

What analysis can be done with high-resolution product data?

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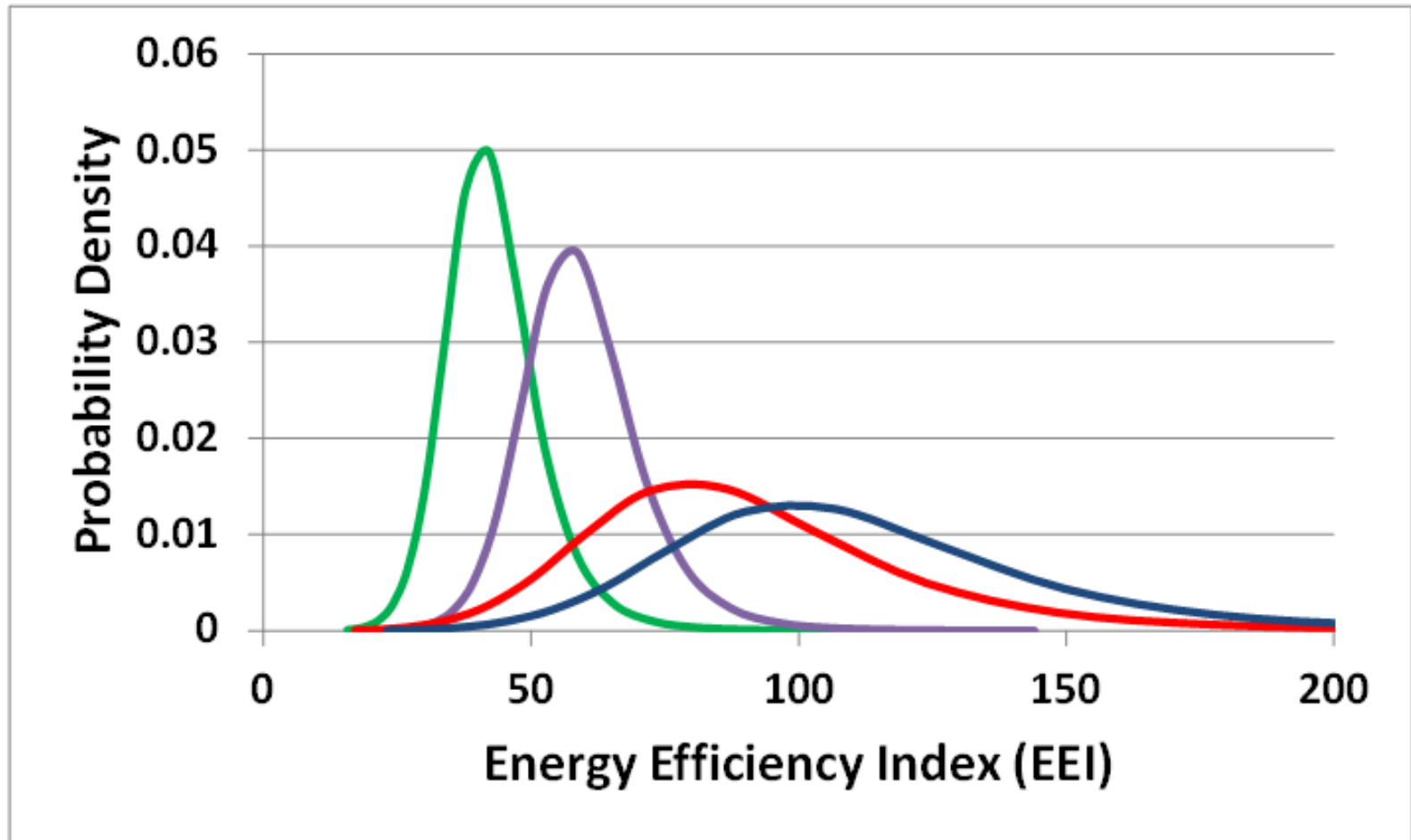
Today's Focus

