Estimation tool for national effects of MEPS and labelling – version 2.0

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Abstract

Within EU-28 appliance energy efficiency is addressed through end-use specific energy labelling and ecodesign requirements (MEPS, minimum energy performance standards). The assumed energy savings of these measures are assessed at EU level but seldom at National level. A simple, yet flexible tool for evaluation of ecodesign and labelling measures at national level has been developed and used for Sweden and Denmark.

The model is a classic bottom-up model establishing stock calculations based on knowledge about sales in high detail. The tool uses nation specific historical sales figures and/or stock data, distributions of sales by energy efficiency classes and assumptions about technology lifespan and natural sales development. The results are an ex-ante estimation of the future sales distribution by technologies/energy classes and the energy consumption of the future stock of appliances. A comparison with a baseline/assumed natural development provides estimates of the energy savings from ecodesign and energy labelling.

For the national energy agencies in Denmark and Sweden, it is very valuable to be able to estimate the national effect of the ecodesign MEPS and labelling schemes. For example, the national estimations can be used in energy consumption forecasts and policy evaluations.

In this paper, we

- describe the basics of the estimation tool together with important assumptions
- present energy savings estimates for several white goods groups for Sweden
- compare earlier ex-ante savings estimates for white goods with the actual development and analyse the differences
- discuss the baseline
- introduce future possibilities of the estimation tool in combination with web-crawler data.

Introduction

Within EU-28, appliance energy efficiency is addressed through product specific ecodesign MEPS (minimum energy performance standards) and energy labelling. The ecodesign requirements mean that a regulated product must have a minimum energy efficiency if they are to be sold in the EU. Energy labelling is used to show to consumers how energy efficient specific products are and allows the customer to compare products and make active choices.

Ecodesign and energy labelling requirements are powerful instruments to achieve energy efficiency and two important measures to help EU-28 achieve its energy efficiency and climate goals. Energy savings from each implementing measure and product group have been estimated at an EU level by the Commission, in pre-studies and impact assessments.

National assessments are seldom made. For national authorities though, it is very valuable to be able to estimate the national effect of the ecodesign MEPS and energy labelling schemes. For example, the national estimations can be used in energy consumption forecasts and policy evaluations. They can also be used to simulate the national effect of stricter ecodesign MEPS or more ambitious labelling scales, which for instance includes the promotion of best available technology (BAT). These evaluations can be used when formulating the national positions in the European negotiations for new ecodesign and energy labelling regulations. In addition, future sales by energy class are estimated and these can be useful when it comes to market surveillance, in order to make necessary priorities. Furthermore, ex-post analysis can directly pinpoint successful product areas as well as areas where the effects deviate from anticipated effects and market development needs stimulus.

National differences in product ownership rate, climate classes, daylight, running hours etc. influence the actual savings in a specific EU member state to an extent where a simple scaling (e.g. by total member state energy consumption) could result in misleading figures at national level, given a specific product group. The national energy agencies in Denmark and Sweden has therefore developed and implemented a national estimation tool.

In this paper, we will give a short introduction to the estimation tool, the assumptions it is based upon and show some examples of the estimation results. We will present the estimation results for white goods in Sweden from 2016 which have been estimated using sales data until 2015. These new results are then compared to earlier estimation results for white goods in Sweden from 2012–2013. We will show and discuss some examples of the comparisons as well as discussing the chosen baseline, thereby establishing a first evaluation of the tool itself. Finally, we will give some examples of how the next generation estimation tool could work using webcrawl data and which analysis and results it could provide.

Description of estimation tool

The methodological basis for the estimation tool is based upon the Danish bottom-up stock model ELMODEL-domestic, see earlier ECEEE proceedings (Fjordbak Larsen et al 2003).

The basic idea of the tool is to simulate the total energy use of a product group using the equation in Figure 1.

The energy savings of the ecodesign and energy labelling regulations are estimated by comparing the energy use of a product group for a base case scenario (without the regulations) with the energy use of the product group for a policy scenario (with the effect of the regulations).

Ideally the estimations would be based on data for the stock of appliances in the households, by energy class, as shown in Figure 1. Detailed data of this kind are not collected in Denmark and Sweden for any product groups though. Instead, the model uses sales data by energy class. The model simulates the stock using a normal distribution assumption for the lifetime of the appliances. Multiple years of sales will then make up for the full stock.

The next step in the model is to calculate a projection of the sales and the stock. This is for the base case scenario done as a simple forecast of the total sales (e.g. linear trends combined with expert knowledge from the relevant retailer organizations etc.) along with an assumed natural development in the sales distribution.

With these inputs the stock per energy class, at a given year, can be calculated as a sum of all sales up until then that have survived according to the lifespan distribution, see Figure 2. In the figure, it is illustrated how the lower energy classes are phased out, while the higher energy classes make up larger shares of the stock.

To estimate the effects of ecodesign MEPS, a scenario parallel to the base case scenario is done, limiting the sales to the allowed efficiency classes according to the legislation stages successively coming into force. If a particular energy class is banned through an ecodesign MEPS criteria, the sales are simulated to take place at the next energy class level. This is illustrated in Figure 3 where sales of banned energy classes are assumed to be 0 the years after the ecodesign requirements enters into force, in this example in two stages in 2012 and 2016.

This is repeated until all sales are set at some energy class. The estimated savings coursed by the ecodesign requirements (MEPS) is the difference between the baseline scenario curve and the policy scenario curve. Note that the natural development of sales distribution is still active in the ecodesign scenario, avoiding the ecodesign scheme from taking all credit for efficiency improvements in the sales.

The tool also provides a means to estimate the effects of energy labelling. This is done similarly to the simulation of natural development, i.e. setting an assumed annual change in percent towards more sales in higher energy classes. This shift of sales is illustrated in Figure 3. The sales in all energy classes are affected every year by the energy labelling. The effects of labelling are calculated in parallel to the ecodesign effects, ensuring that any sales already simulated by MEPS will not be simulated affected by labelling also. This ensures no double-counting of measures.

