Factors influencing the penetration of energy efficient appliances into national markets in Europe

Abstract

We present the findings of a study prepared for Defra / The market Transformation Programme on the "Factors influencing the penetration of energy efficient electrical appliances into national markets in Europe". The study was finalised in January 2010.
Three main sources of information have been used: market data bought from a specialised marketing company (over 1400 graphs), published and grey literature (70 references), and interviews with key stakeholders (29 interviews).
The study covers seven product categories of domestic appliances bearing the European Energy Label (cold appliances, freezers, washing machines, tumble driers, ovens, dishwashers and air conditioners) and nine European countries, selected for the potential differences they could illustrate: Switzerland (CH), Germany (DE), Denmark (DK), France (FR), United-Kingdom (UK), Italy (IT), the Netherlands (NL), Poland (PL), Portugal (PT).
The considerable volume of information gathered and analyzed shows marked differences between national markets in terms of:

- Market share of efficient appliances and the number of models available for consumers. In summary - high in CH, DE, DK and IT for certain product categories; low in UK and PT
- Purchase price of efficient models: often low in UK and PL; often high in DK, DE and IT
- Electricity prices (purchasing power corrected) – which may be correlated with market shares: high in IT, PL and DE; low in UK and FR

Marked disparities between quantitative and qualitative data have allowed us to develop over 20 hypotheses, which can potentially explain these differences. Influence factors identified relate to energy prices and country structure, the appliance market, consumers' attitudes and policy strategies.

Introduction

This paper presents a study prepared for Defra / The market Transformation Programme on the "*Factors influencing the penetration of energy efficient electrical appliances into national markets in Europe*". The study was finalised in January 2010 [1].

The European market for electrical appliances seems to be governed by a paradox. On the one hand, many elements of the supply chain drive the market towards homogeneity: a few large manufacturing companies are present in all countries and able to supply all countries; products are generally similar from a technical point of view, and the European Energy Label facilitates a standardised approach to energy efficiency labelling throughout Europe. On the other hand, this study reveals very important national differences in terms of the market share and supply strategies for efficient appliances. This paradox can be partly explained by the market structure, which is less international than it initially seems. On the manufacturing side - especially in the white goods sector - sister companies or subsidiaries are often independently managed and, together with retailers, they choose the products they want to sell, influence the marketing of the various brands they manage, and set the price.

Legitimate reasons for national market differences, however, have to be examined through factors specific to each country, such as energy efficiency policies and their enforcement, and electricity prices and purchase price of energy efficient products, as well as cultural anomalies, sensitivities to environmental issues and differences in purchasing power. The European Energy Label has played a crucial role, firstly in forcing manufacturers to recognise the value of energy efficiency and in raising consumers' awareness. But the labelling of appliances *per se* does not seem to be enough to spontaneously shift the market and result in higher market shares for efficient appliances.

The study covers seven product categories of domestic appliances bearing the European Energy Label (light bulbs were excluded because the industry and market structure would have been completely different): Cold appliances, freezers, washing machines, tumble driers, ovens, dishwashers and air conditioners.

Nine European countries were covered, selected for the potential differences they could illustrate in terms of size, regions (Southern, versus Northern Europe, versus Eastern Europe), national product policies (e.g. use of rebates or not), population sensitivity to environmental issues, differences in electricity prices, etc.: Switzerland (CH), Germany (DE), Denmark (DK), France (FR), United-Kingdom (UK), Italy (IT), The Netherlands (NL), Poland (PL), Portugal (PT)

Three main sources of information have been used: market data bought from a specialised marketing company (over 1400 graphs), published and grey literature (70 references), and interviews with key stakeholders (29 interviews). (See the study for detailed definitions of products and sources, mainly GfK and EFA for CH and recognised journals for publications).

The study consists of three main sections and two appendices

- Market share of efficient appliances: Efficiency class distribution of the appliances between 2005 and 2009 for the nine countries covered by the study, country-by-country comparison of sales distribution and diversity of efficient appliance offerings across different markets.
- Influencing factors: Twenty-eight identified factors influencing the penetration of energy efficient appliances into national markets were identified in the research phase (barrier factors and supportive factors). Each factor's effects are described, the evidence presented and short policy recommendations are made. Results from interviews largely helped to determine the influencing factors.
- Policy instruments: Seventeen different policy instruments aimed at increasing market share of energy efficient domestic appliances are presented. A description and overview of their implementation in each of the relevant countries is provided for each instrument, and pros and cons are discussed, based on findings from interviews and, more significantly, from the literature review.
- Appendix A contains a country comparison matrix. It provides an overview of the main contextual elements, product and price anomalies across all product categories covered as well as existing policy instruments across all studied countries and in the EU.
- Appendix B presents a list of nearly 70 references and links to relevant country-specific and European websites.

Striking differences between national market developments

Table 1 shows estimates of maximum savings potential (per unit) when inefficient appliances are replaced with very efficient ones. The table shows, for example, that replacing cooling appliances (A++ instead of B) leads to large savings (2550 kWh per appliance over 10 years); while virtually no savings are currently likely with dishwashers, as nearly all models are of similar efficiency.

