Promoting energy efficient behaviour: An econometric analysis of the impact of information on household appliance composition regarding energy efficiency

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Overview

Different policies have been implemented in recent years, in order to promote energy efficient behavior. In this paper we evaluate the effect of one such policy that aims at increasing market transparency. Specifically, we investigate the changes in sales of cooling appliances in Denmark (refrigerators, freezers and combinations of these) with respect to their energy efficiency ranking. We use point of sales data with monthly frequencies, collected by GfK. During the time period we are looking at, the label changed from the A-to-G scale, to also include A+ A++ and A+++. Because the scale of the energy efficiency stayed the same (i.e. an A is the same both on the new and the old scale) and data regarding the number of A+, A++ and A+++ sold is available both before and after these categories where implemented in the label, we are able to identify and examine the changes caused by the new labeling scheme, using an empirical time series approach.

Specifically, we look at 5 dates which we expect have had an effect on the number of appliances sold in different energy efficiency categories. In June 2010 it was announced that the new energy efficiency label would be implemented and this would be done in two steps; first with a requirement for the new label to be present in physical stores (November 30, 2011) and then for the new label to be present in printed commercial material (March 30, 2012). Likewise, in March 2014 it was announced that web-based retailers must also provide up-to-date energy efficiency labeling and certain additional information regarding energy efficiency starting January 1, 2015.

Methods

In order to target our research question more precisely, and simplify the analysis, we group energy efficiency rankings into two categories. Thus, we aggregate the 'low energy efficiency' appliances (ranking A and below) and the 'high energy efficiency' appliances (ranking A+, A++ and A+++). In effect, the 'high energy efficiency' group is the sum of appliances with a ranking that is introduced in the new energy efficiency label. Because we aggregate our data in this manner our hypothesis becomes very clear; we expect the high energy efficiency group to increase sales after the new label is introduced, while we expect the opposite for the low energy efficiency group. In Figure 1 the data that the analysis builds on is presented.

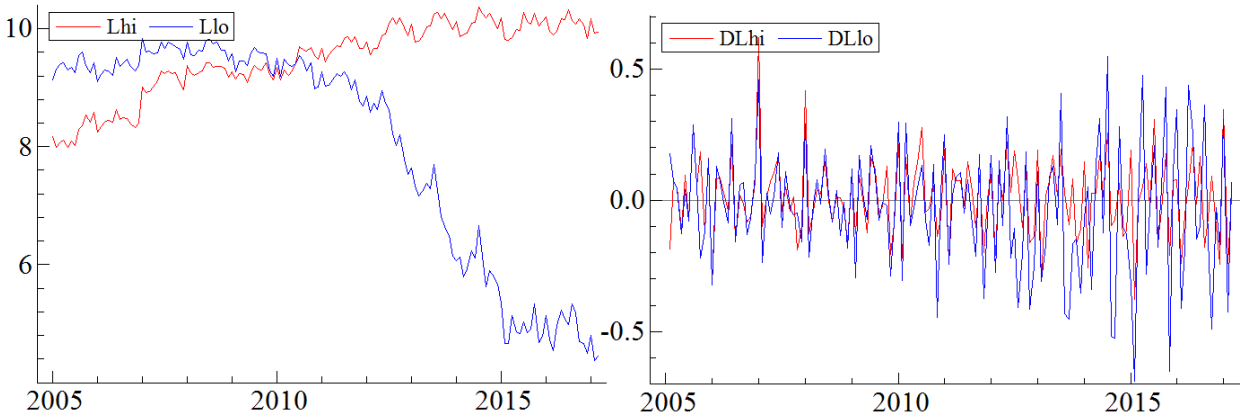

Figure 1: Data in logs and first differences

Since the two time series display dynamic interdependence as well as time persistence we use a vector-auto-regression (VAR) model which allows for cointegration (data is assumed to be I(1), see Figure 1), in order to examine the effect of the new energy efficiency label on both the high energy efficiency group and the low energy efficiency group. In our analysis we are interested in different dates, i.e. we allow for an impact on sales at both the announcement date and the implementation date of the new label. The former supposedly representing a supply side

effect and the latter a demand side effect. To estimate these impacts our econometric model includes level shift dummies that shift at the respective dates. Furthermore, in order to maintain a statistically well-specified model and hence valid statistal inference, we control for other significant events, such as the economic crisis, other policies which are not of direct interest, trends and seasonality.

Our approach allows us to examine changes in long-run relations in the data and attribute these changes to specific time periods. Furthermore, short-run relations are estimated and equilibrium paths are established. To the authors knowledge the VAR model approach is somewhat novel within this literature.

Results

Conditional on the included breaks and trends we find two long-run relations in the data meaning that the vector process is stationary. One relation thus describes the equilibrium level of the low energy efficient appliances and another describing the equilibrium of the high energy efficient appliances. Thus, we are able to interpret the effects of the new energy efficiency label as equilibria shifts on the 'market for low energy efficiency appliances' and the 'market for high energy efficiency appliances', separately.

Table 1: Estimation results

	α_1	α_2		Log(high)	Log(low)	2010-6	2012-4	2006-12	Trend
ΔLog(high)	-0.45	0	β_1'	1	0	-0.399	-0.391	-0.827	0
(t-value)	(-6.0)					(-5.9)	(-6.09)	(-12.0)	0
ΔLog(low)	-0.516	-0.085	β_2'	0	1	0	3.8	0	0.0088
(t-value)	(-4.5)	(-6.3)					(6.7)		(1.3)

Table 1 presents (tentative) estimation results, dates of interest that were not significant in the cointegration relations are included instead as unrestricted impulse dummies. Note that a level shift is included in December 2006, this date is not of direct interest to the analisys but is accounting for other factors influencing the market at this time. We find that both the announcement (2010-6) and the implementation (2012-4) of the new energy efficiency label significantly increases the quantity of high energy efficiency appliances sold. This indicates (tentatively) that the suppliers first react to the announcement by increasing the energy efficient products on the market, perhaps because they expect a change in demand once the label is implemented. However, there is an additional effect once the label is implemented, which can be interpreted as the demand changing more than producers expected, when the policy was announced. Likewise, we find that the demand for low energy efficient appliances decreases significantly only around the implementation date (2012-4).

Conclusions

This paper seeks to examine the effect of increased information regarding energy efficiency on the market for electric appliances in Denmark, using household cooling appliances as the case. We use a novel approach within this literature to thoroughly examine short and long-run effects. The purpose of this research is to evaluate a specific policy and is, in that regard, part of a broad research area developed to understand and give advise on policy effects and effectiveness. We find that the new energy efficiency label has had the expected effect on sales of cooling appliances, i.e. we find a shift away from low energy efficient appliances and towards high energy efficient appliances. In particular, the long-run equilibrium of the sales of both the high energy efficiency appliances and the low energy efficiency appliances undergo significant shifts which can be attributed specific dates related to the new energy efficiency label. Furthermore, we are able to differentiate between the supply side effect, which we argue is present when the new label is announced, and the demand side effecet, which we argue is present when the new label is implemented.