The estimated savings by the ecodesign and energy labelling regulations is the difference between the base case scenario and the policy scenario with calculated effects of ecodesign and energy labelling.

The modelling is based on several assumptions, some of which are:

- Normal distributed lifetime of products, typically mean value around 8–10 years for white goods.
- Each energy class can be characterized by a mean annual energy consumption value.
- The baseline is defined as a natural development in the market of 2 % per year, i.e. the sales are assumed to move 2 % per year towards more energy efficient classes. This assumption is based on the fact that EU in general aims at a 2 % inflation rate. It is possible to adjust this number, since the development of the market can differ for different types of products.
- Sales prevented by ecodesign MEPS will go to the nearest available energy class.
- Labelling will target all classes in terms of shift of sales to the next class. This development is calculated as an X percent shift towards more efficient appliances every year, where X is assumed to be high (~25 %) the first years after the requirements come into force, and lower later on (~5 %). This assumption is based on knowledge from the introduction of energy labelling for white goods in the late 90'ies.

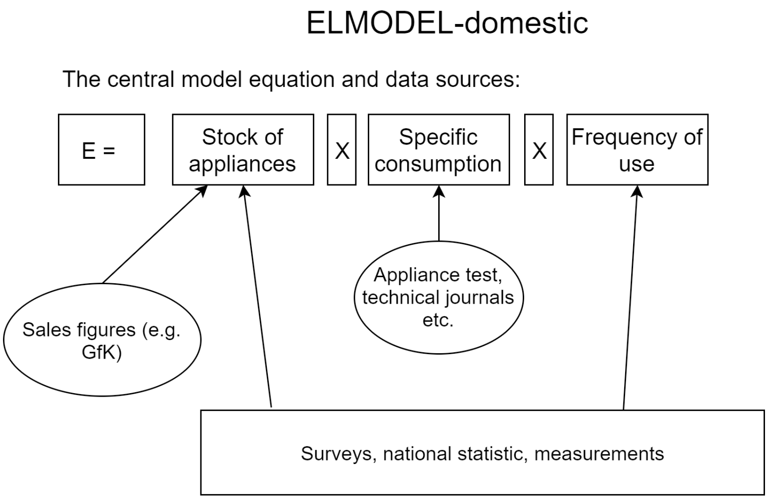

Figure 1. Central model equation of ELMODEL-domestic and the estimation tool. Source IT-Energy.

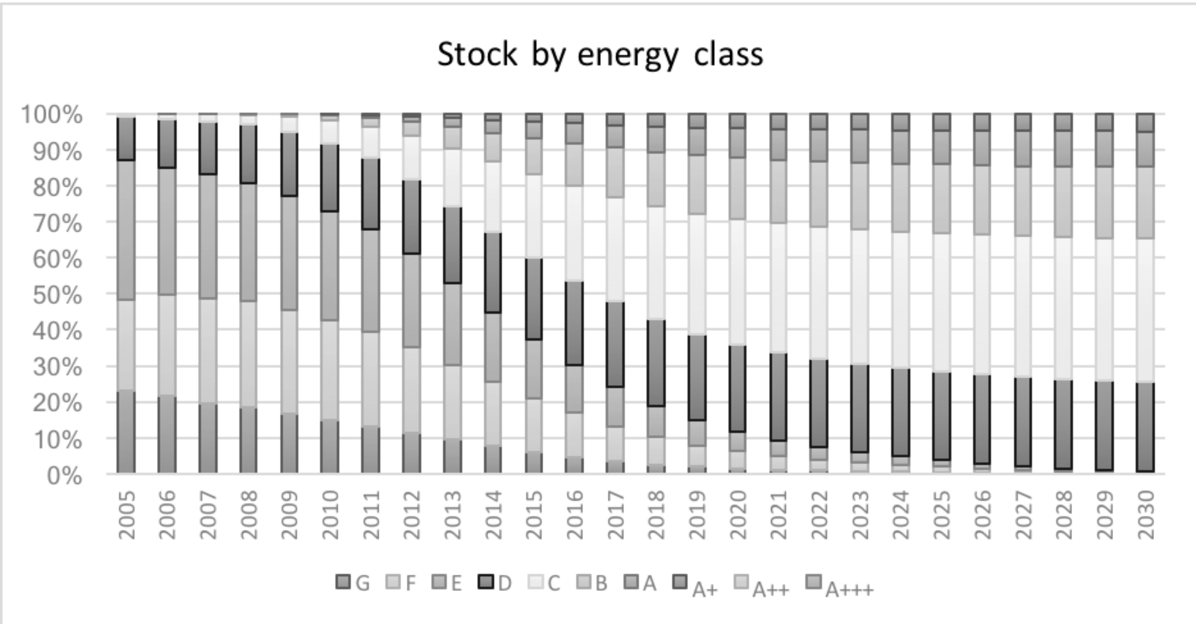

Figure 2. Example of calculated stock split by energy class. Source Big2Great/Swedish Energy Agency.

SALES for generic product group

MEPS in to force

Annual improvements from labelling

CLASS\YEAR	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
G	0	0	[illegible]	[illegible]	0	0	[illegible]	[illegible]	[illegible]	[illegible]
F	0	0	[illegible]	[illegible]	0	0	[illegible]	[illegible]	[illegible]	[illegible]
E	746	0	0	0	0	0	0	0	0	0
D	3812	0	0	0	0	0	0	0	0	0
C	7030	7712	4787	4410	4725	0	0	0	0	0
B	1758	3098	2976	3579	4638	8326	7653	7185	6888	6739
A	653	1209	1405	1974	2904	3748	4287	4672	4960	5190
A+	163	411	564	895	1452	1816	2141	2431	2677	2879
A++	41	130	205	359	631	815	985	1144	1284	1400
A+++	14	55	102	200	387	533	672	807	928	1030

Figure 3. Model principle for simulation of sales as a function of ecodesign MEPS and energy labelling. Source Big2Great/Swedish Energy Agency.

