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Retailer Compliance with Energy Label  
Regulations



## **Abstract**

With the Framework Directive 92/75/EEC on Energy Labelling of Household Appliances, the European Union introduced a labelling system that applies to major household appliances. The EU Directive requires manufacturers to provide the data strip (accurate product energy consumption information) with each appliance to the retailers. Retailers are compelled to “provide all the appliances displayed in salesrooms with complete energy labels placed on top or front of the appliance in original size and colour and clearly visible” (Directive 92/75/EEC). Retailers therefore play a crucial role in the implementation of the European energy label program. Surprisingly however, their role in the success of the program has not received any attention so far.

In this paper, we first develop a theoretical framework to explain retailers' compliance with the Directive. The framework comprises instrumental motives for compliance like perceived costs and benefits of compliance as well as normative motives like internalization of regulation or social pressure to comply. These factors are moderated by retailers' ability to comply. Second, we test this framework econometrically on a sample of ca. 100,000 appliances from close to 1,400 retail stores in 27 European countries. Two sets of data were collected in each store: a compliance audit and a standardized survey of store managers. For the compliance audit, researchers noted for each household appliance available in the stores whether the energy label information was available, complete, and placed as required. The survey included perceptual measures of external and internal monitoring, manufacturer compliance, effort to comply, and consumer acceptance of labels. Using as dependent variable the share of completely labelled appliances per retailer – either at the aggregate level or per product category – estimation results of fractional logit models suggest that normative motives generally appear stronger than instrumental ones.

**Keywords:** Energy label, compliance, household appliances, retailer

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## 1 Introduction

Household appliances, which are estimated to account for 34% of EU household residential electricity consumption (Bertoldi et al. 2012), have long been the target of regulatory attention. One of the largest regulatory attempts to deal with energy consumption of household appliances was initiated in Europe in the early 1990s. Through the Framework Directive 92/75/EEC on Energy Labelling of Household Appliances, the European Union (EU) introduced a mandatory labelling system that currently applies to the following household appliances: refrigerators, freezers, washing machines, driers, dishwashers, electric ovens, air-conditioners, TVs, and household lamps in all 27 EU countries. In 2010, the “Labelling Directive” has been replaced by Directive 2010/30/EU – one of the reasons being to be able to include further appliances, such as monitors, electric motors, ventilation fans, or electric pumps (ECEEE 2011). Currently, mandatory labelling schemes exist in 54 countries, voluntary schemes in five countries (including Russia) and nine more countries (including South Africa) are in the process of introducing such schemes (World Energy Council 2010, p. 52). Among the existing schemes, the EU labelling scheme, which served as a model for several countries, including Argentina, Brazil, China, Israel, South Africa, and Switzerland (European Commission, 2008; Harrington and Damnics 2004) is the most widespread energy labelling program worldwide.

The EU Directive is mandatory for two parties: manufacturers and retailers. Under the Directive, manufacturers have to provide the product fiche (accurate product energy consumption information) with each appliance to the retailers. Retailers are then under the Directive compelled to “provide all the appliances displayed in salesrooms with complete energy labels placed on top or front of the appliance in original size and colour and clearly visible” (Directive 92/75/EEC, latest amendment Directive 2010/30/EU). Retailers therefore play a crucial role in the implementation of the European energy label program. It is under their responsibility to physically associate each appliance with the correct label and to ensure that the label is visible<sup>1</sup>. Surprisingly however, while there have been some studies focusing on retailer compliance with the regulation, there has been no attempt so far to understand why retailers may or may not follow the regulation. This paper addresses this gap and investigates the factors that lead to retailer compliance (or lack thereof) with the European energy label

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<sup>1</sup> The focus of our study is on brick-and-mortar retailers. Note however that online retailers are also required to show the labels for the appliances.

regulation. Specifically, we combine data from a recent study on retailer compliance (Schlomann et al. 2009) with a survey on retailer motives to comply that was collected within the same project.

The main take-outs of our research are as follow. In order to explain retailer compliance with the energy label regulation, we first develop a conceptual framework that integrates instrumental and normative models of regulatory compliance. We then test this framework econometrically through a large scale empirical study of ca. 100,000 appliances in 1,316 stores in all 27 European countries. Our results show that perceived costs and benefits, internalization of the regulation, and social influence all play a role in explaining retailer compliance with the EU energy labels program. We use these results to develop public policy recommendations geared towards retailers for the implementation of such programs.