Appliance Category	Criteria	Efficient kWh/a	Inefficient kWh/a	Potential kWh over 10 years
Cold appliances	A++ versus B	170	425	2 550
Ovens and cookers	A versus B	115	143	280
Dishwashers	A versus A	260	260	0
Washing machines	A+ versus B	170	230	400
Driers	A versus C	320	640	3 200
Air conditioners	A versus D	500	615	1 150

Table 1 - Rough estimation of maximum savings potential per unit[1]

Keeping these orders of magnitude in mind, the graphs provided below show there is still room for national context and policies to influence markets. Although the nine countries studied are governed

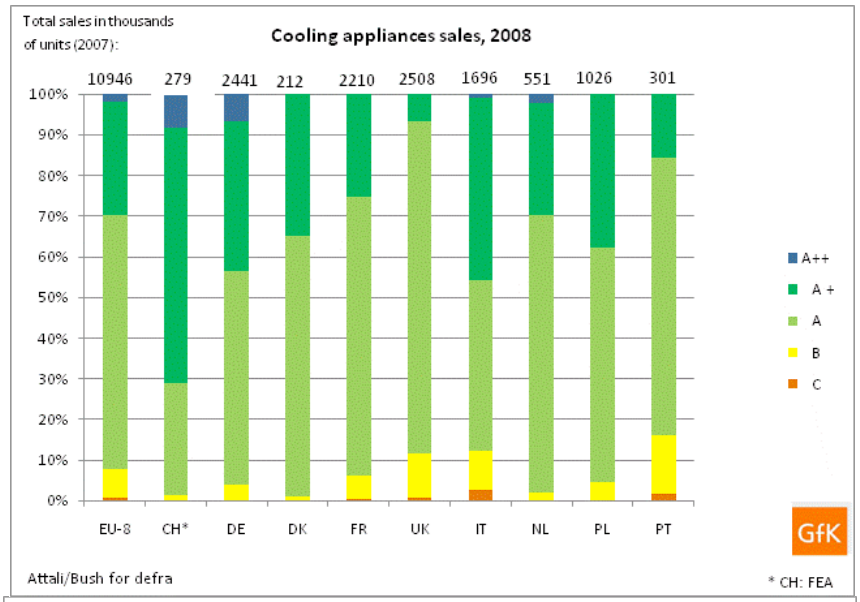
[1] The table shows electricity consumption of very efficient appliances (according to energy label and www.topten.info), of inefficient appliances (according to energy label) per year and the difference between them during their (assumed) life cycle of 10 years (in 2009).

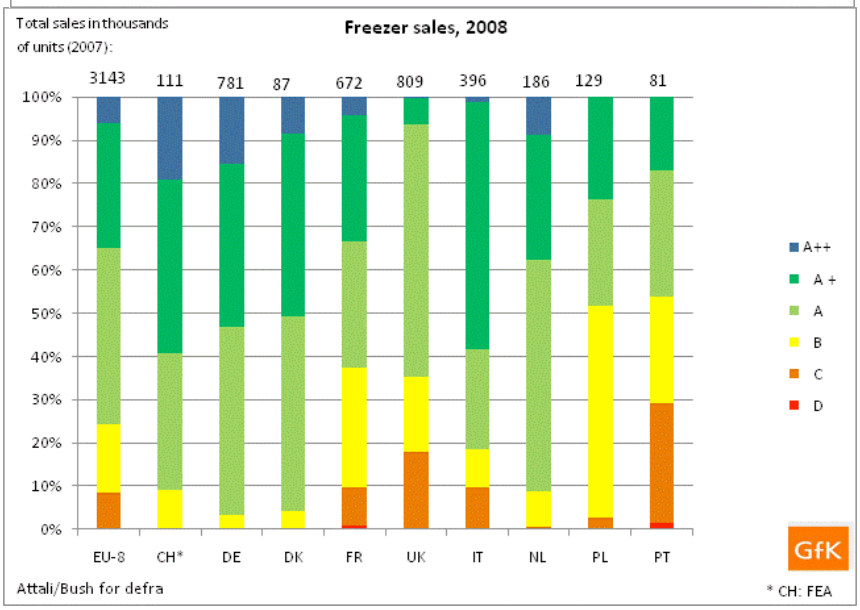
by the same basic legislation on energy labelling and minimum energy performance standards, and are supplied by the same manufacturers, there are marked national differences in the market share of efficient models across all product categories.

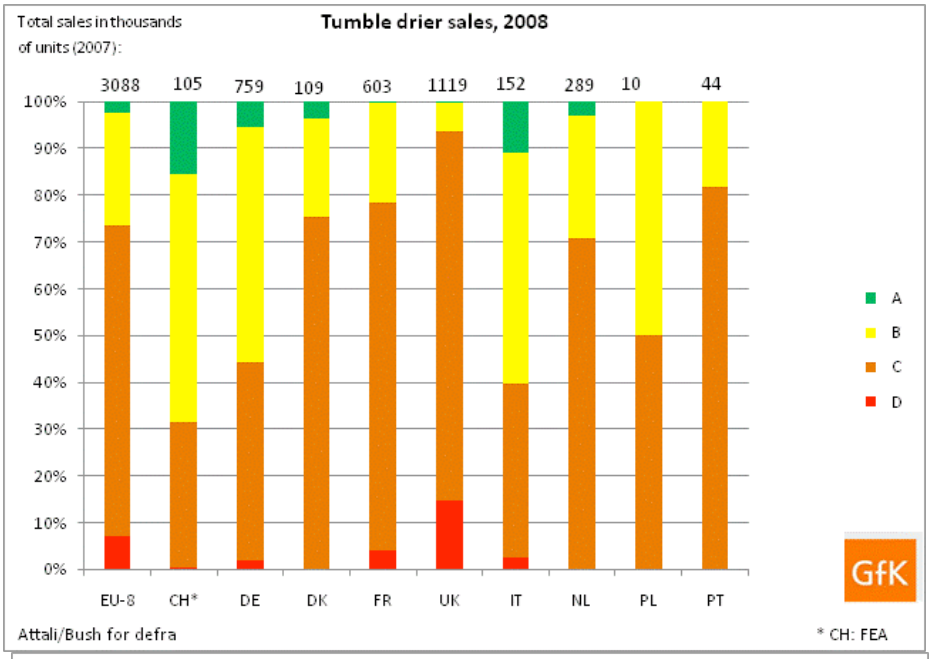
The full study shows specific examples illustrating differences between countries in terms of market penetration of efficient models, and market developments between 2004 and 2008, but the graphs below show the sales' share for 2008 (10 months, from January to October). For the comparisons between countries, the numbers given are those of 2007, the last year for which full data was available