All assumptions can be modified for each product group that are simulated.

Data sources used for the modelling:

- Sales data from FEHA – The Danish Association for Suppliers of Electrical Domestic Appliances. The association collect sales figures for white goods from their members.
- Gfk sales data
- National energy statistics
- Danish bi-annual survey with about 2,000 households performed by Energistyrelsen
- Data from electricity measurements in households in Sweden

Since Denmark and Sweden have many similarities some data and estimations can be shared.

Since the model is based on a bottom-up principle, the results from a top-down approach cannot be provided. This could for example be elasticities for prices of appliances and electricity and how the market develops under different assumptions for these, subsequently leading to other savings estimates. Also, the bottom-up modelling is data demanding and the quality of the results depends of the quality of the input data, especially sales data for all the included product groups. Since these data can be hard to get, assumptions sometimes have to be introduced to establish sales data at the needed granularity.

The long-term projections of the model are also uncertain, since many of the assumptions made to establish the bottom-up basis are not valid in a long perspective. The model should only be used for 5–15 year's projections, equal to one generation of most white goods. Otherwise, it should be developed further to incorporate top-down elements to guide some of the assumed developments (or statics) in the model.

In summary, the model can, under the mentioned restrictions, estimate how the stock at any given year is composed in terms of energy parameters using data for how the actual sales are distributed a particular year among energy classes. This enables us to calculate the total energy consumption for a baseline situation, as well as the energy consumption for policy scenarios. The difference between the baseline and the policy scenario constitutes the savings at national level from the policy.

Examples of simulation results for Sweden are presented in the next section.

Estimated energy savings in Sweden from ecodesign and energy labelling of white goods

Energy savings estimates have been simulated with the estimation tool for several product groups and ecodesign and energy labelling regulations for both Sweden and Denmark, for example lighting, TV, heat pumps, standby, circulation pumps and white goods. At IEPEC (2012), results for two specific end uses, TV sets and lighting, were presented (Fjordbak Larsen et al, 2012). For white goods in Sweden, energy savings estimates were first simulated in 2012–2013 (old simulations), but have now been recalculated using new knowledge and sales data until 2015 (new simulations). The obtained energy savings estimates for white goods from the new simulations are presented in Table 1.

In Table 1, the simulated energy consumption for the baseline scenario (BL) is presented for 2010, 2015, 2020 and 2030. The baseline scenario represents the development without the ecodesign and energy labelling regulations, i.e. what the energy consumption could have ended up being for the different white goods product groups had they not been regulated.

In the CONS columns. the simulation result of the policy scenario (with ecodesign and energy labelling) is presented. The energy consumption for the different appliances in 2010 and 2015 is simulated using sales data until 2015, and simulation forecasts have been performed for 2020 and 2030. The difference between the baseline scenario and policy scenario constitute the estimated savings per year, presented in the third column for the years (SAV).

Some of the white goods product groups were regulated before 2010, but 2011 has been chosen as the starting year for the simulations of the estimated energy consumption with the regulation, and that is the reason why the savings in 2010 are 0. In other words, the savings due to policies that came into force after 2011 are measured.

The sales data used for the estimation of savings from ecodesign and energy labelling of white goods are from FEHA – The Danish Association for Suppliers of Electrical Domestic Appliances that collects sales data for white goods from their members. It has been assumed that the Danish and Swedish consumers have the same preferences when buying white goods, which means that we can use the sales distribution of energy classes from Denmark. An argument for this assumption is the fact that web-shops like Elgiganten has the same web-pages and content in Denmark and Sweden. The sales figures (number of sold models per year) are scaled to adjust for the larger population of Sweden.

Using the model capabilities to keep track of the energy class distribution of all white goods appliances used in residential buildings in Sweden, the consumption of the stock by energy class can be calculated. In Figure 4 these results for all the white goods are presented.

From Figure 4 it is clear how the best energy classes take over the stock in terms of total consumption, as a result of sales changed towards better energy classes. A-labelled products will be in the stock and use a large share of the energy until after 2020 though, despite being removed by MEPS in 2014. This is due to the lifetime of the products, that is assumed to be normally distributed, with a mean value typically around 8–10 years. By 2025 they are estimated to be phased out and only A+-A+++-labelled products are left in the stock. This transformation process is naturally different for different types of product groups, due to the lifetime of the products.

New estimated energy savings in Sweden from ecodesign and energy labelling of white goods compared to earlier estimates

Earlier estimations for Sweden were performed in 2012–2013 (old simulations). With sales data from 2012–2015, new simulations were conducted in 2016. The results of these new simulations were presented in the previous section. The data updates and new scenarios enables improved forecasts of the national effects, as well as the possibility to compare earlier forecasts with the actual development for some years. These comparisons both give us knowledge that are of use in future simulations, and knowledge of the market transformation

Table 1. Model estimated baseline (BL), energy consumption in policy scenario (CONS) and savings (SAV) in GWh/y for white goods in Sweden, 2010–2030.

APPLIANCE \YEAR	2010 (stat.)			2015 (stat.)			2020 (Est.)			2030 (Est.)		
GWh	BL	CONS	*SAV*	BL	CONS	*SAV*	BL	CONS	*SAV*	BL	CONS	*SAV*
Dishwasher	756	756	*0*	799	757	*42*	804	685	*119*	893	701	*192*
Washing machines	578	578	*0*	589	550	*39*	568	462	*106*	631	473	*158*
Dryers	386	386	*0*	403	355	*48*	397	259	*138*	507	241	*266*
Ovens	509	509	*0*	430	414	*16*	356	293	*63*	339	211	*128*
Refrigerator	206	206	*0*	192	182	*10*	163	129	*34*	145	85	*60*
Refrigerator w/ ice box	97	97	*0*	84	79	*5*	72	57	*15*	65	38	*27*
Combined fridge/ freezer	528	528	*0*	429	405	*24*	346	272	*74*	338	202	*136*
Chest freezer	76	76	*0*	60	57	*4*	54	43	*11*	50	31	*18*
Upright freezer	344	344	*0*	311	293	*17*	284	228	*55*	288	183	*105*
TOTAL	3,480	3,480	*0*	3,297	3,092	*205*	3,044	2,428	*615*	3,256	2,166	*1,090*

Source: Big2Great/Swedish Energy Agency.

