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# Evaluating the role of energy efficiency labels: the case of Dish Washers

Ibon Galarraga, Mikel González-Eguino and Anil Markandya<sup>1</sup>

*This article uses the hedonic approach to estimate how much is paid for energy efficiency in the dishwasher market in Spain. The estimations suggest that 15.6% of the final price is paid for the characteristic represented by the A+ label. This accounts for about 80€ of the average price. We use this estimate combined with a demand system to obtain own and cross price elasticities of demand, vital for policy designing and analysis. This is done by combining the use of the estimate with the Quantity Based Demand System (QBDS) model to completely determine the demand function for different dishwashers. Finally, the elasticity results are compared with the ones calculated using the Linear Almost Ideal Demand System (LA/AIDS). The comparison of the results confirm that the QBDS model is easier to handle and less data demanding than the LA/AIDS model while providing reliable estimates of demand elasticities.*

Keywords: energy efficiency labelling, house-hold appliances

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# 1. Introduction

Energy transformation and consumption account for a significant share of global anthropogenic greenhouse gas (GHG) emissions. Energy efficiency policies are essential to reduce GHG emissions and save scarce economic resources. The replacement of old appliances is judged to be one of the most cost-effective short term measures among these options (McKinsey 2009). However, private investments in energy efficiency that at first glance might seem economically worthwhile are not always undertaken. This so-called energy efficiency paradox (Jaffe et al 2004, Linares and Labandeira 2010) can be explained by existing barriers such as insufficient information, principal-agent problems, lack of access to capital or divergences between social and private discount rates. Understanding these barriers and what hinders real decisions to purchase highly efficient appliances is very important for designing more effective policies.

Energy labelling is one of the crucial measures to provide consumers with the necessary data to overcome the lack of information barrier. At the European level, the use of information on energy and other resources consumption in household appliances was regulated by Directive 92/75/ECC<sup>2</sup> and has been followed by many amending acts.

Energy labelling policy is acquiring a major importance in the light of the well-known EU Climate and Energy package (COD, 2008 and COM 2008) that sets the target of reducing energy consumption by 20% by 2020 and the goal of a 27% energy saving in the residential sector (European Council 2006).

The first section of this paper estimates “actual willingness to pay” or “price premium actually paid” for energy efficiency in the dishwasher market using the hedonic price technique. This technique allows us to estimate, *ceteris paribus*, a proxy of what the consumer pays for this single characteristic (represented by A+ label) of the article. We analyse the case of the programme to renew household electrical appliances in Spain<sup>3</sup>. The programme is part of the Energy Saving and Efficiency Action Plan<sup>4</sup> that sets a minimum of €50 as a lump sum subsidy to consumers (both public or private) willing to purchase highly efficient durables, i.e. labelled as class A or higher<sup>5</sup>; some Autonomous Communities have increased this premium to €70-105. The programme starts with an approved budget and it will run

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<sup>2</sup> Council Directive 92/75/EEC of 22 September 1992 on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances.

<sup>3</sup>This programme is held by the Institute for Energy Diversification and Saving (IDEA, Instituto para la Diversificación y el Ahorro Energético) [www.idae.es](http://www.idae.es)

<sup>4</sup> Regulated by Royal Decree 208/2005, 25 February 2005, on electrical appliances and electronic devices and the management of their wastes.

<sup>5</sup> As the programme is run by the Government of each of the Autonomous Communities, the amount of the subsidy can vary from 50 to 75 euro depending on the region analysed.

until a certain date or until the budget is exhausted. Therefore retailers are uncertain about how long the programme will last. The discount is applied by the retailer on the final price at the moment of purchase.

The second part of the study is devoted to the use of two complementary methodologies to obtain information about price and cross elasticities. As this information proves to be crucial for both an optimal design of the policy and to support any fine tuning and revision of the policy outcome, studies need to be considered that can provide reliable estimates of the sensitivity of demand.

There are few studies that deal with elasticities of demand for household durables and only the odd one considers close substitutes such as labelled and non-labelled goods. The methodology presented here seeks to overcome this limitation by providing reliable estimates from limited data. The estimates presented here should provide valuable information to evaluate the current subsidy scheme and design future policy instruments for these and similar goods.

## 2. Data and results

The data analysed in the paper was collected from nineteen different retailers that includes a representative number of large shopping centres, small town-shops and medium-size specialist stores in the three provinces of the Basque Autonomous Community (BAC) in Spain during December 2009. As each Autonomous community manages its own version of the IDAE general programme, the subsidy size varies slightly among regions. Therefore it is reasonable to only focus on one of the markets that are affected by the instruments, in this case the Basque Market. The “Centro para el Ahorro y Desarrollo Energético y Minero” (CADEM) (part of the EVE group) runs the programme locally.

