therefore, in order to buy the former it is necessary to prove that this diesel is going to be used to power a tractor, being prohibited for other vehicles.[44] Following this mandate, we should expect that all car, motorcycle and small truck and van owners would not buy diesel B (because is prohibited), while all tractor owners would buy diesel B (because is cheaper).

The results are very similar to those that we find for unleaded gasoline demand. First, regarding diesel A consumption–columns (1), (2) and (3)– we find a similar effect as the one found for unleaded 98: while "pre-tax" demand elasticity is negative and significant at the 1% level in the three specifications of the model, with coefficients -0.39 without controls, -0.34 when controlling by vehicle fleet and -0.33 with the full set of controls, the elasticity of the demand due to changes in taxes is negative and significant at the 1% level in all the model specifications, but the coefficients are much bigger: -0.58, -0.53 and -0.48 respectively. The test for equal coefficients is rejected at the 1% level in the first two cases, and rejected at the 5% level in the last case.

For the diesel B case–columns (4), (5) and (6)– we find similar evidence: the coefficients for the tax-exclusive price are negative and significant at the 1% level (around -0.5 for the three specifications of the model), but the coefficients for the tax are significant at the 1% level and much greater (around -2.4 for the three specifications of the model). Again, the "equal-effect" test are rejected at the 1% in the three cases.

We end this section with some concluding remarks about these results. First, for the most commonly used fuels for transportation purposes (unleaded 95 and diesel A) the credit and housing coefficient are positive and significant. However, for the premium unleaded gasoline only the housing variable is significant at the 5% level. Thus, as we expected, premium gasoline consumers appear to be less sensitive to changes in variables that are related to their income. For the diesel B case non of the additional controls included in column (6) are significant.

Second, we can check that the results for unleaded 95 gasoline as well as for diesel A, which are the two main fuels used for transportation purposes in Spain, are similar to those in Li et al. (2014). On the other hand, the estimated impact of the tax on consumption of unleaded 98 gasoline and diesel B are much greater. Thus, with our analysis, we are able to identify that those consumers using premium gasoline as well as the usage of gasoline linked purely to professional motives (tractors) suffer a much greater impact that the fuel types used by the average car, motorcycle or small truck driver.

[44] This is included in the Spanish *Ley 38/1992, de Impuestos Especiales.*

Table 2: OLS model for unleaded fuels

	(log)Unleaded 95 cons.			(log)Unleaded 98 cons.		
	(1)	(2)	(3)	(4)	(5)	(6)
(log)Unleaded 95 pre-tax price	-0.0099	-0.0598	-0.0636			
	(0.0469)	(0.0473)	(0.0474)			
(log)Unleaded 95 tax	-1.5617***	-1.3860***	-1.3299***			
	(0.0459)	(0.0582)	(0.0620)			
(log)Unleaded 98 pre-tax price				-0.4377***	-0.4938***	-0.4931***
				(0.1065)	(0.1079)	(0.1080)
(log)Unleaded 98 tax				-3.8919***	-3.5041***	-3.4229***
				(0.0931)	(0.1208)	(0.1264)
(log)Unleaded Vans & Trucks		0.0021	0.0023		0.0092**	0.0092**
		(0.0021)	(0.0022)		(0.0045)	(0.0045)
(log)Unleaded Buses		0.0254**	0.0264**		0.0661**	0.0663
		(0.0116)	(0.0117)		(0.0262)	(0.0262)
(log)Unleaded Cars		,0013319	,0011625		0.0086	0.0085
		(0.0025)	(0.0025)		(0.0060)	(0.0059)
(log)Unleaded Motorcycles		0.0021	0.0018		0.0037	0.0034
		(0.0022)	(0.0022)		(0.0053)	(0.0053)
(log)Unleaded Other Vehicles		0.0191*	0.0052*		0.0010*	0.0097
		(0.0032)	(0.0031)		(0.0059)	(0.0058)
(log)Unleaded Tractors		0.0974***	0.0916***		0.2368***	0.2260***
		(0.0191)	(0.0191)		(0.0439)	(0.0441)
(log)Credit			0.0191***			0.0108
			(0.0059)			(0.0113)
(log)Housing			0.0258***			0.0421**
			(0.0082)			(0.0183)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
p-value ($\beta_1 = \beta_2$)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	2300	2161	2161	2300	2161	2161
R^2	0.991	0.991	0.991	0.971	0.972	0.972