1. Energy Efficiency

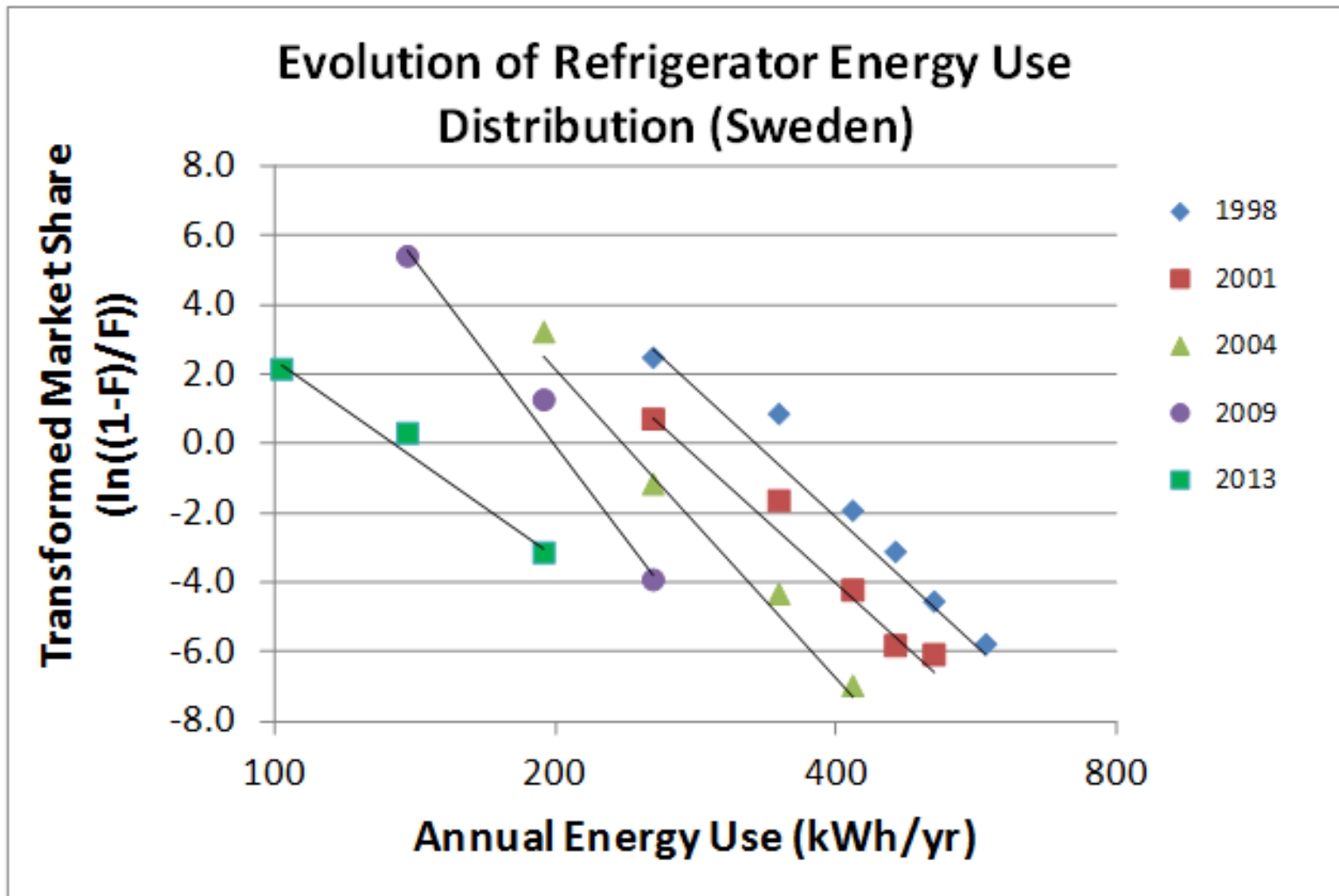
Improvement Rates &

2. Economic Analysis of Market
Conditions

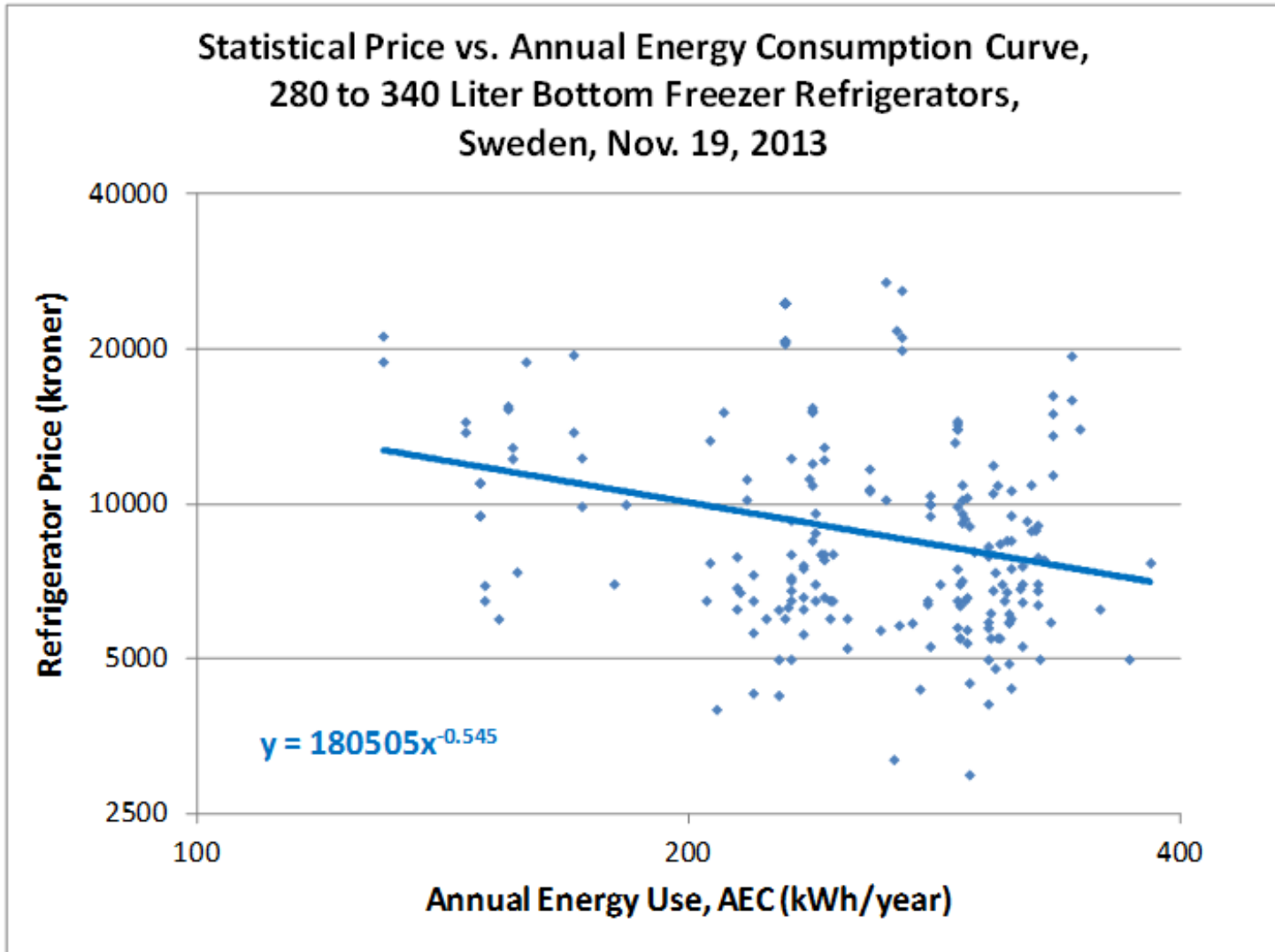
Measuring Changes in Efficiency



Mathematics can help make EE market measurements more accurate



