

## The usefulness of sales data to understand energy stakes for appliances

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### Abstract

Knowing the market is key for deciding on energy label classes' thresholds, minimum energy performance standards (MEPS) and revisions of these policies. The EPREL database has started to operate but in the absence of sales data, will it fulfil one of its purpose, i.e. to provide the Commission with up-to-date energy efficiency information for products for reviewing energy labels?

Our paper demonstrates the potential of systematic market monitoring based on sales data. In a report published in March 2021, updating a previous report published in 2017, comprehensive sales data from GfK is analysed for refrigerators, washing machines and tumble driers. The data covers the years 2004 – 2019 and the national markets of France, Germany, Italy, and for the whole EU market. It includes information on sales per energy efficiency class, average energy consumption, size and price.

The results show that the efficiency of refrigerators has improved by 40% since 2004. The energy consumption, however, has decreased less than that. For washing machines, large drums confirm their popularity, in part because high efficiency is strongly linked to large drums. Considering the low efficiency of small partial loads, the calculated energy and cost savings are up for discussion. Heat pump tumble driers have continued to extend their popularity among consumers: this energy-efficient technology made up nearly 60% of all drier sales in the EU in 2019. On national markets, their sales share can be even higher. A ban of non-heat-pump models could save Europe around 8 TWh per year. The results further show large differences between national markets – even though the same regulatory framework applies in all EU Member States, and the same international manufacturers dominate most markets.

### 1. Regular monitoring of the market would be of great benefit to Europe

Energy labels and minimum energy performance standards (MEPS) for energy-related products are crucial policy measures that accompany the ongoing market transformation towards increased energy efficiency and reduced energy consumption. Appropriate thresholds for energy label classes and their link to MEPS thresholds are essential for the effectiveness of these instruments. When most models are already in the best class of the label and MEPS levels are undemanding, innovations can be delayed. This was the case for example for washing machines in Europe between 2013 and 2020.

Ambitious energy performance classes, for which there are no products yet (but presumably are technically achievable in the medium term), stimulate the market ("market pull"), and demanding MEPS levels raise the efficiency level of the least efficient appliances ("market push"). Together, these two policy tools ensure continuous performance improvement (see the example of refrigerators in the previous market monitoring report ([1] Michel, Attali, Bush, 2016).

In order to define effective policy and programme measures, it is essential to understand the market - what products are being purchased and what are their characteristics, including energy performance. Indeed, understanding the market gives policy makers the ability to make informed decisions about the optimal level of new MEPS and energy class thresholds on labels, and how to plan for them. If sales data are available over a long period of time, it is possible to develop statistical models of the installed base to estimate trends in energy consumption and other parameters ([2] Attali, Bush, 2013). These models can be used to assess past savings from previous measures, but also to estimate future savings from proposed new policies (see the Australian example for refrigerators: ([3] Harrington, Lane, 2010).

Many developed countries and emerging economies have a market monitoring system for products labelled or regulated by MEPS or energy labels. It is based either on sales figures obtained from specialised companies or manufacturers, or on information on models placed on the market, which must be registered in a database ([4] Michel, Attali, Bush, 2014). In the past, Australia even used its register with the detailed characteristics of each model to cross-match with model sales data ([5] Michel, Harrington, 2015). To date, Europe does not regularly monitor the market with sales data ([2] Attali, Bush, 2013). When the European Commission needs information about markets and products in order to establish future regulations, the available data are compiled by consultants during preparatory studies or impact assessments. The problem with this data, which is often provided by industry, is that it is incomplete, often outdated and cannot be compared over time or between countries. Without sufficient information on real market trends, it is difficult for European policy makers to launch timely policy revisions and to set label classes and MEPS levels at an optimal level.

The latest framework regulation on product labelling (EC, 2017/1369) has foreseen the creation of a database for products covered by the energy label: suppliers - be they manufacturers or distributors - have to register all products placed on the European market with their technical data but also documents useful for market control authorities (who have restricted and specific access for these elements that are not public).

This database - "EPREL - European Product Database for Energy Labelling" - has three official objectives:

- support the market surveillance authorities in the performance of their tasks
- provide the public with information on products placed on the market and their energy labels, as well as product information sheets
- provide the Commission with up-to-date information on the energy efficiency of products for the review of energy labels

Although the process of creating the database has been delayed, EPREL is now operational. However, it can be observed that, while market surveillance authorities will indeed be able to rely on EPREL for part of their work, it is unlikely that the other two objectives will be achieved (or at least without substantial change, or the development of additional digital tools). Indeed, as it has been constructed, EPREL does not allow the user to know if appliances are really on the market, or if they are still on the market, and on which national market they are available - the "European consumer" is in fact "national" and it will be impossible for a French consumer, for example, to filter the offer available in his country. As sales data is not collected, even in aggregate, EPREL will not provide a sound basis for reviewing regulations (international experience shows, for example, that even for databases that charge for registration of each device, a significant percentage of models are never sold ([6] Michel, Jones 2015).

Sales data, as presented in this report, is therefore an essential complement to the information provided by the EPREL database. It will be several months before EPREL produces full analyses, but the sales data can be purchased now.

## **2. Market monitoring study**

ADEME (French Agency for Ecological transition) regularly funds studies on white goods market monitoring, demonstrating the value of systematic market monitoring, based on robust sales data (recent, complete and consistent over time). This paper presents the latest study (published in March 2021), i.e. the results of the analyses for refrigerators, washing machines and dryers in Europe as a whole as well as France, Germany and Italy, for the period 2004-2019.

After introducing the methodology and data structure, a summary of the results is presented, first per product, and then per country. In order to bring as much information as possible in this paper which length is limited, and since it is interesting to underline the cross references between the 2 types of results (showing differences depending on products and differences hiding behind the European averages), the figures have been grouped.