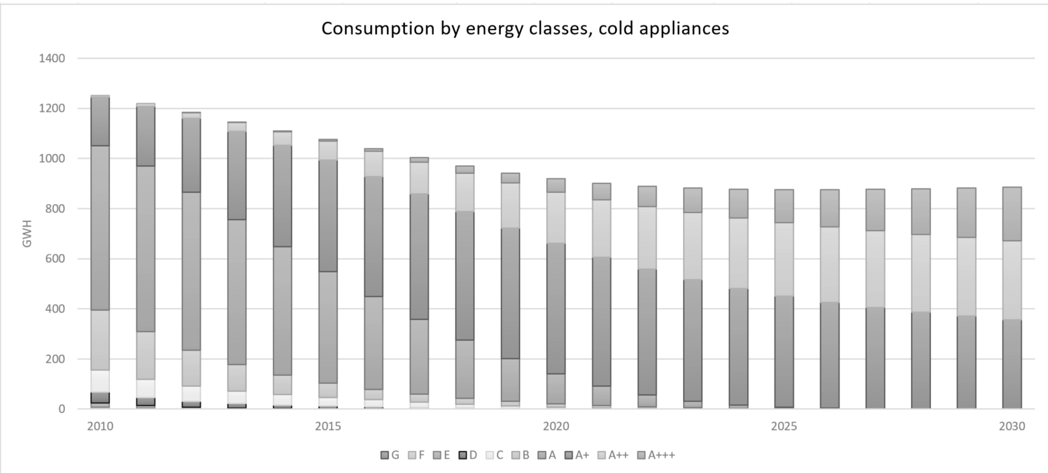

Figure 4. Energy consumption by energy class, all cold appliances in Sweden. Source Big2Great/Swedish Energy Agency.

for different types of products. The knowledge of the market transformation is valuable to the Swedish and Danish Energy Agencies in the work with revisions of the ecodesign and energy labelling regulations and when acting as market surveillance authorities.

In Figure 5, both the earlier (2012–2013) and updated (2016) total estimated savings of ecodesign and energy labelling of white goods in Sweden are presented. The savings per year in each year are shown as bars in the graph, and the accumulated savings as lines.

As Figure 5 shows, the total savings for all white goods in Sweden are quite similar for the old and the new simulations. The difference in 2020 is only 7 GWh for the yearly savings, and 78 GWh for the accumulated savings. The difference is due to a sales distribution development better than expected (in 2011–2015) for dishwashers, washing machines and dryers. The sales distribution development was weaker for the other white goods appliances in 2011–2015 than expected in the old simulations. In total, the savings are slightly higher than anticipated in the old simulations. For dryers and chest freezers there have been no sales of banned energy class products, while for the other white goods product groups there have been sales of models that are not living up to the ecodesign requirements of energy efficiency. The share of banned models ranges from 2 % up to 11 % for washing machines. One reason to this is that older products already in stock at a European dealer are not covered by the regulations and therefore allowed to sell. But there may also be sales of non-compliant, banned, products.

In the following figures we present some examples of the white goods product groups. In Figure 6 the estimated savings for ecodesign and energy labelling of dishwashers in Sweden are presented. As Figure 6 shows, the estimated savings are higher in the new scenario.

The difference is primarily due to a sales distribution development much better in 2011–2015 than expected in the old scenario, see Figure 7 where it is illustrated that A+++- and A++-labelled dishwashers make up a larger share of the sales in the new scenario (sales data) than in the old scenario (projection). There are still sales of banned models according to sales distribution statistics. In 2015, 6 % of the sold appliances were models that were banned according to the ecodesign regulation (FEHA data).

The tendency is the same for washing machines and dryers, the sales distribution development has been better than expected and the estimated savings are therefore higher in the new scenario. For the combined fridge/freezers, the situation is the opposite, see Figure 8.

Clearly the sales have not developed as anticipated, see Figure 9. For the combined fridge/freezers the old scenario expected much faster shift towards better energy classes then what actually happened. There are also still sales of banned models according to sales distribution statistics. In 2015, 2 % of the sold appliances were models that were banned according to the ecodesign regulation (FEHA data).

As we can see from the results above, the development of different types of product groups happen at different rates. Knowledge of this kind could be considered when new legislation is formed, so that different tiers of legislation are adapted to the specific product groups and come into force at different pace. For some product types, the energy efficiency levels required by the ecodesign regulations are met earlier than for others. This is probably true for example for electronics, where the transformation of the market is rapid. It might not be possible to sell older products from stock for several years after the ecodesign regulations come into force, as seem to be possible for some