Statistical Price-Efficiency Curves



Pro's and Con's of Hi-Res Data

Advantages

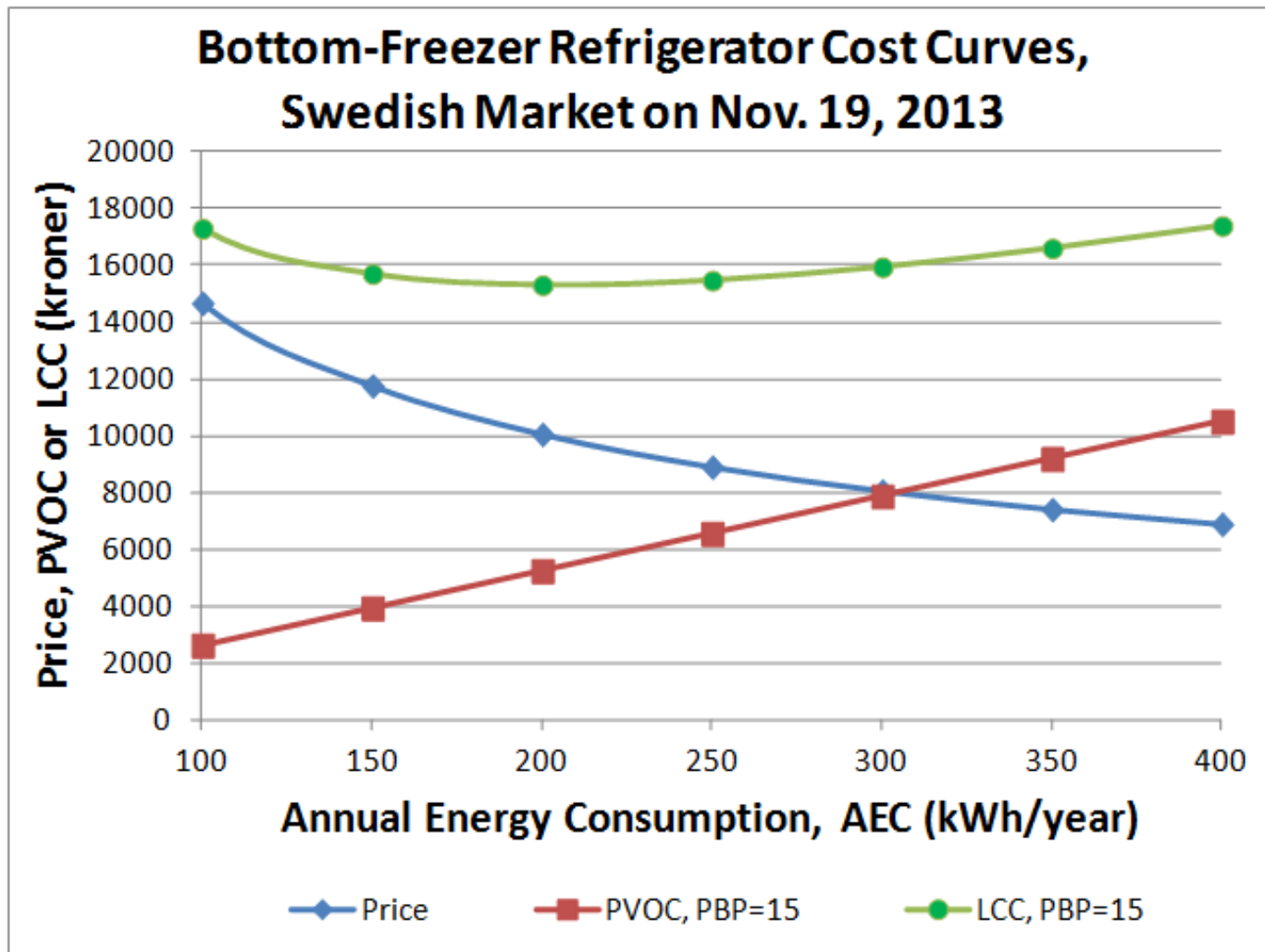
- More up-to-date
- Greater empirical product/feature/price detail
- Is closer to actual prices paid by actual consumers

Disadvantages

- Large amounts of variability & noise
- Consumer prices don't directly reflect manufacturing costs
- Statistical analysis can be unreliable: "Lies, damn lies and statistics"*

Quote attributed to Mark Twain: "There are three kinds of lies: Lies, damn lies and statistics"