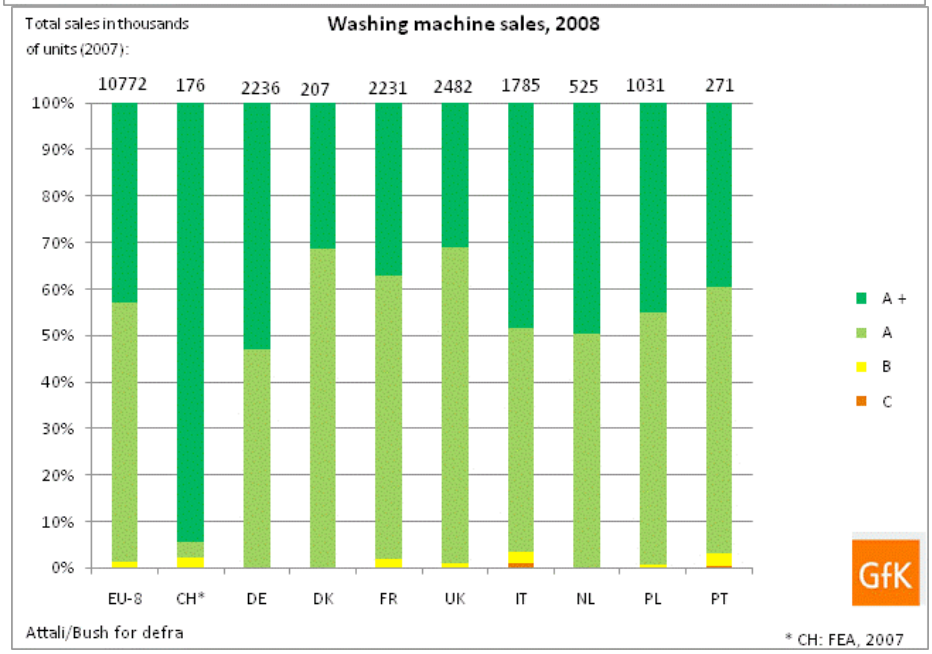
Many comments can be deduced from these graphs. We just mean to show differences on the common European market, for example that:

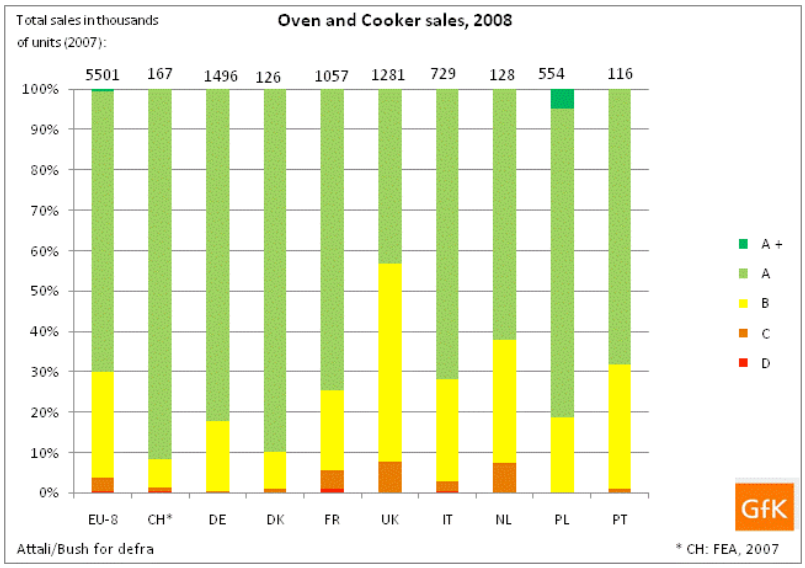
- For cooling appliances, UK has a market share of A+ models of less than 10% whereas it reaches round 45% in IT and DE
- For freezers, A++ models are present on the market, with up to 10 and 20% market share in DK and CH, whereas they are totally absent from other national markets
- Same situation for driers, where the A class is present in some countries (15% in CH, 5% in DE) and absent from others
- For washing machines and ovens, the market is more homogeneous, however showing a market share of 95% for A+ washing machines models in CH compared to 35% in France or 30% in the UK, and whereas many countries show more than 60% A models for ovens, UK shows only around 45%
- For air conditioners, hot climate Portugal has a lower market share of class-A models than cooler Germany











Note: A+ cookers do not actually exist. The reference to A+ models above reflects a misuse of the energy label by one manufacturer in Poland.