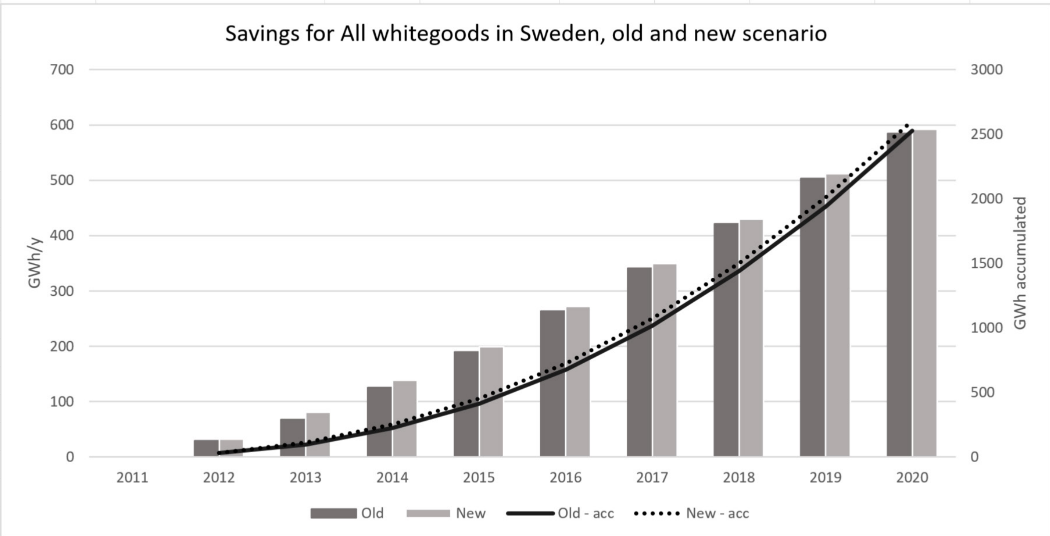

Figure 5. Model estimated savings in GWh/y for all white goods in Sweden, 2010–2020, old and new scenario. Source Big2Great/Swedish Energy Agency.

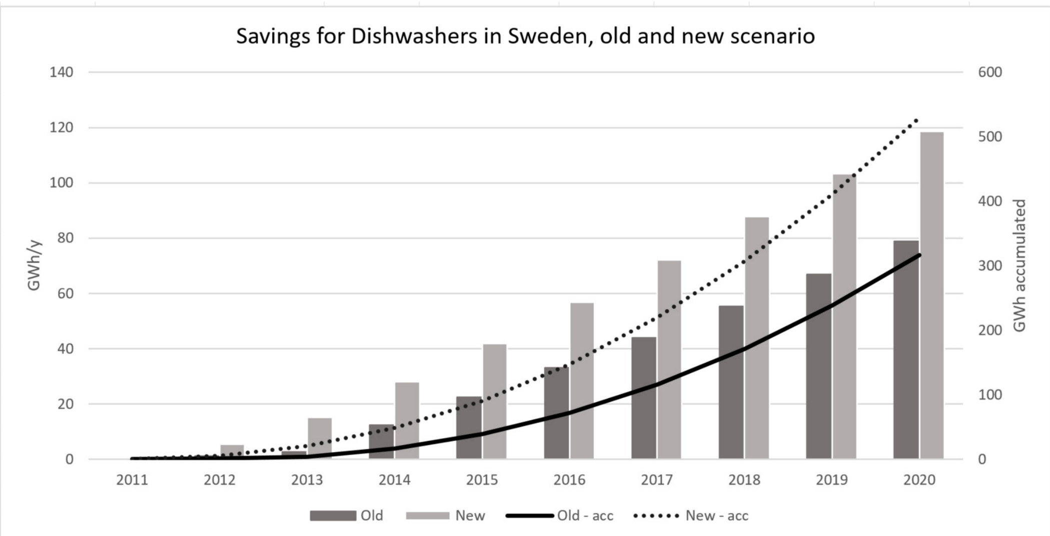

Figure 6. Model estimated savings in GWh/y for dishwashers in Sweden, 2010–2020, old and new scenario. Source Big2Great/Swedish Energy Agency.

white goods appliances. The knowledge can also be used in future simulations of the product groups.

Baseline discussion

When simulating the effects of ecodesign MEPS and labelling with the estimation tool, the calculated new market and stock with legislation are compared with a calculated market and stock without any legislation, the baseline. The calculated total savings will be the accumulated annual difference between the baseline and the actual annual energy use, and that number will depend on the choice of baseline settings. Note that baseline and policy scenario can be the same, if no change in regulations is in force for a product group until later. The savings will then be 0. The baseline situation describes what could have happened if ecodesign and energy labelling regulations had not come into force. What we set the baseline to is important for the estimations of the savings, but we will never have full knowledge of what the baseline scenario is or should have been had there been no regulations.

As was demonstrated in the previous section, the actual development of the annual energy use can be both higher and lower than the projections, leading to higher or lower accumulated savings than expected. This opens for a discussion about which

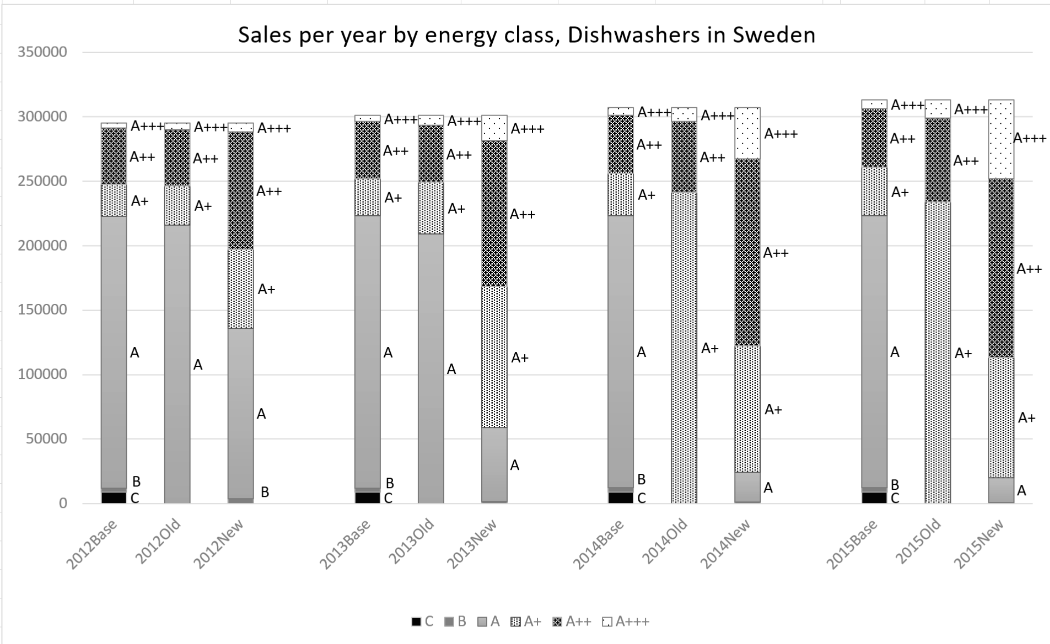

Figure 7. Sales by energy class, dishwashers in Sweden, 2012–2015, baseline, old and new scenario. Source Big2Great/Swedish Energy Agency.