Real-time Life-cycle Cost Calculation



Equations of LCC-Optimum Market Dynamics

Life-cycle Cost (LCC):

$$LCC = P_A + PVOC = P_A + PBP \cdot P_E \cdot AEC$$

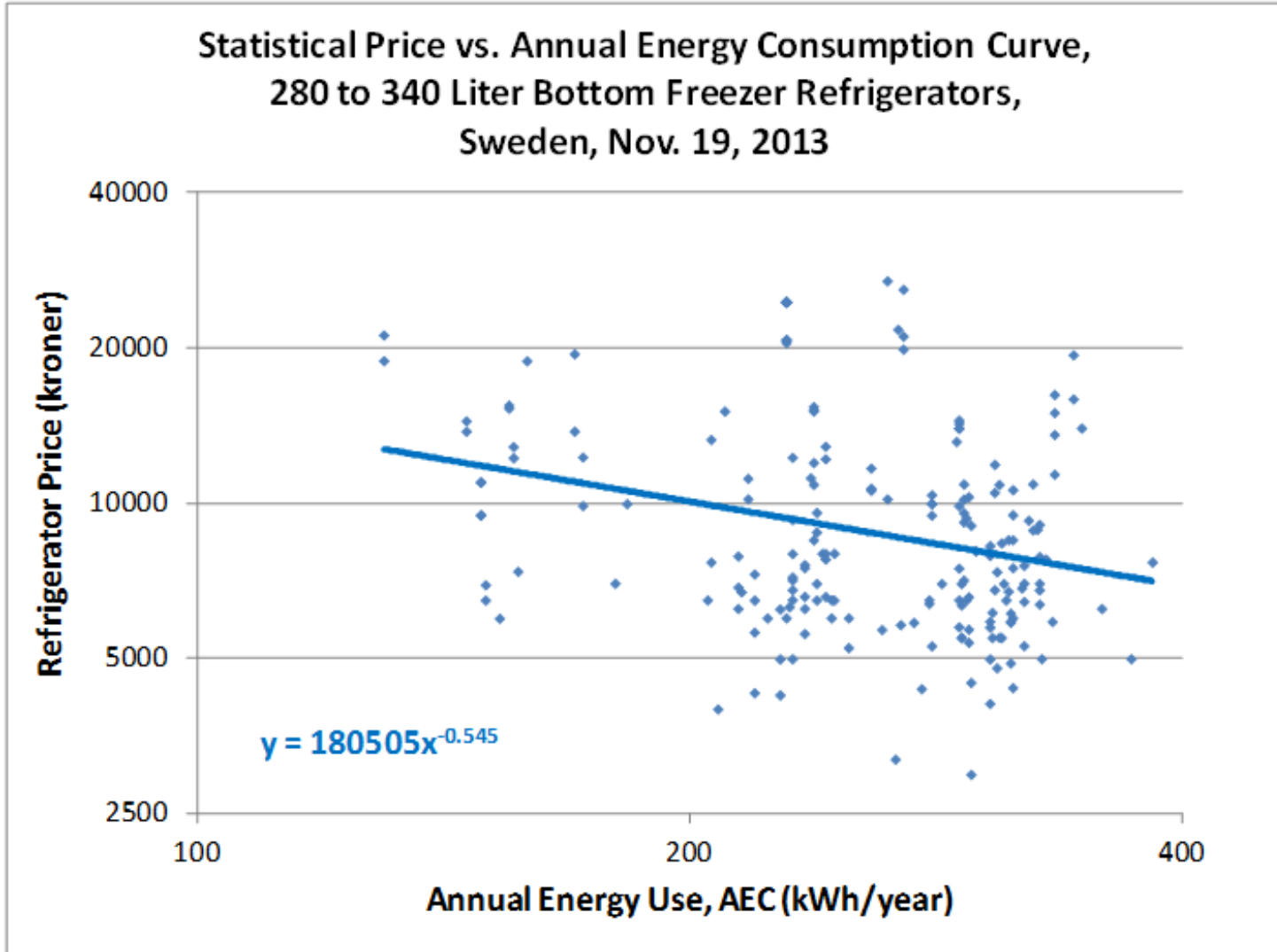
LCC Minimization:

$$\frac{\partial LCC}{\partial AEC} = 0 = \frac{\partial P_A}{\partial AEC} + PBP \cdot P_E$$