## 2.1 Data and Methodology

The authors acquired sales data for domestic refrigerators, washing machines and tumble dryers from GfK. GfK is a leading market research company operating in many countries around the world. In Europe, GfK monitors around 90% of the white goods markets and the 27 Member States (23 for tumble dryers) plus the UK. Sales data and many product characteristics are obtained by GfK from retailers.

For this study, GfK provided for each energy efficiency class (A++ to G<sup>1</sup>) the sales, the sales-weighted average energy consumption, the size and for washing machines, the water consumption, and the average prices. This information is based on declarations made according to the energy label regulations, with the exception of product prices. The data is aggregated and does not contain information on brands or models. These aggregated data have been acquired for the EU-21<sup>2</sup>, as well as at national level for France, Germany and Italy. The years covered are 2004 to 2019.

## 2.2 Taking the economic situation into account

The sale of consumer products and their prices can be strongly influenced by the economic situation. When interpreting the data, readers should bear in mind that within the period covered in the study, 2004 - 2019, there have been periods of financial and economic turmoil in Europe. Countries have been hit at different times, and not always with the same intensity. Purchasing power, which is specific to each country, has also changed over time. These variations are not reflected in the EU averages, although a general decline in sales can be observed between 2008 and 2010. The study covers the period up to 2019, the last year with available data. The impact of COVID-19 and the subsequent recession are therefore not visible in the analysis.

# 3. Results and discussion

## 3.1 The European market

Over the last 15 years, the markets for refrigerators, washing machines and tumble dryers have become more energy efficient, in terms of the distribution of sales according to energy label classes. The speed at which energy efficiency is improving has slowed down in recent years. These changes can be interpreted differently for the three product categories.

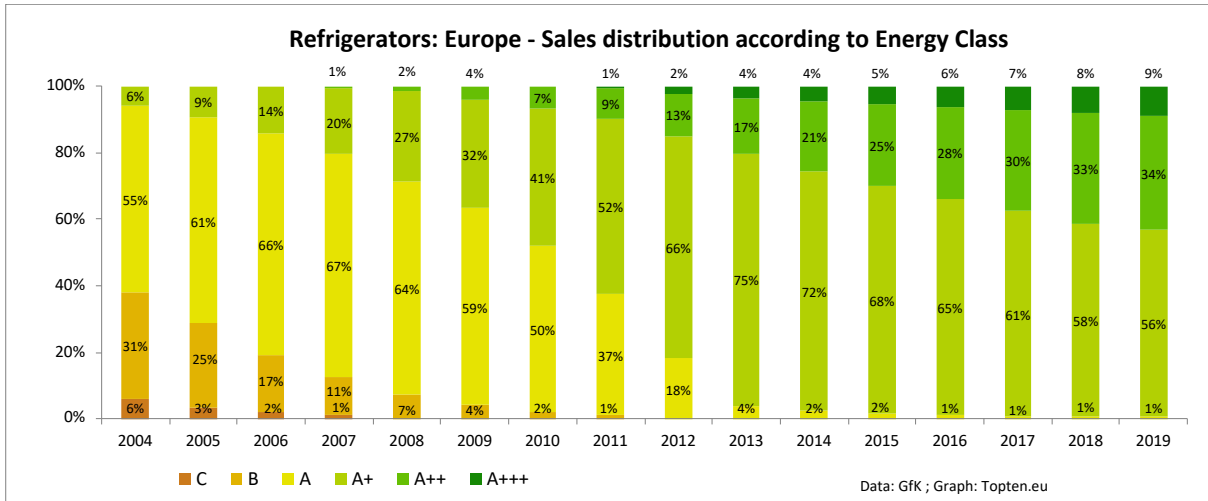
### 3.1.1 Refrigerators

The European refrigerator market has steadily improved in terms of energy efficiency between 2004 and 2019. During that period, the average energy consumption fell by 27% despite a remarkable increase in unit volume of around 9%. In France, the market shares of very energy efficient refrigerators are lower than for the European average; in Germany and Italy, on the contrary, efficient refrigerators are sold more than the European average (8.9% of sales in A+++ in 2019 in Europe, 19.7% in Germany, 12.2% in Italy and only 1.9% in France). Italy has the highest reported average energy consumption, as Italians prefer relatively large and less efficient refrigerators. The Germans, on the other hand, prefer smaller, more efficient refrigerators, with lower energy consumption. New, more demanding MEPS apply since March 2021, as well as a new energy label with an A to G scale and more stringent thresholds. The European Commission estimates that these measures will generate savings of 10 TWh of electricity per year in 2030.

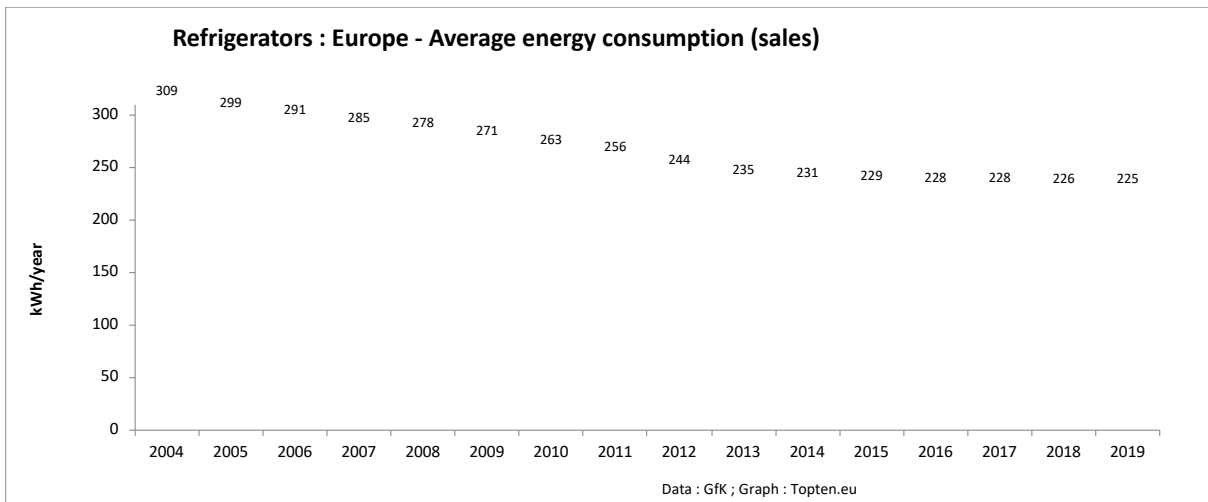
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<sup>1</sup> For refrigerators and washing machines, the label classes analysed in this paper are based on label previous to 2021