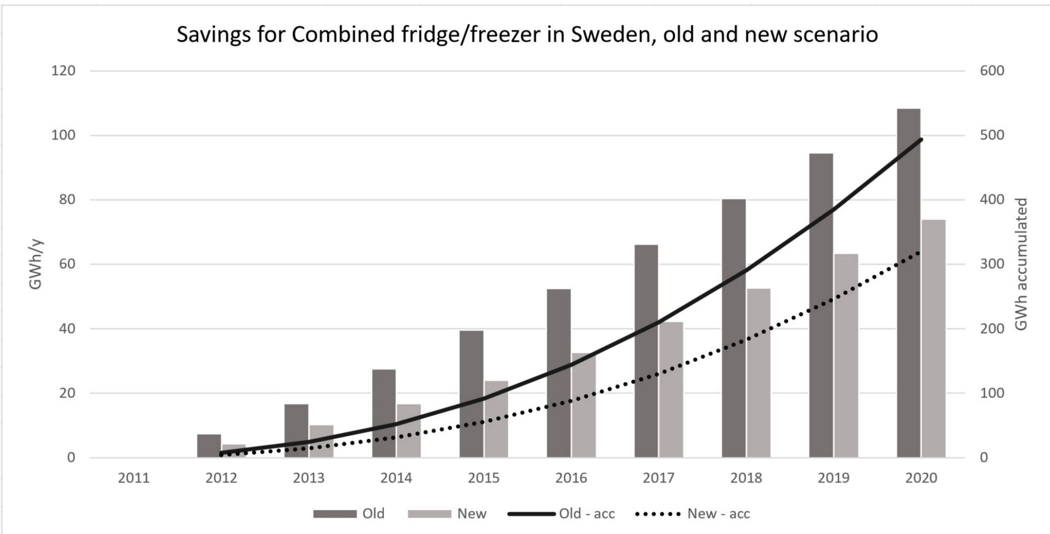

Figure 8. Model estimated savings in GWh/y for combined fridge/freezer in Sweden, 2010–2020, old and new scenario. Source Big2Great/ Swedish Energy Agency.

baseline the policy scenarios should be compared to. Depending on the choice of baseline, different questions can be answered.

This section will explore this more in detail, bridging over to the final section where it is discussed how the use of detailed, high time-resolution data collected with web crawler techniques will open up new possibilities for a more dynamic calculation of the total energy savings.

BASELINE USED FOR SIMULATIONS PRESENTED IN THIS PAPER

The baselines used for the simulations presented in this paper are exactly the same for both the old and the new simulations. The switch from historic sales data to the baseline projection has been fixed to 2011 in both simulations. This means that the first year for simulating the baseline is 2011. From 2011, the baselines are defined as a natural development in the market of 2 % per year, i.e. the sales are assumed to move 2 % per year towards more energy efficient classes. The difference between the old and the new simulations is the year for the switch from historic data to projections for the policy scenario, that is the first simulation years differ. The switch from historic sales data to the policy scenario was in the old simulation fixed to 2011 (first simulation year). I.e. from 2011 and on the difference between the baseline and policy scenario define the effects of ecodesign MEPS and labelling. Hence the effects are estimated for 2011 and on.

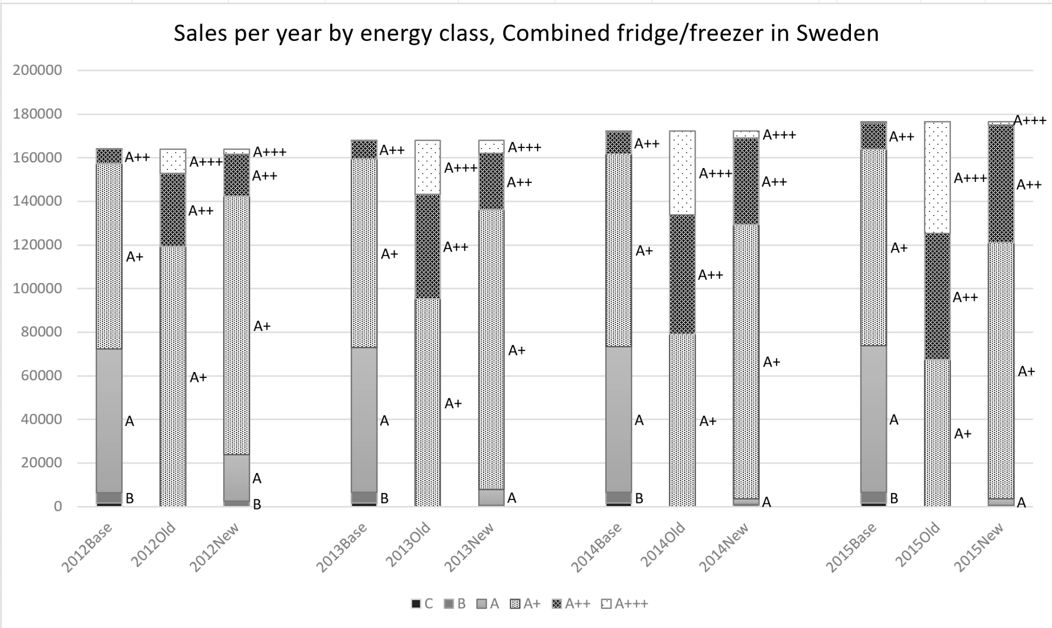

Figure 9. Sales by energy class, combined fridge/freezers in Sweden, 2012–2015, baseline, old and new scenario. Source Big2Great/Swedish Energy Agency.