The paper is organised as follows. We first provide a brief background of the EU energy labelling framework and of existing research on this label. We then develop a theoretical framework of compliance, which we operationalize and test empirically. The concluding section summarizes and discusses the main findings and offers suggestions for future research.

## 2 EU energy labelling framework

The EU energy label is a comparative label system (Harrington and Damnics 2004)<sup>2</sup>. Appliances are rated on a 7-point A-G scale (with A being the best and G the worse rating) that is also colour-coded from a green code for A-rated appliances to a red code for G-rated appliances (Figure 1).

Physically, the label consists of two parts: a background and a data strip (see Figure 1). The background depicts the label's colour codes and the information requested for a given product category; for instance, washing machine labels require information about electricity consumption per cycle, washing and spin drying performance, and capacity; noise level can be indicated; refrigerators require information about electricity consumption, and fresh and frozen food volume; noise level can be indicated. The data strip consists of the information

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<sup>2</sup> Note that since the empirical study was conducted in 2008, we describe the regulation as of this date and do not consider new developments of the regulation. We briefly discuss these new developments in the conclusion section.

specific to a given appliance; it provides for instance the exact rating, number of kWh, volume, and decibels of a given refrigerator.

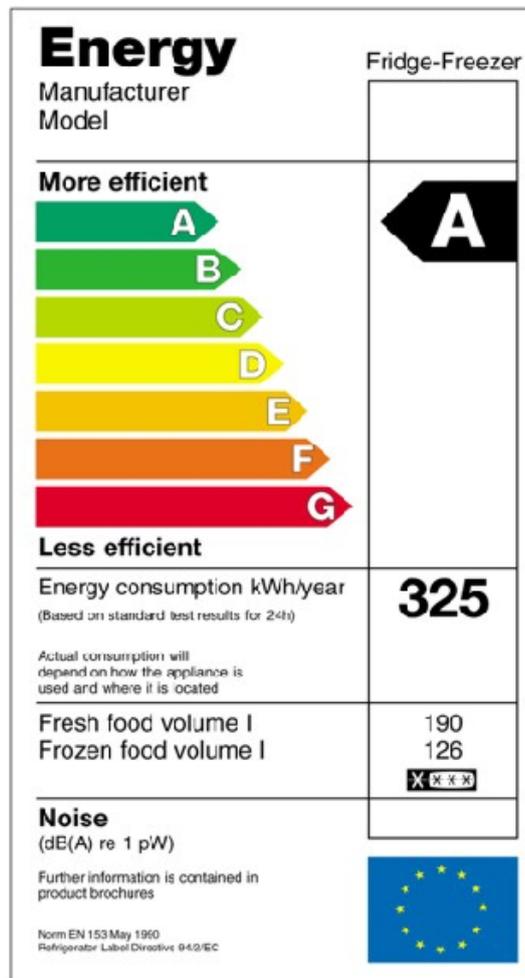


Figure 1 Picture of an energy label for cool appliance (background and data strip)

The EU energy label was progressively introduced in the different European countries. The initial framework Directive covered refrigerators and freezers; it was extended over time through specific implementing directives to also include washing machines and dryers, dishwashers, and electric ovens and air conditioning. The implementation of the Directive into individual country law also differed, with individual countries adopting the Directive immediately and others taking up to 5 years to adopt it into national law; of course, the countries joining the EU in the 21st century could only adopt the regulation in national law after being part of the EU. As a consequence, the regulation was implemented at different points in time in different EU countries.

### 3 Theoretical framework

There are two main approaches for explaining regulatory compliance. Instrumental models explain compliance through functional motives in which the actors comply either in order to serve their own self-interest or to avoid possible sanctions. Normative models explain compliance through the actors' internalization of the regulations or through social norms to comply.