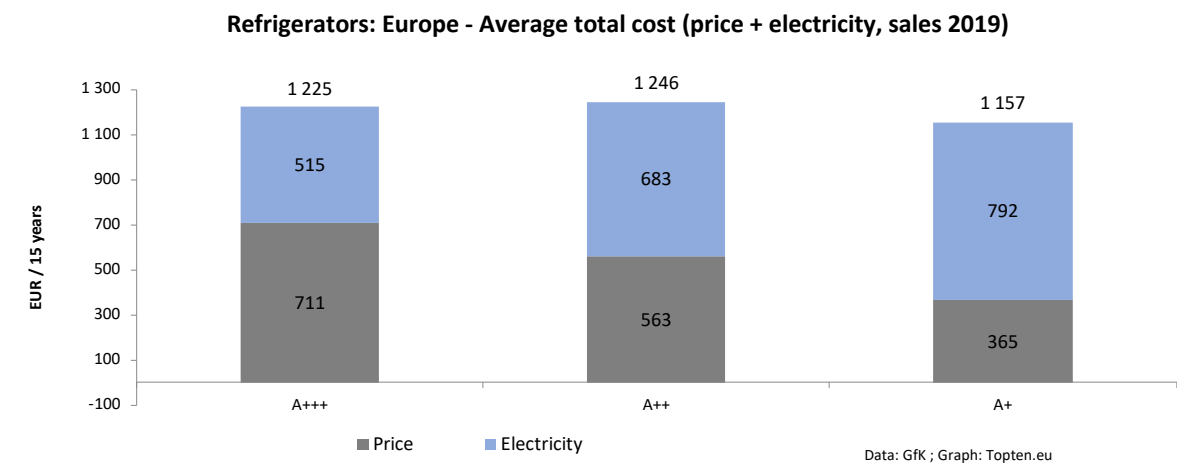
<sup>2</sup> Only countries covered by GfK since 2004 were taken into account: AT, BE, CZ, DE, DK, ES, FI, FR, GB, GR, HR, HU, IE, IT, NL, PL, PT, RO, SE, SI, SK



**Figure 1 - Refrigerators: 40% improvement of the Energy Efficiency Index**



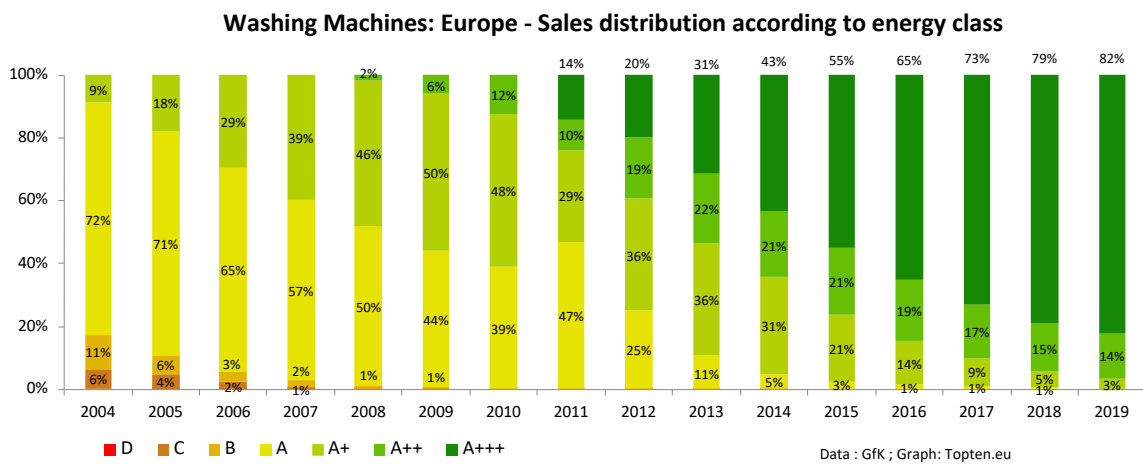
**Figure 2 - Refrigerators: 27% improvement, i.e. reduction of kWh**



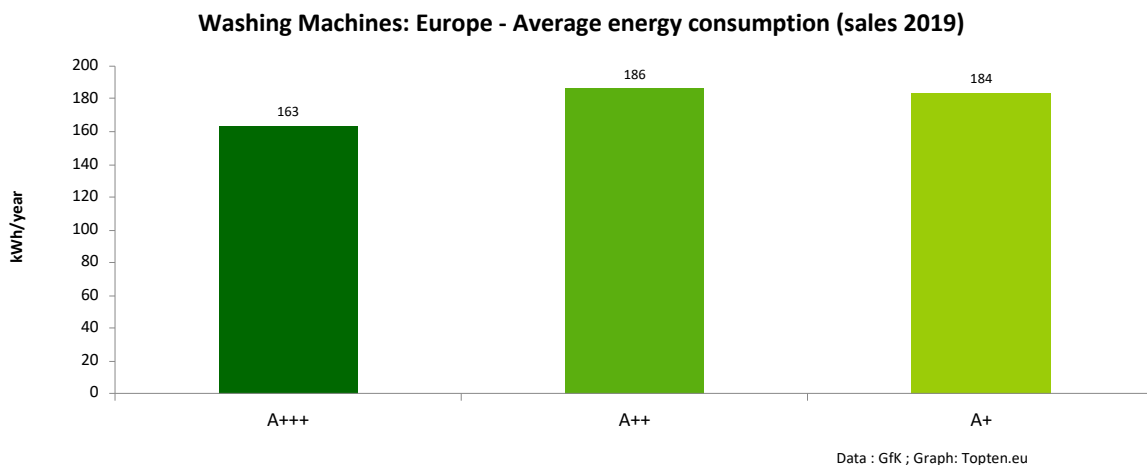
**Figure 3 - Refrigerators' efficiency: always good for the planet, may be neutral for the wallet**