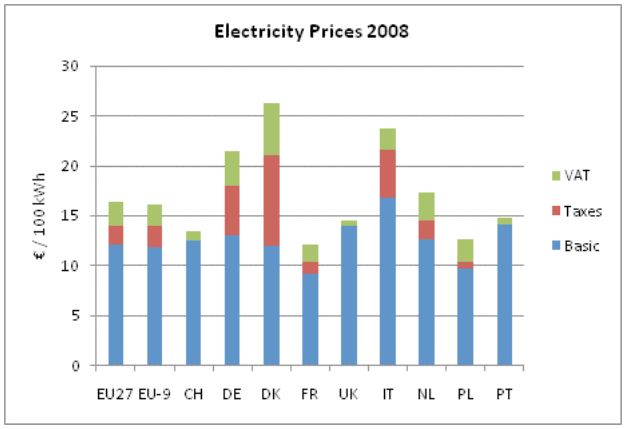
Dishwashers are currently an exception, because as nearly all products are A-labelled, there is no information about national differences available.

Factors influencing the penetration of efficient appliances on national markets

Marked disparities between quantitative and qualitative data have allowed us to develop over 20 hypotheses which can potentially explain the fact that there are differences on national markets even though legislative background and the suppliers are the same all over Europe. These factors have been identified and classified according to the following themes: energy prices and country structure; the appliance market, consumers' attitudes and policy. They are briefly presented hereafter with some illustrating graphs.

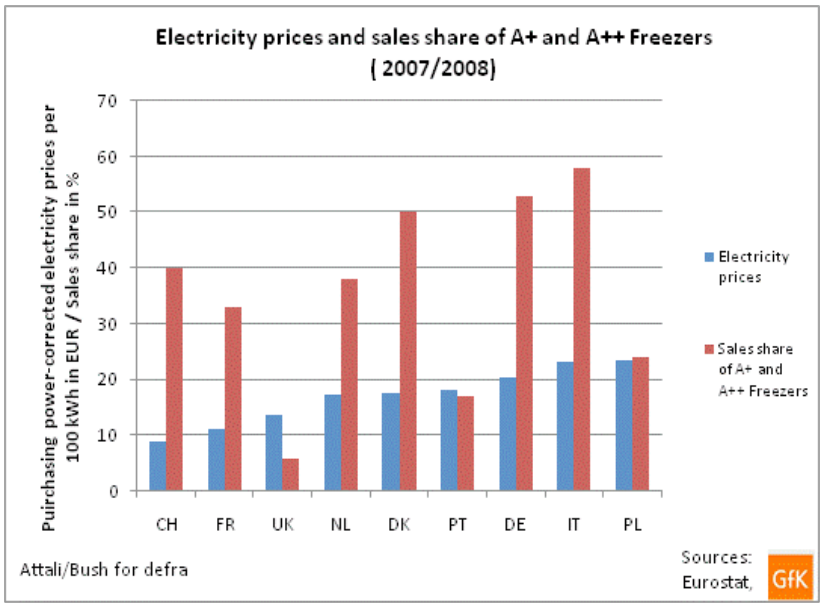
Factors relating to **energy prices** and **country structure** include:

- Electricity tariffs and their structure, impacting both consumers' and utility companies' perceptions of the economic value of energy efficient appliances;
- The presence of institutions that have a mandate to promote energy efficiency and thus promote efficient appliances;
- The existence of large-scale buyers able to influence the market;
- The impact of the size of the country, which determines the number of stakeholders and creates possible difficulties with control mechanisms within large territories.



For example, electricity prices vary by a factor of two between countries. Market shares of efficient products are correlated to a certain extent (see DK, IT and DE).

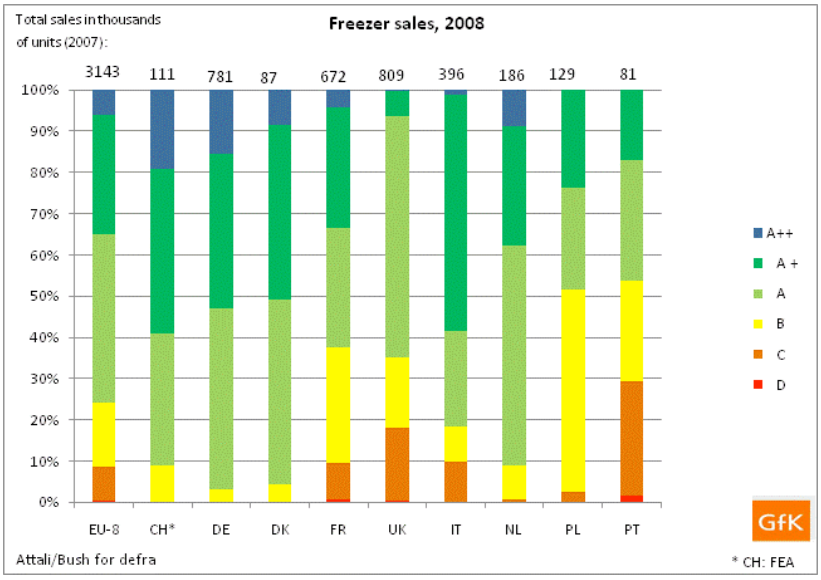
(Sources: For EU: Eurostat 1st sem. 2008 (IT 2nd sem. 2007), CH: http://strompreise.preisueberwacher.ch)