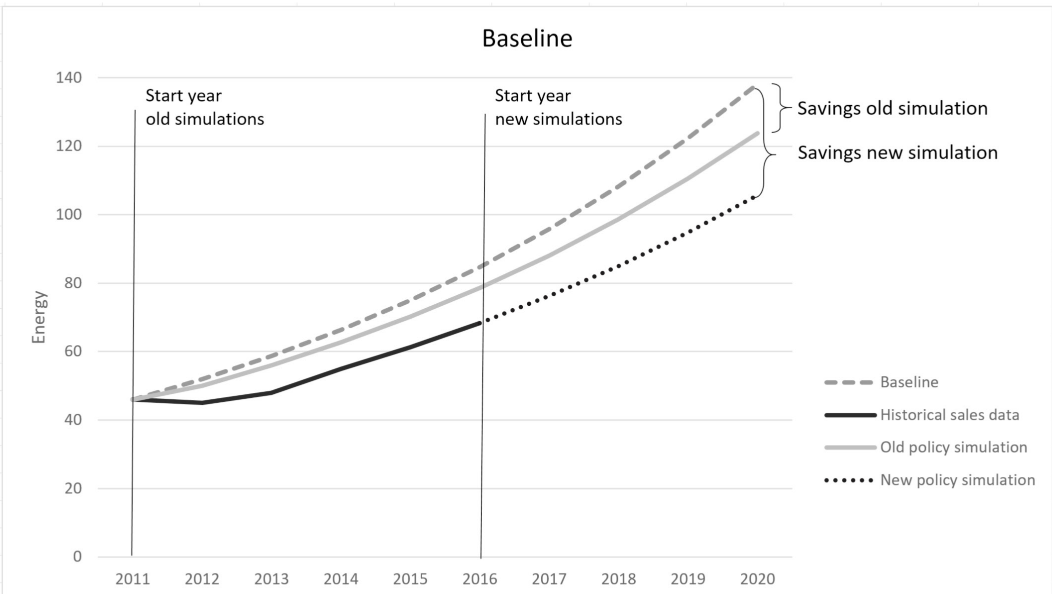

Figure 10 Baseline choice for calculating all savings after regulations enter into force.

In the new simulations from 2016 the first simulation year was moved to 2016 for the policy scenario, i.e. historic sales data for four more years, 2012–2015, were used. This makes the simulations for 2016 and ahead more accurate since they take into account the recent years of sales data, and the effects of the legislation in all years after 2011 will be estimated.

Normally, a baseline reflects the historic development and reality for as long as possible, i.e. until any effects are subject for evaluation. In this case, the baseline does not necessarily coincide with the actual development for the year 2011–2015, since it is a simulation. Since the purpose of the simulation is to estimate all savings stemming from the ecodesign and energy labelling regulations, the baseline needs to be a scenario without the regulations. Therefore, the baseline was not changed in the new simulation.

The option is illustrated in Figure 10.

ALTERNATIVE WAYS OF SETTING THE BASELINE

There are several ways of adjusting the baseline that the policy scenario is compared to. As time goes by and more sales data are collected, it is possible to adjust the baseline in two ways depending on what one wants to asses, either by choosing another starting year for the simulations or by adjusting the offset in annual energy use for the starting year. It is also possible to adjust the slope of the baseline curve, for example by assuming another natural development in the market than the 2 % that has been assumed in these simulations. The last way is not described further in this paper, but can be used both on its own or in combination with the other two ways of adjusting the baseline. None of the alternative ways of adjusting the baseline has been used for the estimation of savings for Sweden, but could be used in future simulations.

Adjusting the starting year for the simulations and the baseline scenario

When updating the data in the simulations, it can be discussed when to shift from historic to simulation period. In this discussion, it is assumed we have real sales data until 2015. One way to adjust the baseline is to adjust the starting year for the simulation of the baseline. The option is illustrated in Figure 11.

In this alternative, the first simulation year for the baseline moves from 2011 to 2016. This means that the historic period with sales data ends in 2015, and hence the curves for baseline and scenarios are the same until 2015 and will start to differ in 2016 and on. This means that the estimated effects in the years 2011–2015 are zero (like effects of labelling before 2011) and only energy savings from 2016 are estimated.

This way of setting the baseline can be used when the purpose of the simulations is to estimate the future savings, not all savings since the regulations entered into force. The baseline can be adjusted as often as desired, since new sales data can be collected at any frequency, to estimate the increase in the future savings. This allows for a dynamic update of future savings, although it is likely that annual updates are sufficient in most cases.

Adjusting the energy consumption in the first simulation year

The other way of adjusting the baseline, is by adjusting the starting point for the energy consumption without shifting the year when the simulation starts. This alternative is illustrated in Figure 12. In this example, it is assumed that the regulations enter into force in year 2014, and that the earlier ex-ante estimations were calculated in year 2011, three years before the regulations enter into force. When calculating the ex-ante estimations, the energy consumption of the product group in year 2014 is estimated as 70 GWh, case A. Later, with access to sales data for year 2014, it is possible to update the simulations and estimate a new figure of the total energy use of the product in year 2014. In the example from Figure 12, the new estimation of the energy consumption is 55 GWh, case B. The baseline is still defined as a natural development in the market of 2 % per year with the starting year of the simulations 2014, but with a new starting point for the energy consumption. This will result in different savings (the blue area); or more specifically, since case B starts at a lower offset (55 GWh), the accumulated savings will be lower.