### 3.1.2 Washing machines

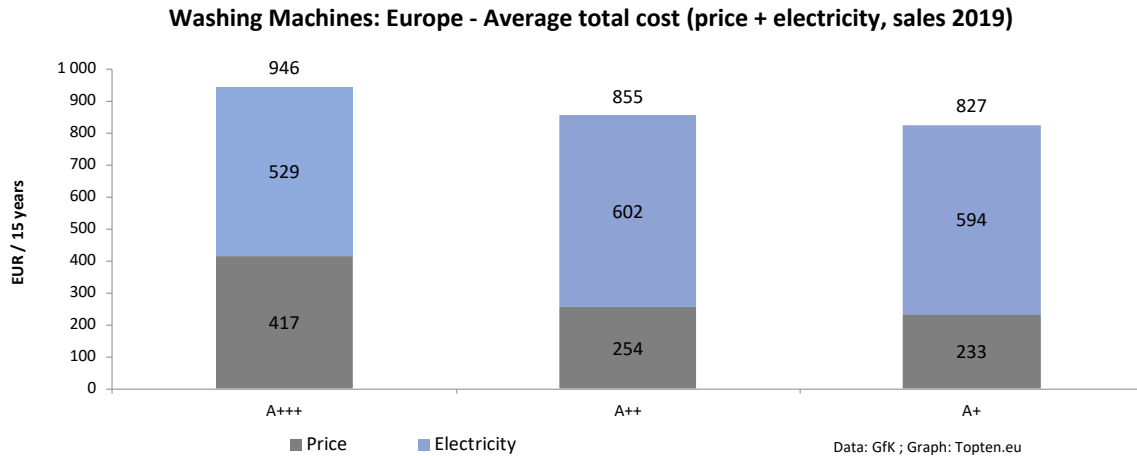
For washing machines, the highest energy efficiency classes have been very well accepted by the market since the introduction of a revised energy label in 2013: A+++ models represent 81.5% of sales in Europe in 2019, with differences between European countries: 70.5% of models sold in France are A+++ ; 81.4% in Italy ; and 92.4% in Germany). Average energy consumption has also fallen in Europe despite a trend towards larger capacities. However, energy consumption is starting to stagnate, for lack of a label that really encourages innovation. Average water consumption has also stalled, or even slightly increased, in Europe in recent years. The main reason is that higher-rated washing machines use more water because they tend to be larger. The trend towards large models observed in previous years is still relevant: higher energy efficiency of washing machines translates into large capacities, rather than lower energy consumption (in 2010, 66% of sold models were ≤6 kilos, this dopped to 23% in 2019). New, more ambitious MEPS apply since March 2021, as well as a new energy label with an A to G scale and more stringent thresholds. The European Commission estimates that these measures will generate savings of 2.5 TWh of electricity and 700 million m<sup>3</sup> of water.



**Figure 4 - Washing machines: showing the need for a revision of the energy label**



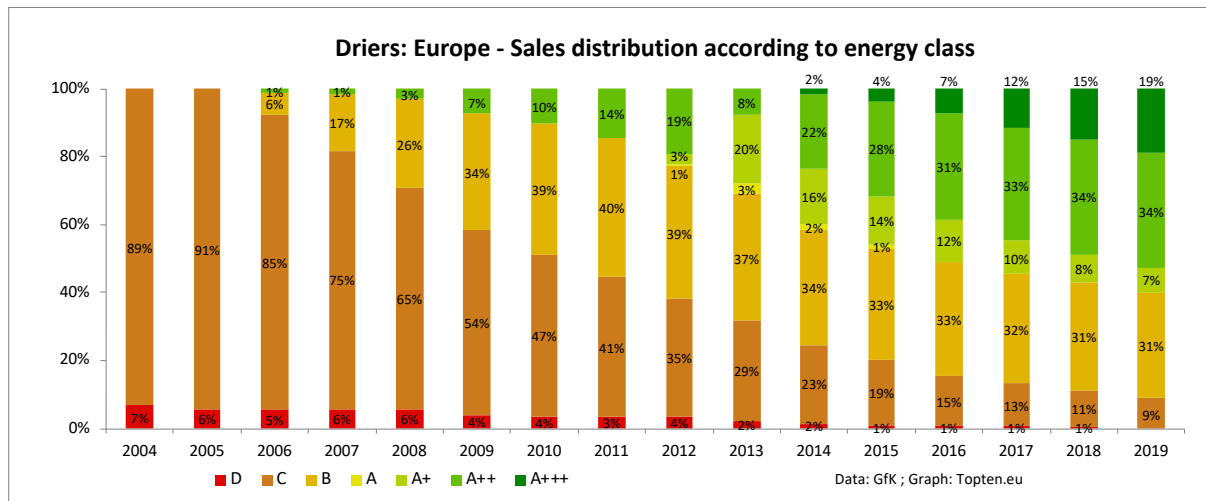
**Figure 5 - Very small differences between classes, partly explained by the fact that best classes are bigger**



