prognos

Energy Information and E-Commerce

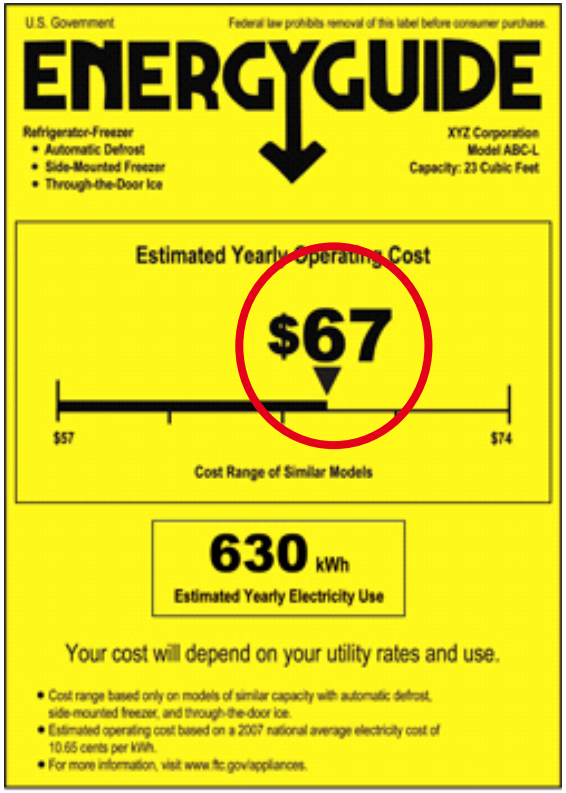
Evaluating the Effect of Life-Cycle Cost Information on Consumer Behavior

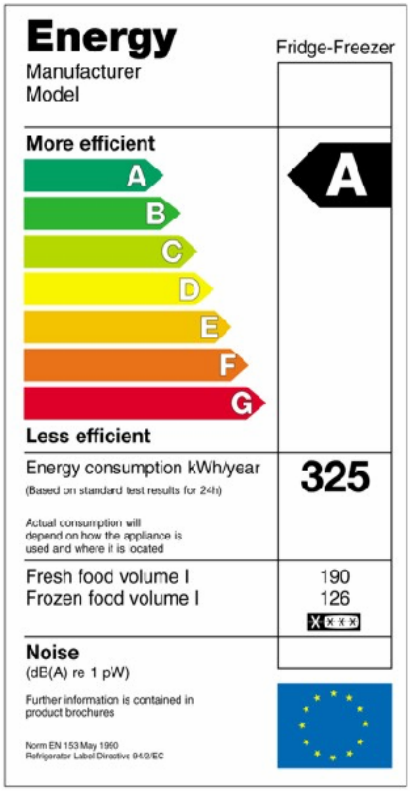
2010 International Energy Program Evaluation Conference (IEPEC)

Matthias Deutsch, PhD
Prognos AG
www.prognos.com

Paris, 9 June 2010

Energy-efficiency labels for household appliances come in different formats: with or without money units





Agenda:

- Background and research questions
- Method
- Data processing
- Models
- Results
- Conclusions

Background and research questions

- **Consumers demand monetary information** in interviews, but the few existing experimental studies are inconclusive
- Missing link between information acquisition and purchasing behavior
- This study is about long-run cost, i.e. consumers' **life-cycle cost (LCC)**

> *LCC = product price + lifetime operating cost*

- **Research questions** for the online experiments:
  - Does LCC disclosure make online shoppers opt for appliances that are more energy-efficient?
  - Does LCC disclosure change the sales revenue for the website that supplies the information?

Method: random assignment to two distinct conditions

Control group

Product	Price
A	€ 400
⋮	⋮
Z	€ 450

Treatment group

Product	Price	Operating cost	Life-cycle cost
A	€ 400	€ 190	€ 590
⋮	⋮	⋮	⋮
Z	€ 450	€ 100	€ 550

- In the long run, product Z is cheaper than product A
- No informed consent of users given minimal risk

Control group

Siemens KA 1501 white

€ 199.00 at baur.de ⓘ

Refrigerator 117 L · 223 kWh/year · efficiency class A · total capacity: 117 L · type: free-standing… more

Now 10 offers at the price comparison or at ebay.

Treatment group

Click to adjust assumptions

Siemens KA 1501 white

Total cost	=	Price	+ Operating cost
€ 377.40	=	€ 199.00	+ € 178.40

at baur.de ⓘ

Refrigerator 117 L · 223 kWh/year · efficiency class A · total capacity: 117 L · type: free-standing… more

Now 10 offers at the price comparison or at ebay.

Adjustable…

- Price of electricity and time horizon (for cooling and washing appliances)
- Price of water and frequency of use (for washing machines)

We measured the characteristics of appliances shoppers chose by clicking on them.