Instrumental models stem from a functional perspective: actors comply with regulations as the result of a cost-benefit analysis (Becker 1968). Costs attached with compliance with a particular regulation are compared to the costs attached with non compliance (typically sanctions in the case of discovery) and with the associated benefits of complying (or not complying). Typical compliance costs include effort and time associated with complying (for instance, cleaning time necessary to comply with sanitary regulations) as well as possible monetary costs associated with compliance (e.g., equipment or personal costs). Costs of non compliance are usually subsumed under sanctions, either monetary or of other nature, received as a consequence of not following the regulation (Beach 2005). Typical compliance benefits may include favourable treatment through control institutions or through customers, for instance, when customers choose to purchase products from companies that are following the regulation or boycott products of companies that are caught not following the regulations. Compliance benefits may also include other dimensions, for instance reduced costs or better information. For instance, non-smoking regulations in restaurants helped reduce cleaning and maintenance costs due to cigarette butts and tar on walls and windows, thereby directly affecting the operating costs of the companies concerned.

Normative models are consistent with Giddens' (1984) theory of structuration. Giddens (1984) points out that while laws and regulations are typically created on the basis of instrumental motives, they form over time a frame for social action, indicating what is socially acceptable and what is right. Two factors form the core of normative models: internalization of the regulation, that is, the conviction that the regulation is actually legitimate and can help achieve a worthwhile societal goal and social norms, that is, the social pressure perceived by members of a society to comply with the regulation—or the social costs attached with acts of non compliance.

According to Giddens (1984), internalization occurs over time: regulations gain legitimacy over time, as the motive for the regulation becomes internalized and

the benefits get weighted higher than the costs. Internalization may also occur from the beginning, when the regulated actors are in strong agreement with the objectives of the regulation and therefore follow this regulation out of conviction and not only obligation. For instance, Nörstrom (1978) found that moral agreement with drinking laws was the best predictor of compliance with these laws. Conversely, internalization may be jeopardized if a regulation is perceived to be at odds with some other important goal(s).

Beside internalization of regulations, normative models also point to the importance of social norms. As a regulation gets implemented through more and more actors in a society, compliance becomes the social norm, and as a consequence lack of compliance becomes more and more difficult to justify and more remarkable: actors who do not comply may fear standing out and becoming isolated. The fact that many other regulated actors follow the regulation also provides a signal that the costs of compliance are not excessively high, and that its benefits have been internalized by many and are therefore socially accepted. This therefore creates a social pressure to follow the regulation that builds up as more and more regulated actors do follow it. This phenomenon is particularly found for regulations that are visible, that is, where one can see whether others follow the regulation or not. In a business context, social pressure may stem from one's peers but also from customers, who have significant social power over stores.

In summary, models of regulatory compliance are dominated by an instrumental and a normative approach. While most authors typically advocate one or the other, both approaches appear to be more complementary than contradictory. In a recent paper, Beach (2005) proposes to use an integrative framework of regulatory compliance in which both instrumental and normative models contribute to explaining compliance. We follow this approach and include both instrumental and normative factors to explain the reasons for retailer compliance with the EU energy labelling regulation. The proposed framework therefore includes costs and benefits, internalization of the regulations, and social pressure. We expect that compliance with the regulation will be negatively related to perceptions of costs of implementing the regulation and positively related to perceived benefits, internalization and social pressure. Figure 2 represents the proposed conceptual framework.

Furthermore, the proposed framework takes into account the fact that retailers may be willing but not able to follow the rules (Kumar, Stern and Achrol 1992). Failure to comply may be due to inability to comply rather than to a purposeful

attempt to break the rules. Models of compliance should therefore also include a moderating factor for the fact that the actors may not be able to comply with the regulations, and this, independent of their motives to comply.