**Figure 6 - Washing machines' efficiency: always good for the planet, bad for the wallet**

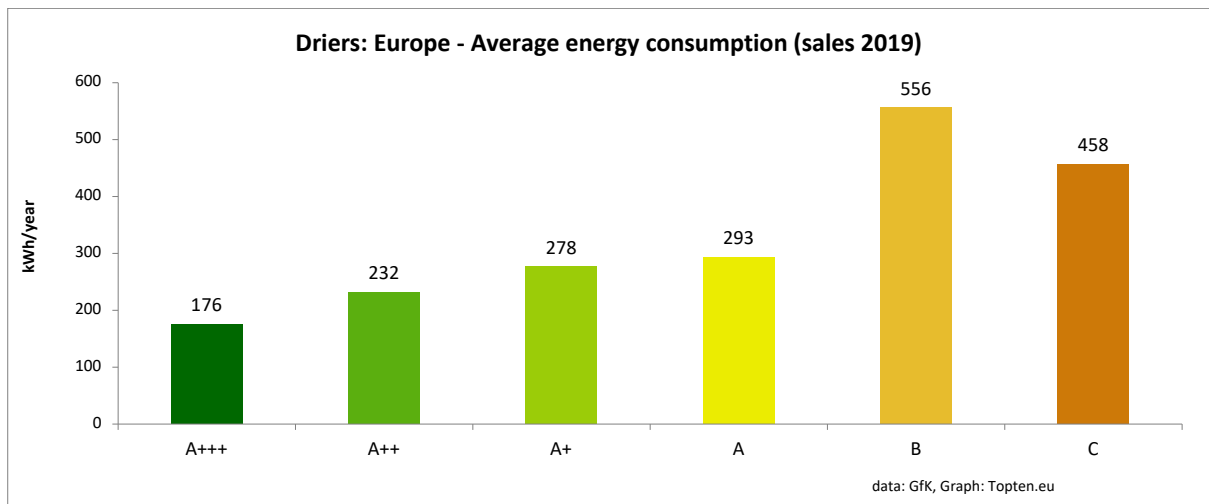
### 3.1.3 Tumble driers

Sales figures for tumble driers still follow the positive trend observed in 2015: heat pump driers (generally rated A+ and better) represent 59.5% of sales in Europe in 2019, 82.9% in Germany and 98.1% in Italy. In France, heat pump driers only represent 37.7% of sales. This low figure for France translates into a much higher average energy consumption for tumble driers sold in France (67% higher than Germany and 84% more than Italy). Over their lifetime, heat pump driers generate a significantly lower total cost to the consumer. The potential energy savings resulting from a future MEPS which would ban the marketing of driers without heat pumps would be 8 TWh/year in Europe, and 1.6 TWh/year in France. Information campaigns or rebates would be necessary to reduce sales of the less efficient models.

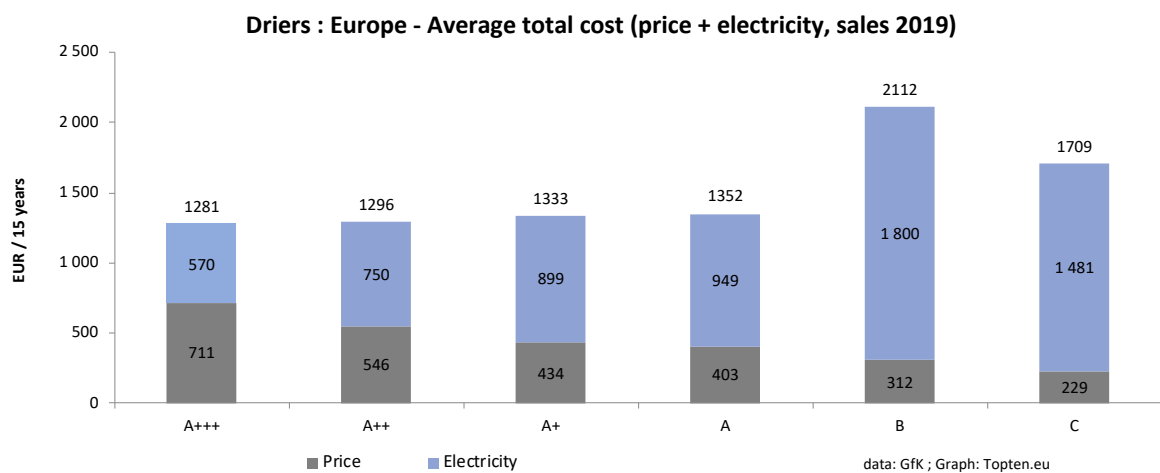


**Figure 7 - Driers – A decade of real progress thanks to heat pump models (from A+ and up)<sup>3</sup>**

<sup>3</sup> Class A has a very low market share and there are almost no models in this class. Therefore, the results for class A are not statistically significant



**Figure 8 - Large consumption differences between energy classes (even when best classes are bigger)<sup>4</sup>**



**Figure 9 - Driers' efficiency: good for the planet and good for the wallet<sup>5</sup>**

### 3.2. National markets

The study also shows that national markets can be very different, while the same regulatory framework applies to all EU countries and the same international manufacturers dominate most markets.

#### 3.2.1 France

Products sold in France were less energy efficient than those sold on average in Europe, for all three product categories studied. This confirms the findings of our latest market monitoring ([1] Michel, Attali, Bush, 2016), as well as the findings of a 2012 study that found more highly efficient products sold in

<sup>4, 4</sup> Class A has a very low market share and there are almost no models in this class. Therefore, the results for class A are not statistically significant

Germany than in France ([7] SOWATT, Enerdata, 2012). Also in Italy, more efficient products are sold than in France.