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3: OLS model for diesel fuels

	(log)Diesel A cons.			(log)Diesel B cons.		
	(1)	(2)	(3)	(4)	(5)	(6)
(log)Diesel A pre-tax price	-0.2980***	-0.3373***	-0.3282***			
	(0.0470)	(0.0509)	(0.05030)			
(log)Diesel A tax	-0.5752***	-0.5301***	-0.4796***			
	(0.0381)	(0.0380)	(0.0368)			
(log)Diesel B pre-tax price				-0.4174***	-0.5004***	-0.5185***
				(0.1099)	(0.1139)	(0.1214)
(log)Diesel B tax				-2.4538***	-2.4213***	-2.3939***
				(0.0801)	(0.0804)	(0.1244)
(log)Diesel Vans & Trucks		0.0004	0.0002			
		(0.0025)	(0.0024)			
(log)Diesel Buses		0.0084**	0.0064*			
		(0.0037)	(0.0036)			
(log)Diesel Cars		0.0048*	0.0041*			
		(0.0024)	(0.0025)			
(log)Diesel Motorcycles		-0.1433***	-0.1135***			
		(0.0251)	(0.0254)			
(log)Diesel Other Vehicles		-0.0061 **	-0.0062**			
		(0.0028)	(0.0028)			
(log)Diesel Tractors					0.0039	0.0037
					(0.0054)	(0.0054)
(log)Credit			0.0237***			0.0054
			(0.0059)			(0.0112)
(log)Housing			0.0732***			-0.0077
			(0.0099)			(0.0192)
(log)Agric. Unemployment						-0.0139
						(0.0311)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
p-value ($\beta_1 = \beta_2$)	0.0000	0.0058	0.0262	0.0000	0.0000	0.0000
Observations	2300	2250	2249	2208	2160	2159
R^2	0.983	0.983	0.984	0.880	0.881	0.879

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Finally, and following the suggestions by Hsing (1990) and as Hughes et al. (2008) do, we have checked that these conclusions are identical when we use a log-linear regression model; the actual tables with the results are not included, but can be made available from the author upon request.

4 Robustness checks: dynamic effects

In the preceding section we discuss the results that we obtain from the estimation of the proposed baseline model. However, we are concerned about potential dynamic effects ignored in this model. For that purpose, the present section analyzes alternative specifications of the main model that take into account potential dynamic adjustments in the gasoline consumption patterns.

4.1 Partial adjustment models in gasoline demand

First of all, following the idea suggested by Houthakker et al. (1974) –and as, among many others, Baltagi et al. (2003), Pock (2007) and Hughes et al. (2008) do– we analyze a similar model in which we include gasoline consumption in the previous month, instead of contemporaneous gasoline consumption. The main reason for that is that, as Hughes et al. (2008) point out, "frictions in the market may prevent reaching the appropriate equilibrium level and, as a result, only a fraction of the desired change in consumption between [two months] is realized". Therefore, we denote the equilibrium demand of gasoline as $D_{it}^{G,*}$ and following Houthakker et al. (1974) we define the adjustment equation as:

$$\frac{D_{it}^{G}}{D_{it-1}^{G}} = \left(\frac{D_{it}^{G,*}}{D_{it-1}^{G}}\right)^{\lambda} \tag{2}$$

for some $\lambda \in (0, 1)$.

Next, reconsider equation 1; hence, if we substitute and plug the equilibrium demand of gasoline as the dependent variable, we get the following expression:

$$\log D_{it}^{G,*} = \beta_0 + \beta_1 \log p_{it}^{G} + \beta_2 \log \tau_{it}^{G} + \Theta X_{it} \tag{3}$$

Thus, substituting equation 2 into our equation 3:

$$\log D_{it}^{G} = \lambda\beta_0 + (1-\lambda)\log D_{it-1}^{G} + \lambda\beta_1 \log p_{it}^{G} + \lambda\beta_2 \log \tau_{it}^{G} + \lambda\Theta X_{it} \tag{4}$$

And renaming the coefficients, we get that:

$$\log D_{it}^{G} = \delta_0 + \delta_1 \log D_{it-1}^{G} + \delta_2 \log p_{it}^{G} + \delta_3 \log \tau_{it}^{G} + \Theta' X_{it} \tag{5}$$

where $\delta_0 = \lambda\beta_0$, $\delta_1 = 1-\lambda$, $\delta_2 = \lambda\beta_1$, $\delta_3 = \lambda\beta_2$ and $\lambda\Theta = \Theta'$.