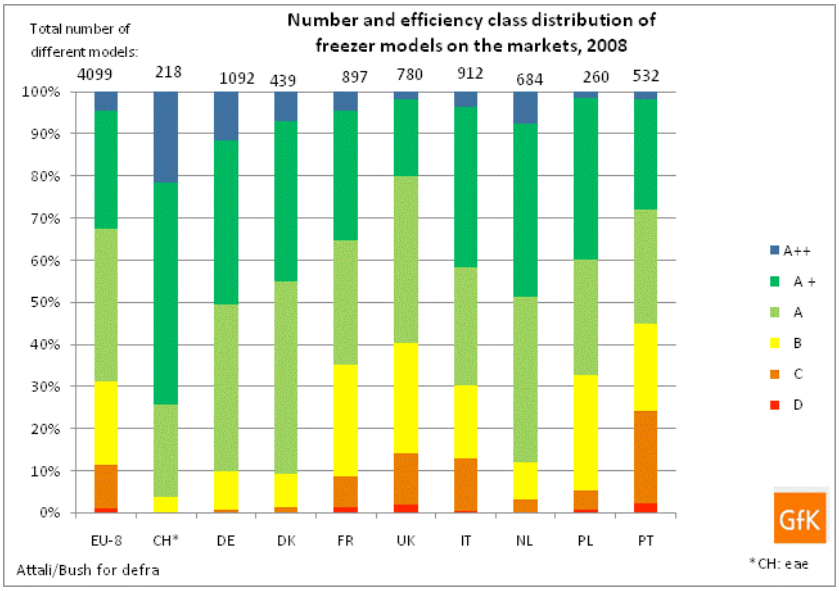


Factors relating to **the appliance market** include:

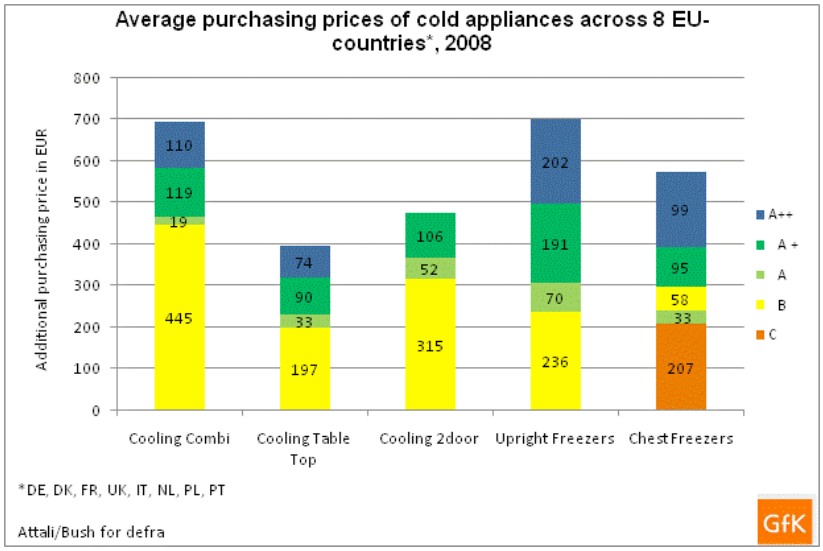
- The type of market – are retailers looking for greater margins and therefore trying to sell efficient models, or are they focused on volume and low-end products? Is the market particularly challenging because of fierce price competition?;
- The range or diversity providing enough/not enough choice to consumers;
- Purchasing prices which are a clear barrier to the wide take-up of energy efficient models. Both the relatively high prices of energy efficient models and low average prices in general (low prices tending to denigrate the offer and increase the focus on price) can be barriers;
- The structure of the retail sector (few powerful players versus more numerous smaller retailers) and business models between retailers and manufacturers (range selection, pricing, commission) – which impact on the policies designed to promote efficient appliances.

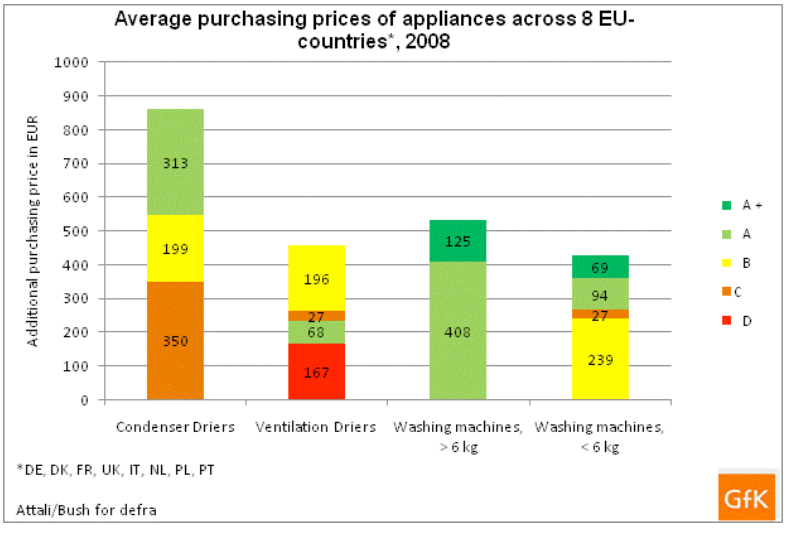
For example, for efficient models: less choice leads to less sales. Even though data regarding products numbers should be read with caution (commercial reference tracking is not an easy task), the next 2 graphs on sales figures and model availability show a certain correlation: it is obvious that consumers cannot buy what is not offered, but it is also true that, in general, energy efficient models sell more if the in-store range is large (within A+ and A++ classes).