Refrigerators, washing machines and tumble dryers sold in France consume on average more energy than those sold in the other two countries and in Europe. Only Italian refrigerators consume more, probably because they are larger. It is striking that the average prices paid by French consumers for new appliances are significantly lower than in Germany, Italy and the European average.

High-performance refrigerator models (A++, A+++) are more expensive than the European average and have a small market share. Refrigerators are slightly larger than the European average but the freezer compartment, which has a greater impact on energy consumption, is smaller. One explanation for the low prices for refrigerators is the relatively higher market shares of private labels with entry-level marketing.

In the case of washing machines, prices are close to the European average, with lower prices for the least efficient classes. This could partly explain why efficient washing machines are not very popular in France. The French preference for small capacity machines (6 and 7 kg) could also explain this low energy performance (as efficient washing machines are often larger).

The same pattern can be observed for tumble dryers: in 2019 only 38% of tumble dryers sold were equipped with a heat pump and the average energy consumption is 25% higher than the European average. Class B was the most purchased in 2019. This was already the case in 2015, and is therefore probably not the result of the C class ban in November 2015. The C class, even if banned, still accounts for 14% of sales in 2019. This is both an ecological and an economic concern, as consumers who do not choose a high-performance dryer end up paying a considerable total cost.

High prices for high performance products in the French market have been found ([8] Toulouse, 2015) when comparing prices of Topten products in France, Germany and Switzerland. When trying to correlate the price level and the preference for the most economical classes in Germany and Italy, it is found that high average prices for a class do not prevent consumers from buying models in that class. It therefore seems likely that French consumers are mainly focused on buying cheap products: not very economical, not too big and with a low purchase price. Additional information on the total cost of the products could be an incentive to choose products with a higher energy performance. Tumble dryers might be the best product category to test such a campaign: the potential for energy and total cost savings for consumers is very high.

### 3.2.2 Germany

The German market is characterised by high market shares for energy efficient products. The data presented here confirms that German consumers buy more highly energy efficient and quality products and are willing to pay more for them; more expensive than consumers in other countries (this has already been shown by ([1] Attali, Bush, Michel in 2009 and 2016)). Regarding refrigerators, the average EEI in Germany is clearly better than the European one (33 vs. 37 for Europe) and the average energy consumption of German refrigerators is 26% lower than the European average. This is related to the German preference for relatively small refrigerators, and probably to prices: average prices per energy class are lower than the European average for the more efficient classes, and higher for the less efficient classes.

92% of washing machines sold in Germany were rated A+++ in 2019, even with an average price for this energy class (and for that of the A++ class) visibly higher than the European average price. German consumers have a preference for 7 kg and 8 kg machines. The average declared consumption is 5% lower than the EU average.

Tumble dryers are generally very popular in Germany and sales are relatively higher than in France, Italy or the European average. This is probably partly due to the colder climate in Germany, which makes it difficult to dry clothes outdoors for long periods.

Since dryer sales are higher in Germany than in France, Italy and Europe on average, it is all the more welcome that German consumers are buying very energy efficient models: heat pump dryers account for 83% of sales in 2019. However, the 17% of dryers in class C and B account for 35% of the electricity consumption of dryers sold in 2019. Therefore, a ban on dryers without heat pumps would save energy even in Germany. As with refrigerators, the average price of the preferred classes (A++, A+) is below



the price level in the EU, but the high sales in these classes make the total average price of tumble dryers higher than the European average.

### 3.2.3 Italy

The Italian market for white goods seems to be quite particular. Italian consumers buy refrigerators and washing machines with high energy efficiency similar to the average European consumer, while for tumble dryers, heat pump models are extremely popular (98% of sales).

As far as refrigerators are concerned, Italians also prefer larger models. The combination of rather large refrigerators with below average energy efficiency results in an average consumption 12% higher than in the European Union. The price level of Italian refrigerators is high compared to the European average. This could be explained by a fragmented retail market, with few sales in discount shops or on the Internet, but also by the preference for large models.

As far as washing machines are concerned, the opposite is true: prices are lower than the European average whether one considers the average total price or the average price per energy class. The energy performance and capacities of Italian washing machines are similar to the European average, resulting in an average energy consumption similar to that of the EU.

For tumble dryers, as mentioned above, the Italian market is very energy efficient. Compared to Germany and France, probably due to climate reasons, sales are lower in Italy. However, tumble dryers are becoming more and more popular and sales are increasing rapidly. It is therefore very positive that energy efficient tumble dryers are achieving very good sales rates in Italy. The most popular class, A++, accounts for 52% of sales. The average price of A++ and A+++ classes is slightly lower than the European average. But because the more efficient classes are more expensive than the less efficient ones, the average prices for all Italian tumble dryers are 17% higher than the European average.