Tables 4 and 5 provide the results of this model for both unleaded gasoline fuels and diesel fuels respectively. We include the same control variables that we included in the baseline case and, again, robust standard errors are in parentheses.

First, Table 4 includes the results for the unleaded gasoline fuels. Again, the effect of a change in the tax on unleaded 95 gasoline demand is negative and significant at the 5% level if no controls are included –column (1)– and negative and significant at the 1% level in the other two model specification –columns (1) and (2). The coefficients obtained are -0.08, -0.12 and -0.12. However, the coefficients for the tax variable are negative and significant at the 1% level in the three cases, but much bigger than the coefficients obtained for the tax-exclusive price (-0.86, -0.77 and -0.75 respectively). The "equal effect" test is rejected in the three cases. The results are very similar for the unleaded 98 case –columns (4), (5) and (6). In fact, we obtain that tax coefficients are approximately 7 times greater than the "pre-tax" price coefficients. Again, the tests of "equal effects" of taxes and "pre-tax" prices on demand are rejected in all cases.

Second, Table 5 provides the results of the new model for diesel fuels. For the diesel B case –columns (4), (5) and (6)– the results are the same as for the baseline model: both taxes and "pre-tax" prices coefficients are negative and significant at the 1% level, but the coefficient of the former is more negative than the coefficient of the later. As we can see, the tests for "equal effects" are rejected in the three model specifications.

However, the results for the diesel A case –columns (1), (2) and (3)– are different this time. In fact, we obtain negative, statistically significant and very similar coefficients for both the tax-exclusive price and the tax (all the coefficients are in between -0.31 and -0.2). Even there is slight evidence that the coefficient of the tax-exclusive price is greater than the coefficient of the tax in column (3).

The use of the partial adjustment model is not standard across the literature. However, for our particular study, the partial adjustment model seems to capture much better the consumption of diesel A, since the consumption of diesel A is more persistent and thus its consumption depends highly on the previous period consumption. In other words, considering that diesel A is cheaper than unleaded gasoline[45], frequent drivers tend to purchase diesel cars rather than unleaded gasoline cars. Therefore, in "diesel drivers" (frequent drivers) we expect that the fuel consumption in the previous plays a major role. Thus, the introduction of the lagged consumption of diesel A mitigates the price and tax effect differences. This result is consistent with the differences in the unleaded gasoline tax revenue and diesel tax revenue in Verboven (2002).

As a final remark, notice that again the credit and housing variables are positive and of the expected sign for the unleaded 95 and diesel A cases. However, these variables are not significant for the other fuels.

4.2 Lagged effect of unemployment on Diesel B consumption

As a second robustness check, we include in our diesel B regression not contemporaneous changes in agricultural unemployment, but previous-period changes on agricultural unemployment. The

[45]More technically, Verboven (2002) points out that "[T]he diesel engine has a higher 'quality' in the sense that it consumes less fuel per mile and requires less expensive fuel".

Table 4: Partial adjustment model for unleaded fuels

	(log)Unleaded 95 cons.			(log)Unleaded 98 cons.		
	(1)	(2)	(3)	(4)	(5)	(6)
(log)Unleaded 95 cons. (t-1)	0.5329***	0.5366***	0.5331***			
	(0.0249)	(0.0259)	(0.0259)			
(log)Unleaded 95 pre-tax price	-0.0769**	-0.1176***	-0.1211***			
	(0.0390)	(0.0399)	(0.0401)			
(log)Unleaded 95 tax	-0.8577***	-0.7745***	-0.7459***			
	(0.0511)	(0.0559)	(0.0575)			
(log)Unleaded 98 cons. (t-1)				0.2974***	0.2843***	0.2830***
				(0.0311)	(0.0331)	(0.0333)
(log)Unleaded 98 pre-tax price				-0.3359***	-0.3733***	-0.3771***
				(0.1008)	(0.1046)	(0.1046)
(log)Unleaded 98 tax				-2.7231 ***	-2.5416***	-2.5026***
				(0.1541)	(0.1700)	(0.1725)
(log)Unleaded Vans & Trucks		0.0003	0.0005		0.0037	0.0038
		(0.0019)	(0.0019)		(0.0043)	(0.0044)
(log)Unleaded Buses		0.0105	0.0112		0.0520**	0.0524**
		(0.0010)	(0.0100)		(0.0253)	(0.0254)
(log)Unleaded Cars		-0.0008	-0.0009		0.0063	0.0062
		(0.0021)	(0.0021)		(0.0058)	(0.0058)
(log)Unleaded Motorcycles		0.0003	0.0001		0.0014	0.0012
		(0.0019)	(0.0019)		(0.0050)	(0.0050)
(log)Unleaded Other Vehicles		0.0011	0.0011		0.0051	0.0050
		(0.0025)	(0.0025)		(0.0056)	(0.0056)
(log)Unleaded Tractors		0.0427**	0.0402**		0.1425***	0.1378***
		(0.0170)	(0.0171)		(0.0440)	(0.0442)
(log)Credit			0.0128***			0.0085
			(0.0047)			(0.0117)
(log)Housing			0.0142*			0.0216
			(0.0075)			(0.0183)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
p-value ($\beta_1 = \beta_2$)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	2250	2113	2113	2250	2113	2113
R^2	0.994	0.994	0.994	0.974	0.975	0.975