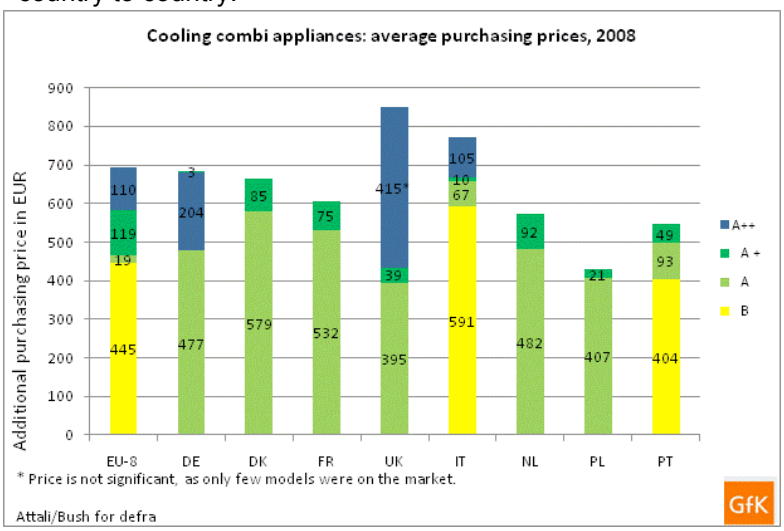


Another example concerns the price of efficient appliances: they are more expensive, even if there are strong variations between countries. In the next two graphs, each bar represents the average price of given appliances for selected countries. For each product, the additional expenses needed to go from one energy class to another is indicated (e.g. in average, for cooling combi which cost 700 € in 2008, there is a 19 € difference between class B and class A, 119 € difference between class A and class A+ and 110 Euros between class A+ and class A++).

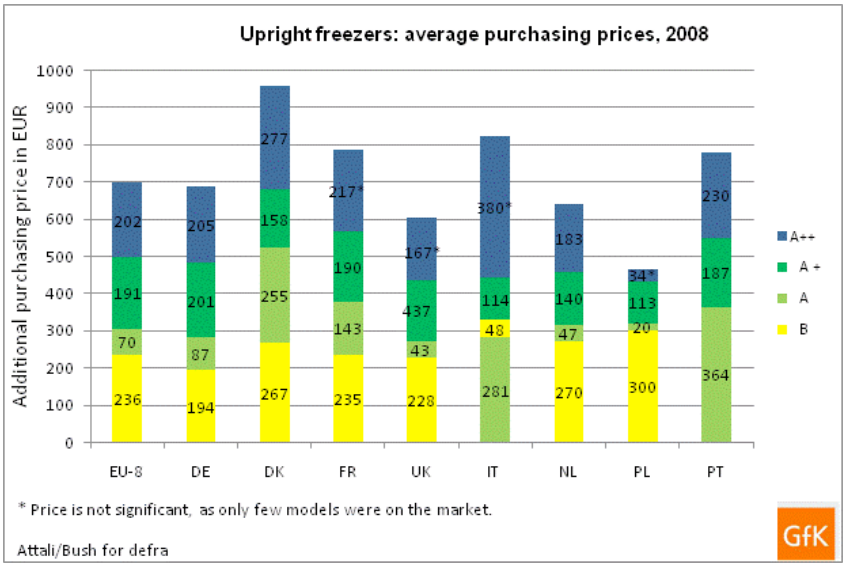




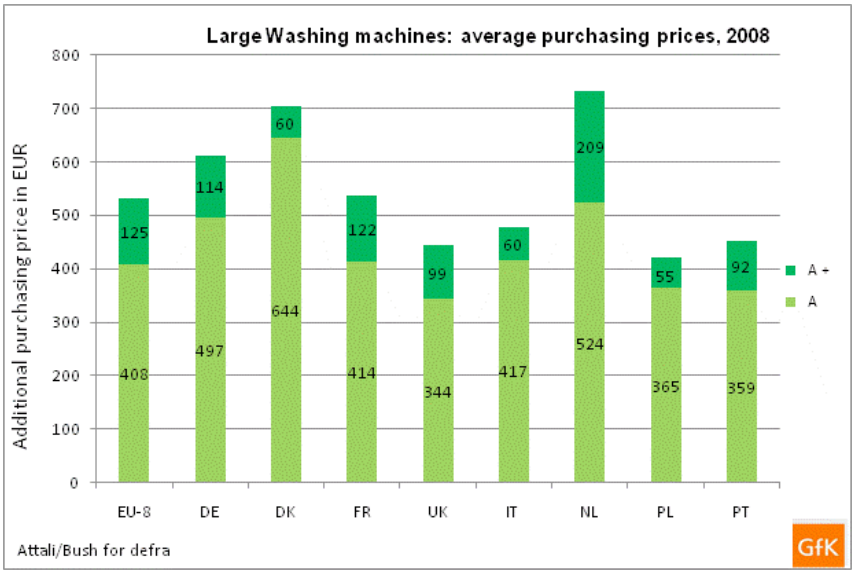
Additional purchase prices for high-efficiency cold appliances (A+ and A++) differ strongly from country to country.



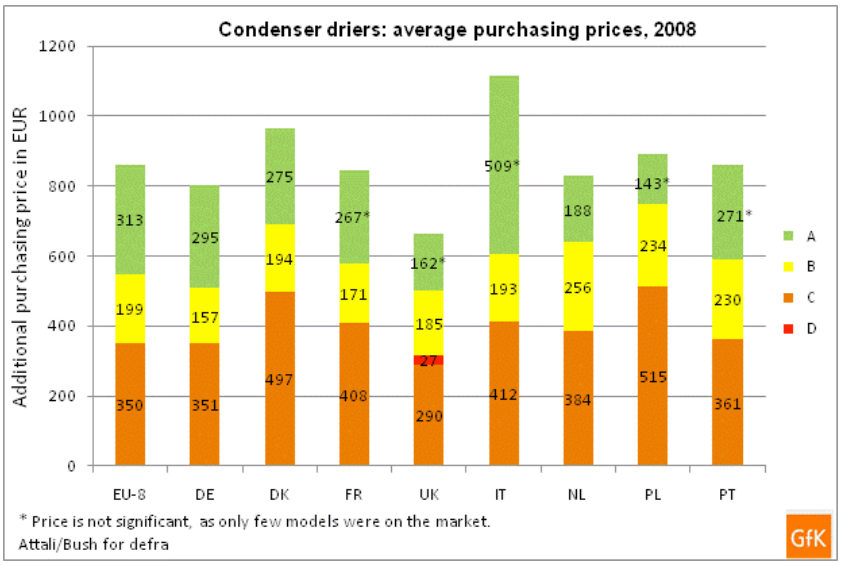
For freezers, price differences between countries are striking. The additional price for A++ is very high.