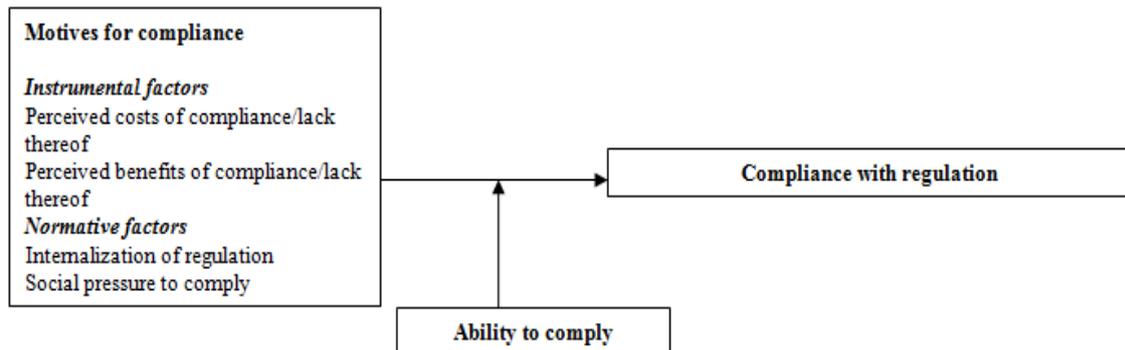


Figure 2 Theoretical framework of regulatory compliance

## 4 Methodology

### 4.1 Fieldwork and data collection

To test the proposed conceptual framework, two sets of data were collected in June 2008 in 1,316 stores spread through all 27 EU countries: a compliance audit, and a store employee survey. The compliance audit was conducted through experienced field workers within a regular store audit. Within this audit, field workers checked, for all appliances falling under the EU labelling Directive in 2008, whether the regulation was followed. Specifically, field workers first noted whether a label was present and if it was, whether the label was complete (background and data strip), in the correct form and colour, where the label was placed, and whether it was visible. This audit was conducted for all white appliances falling under the EU energy labelling directive: refrigerators, freezers, washing machines, driers, dishwashers, and electric ovens.

The store employee survey was conducted in the same stores immediately after the audit. This standardized survey was administered face-to-face by the field workers. In large stores, the survey was answered by the employee responsible for the white appliances department; in smaller stores, it was answered by the store manager. This survey focused on store employee perceptions about factors expected to affect compliance with the Directive, as developed in the conceptual framework.

To ensure representativeness of the results, stores were randomly sampled in each country so that they respected the retail structure in the country (GfK retail panel). 75 stores were sampled in the largest European countries, 25 in the smallest countries, and 50 in all others. The panel included the following types of retail stores: electro superstores, electric specialists, kitchen/furniture stores, hypermarkets/cash & carry, and department stores.

In total, 95758 appliances were audited (28152 refrigerators, 9328 freezers, 24331 washers, 7305 dryers, 12555 dishwashers, and 12423 ovens). The number of appliances audited by shop ranged from a minimum of one to a maximum of 409, with an average of 73.5 appliances checked in each store. Note that some stores did not offer certain types of products so that the number of stores to be included in the analyses varies for each product category.

The rate of compliance with the regulation was quite low: 11% of the audited appliances had no label; another 28% of the appliances did not have a label in compliance with EU regulations (that is, either part of the label was missing or the label was not in the proper colours or was not placed visibly in front or on top of the appliance). Therefore, only 61% of the audited appliances complied with EU regulations. There were large differences across countries (with compliance rates between 80 and 90% in Denmark, Hungary and Portugal and below 35 % in Greece and Bulgaria), across types of stores (with a compliance rate of 67% found in superstores and department stores and of 40% in kitchen specialty stores), and across types of appliances (compliance rates as high as 70% for tumble driers) (Schlomann et al. 2009).

## **4.2 Construct operationalization**

To test the theoretical framework, a careful consideration of construct operationalization was necessary. Whenever possible, we used multiple item scales to assess the constructs of interest. However, because of space constraints in the employee survey, straightforward constructs were assessed with single items.

### **Instrumental benefits of compliance/non compliance**

The main purpose of the EU energy label system was to create a system that is easily understandable (by both retailers and consumers) and therefore helps consumers identify appliance efficiency. This should therefore be the main benefit of the labels for retailers: the labels should help them advising consumers more effectively on energy efficiency. This notion was assessed on a 8-item 11-

point scale that tapped the extent to which retailers perceive that the energy labels are helpful to them to sell efficient appliances. An exploratory factor analysis showed that these factors all loaded on a single factor. After checking adequate reliability (Cronbach's alpha = .86), these items were averaged and subsumed under the factor "helpful".

### **Instrumental costs of compliance/non compliance**

Following the literature, we identified two main types of costs of the label system for retailers. First, there is a certain level of effort involved in attaching the correct labels to the appliances. Perceived effort to administer the labels was measured through an 11-point item (effort). Second, as indicated by instrumental models of compliance, a core cost linked to non compliance with regulations is the fear of sanctions. As sanctions can only happen to the extent that some control occurs, we assessed the extent to which retailers perceive that compliance with the regulation is being controlled, either externally (through the regulating authorities) or internally (through store management). Both of these measures (officialcheck and managercheck) were assessed nominally (occurrence of control in the preceding 12 months).