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Partial adjustment model for diesel fuels

	(log)Diesel A cons.			(log)Diesel B cons.		
	(1)	(2)	(3)	(4)	(5)	(6)
(log)Diesel A cons. (t-1)	0.7357***	0.7278***	0.7147***			
	(0.0246)	(0.0248)	(0.0250)			
(log)Diesel A pre-tax price	-0.2490***	-0.3003***	-0.3061***			
	(0.0392)	(0.0427)	(0.0426)			
(log)Diesel A tax	-0.2321***	-0.2157***	-0.1996***			
	(0.0242)	(0.0247)	(0.0240)			
(log)Diesel B cons. (t-1)				0.5259***	0.5240***	0.5242***
				(0.0218)	(0.0219)	(0.0218)
(log)Diesel B pre-tax price				-0.4785***	-0.5603***	-0.5447***
				(0.1035)	(0.1064)	(0.1107)
(log)Diesel B tax				-1.2469***	-1.2295***	-1.2677***
				(0.0731)	(0.0735)	(0.1181)
(log)Diesel Vans & Trucks		0.0004	0.0004			
		(0.0020)	(0.0020)			
(log)Diesel Buses		0.0051	0.0042			
		(0.0032)	(0.0032)			
(log)Diesel Cars		0.0009	0.0007			
		(0.0018)	(0.0018)			
(log)Diesel Motorcycles		-0.0551***	-0.0442**			
		(0.0188)	(0.0189)			
(log)Diesel Other Vehicles		-0.0025	-0.0025			
		(0.0019)	(0.0019)			
(log)Diesel Tractors					0.0002	0.0002
					(0.0043)	(0.0043)
(log)Credit			0.0182***			0.0013
			(0.0041)			(0.0092)
(log)Housing			0.0293***			-0.0113
			(0.0067)			(0.0165)
(log)Agric. Unemployment						0.0053
						(0.0285)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
p-value ($\beta_1 = \beta_2$)	0.7150	0.0894	0.0323	0.0000	0.0000	0.0002
Observations	2250	2200	2200	2160	2112	2112
R^2	0.992	0.992	0.992	0.916	0.917	0.917

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

reason for that is that, as Jimeno and Bentolila (1998) find in their seminal paper, there is evidence in Spain that the effect of unemployment on wages is not immediate but rather lagged. Therefore we expect that, likewise, the effect of agricultural unemployment on diesel B consumption is not contemporaneous but rather lagged.[46] Thus, we propose the following alternative model:

$$\log(D_{it}^{G}) = \gamma_0 + \gamma_1 \log u_{it-1} + \gamma_2 \log p_{it}^{G} + \gamma_3 \log \tau_{it}^{G} + \Theta'' X_{it} \quad (6)$$

Table 6 provides the results of this model for the diesel B case. Again, the same set of control variables is included in our analysis, namely the number of registered tractors powered by diesel fuel and the credit and housing variables. Robust standard errors are included in parentheses.

In all the alternative specifications, the coefficient for the "pre-tax" price is negative and statistically significant at the one percent level. In particular, the coefficient ranges from -0.72 when no controls are included, to -0.61 when including the full set of controls. On the other hand, the tax coefficients are negative and significant at the 1% level, but much greater than the tax-exclusive coefficients. In particular, the tax coefficient ranges from -2.22, when controlling for unemployment in the previous month, to -1.06, when controlling for unemployment in the previous month and tractor fleet. The "equal effect" tests are rejected in all the specifications at the 1% level.