For washing machines, the striking price difference might be due to different performance levels in different countries, especially with regard to the spinning efficiency.



The (still) relatively high purchase price of heat pump driers slows down the breakthrough of profitable energy savings over the life cycle.

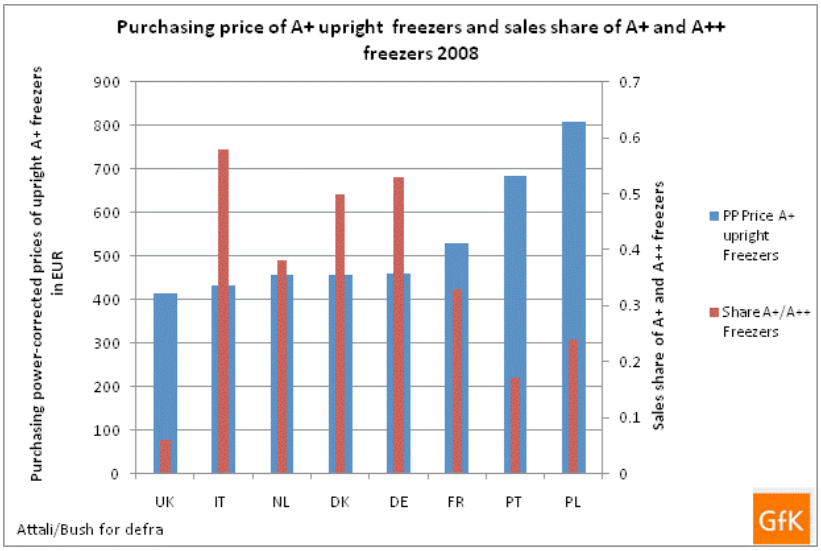


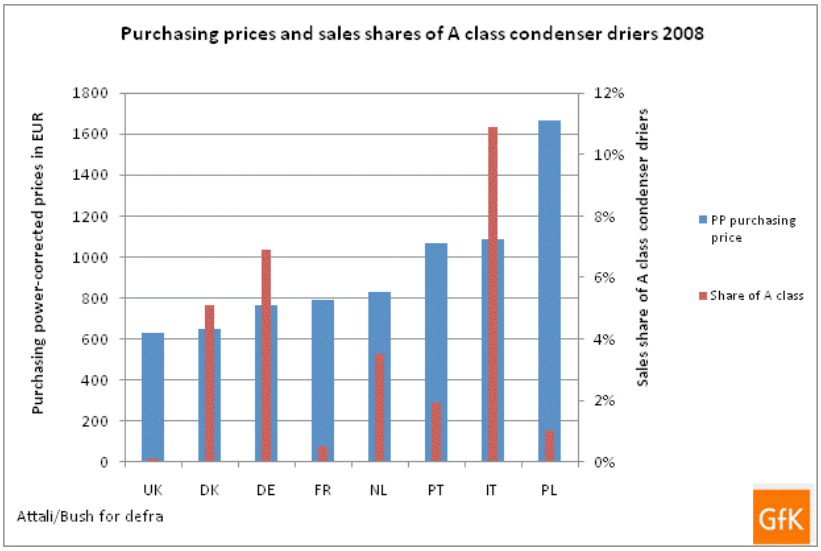
Factors relating to **consumers' attitudes** include:

- Consumers' sensitivity to environmental issues, which can make them well-disposed towards energy efficient models;
- Their desire for brands and trusted products which may (or may not) be particularly energy efficient;
- Their focus on purchase price which can override any other sales promotions and can encourage retailers and manufacturers to enter a downward spiral of low purchasing prices;
- Their level of awareness of energy issues in general and the European Energy Label in particular – the penetration of efficient models being greater when consumers know about the label and relate domestic appliances to energy consumption, lower energy bills and wider issues such as climate change.

For example, attitude towards purchase price is not sufficient to explain market shares of efficient models. Price is always important to consumers but in some countries consumers focus on quality and brand, and only then look for competitive prices (e.g. CH and DE). In other countries, price is the

primary criteria but other criteria are also considered (e.g. FR, IT) and for some countries, it is difficult to develop marketing strategies other than by focusing on the purchase price (e.g. UK and PT).





Factors relating to **policy** include:

- Market transparency and the enforcement of regulations – which have an impact on market stakeholders' behaviour;
- The availability of regular national and European market analysis, covering both sales data and detailed market operations – which could positively influence policy design;
- The general context in which the policies are designed: whether background regulation encourages (or discourages) energy efficiency measures; the time frames within which decisions are taken; stakeholders' involvement, and the current economic crisis.

While no single factor can fully explain the reasons for market differences between countries, all have an impact on the policies that address product efficiency.

