Discussion of "Lumpy Price Adjustments: A Microeconometric Analysis" by Dhyne, et al. (2007)

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Lumpy Price Adjustments: A Microeconometric Analysis

by

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Discussion by:

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Why the Coca-Cola Tie?

Brief Summary

- Goal: Decompose the observed price stickiness into *intrinsic rigidity* and *extrinsic rigidity*

- Model: A version of state-dependent price setting
  Intrinsic rigidity – *price adjustment cost*
  Extrinsic rigidity – *marginal cost* and *desired markup*

- Data: CPI component price series (over 20 million obs.)
  Belgium – 98 product categories
  France – 93 product categories
  July 1994 – February 2003 (monthly)
  Average No. Outlets: 285 (Belgium), 291 (France)

Motivation

- Carlton and Perloff (1994, p. 722):

  "Price rigidity is said to occur when prices do not vary in response to fluctuations in costs and demand."

- Blinder (1991, p. 93):

  "From the point of view of macroeconomic theory, frequency of price changes may not be the right question to ask…We are more interested to know how long price adjustments lag behind shocks to demand and cost."

Key Conceptual Argument

- Dhyne, et al:
  - *We need to be careful in interpreting data that show infrequent price changes.*
  - *Infrequent price changes are not necessarily due to high price adjustment costs.*

Example: Haircut Prices

- There may be no need for a price to change if market conditions don't change.

  "For example, Mark, the guy that cuts my hair:

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  "For example, Mark, the guy that cuts my hair:

  - may not experience much variation in *costs or demand* …
  - he may pay the same *price for the supplies* he buys,
  - there may be little fluctuation in the *no. of his customers*
  - the *rent* he pays may be fixed through a contract …

  → It would make sense for him to keep his price unchanged."

Common Practice

- Yet, dozens of studies use the price change frequency (or price spells) to quantify the extent of nominal price rigidity.

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  Why?

  - Primarily because of the lack of data:
  - No data on *costs*
  - No data on *demand*
  - *Unobservables* (e.g., *optimal price*, *desired markup*)

  → Economists were forced to rely on the price data

Until Dhyne, et al. Came

- Dhyne, et al propose a simple, yet clever way to assess the determinants of price rigidity/flexibility
  - Using only price data
  - Assess/quantify the effect of price adjustment cost
  - Assess/quantify the effect of unobservable "fundamentals:" *optimal price* and *desired markup*
  - Follow Rosett (1959)

What Do Dhyne, et al. Argue?

- They argue:
  - A price change decision depends on its cost and benefit
  - c_{it} (a broad notion of "adjustment cost") captures the cost side
  - However there is a benefit side: adjusting prices to changes in "fundamentals" can be beneficial. (How beneficial? That depends on the shape of the profit function.)
  - For example: adjusting prices to changes in market conditions (competition, demand, marginal cost, etc.)

In Other Words

- They argue the following:
  - If we interpret infrequent price changes as evidence of price rigidity, we implicitly ignore the benefit side and consider only the cost side.

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- They argue the following:
  - If we interpret infrequent price changes as evidence of price rigidity, we implicitly ignore the benefit side and consider only the cost side.
  - That is not so good.

The Model

- Price adjustment mechanism:

Price adjustment cost

$$p_{it} = \begin{cases} p_{i,t-1} & if \quad \left| p^*_{i,t} - p_{i,t-1} \right| \leq c_{it} \\ p^*_{i,t} & if \quad \left| p^*_{i,t} - p_{i,t-1} \right| > c_{it} \end{cases}$$

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Price change trigger

Price Change Trigger

- Price adjustment cost, c_{it}:

$$\left| p^{*}_{i,t} - p_{i,t-1} \right| > c_{it}$$

- Usually, this condition is specified in terms of the *profit gap*

- The current specification contains implicit assumptions about quantity response, i.e., about the *demand elasticity*. Also, it implies that the price adjustment cost is incurred for each unit.

- Suggestion: state these assumptions explicitly

Are These Assumptions Problematic?

- From practitioners point of view:

  Not necessarily (*Examples from some field-studies)*

- From econometric point of view:

  Perhaps: how does a profit function misspecification affect $\hat{c}_i$*?*

- Suggestion: try to explore this effect

The Nature of Price Adjustment Costs

- I agree with the authors that in their model:

  The price adjustment cost, c, should be a broader concept than "menu cost."