Finally, notice that in this case, the unemployment in the previous month is negative and significant in all the cases. Indeed, we find evidence of a lagged effect of unemployment in the agricultural sector in the consumption of diesel for agricultural purposes. Still in this model, the housing and the credit variables play a marginal role.

5 Conclusions

Policy makers have previously thought that, since gasoline demand has been proven to be price inelastic[47], raising taxes on gasoline can lead to a substantial increase in the tax revenue, helping thus to reduce the budget deficit. That was true, for instance, in many countries during the years of the economic crisis that began in 2008. We examine the elasticity of the demand for different fuels using monthly data from 2011 until 2014 at the regional level in Spain taking into account separately changes in tax-exclusive fuel prices and changes in taxes on fuels. We find that, while changes in "pre-tax" prices has little or no impact on the gasoline demand, changes in taxes produce much larger and significant decreases in the gasoline consumption. This result holds for the main four used fuels in Spain for transportation purposes –namely regular unleaded gasoline, premium unleaded gasoline, regular diesel and agricultural diesel.

Moreover, we find that our result is robust to alternative specifications of the main model that take into account potential dynamic adjustments in the consumption patterns of both unleaded

[46] One might think that the effect of unemployment is cumulative. Thus, as an additional robustness check, we include both the agricultural unemployment in the previous month and the agricultural unemployment in the current month.

[47] See Ramanathan (1999), Galindo (2005),Akinboade et al. (2008), Brons et al. (2008) and Havranek et al. (2012), among others.

Table 6: Model with lagged agricultural unemployment for Diesel B

	(log)Diesel B cons.				
	(1)	(2)	(3)	(4)	(5)
(log)Diesel B cons. (t-1)			0.5220***	0.5211***	0.5212***
			(0.0219)	(0.0218)	(0,0218)
(log)Diesel B pre-tax price	-0.7200***	-0.6881***	-0.6419***	-0.6144***	-0.6063***
	(0.1256)	(0.1255)	(0.1104)	(0.1103)	(0.1107)
(log)Diesel B tax	-2.1263***	-2.2203***	-1.0608***	-1.1439***	-1.1660***
	(0.1148)	(0.1208)	(0.1129)	(0.1168)	(0.1189)
(log)Agric unemployment (t-1)	-0.0999***	-0.2178***	-0.0563**	-0.1584***	-0.1591***
	(0.0294)	(0.0481)	(0.0273)	(0.0477)	(0.0477)
(log)Agric unemployment (t)		0.1521***		0.1316***	0.1311***
		(0.0518)		(0.0502)	(0.0500)
(log)Diesel Tractors	0.0034	0.0036	-0.00002	0.0001	0.00006
	(0.0053)	(0.0054)	(0.0043)	(0.0043)	(0.0043)
(log)Credit					0.0003**
					(0.0092)
(log)Housing					-0.0128
					(0.0165)
Time FE	Yes	Yes	Yes	Yes	
Province FE	Yes	Yes	Yes	Yes	
p-value ($\beta_1 = \beta_2$)	0.0000	0.0000	0.00257	0.0058	0.0040
Observations	2112	2112	2112	2112	2112
R^2	0.881	0.882	0.917	0.918	0.918

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

gasoline (regular and premium) and in the diesel fuel used for agricultural purposes. However, when taking into account this dynamic adjustment in consumption, the results for the regular diesel fuel are non conclusive. A fact that is consistent with the previous papers that have studied the different incidence of taxes on different fuels –see Verboven (2002). Finally, for the diesel B case (agricultural diesel), we have also considered a lagged effect of unemployment in the agricultural sector with no significant change in our main result.

Overall, this finding casts doubt on previous studies that have assessed, for instance, the potential impact of an increase of gasoline taxes based on the tax-inclusive gasoline price; according to our results, these studies have overestimated the tax revenue derived from an increase in the tax and have underestimated the environmental gains derived from such taxes.