### **Internalization of regulation**

As stressed by Giddens (1984), time is a key factor leading to the internalization of regulations. The longer a regulation has been in place, the more "normal" it appears, and the less resistance is built against it. As mentioned in the beginning of the paper, the EU energy labelling Directive was not applied simultaneously throughout the EU. Using external databases (MURE 2011), we obtained for each of the 27 EU countries the first date of implementation of the Directive in national law. We then subtracted this date from 2008 (year of data collection) to obtain the years since first implementation of the Directive in each country (*implementtimelag*).

Interviews with retailers conducted at the outset of the study indicated that label design and aesthetics were a major concern for many retailers. This appeared to be particularly a problem for appliances presented in furniture stores, for instance electric ovens or dishwashers presented within a model kitchen. We therefore included a question about perceptions of the effects of the label on appliance aesthetics (*pooraesthetics*). We expected compliance to decrease when retailers perceive that the labels have a negative aesthetical impact, that is, when they are at odds with an important goal for retailers.

## Social norms

As indicated by normative models, social norms stem from the adoption of a regulation among one's peers. To tap this notion, we computed within each country the rate of compliance with the regulation and used this country compliance rate as a measure of peer pressure (*complyrateappliancetype\_co*). We expected compliance at the retailer level to increase when the level of compliance within the country increases.

Social pressure may also originate from consumers. These may exert pressure on the retailer in a number of ways. First, they may demand efficient appliances; second, they may be willing to pay more for efficient appliances and grant a large importance to energy labels. Finally, they may be paying attention to a number of factors when purchasing an appliance, some of them consistent with energy labels (energy costs), others inconsistent (price or design). We therefore operationalize consumer pressure through the following constructs: trend for demand for efficient appliances in the past 2 years (*demandpast*), willingness-to-pay (*wtpappliancetype*) more for efficient appliances and importance of the label (*labelappliancetype*) (both of these measures were taken separately for each product category), and relevance of energy costs, design, and price as purchase factors (all these factors are measured as as perceived by retailers) (*energycosts*, *design*, and *price* respectively). These variables were all measured on 11-point scales. We expected a positive effect of focus on energy costs, demand and willingness-to-pay for efficient appliance on retailer compliance and a negative effect of focus on price and on design.

## Control variables

As explained in the beginning of the paper, retailers depend on the manufacturers to obtain the product data strip for the labels. When manufacturers fail to provide this data strip, retailers cannot comply with the law. Missing data strips therefore generate a possibility for retailer inability to comply. We therefore assessed perceived frequency of missing data strips (*stripmissing*) and expected that compliance would decline when the proportion of missing data strips increased.

In addition to missing strips, we also included the following control variables: type of store, country, and store size (*nbrpdts*), which was assessed as the number of appliances sold in the store. We expected to find higher levels of compliance in the better organized stores, as indicated by store size and retail chains (superstores).

## Dependent variable

The dependent variable (`complyrateappliancetype`) was the share of correctly labelled appliances (by appliance type) at the level of individual retailers.

## 5 Results

We assessed the impact of the different explanatory variables on the share of correctly labelled appliances by store. The model provided the direction of each effect and whether the effect was statistically significant<sup>3</sup>. We present a summary of the results (direction of effect and significance of the effects) for all seven appliance types in Table 1.<sup>4</sup>

Table 1: Results

	Fridge	Freezer	Washer	Dryer	Dishwasher	Oven
effort	-0.004 (0.024)	0.025 (0.028)	-0.011 (0.024)	-0.058 * (0.031)	-0.007 (0.025)	-0.025 (0.025)
helpful	0.019 (0.048)	-0.013 (0.061)	-0.015 (0.047)	-0.119 (0.078)	0.011 (0.054)	-0.040 (0.052)
officialcheck	0.313 * (0.1379)	0.279 * (0.167)	0.395 *** (0.150)	0.610 *** (0.200)	0.355 * (0.148)	0.412 *** (0.149)
managercheck	0.685 *** (0.184)	0.712 *** (0.234)	0.427 * (0.204)	0.447 * (0.242)	0.614 *** (0.216)	0.423 * (0.239)
implementlag	0.132 * (0.076)	0.173 * (0.081)	0.072 (0.061)	0.081 (0.072)	0.060 (0.109)	0.103 * (0.062)
pooraesthetics	0.040 *** (0.012)	0.045 *** (0.015)	0.045 *** (0.013)	0.077 *** (0.018)	0.062 *** (0.014)	0.036 *** (0.013)
complyrate_co	-0.009 (0.027)	-0.014 (0.022)	0.014 (0.026)	0.016 (0.029)	0.018 (0.030)	-0.012 (0.043)
demandpast	0.248 * (0.108)	0.138 (0.081)	0.192 (0.081)	-0.084 (0.081)	0.239 * (0.081)	-0.008 (0.081)