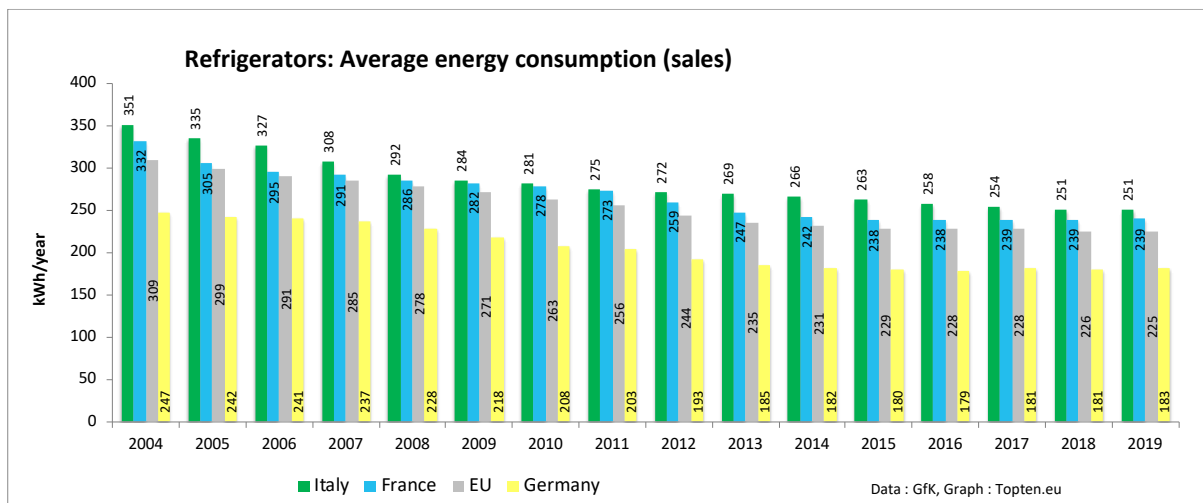
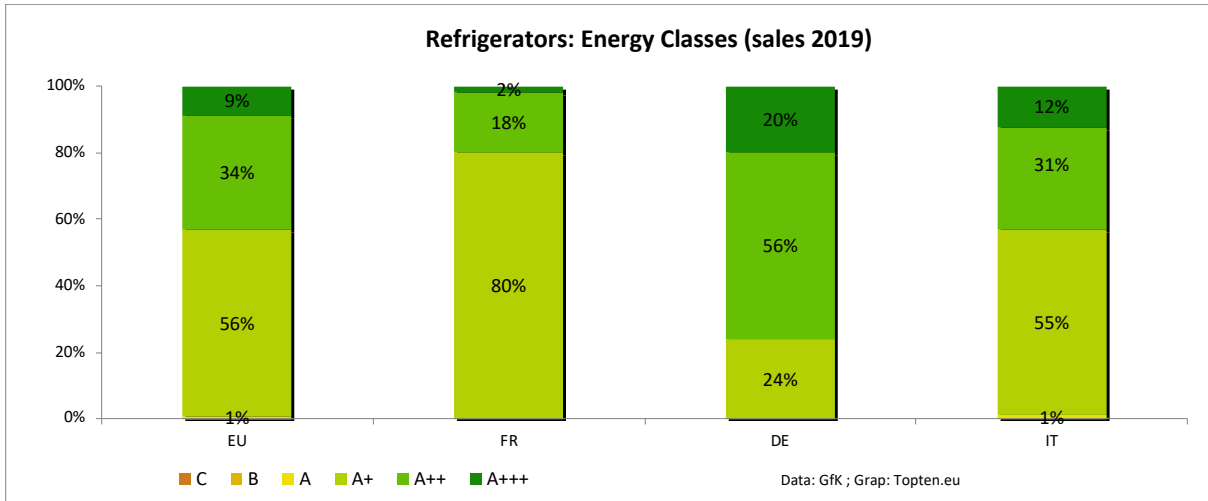
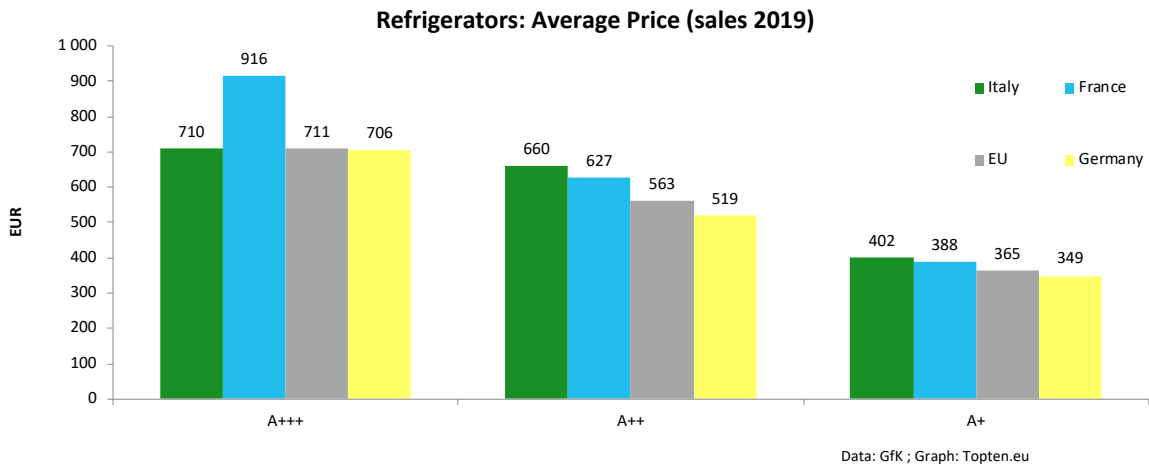


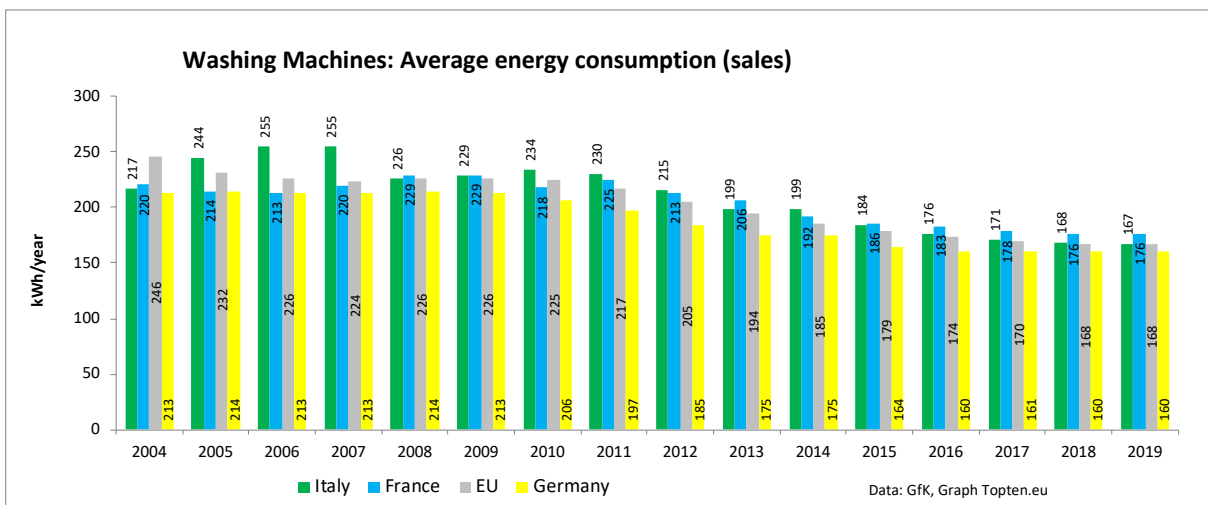
Figure 10 - Refrigerators: National differences in average energy consumption