Policy instruments relating to efficient appliances

The study has also identified 17 policy instruments which are used (or where the use of which is under discussion) to reform the various domestic appliance markets. These instruments are classified in four main group, described and discussed in the study:

- **Regulatory measures**
  - Informative labels;
  - Minimum energy performance standards (MEPS);
  - Enforcement activities – product testing and correct labelling in shops;
  - Taxes on electricity prices;
  - Energy saving and CO_2 reduction obligations on energy suppliers
- **Financial incentives**
  - Subsidies targeting consumers, retailers, manufacturers;
  - Support for Research and Development;
  - Other types of subsidies
- **Voluntary measures**
  - Endorsement labels;
  - Information campaigns;
  - Voluntary agreements and programmes;
  - Voluntary target programmes;
  - Training campaigns
- **Other instruments**
  - Data and market analysis;
  - Public procurement;
  - Technology and cooperative procurement;
  - Identification of most efficient products.

Again, no single policy instrument can be described as fully determinant regarding the penetration of efficient appliances on the market, because each of them have pros and cons, and for each of them success is very much linked to their detailed design.

However, the nine countries studied have all implemented different strategies:

- In Denmark and United Kingdom, an explicit product strategy is applied with a comprehensive approach, covering all aspects from market research, to regulation enforcement, national endorsement label, voluntary programmes, etc.
- In France, Germany, Italy, the Netherlands and Switzerland, governments implement many activities but not necessarily within a comprehensive framework.
- In Poland and Portugal, fewer measures are implemented, and/or the scope seems to be more limited.

Conclusion

Sales data are of crucial importance at a national but also at a European level, in order to compare and effectively monitor markets and policies. They show that energy efficient models have very different market shares in the various countries, even when strategies to promote efficient models are similar (policies, training for retailers, information to consumers, etc.). This suggests that contextual factors are of crucial importance: different tax systems, different electricity prices, different stimuli for energy saving, different consumer cultures regarding product preference, sensitivity to environmental issues, etc. Therefore, success also seems to depend on combinations of policy instruments - combinations which should be chosen carefully and tailored to the factors influencing each national market.

Appendix 1 – Details on collected data and definitions

For the EU-countries, GfK[2]-sales data on major domestic appliances covered by the European Energy Label for the years 2004 – 2008 was obtained. For Switzerland, sales data was separately

[2] www.gfk.com

researched from FEA and eae[3]. More than 1 400 GfK-graphs were analysed in the framework of this study. The seven product categories cover the following sub-categories:

1. Cooling (also known as "cold") appliances
    - "1 door": refrigerators with one external door, possibly including a small freezer compartment.
    - "2 door": fridge/freezers with two external doors, with a relatively small freezer compartment on top of the larger refrigerator.
    - "Combi": fridge/freezers with two or more external doors, with a rather large freezer compartment at the bottom and a cooling compartment of equal or larger size on top of it. Usually these appliances have one compressor, but can also have two compressors.
    - "Table top": small 1 door refrigerators which can be put under a shelf. They might also have a small freezer compartment inside.
    - "US-Style": large-volume fridge/freezers with two vertical doors, the freezer compartment possibly being narrower than the cooling compartment.
2. Freezers: Upright freezers and Chest freezers
3. Washing machines (also known as "wet" appliances): Small washing machines[4]: for less than 6 kg of laundry and Large washing machines[5]: for 6 kg of laundry or more.
4. Tumble driers
    - Condenser driers: condenser driers condense the humid air, collecting the water.
    - Ventilation (or evacuation) driers: these driers channel the humid air outdoors.
5. Ovens and Cookers
    - Ovens: baking appliances, without hotplates
    - Cookers: one appliance containing hotplates and an oven. The energy label however refers to the oven only.
6. Dishwashers (also known as "wet" appliances): Small dishwashers[6]: for less than 12 place settings and Large dishwashers[6]: for 12 or more place settings.
7. Air conditioners: Mobile air conditioners: air conditioners in one piece and Split air conditioners: with external compressor.

In relation to the literature review, almost 70 published articles covering energy efficient appliances have been examined. Most of the literature was found in major, well regarded energy journals and books, proceedings of targeted conferences (eceee and EEDAL) and pieces of grey literature. The focus was on literature from Europe in order to cover policy instruments applied in Europe, but some more international sources have also been used. As the topic of domestic appliances in Europe is quite specialised, many sources were only of partial relevance. Some sources were not used because their content was outdated.

29 qualitative interviews have been conducted with policy officers, experts and different market stakeholders, between mid January and mid March 2009. 20 of these experts were interviewed face-to-face, and nine by phone. 14 interviews were held with policy officers from government and administration, six with experts from the manufacturing industry[7], four with researchers, three with retailers and two with NGO experts. The interviewees represent all countries covered by the study: CH (1), DE (2), DK (4), FR (2), UK (5), IT (6), NL (1), PL (3), PT (3), International (2).

Reference

[3] Fachverband Elektoapparate Haushalt und Gewerbe Schweiz (FEA), 2007 and energie agentur elektrogeräte (eae)

[4] This is a marketing definition, different from the technical classification of washing machine sizes: from a technical point of view, small washing machines would cover 4kg of laundry or less, normal size machines 5 – 7 kg and large washing machines 8 - 10 kg.

[5] This is a marketing definition, dishwashers for 12 place settings are generally considered of "normal" size.

[6] The wording "Manufacturer" in this study covers both producers and importers.

[1] Factors influencing the penetration of energy efficient electrical appliances into national markets in Europe, a report for Defra / MTP prepared by SOWATT (Sophie Attali) and Bush Energie (Eric Bush & Anette Michel), http://efficient-products.defra.gov.uk/cms/library-publications/