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Appendix: Summary Statistics for (nominal) Tax Data (by Autonomous Community)

Auton. Com.	Statistic	Diesel A	Diesel B	Unleaded 95	Unleaded 98
Andalucia	Mean	0.59	0.25	0.69	0.74
	Std. dev.	0.03	0.02	0.03	0.03
	Min	0.54	0.22	0.64	0.69
	Max	0.63	0.28	0.74	0.79
Aragon	Mean	0.54	0.25	0.65	0.70
	Std. dev.	0.02	0.02	0.02	0.02
	Min	0.51	0.21	0.61	0.66
	Max	0.57	0.28	0.68	0.73
Asturias	Mean	0.58	0.26	0.69	0.74
	Std. dev.	0.03	0.02	0.03	0.03
	Min	0.54	0.23	0.64	0.69
	Max	0.62	0.28	0.74	0.79
Balearic Islands	Mean	0.59	0.26	0.69	0.74
	Std. dev.	0.05	0.02	0.05	0.05
	Min	0.51	0.22	0.62	0.67
	Max	0.63	0.28	0.74	0.79
Canary Islands	Mean	0.17	-	0.25	0.25
	Std. dev.	0.06	-	0.02	0.02
	Min	0.10	-	0.22	0.22
	Max	0.22	-	0.26	0.26
Cantabria	Mean	0.58	0.25	0.68	0.73
	Std. dev.	0.04	0.02	0.04	0.05
	Min	0.51	0.22	0.62	0.66
	Max	0.63	0.28	0.74	0.79
Castilla-La Mancha	Mean	0.59	0.25	0.69	0.74
	Std. dev.	0.03	0.02	0.03	0.03
	Min	0.54	0.22	0.64	0.69
	Max	0.63	0.28	0.74	0.79
Castilla and Leon	Mean	0.58	0.25	0.69	0.74
	Std. dev.	0.04	0.02	0.05	0.05
	Min	0.51	0.22	0.62	0.66
	Max	0.63	0.28	0.74	0.79
Catalonia	Mean	0.59	0.26	0.69	0.74
	Std. dev.	0.03	0.02	0.03	0.03
	Min	0.54	0.23	0.64	0.69
	Max	0.63	0.29	0.74	0.79
Ceuta	Mean	0.16	-	0.21	0.22
	Std. dev.	0.00	-	0.00	0.00
	Min	0.16	-	0.20	0.22
	Max	0.16	-	0.21	0.22
Extremadura	Mean	0.59	0.25	0.69	0.74
	Std. dev.	0.03	0.02	0.03	0.03
	Min	0.54	0.22	0.64	0.69

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Auton. Com.	Statistic	Diesel A	Diesel B	Unleaded 95	Unleaded 98
	Max	0.63	0.28	0.74	0.79
Galicia	Mean	0.57	0.25	0.68	0.73
	Std. dev.	0.03	0.02	0.03	0.03
	Min	0.53	0.22	0.64	0.69
	Max	0.62	0.28	0.73	0.78
Madrid	Mean	0.57	0.26	0.67	0.72
	Std. dev.	0.02	0.02	0.02	0.02
	Min	0.53	0.23	0.64	0.68
	Max	0.59	0.28	0.70	0.75
Melilla	Mean	0.10	0.00	0.17	0.17
	Std. dev.	0.00	-	0.00	-
	Min	0.09	0.00	0.16	0.17
	Max	0.10	0.00	0.18	0.17
Murcia	Mean	0.58	0.26	0.69	0.74
	Std. dev.	0.04	0.02	0.03	0.03
	Min	0.52	0.23	0.64	0.69
	Max	0.62	0.28	0.73	0.78
Navarra	Mean	0.55	0.25	0.66	0.71
	Std. dev.	0.03	0.02	0.03	0.03
	Min	0.51	0.21	0.61	0.66
	Max	0.60	0.28	0.71	0.76
Basque Country	Mean	0.55	0.26	0.65	0.70
	Std. dev.	0.02	0.02	0.02	0.02
	Min	0.51	0.22	0.62	0.66
	Max	0.57	0.28	0.68	0.73
La Rioja	Mean	0.55	0.25	0.65	0.70
	Std. dev.	0.02	0.02	0.02	0.02
	Min	0.51	0.22	0.62	0.66
	Max	0.57	0.28	0.68	0.73
Valencia	Mean	0.59	0.25	0.70	0.75
	Std. dev.	0.04	0.02	0.03	0.03
	Min	0.53	0.22	0.64	0.69
	Max	0.63	0.28	0.74	0.79

Source: *Comisión Nacional de los Mercados y de la Competencia* (CNMC)