According to our estimates, the coefficient for the variable for energy labels (LAB A+) is 0.156 and significant at the 10% level. **At the market equilibrium price, the presence of the label will increase the price by 15.6% ceteris paribus<sup>6</sup>.**

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<sup>6</sup> It should be noted that the market price of the dishwashers did not change in the years of application as a consequence of the subsidy. We are thus referring to the pre-subsidy prices. At the time of collecting the data, the subsidy programme was not running anymore. The year 2009 can be used as a very good example to understand the rationale of this statement. The subsidy scheme was operative for the first months of the year and was cancelled when the budget was finished. As an exceptional measure, the Government decided to open a second round of subsidies for the second half of the year until very early December. The scheme was again not operative at the time of the data collection in mid- December.

The results indicate **that for an estimated average price of washing machines of €14, the price will go up around €80 for an energy efficient product with A+ label.** Note that while the minimum subsidy regulated by the Royal Decree is €50, the BAC authorities subsidise up to €85. The result of this estimation poses many questions when compared to the subsidy figure as will be discussed later in this paper.

The other statistically significant results all have the expected signs and numerical values that are reasonable and can be consulted in the working paper.

Taking into account that, for policy purposes, the information on price differentials between energy efficient and other dishwasher is useful but not sufficient, or not even the most important factor, the method to obtain price elasticities needs to be further developed. That is, the sensitivity of demand for energy efficient dishwasher with respect to the prices of both energy efficient and other dishwashers, as along with guidance on the cost of supply of energy efficient and other dishwashers.

While there is no alternative to a more detailed supply side analysis, some information on the demand side can be obtained from the work that has been done so far. In this section, we report on the use of a demand system for close substitutes (the so-called Quantity Based Demand System, QBDS, Galarraga and Markandya, 2004) to estimate the own price elasticity for energy efficient dishwashers and the cross price elasticities between energy efficient and other dishwashers for Spain, given the data from the hedonic estimation presented above (see Table 2).

**Table 2. QBDS and LA/AIDS Estimates for Price Elasticities of Demand**

	QBDS		
	cross O/L	own for "L"	cross L/O
<b>Price Elasticity of demand own O/O</b>			
-0.5	0.1	-1.2	0.8
-0.75	0.35	-3.2	2.8
-1	0.6	-5.2	4.8
-1.25	0.85	-7.2	6.8
-1.5	1.1	-9.2	8.8
-1.75	1.35	-11.2	10.8

-2	1.6	-13.2	12.8
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Comparing the results obtained from the LA/AIDS model (Deaton and Muellbauer, 1980) with the ones obtained from the QBDS model, we find that the values estimated are the same. As the values determined for the LA/AIDS are set using the values obtained with the QBDS, this further supports the validity of the methodology.

### 3. Conclusion

Important global environmental problems such as climate change are nowadays driving energy efficiency policies due to the great energy savings targets of authorities worldwide. The EU 20-20-20 energy and climate package is a very good example of ambitious energy saving targets. In this context, energy labelling is also acquiring a major role. Regulated since the early 1990s, it has been growing in importance since 2008 as a useful policy instruments for other policies such as energy taxing or the lump sum subsidy schemes used in Spain.

The paper has proposed a methodology to overcome the two main limitations that handicaps the design of such lump sum subsidy schemes; (a) the lack of long term time series data for labelled goods that would allow for traditional econometric analysis and (b) the intention behaviour gap that poses a great bias in the questionnaire based studies.

The study has allowed us to estimate that when controlling for the rest of the variables, the price premium paid in the market for dishwashers carrying an energy efficient label (A+) is close to 15.6% of the final price. This percentage accounts for around €80.

While the market information suggests that the slightly larger amount should be sufficient to get consumers to switch from non-labelled appliances to labelled ones, the energy efficiency subsidy programme run by CADEM at the BAC pays up to €85 (a minimum of €50 is regulated for Spain as a whole). The first question that arises is whether the subsidy scheme has over-estimated this figure. Most probably because the method used to calculate this subsidy did not account for other characteristics attached to labelled appliances, when the truth is that, labelled appliances usually incorporate advanced equipment and are produced under the most recognised (and therefore expensive) brands in the market.

Other interesting questions could also be raised regarding the fact that these extra €5 could indeed be highly useful to overcome some barriers behind the energy efficiency paradox and to offset the positive externalities attached to less energy consumption. Preliminary information on the CADEM programme as well as the market data collected for this study strongly suggest that the policy has been

extremely successful so far. Nowadays, nearly all of the household appliances sold in the market are labelled A or A+.

Many other policy analysis questions are relevant at this point but much more detailed information is needed to try to answer them.

The information on the price premium has been combined with the Quantity Based Demand System (QBDS) to estimate own price demand elasticities for labelled dishwashers and cross price elasticities of demand for both labelled and non-labelled. The calculations suggest that the demand for labelled appliances is much more elastic than the demand for non-labelled ones. In particular, for an own price elasticity of demand for non-labelled dishwashers ranging from -0.5 to -2, the own price elasticity of demand for labelled appliances varies from -1.2 to -13.2. These results are important for a useful and reliable policy analysis

These results have also been compared with the ones from the well known LA/AIDS model. The fact that the same figures were obtained supports the use of the QBDS (a much less data demanding model) as a robust model for the analysis of close substitutes.

Future work should allow us to produce information on the welfare analysis side; essential for the fine tuning of effective and reliable energy efficiency policies.

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