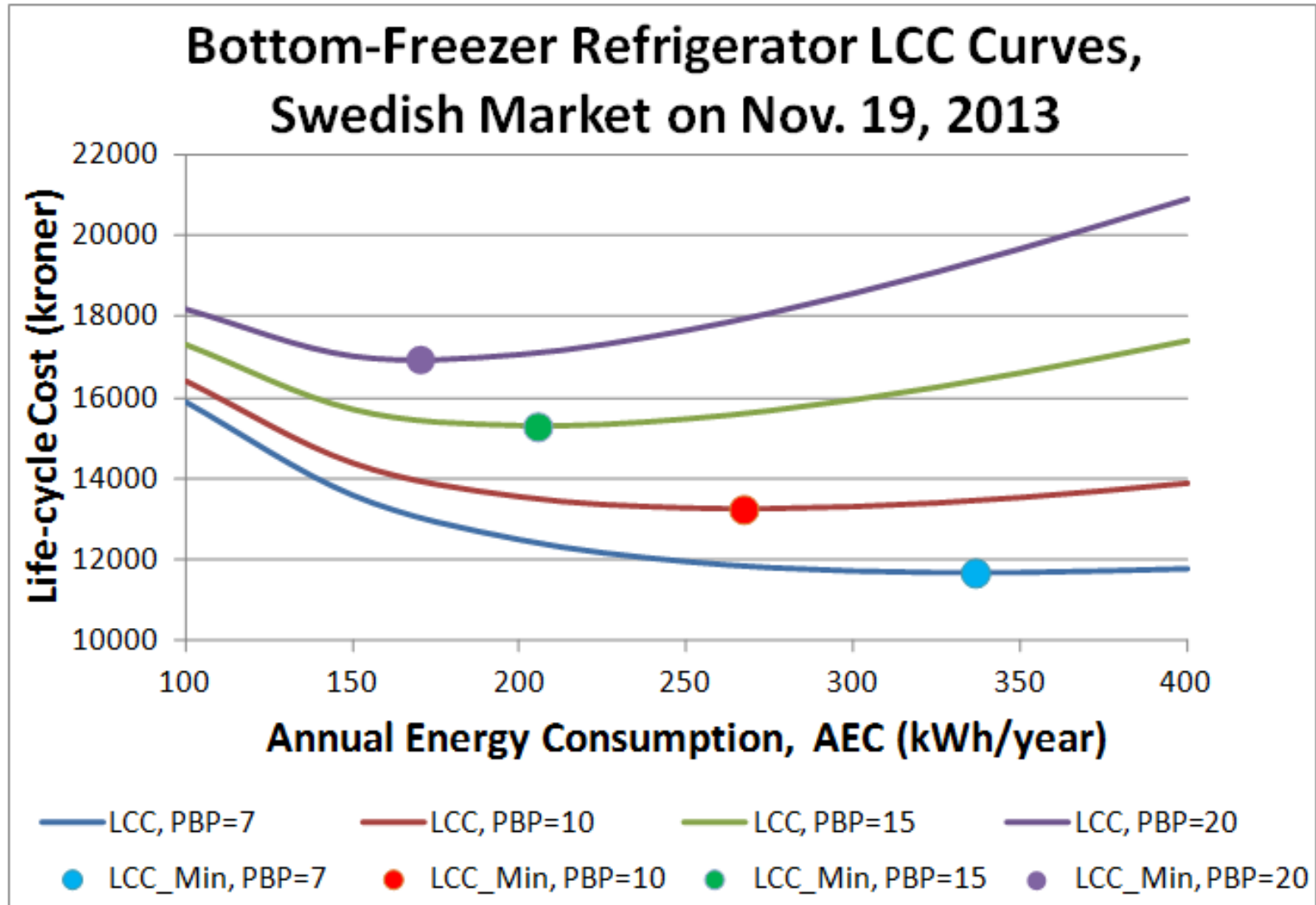
$$\frac{AEC}{P_A} \frac{\partial P_A}{\partial AEC} = \frac{\partial \ln(P_A)}{\partial \ln(AEC)} = -\varepsilon = -\frac{PBP \cdot P_E \cdot AEC}{P_A} = -\frac{PVOC}{P_A}$$