<sup>3</sup> Since our dependent variable is bounded between 0 and 1, with high shares of observations at the boundaries, the effects of the explanatory variables tend to be non-linear and the variance tends to decrease when the mean approaches 0 or 1. Hence, linear regression analysis is not appropriate. Instead, we apply the fractional logit model, originally developed by Papke and Woolridge (2006).

<sup>4</sup> To save space we only present summary results. Detailed results are available upon request.

	Fridge	Freezer	Washer	Dryer	Dishwasher	Oven
	(0.122)	(0.139)	(0.128)	(0.166)	(0.132)	(0.134)
wtp	0.003	0.028	0.011	0.008	-0.032	-0.013
	(0.034)	(0.040)	(0.032)	(0.045)	(0.034)	(0.035)
label	0.022	0.051	0.045	0.172 ***	0.069 *	0.062 *
	(0.044)	(0.049)	(0.039)	(0.052)	(0.041)	(0.038)
energycosts	-0.050	-0.086 *	0.042	-0.016	-0.044	-0.018
	(0.038)	(0.046)	(0.039)	(0.049)	(0.040)	(0.043)
design	-0.001	-0.002	-0.061 *	-0.089 *	-0.013	-0.045
	(0.034)	(0.042)	(0.035)	(0.047)	(0.036)	(0.039)
price	0.054	-0.032	0.001	0.016	0.042	0.017
	(0.044)	0.052	0.045	0.059	0.048	0.047
fichemissing	-0.061 ***	-0.067 *	-0.083 ***	-0.106 ***	-0.053 *	-0.058 *
	(0.023)	(0.029)	(0.026)	(0.035)	(0.027)	(0.026)
nbrpdt	0.007 ***	0.005 ***	0.008 ***	0.004 ***	0.007 ***	0.004 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
superstore	0.322 *	0.334 *	0.306 *	0.771 ***	0.443 ***	0.168
	(0.150)	(0.174)	(0.158)	(0.200)	(0.161)	(0.164)
Loglikelihood	-553.70	-449.52	-511.23	-352.49	-504.93	-500.24
Sample size	1075	859	1013	717	993	940

Note: \*\*\* indicates significance at the  $p=0.01$  level, \*\* indicates significance at the  $p=0.05$  level and \* indicates significance at the  $p=0.1$  level in a two-tailed test

The Table suggests that findings in terms of significance levels, signs, and order of magnitude of parameter estimates are quite consistent across appliance types. Hence, findings appear robust across appliances. Rather than discussing the findings for each appliance type individually, we focus, where possible, on the generic findings across all appliance types.

### Instrumental benefits

The extent to which retailers perceive the labels to be helpful in selling more efficient appliances (*helpful*) is not found to be significant. Therefore, the results indicate no effects of instrumental benefits on compliance.

### Instrumental costs

The parameter estimates associated with *effort* exhibit the expected negative sign for all appliance types, but are only statistically significant for dryers.

Hence, for most appliances, perceived effort to comply with labelling requirements does not appear to affect compliance. Controls through officials and internal management controls are usually found to be statistically significant, implying that, as expected, monitoring of labelling improves compliance. Furthermore, the point estimates suggest that monitoring by managers tends to be more effective than monitoring by officials (but the difference is not statistically significant at conventional levels).

### **Internalization**

The first variable focusing on retailer internalization of the labelling regulation is the time since implementation of the Directive. As suggested by theory, *implementlag* exhibits the expected positive sign and is statistically significant at conventional levels for three types of appliances. Hence, there is some empirical support for the hypothesis that as the regulation has been longer in place in a country, retailer compliance with the regulation increases.