	Cooling appliances (price comparison)	**Washing machines** (online shop)
Clicks measured	▪ From price comparison to final retailers	▪ To put product into virtual shopping cart
Variables of interest	▪ Energy use per year ▪ Number of clicks	▪ Energy use per standard washing cycle ▪ Water use ▪ Number of clicks

Data processing

- Original experimental data consisted of **server log files**.
- **Non-human user agents** („Robots“, „spiders“, „crawlers“) cannot be easily distinguished from human internet users in server log files.
- Our **approach**:
  - Identification with special **blacklists** available (but one cannot be certain that those are up-to-date)
  - Use of a **cut-off criterion** for the number of clicks
  - **Robustness check** with a subset of the data

Models

- The analysis took into account several product-specific factors such as an appliance's capacity or brand by means of **multiple regression**

$$\ln(energy)_i = \beta_0 + \beta_1 LCC_i + \beta_2 Z_i + \mu_i$$

where *LCC* = treatment dummy variable, *Z* = vector of covariates (capacity etc.), μ = error term

- Estimation with robust Ordinary Least Squares

$$ctcount_i = \beta_0 + \beta_1 LCC_i + \beta_2 Z_i + \mu_i$$

where *ctcount* = number of clicks per user

- Estimation with a negative Binomial model

Results:
Energy use gets reduced through LCC disclosure

	Cooling appliances (price comparison)	**Washing machines** (online shop)
Energy use	-2.5% [kWh per year] **	-0.83% [kWh per standard washing cycle] ***
Water use	n/a	-0.74% [liters per standard washing cycle] *
Retail volume	-23%**	not significant
Number of observations	1969	2065

* p<0.05, ** p<0.01, *** p<0.001

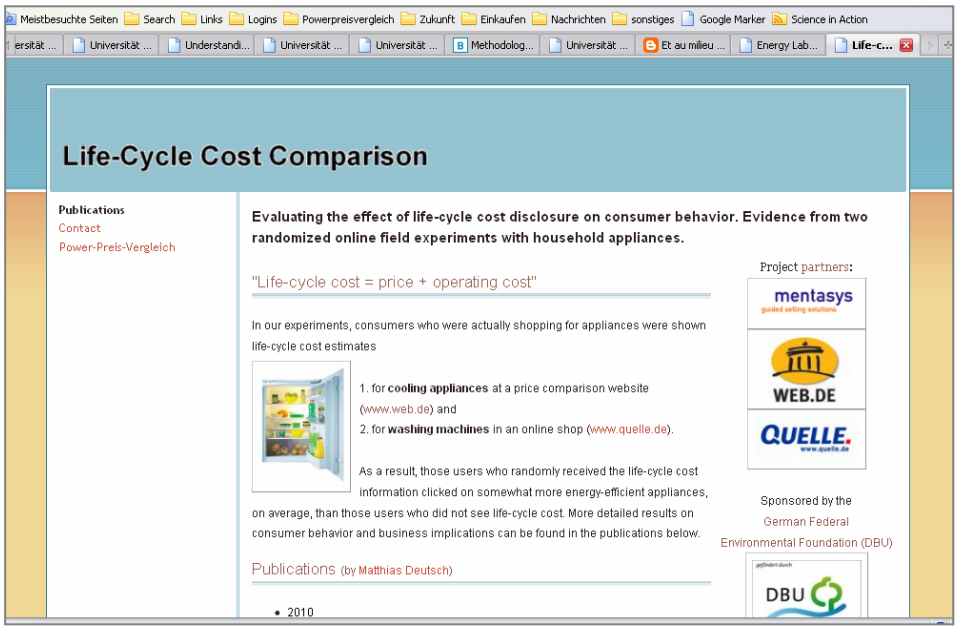
Conclusions (I)

- LCC disclosure makes individuals opt for appliances that are **more energy-efficient**.
- LCC disclosure is **unlikely to bring about higher sales revenue** for the online retailer or price comparison website that provides the information.
- The second finding needs to be **validated** with data on final purchases.
- The substantive **size of energy savings** through LCC disclosure does not appear to warrant policy intervention when weighing estimated benefits and costs.

Conclusions (II)

- **Future research** should evaluate
  - **alternative formats**, such as annualized life-cycle costs or long run savings
  - **different experimental settings** (other countries and energy prices)
  - **actual final purchases** for strengthening measurement validity

Questions & answers



For more information, visit the project website at

www.lifecyclecosting.eu

References

- Deutsch, M. (2010): Life-Cycle Cost Disclosure, Consumer Behavior, and Business Implications: Evidence from an Online Field Experiment, *Journal of Industrial Ecology,* 14 (1), 103-120,(http://dx.doi.org/10.1111/j.1530-9290.2009.00201.x)
- Deutsch, M. (2010): The effect of life-cycle cost disclosure on consumer behavior: evidence from a field experiment with cooling appliances, *Energy Efficiency* (http://dx.doi.org/10.1007/s12053-010-9076-4)
- Deutsch, M. (2009): Life-Cycle Cost Disclosure and Consumer Behavior: Expectations in the Energy Policy Community Versus Experimental Evidence, In D. M. Bergmann (Ed.), *Energy Efficiency Research*. Hauppauge, NY: Nova Science Publishers
- Deutsch, M. (2007). The effect of life-cycle cost disclosure on consumer behavior. Dissertation, University of Maryland, College Park, http://hdl.handle.net/1903/6794 .