**Figure 11 - Refrigerators: National differences in energy classes' distribution**



**Figure 12 - Refrigerators Prices illustrating marketing policies and readiness to pay**



**Figure 13 - Washing machines: National differences in average energy consumption**

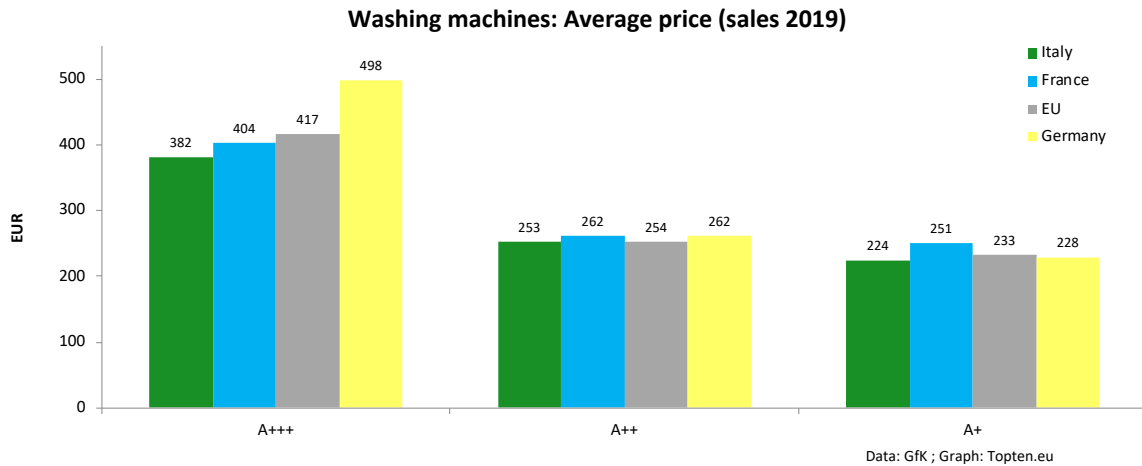


Figure 14 - Washing machine prices: national differences in prices

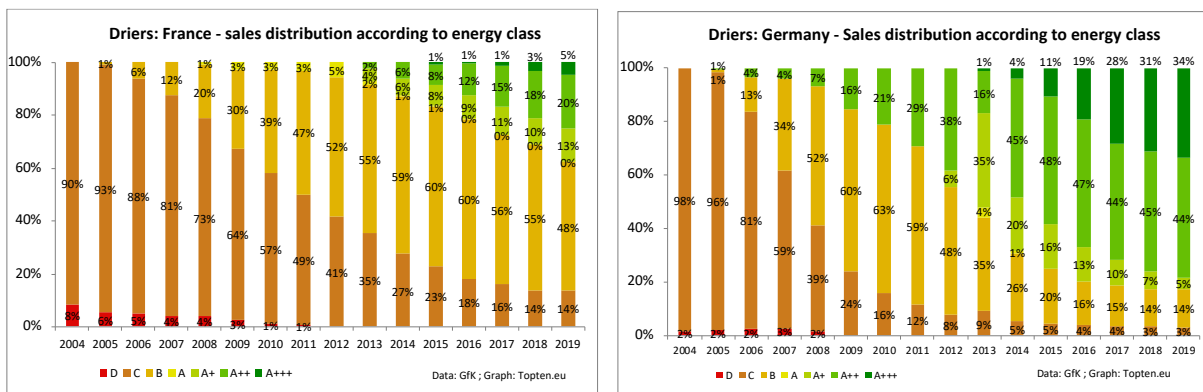


Figure 15 – Tumble Driers – National differences in energy classes’ distribution in France and Germany

#### 4. Advocating for combining sales data and EPREL

The study shows the enormous potential of systematic market monitoring for Europe. It reveals trends, differences between national markets and also problem areas. Regular (annual) market monitoring could allow policy makers to initiate improvements and label updates when needed, and to base their decisions on reliable data. The risks of a late revision and of setting classes on the label with a lack of ambition (as was the case for washing machines), could be minimised.

The EPREL database will provide an overview of the products on the market, allow changes in models to be identified, and is likely to facilitate international exchanges of test results, making market surveillance operations more efficient and effective. It will take time to become fully operational (and there is no mechanism in place to monitor that all products are actually registered) whereas market monitoring based on sales data could be implemented immediately.

It would be essential to complement it with sales data. EPREL information is not weighted by sales: each model will have the same weight, whether it sells well or not, it will be impossible to analyse national differences. In contrast, sales-based data is attributable to a country, takes into account models according to their weight in the market, and the aggregated data is stripped of detailed information and therefore requires less analytical work.

Information based on reported consumption values - whether from supply-side or sales-side analyses - should also be compared and contrasted with measured outcomes and user behaviour studies.

Understanding these behaviours and how declared values translate into actual consumption is key: declared values and improved energy efficiency levels on the label must make sense to consumers if they are to translate into real energy savings.

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