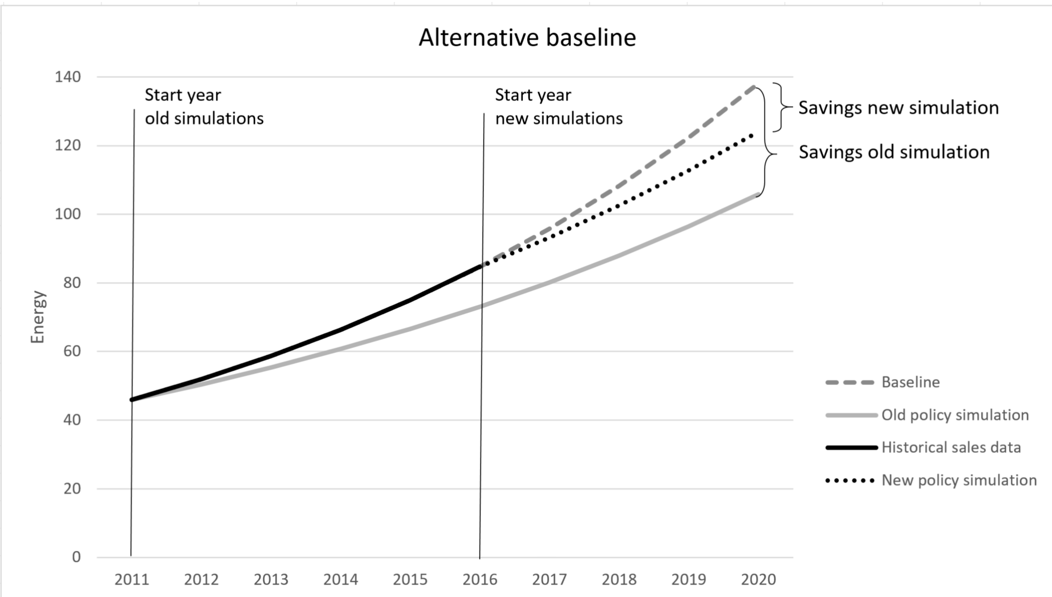

Figure 11. Alternative with adjusted starting year for simulation and baseline scenario.

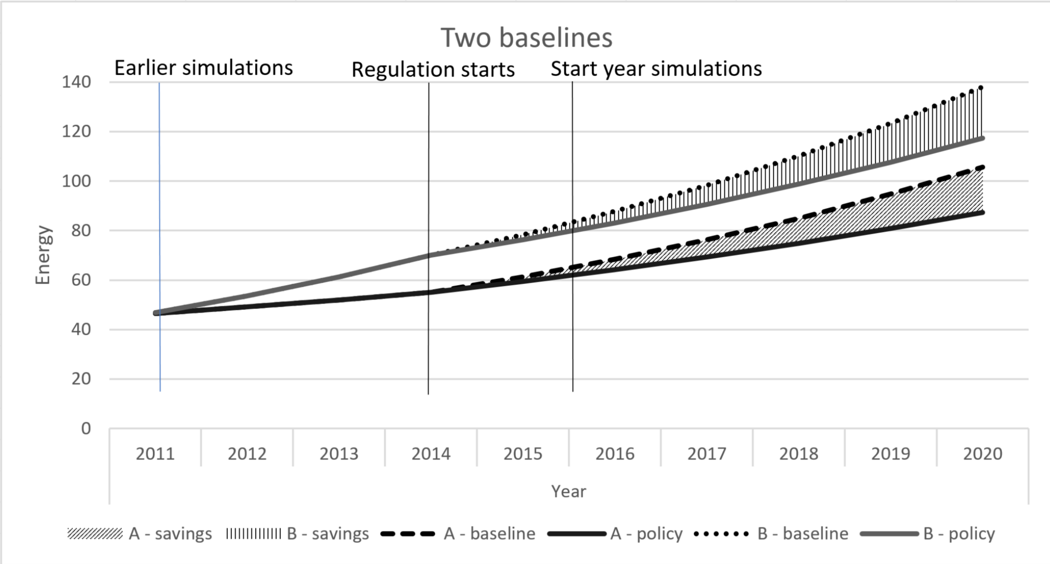

Figure 12. Illustration of the difference when adjusting the energy consumption for the starting year of the simulations.

Future versions of the estimation tool using webcrawl data

The results presented so far have been calculated using data coming from various sources such as enquiries and sales data from FEHA. For estimations of savings from other product groups, commercially available sales data from GfK have also been used. Although these sales data are mostly of high quality, they can be expensive and often aggregated in terms of product models or even product groups, and with a low time resolution (typically a year).

In contrast, more and more information about products are now available on the Internet, why in recent years web crawler techniques have been developed at a rapid pace. New methods to web-scrape data about the market for common household appliances have emerged through smart processing of web page contents. With intelligent software, it is possible to scrape large volumes of data from publicly available data sources on the net, basically in real time. Thus, this offers alternative means to track products available at the market place, when compared to more traditional data collections. Typical information of products and model names, claimed performance on functionality and energy use, and finally purchase price, is thus cheap and relatively easy to collect and analyse in real time. With advanced modelling based on ranking (popularity indexes at price comparison sites) it is even possible to estimate the market share of a model (Touzani, Van Buskirk, 2015).

In short, the web crawling process consists of two parts. The first part is to download the webpage and the second is to extract information from the page. The crawler is set to a start page (URL) and from that page it will visit and download all linked pages until it reaches a specified depth (links away from the start page). When a page is downloaded, the information can be extracted using a source and appliance specific "recipe". The recipe specifies which information to extract as a specific product attribute. The recipe is either a specific address like "second row, first column in the table is the model name" or relative like "next word after 'model name:' is the model name".

The new possibilities for policy evaluation are extensive. With detailed and in-real time (or high time resolution) data, it is possible to track the impact of policy almost in real time. This could be used to measure how fast new regulations are adopted in the market and lead to better judgement of how and when different steps in a multi-tier regulation should come into force. It also opens up for quicker corrections of the legislation where it evidently does not work as expected.

Long-term impact by MEPS and labels can be tracked as shown in this paper, but with the possibility of much more rapid updates of the evaluated effects. And, in addition, the impact of short-term measures like campaigns (either by governments or by retailers) can be followed and evaluated. It would also be possible to base the thresholds for the ecodesign energy efficiency requirements on current data, instead of data that already are a couple of years old. Another possibility is the design of new consumer tools when choosing and buying energy using products.

In summary, this relatively simple estimation tool provides the means to do policy evaluation at a national level, which is very valuable to national authorities. The results can be used both for the negotiations of the regulations, and for evaluation of effects and impact. Combined with real-time data collected with web crawler techniques the possibilities are extensive.

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