$$AEC = \frac{\varepsilon P_A}{PBP \cdot P_E}$$

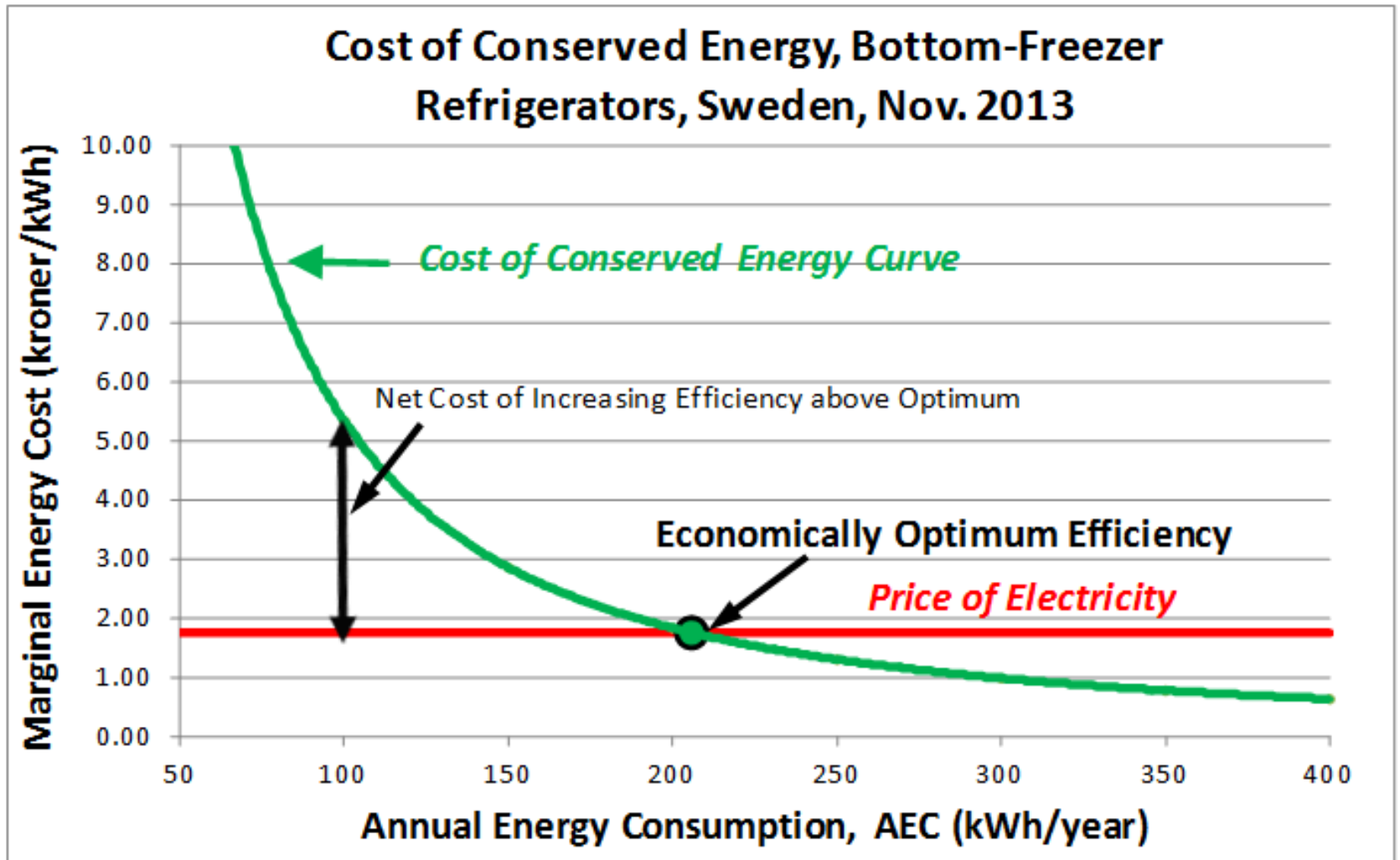
Possible Measurement of ε



Min-LCC as a Function of PBP



Marginal Cost of Conserved Energy Curve



Remaining Challenges

- Automating data collection and quality control to make large volumes of data cheaper and easier to get
- Developing improved statistical techniques for using data to calculate quantities of interest with confidence
- Educating the international policy community on how to use analysis products and having the discussion on policy implications
- Providing expanded access to analysis products of interest