As expected, perceptions that the labels negatively affect the aesthetics of the appliances are found to have a significant negative effect on compliance ( $p=0.01$ ) for all appliances, suggesting that retailers comply less when they see the label as jeopardizing an important goal.

### **Social norms**

The overall compliance rate for a particular appliance within a country (*complyrate\_co*), is not found to affect compliance of individual retailers. The results therefore show little support for the notion that peer norms affect compliance.

However, the results show more effects for consumer pressure. While *wtp* is not found to be statistically significant that is, consumer willingness to pay more for higher efficiency appliances appears to have no impact on retailers' labelling compliance), consumer perceived importance of labels (*label* is always positive and significant in 3 product categories), consumer demand for efficient appliances (*demandpast* shows a positive effect significant in 2 product categories) have the expected impact on retailer compliance. Moreover, while retailer perceptions that consumer choice is mostly driven by energy costs or price have no effect on compliance, their perception that consumer choice is driven by design considerations does exhibit the expected negative impact on compliance and is significant in 2 product categories.

## Control

As expected, retailers' labelling performance is negatively affected if manufacturers do not provide the product fiche. The parameter associated with *fichemissing* is found to be statistically significant for all appliances. Retailers which sell a larger variety of products are also found to perform better in terms of labelling compliance. *Nbrprts* is statistically significant for all appliances. Finally, for most appliances *superstore* retailers are found to be associated with statistically significant higher labelling compliance rates than other stores.

## 6 Discussion

Interestingly, with the exception of compliance controls, the data show little impact of instrumental factors on compliance: neither effort nor benefits directly linked to the labels have an effect on retailer compliance. Fear of sanctions however appears relevant, especially internal sanctions.

Normative factors appear to have a particularly strong impact on compliance: internalization of the Directive appears to play a strong role, as does perceived consumer pressure. Peer pressure however appears to have little if any impact. Possibly such peer pressure is only effective in the lower levels of acceptance of a regulation. Overall, retailers appear to react more to pressure from their customers than to peer pressure.

## 7 Conclusions

Overall, the findings from this study provide support for the theorized model. While some factors do not appear significant, all significant results are consistent with theory. The results therefore indicate that the proposed model focusing on instrumental costs and benefits, internalization and social norms (controlling for the ability to comply) receives broad empirical support. To our knowledge, this is the first large-scale test that helps understand why retailers may or may not comply with the EU Labelling regulation. A particular methodological strength of the study is the clear separation between survey responses (explanatory variables) and audit results (dependent variable): this separation guarantees low common method bias and makes the results particularly impressive. Indeed, past studies focusing on regulation compliance have often suffered from common method bias, where both dependent and independent variables were measured in the same survey.

From a theoretical perspective, this study shows that both instrumental and normative factors play a role in explaining regulatory compliance. It therefore provides further support for integrated models of compliance that combine both types of approaches (see also Beach 2005). Moreover, the study also indicates a greater impact of normative factors, especially internalization and consumer pressure. Concerns about effort of implementation of the Directive through the retailers appear unwarranted. The results instead suggest that fear of sanctions, internalization of the Directive, and consumer pressure have a strong impact on retailer compliance.

Some puzzling results would deserve attention in further studies. One of the most interesting results is the fact that retailer perceptions that consumers focus on energy costs when purchasing appliances was found to have no effect on retailer compliance. This non-result may be due to the fact that the labels do not explicitly include energy costs, but only energy consumption, which may be too abstract for consumers. Alternatively, one could also speculate that retailers may use the labels strategically, complying with the regulation for high efficiency appliances but failing to do so for low efficiency appliances. Unfortunately, we could not check this possibility with the current data as the energy class of the audited appliances was not collected for non labelled appliances. Exploring this phenomenon would however be highly interesting.

In light of potential future changes in the EU energy labels, further studies could also focus on the rate of adoption of the new labels through retailers. One can wonder whether appliances will immediately receive the newer labels, or whether the change will occur step by step as retailers first sell appliances received ordered before the new label requirements. A simultaneous use of older and newer labels for the same product categories in stores may generate quite some confusion for consumers, and efforts should be undertaken to accelerate the switch as much as possible.

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