

Shrinking Goods and Sticky Prices – A Model of Cognitive Costs with a Quantity Adjustment Mechanism: Theory and Evidence

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Swan's Theorem (1970):

- **Same Unit-Prices:**

Price = Package-Size

But often they are not

- **Demand responds more to prices**
 - **Gourville and Kohler (2004)**
- **Consumer outcries: Downsizing**
 - **Rotemberg (2005)**
- **Adjustment Mechanisms**
 - **Knotek (2008)**

Decreases

Increases



Upsizing

Downsizing



Attention and Inattention

- **Inattention to Package Size**
 - Gourville and Kohler (2004)
- **Inattention to Prices**
 - Dickson and Sawyer (1990)
 - Vanhulle and Dréze (2002)
- **Price Changes “In the Small”**
 - Chen et al. (2008)

Consumers' Inattention: Model

- **Utility Function:**

$$U(C, N, T) = \frac{C^{1-\sigma}}{1-\sigma} - \frac{N^{1+\varphi}}{1+\varphi} - \frac{T^{1+\varphi}}{1+\varphi}, \quad \sigma \in (0,1), \varphi \geq 0$$

- **N - Labor, T - cost of information processing,**

$$C = \left\{ \int_0^1 \left[C(i) Q(i) \right]^{\frac{\varepsilon-1}{\varepsilon}} di \right\}^{\frac{\varepsilon}{\varepsilon-1}} .$$

Cost of Processing Information

- Processing information: Attention
 - Find target (Price tag, Package-Size tag)
 - Process in working-memory
 - Store in long-run memory
 - Use in Comparisons
- Cost: Constant time per target
 - Price: τ_P
 - Package-Size: τ_Q

Producers:

- Monopolistic Markets
- Infinite number of goods
- Expected Marginal cost: Ψ
- Expected Price: $\frac{\varepsilon}{\varepsilon - 1} \Psi$
- Expected Package-Size: Q

Adjustments

- Adjust prices: θ_P
- Adjusted Price: $\frac{\varepsilon[\Psi + \eta(i)]}{\varepsilon - 1}$
- Adjust package-size: θ_Q
- Adjusted package-size: $\frac{\Psi}{\Psi + \eta(i)} Q$

Consumers Choose:

- **Price and Package-Size Inattentive (IA)**
- **Price Attentive (PA)**
- **Package-Size Attentive (QA)**
- **Price and Package-Size Attentive (PQA)**

Baseline

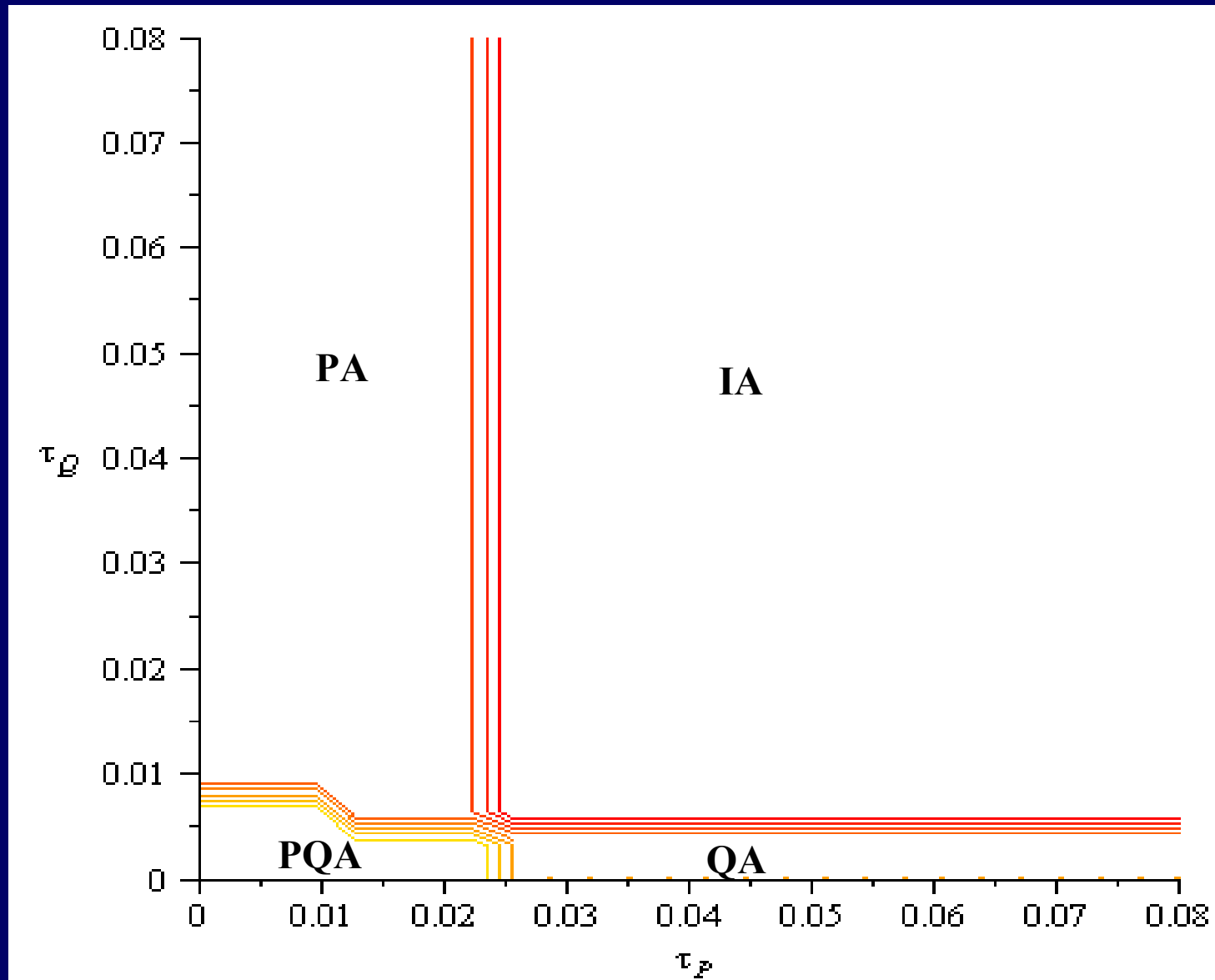
$$\sigma = 0.2, \quad \varphi = 0.1, \quad W = 1$$

$$\varepsilon = 11, \quad \Psi = 1, \quad Q = 1$$

$$\eta_h = 0.15, \quad \eta_l = -0.15$$

$$\theta_P = 0.15, \quad \theta_Q = 0.05$$

Consumers' Choices



Simulating Parameters

- **More Attentive:**

- **Elasticity of consumption:** High
- **Disutility from Labor:** High
- **Elasticity of Substitution:** High
- **Variance of prices:** High
- **Price Changes Rate:** High
- **Package-Size Adjustments Rate:** High
- **Package-Size:** Large

- **Ambiguous:**

- **Expected Prices**
- **Income**

Test 1: Recall Survey

- **If you bought good X:**
 - Recall price
 - Recall Package-Size
- **Goods attributes:**
 - Consumed by:
 - consumer/ spouse/ children/ friends
 - Consumption rate
 - Units bought

Data

- **13 Supermarkets (7 cities)**
- **1078 Consumers**
- **17 Categories: 1 – 8 goods**
- **Price Range: NIS 2.99 – NIS 86.99**
(Osem Bamba – Huggies Diapers)
- **Answered: 2.3 – 8.1 goods**
- **Period: 2006 – 2008**
- **Average Error price: 33%**
- **Average Error package-size: 450%**

Predictions:

Price and Package-Size abs. % Errors

- **Cost of processing:**
 - More effect on package-size (higher costs)
- **Holidays: High elasticity of consumption**
 - More effect for package-size than prices
- **Higher alternative cost of time**
 - Less information processing
- **More Substitutes (competitive markets)**
 - More information processing

	Price	Package-Size
Religion	-0.031	1.04*
Academics	-0.015	-1.83***
Gender	0.119*	0.889*
Large family	-0.075	-0.951
Discount supermarket	0.051	-3.86*
Outside City	0.19	2.52
Year 2008 (inflation)	-0.224*	-6.75***

	Price	Package-Size
Recalled Price	0.081***	-0.028**
Recalled Package-Size	-0.0002	0.079***
Category Avg. price	-0.024***	0.055
Category Avg. Package-Size	-0.003	-0.145***
Category Price S.D.	-0.036***	-0.009
Category Package-Size S.D.	-0.0004	0.0209**

	Price	Package-Size
Multiple goods per package	-1.09***	2.86**
Goods consumed quickly	0.008	-2.55***
Holiday	-0.158*	-1.62***
Constant	0.248	4.5***
Observations	4184	4184

Test 2: Discount processing

- Is good X sold at a discount?
- Easy to recall
 - Simple: yes/no
 - Even from implicit memory
- High value: Average 15% – 20%

Data

- **Two Supermarkets**
- **30 goods each week**
- **249 consumers**
- **Average Consumer: 5-8 answers**
- **Period: 2005 (around Passover)**

Maximum-Likelihood: P(correct)

- Consumers' Attributes:
 - Attentive / Inattentive
- Goods' Attributes:
 - Consumer recall or not

$$\text{Log}(L) = \sum_{i=1}^N \log \left[P(\text{Consumer with } X_i \text{ chose } k) \times P(\text{Response } c \text{ when good has attributes } Z_j) \right]$$

$$k \in \{\text{attentive}, \text{inattentive}\}$$

$$c \in \{\text{correct}, \text{incorrect}\}$$

Religion	-0.257*
academic	0.111
gender	-0.08
Large-family	0.659***
45 - 55 age group	0.486***
High Value of time	-0.271**
Holiday	0.868***
constant	0.569***

Small Discount (<10%)	-1.153***
Supermarket 2 (luxurious)	-0.935***
Expensive (>20 NIS) during holiday	2.06***
Price Discount	1.789***
Package-Size Discount	1.315***
Price Discount during holiday	-0.325
Package-Size Discount during holiday	1.02***
constant	0.871

Conclusions

- **Processing costs affect attention**
- **Inattention varies:**
 - **Period (holiday)**
 - **Consumers' attributes**
 - **Economic status (inflation)**

Possible Implications:

- **Non Price Adjustments**
 - Upsizing in holidays?
 - Downsizing in recessions?
- **Inflation**
 - Higher costs when attentive?
 - Lower Inflation when attentive (holidays)?
- **Consumer Anger**
 - Long range effects of downsizing?



~~\$ 50.00~~
\$ 25.00