- I also agree that to capture the extent of the heterogeneity found in the data:

  Price adjustment cost, c_i, should vary across categories

Optimal Price

- Optimal price:

Desired markup

Marginal cost

$$p^*_{i,t} = mc_{it} + \mu_{it}$$

Optimal Price

- Optimal price:

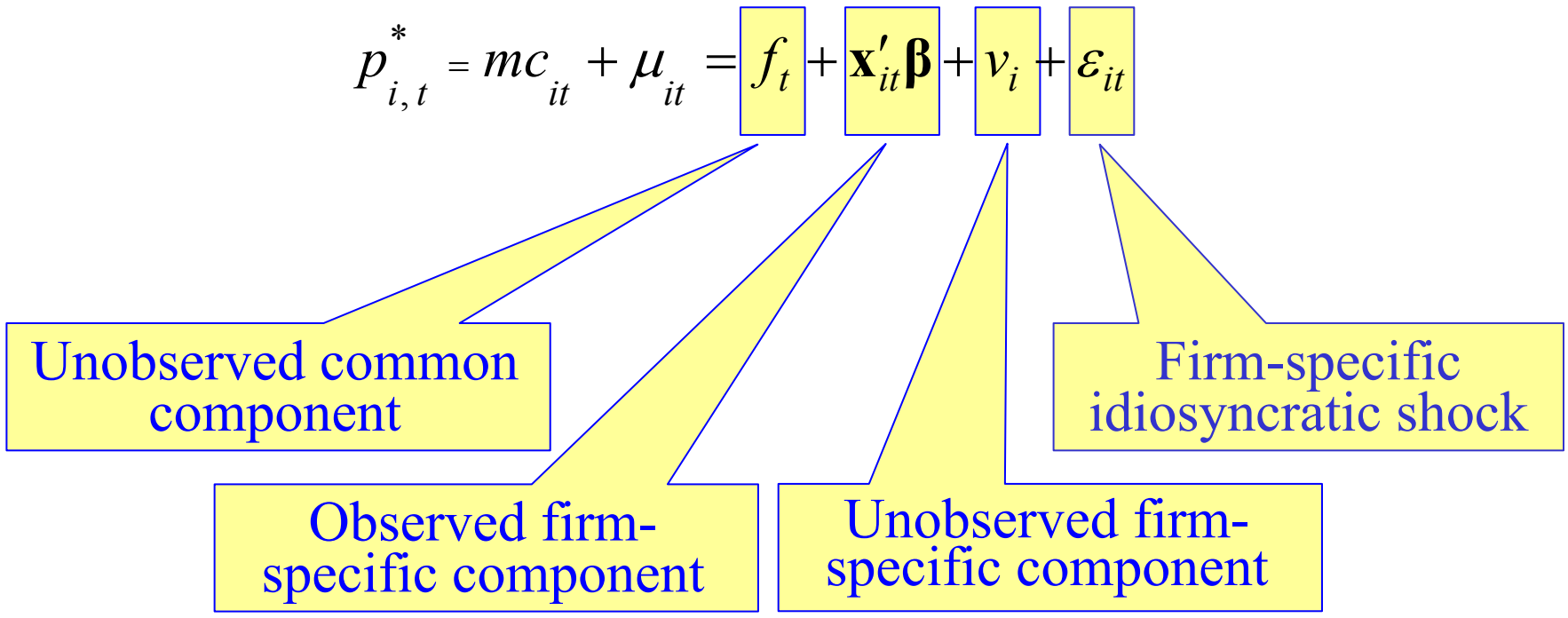
Unobservable

No data

$$p^*_{i,t} = mc_{it} + \mu_{it}$$

Optimal Price Decomposition

- Optimal price decomposition:



Econometric Estimation

- Heavy econometrics. I believe them.
- One note: Authors provide a long list of variables the vector $\mathbf{x}_{it}$ could potentially contain. In the end it turns out to be only a dummy variable.
- Suggestion: Either increase the dimension of the vector or state upfront that it is a dummy variable.

Price Adjustment Cost Estimates 1

- Dhyne, et al: Average $\hat{c}$ (% of the average price)

  36% (Belgium), 33% (France)

- They cite Levy, et al (1997): use a very different approach

  Large US supermarket chains: 27% - 40%

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  I am starting to believe my own results!

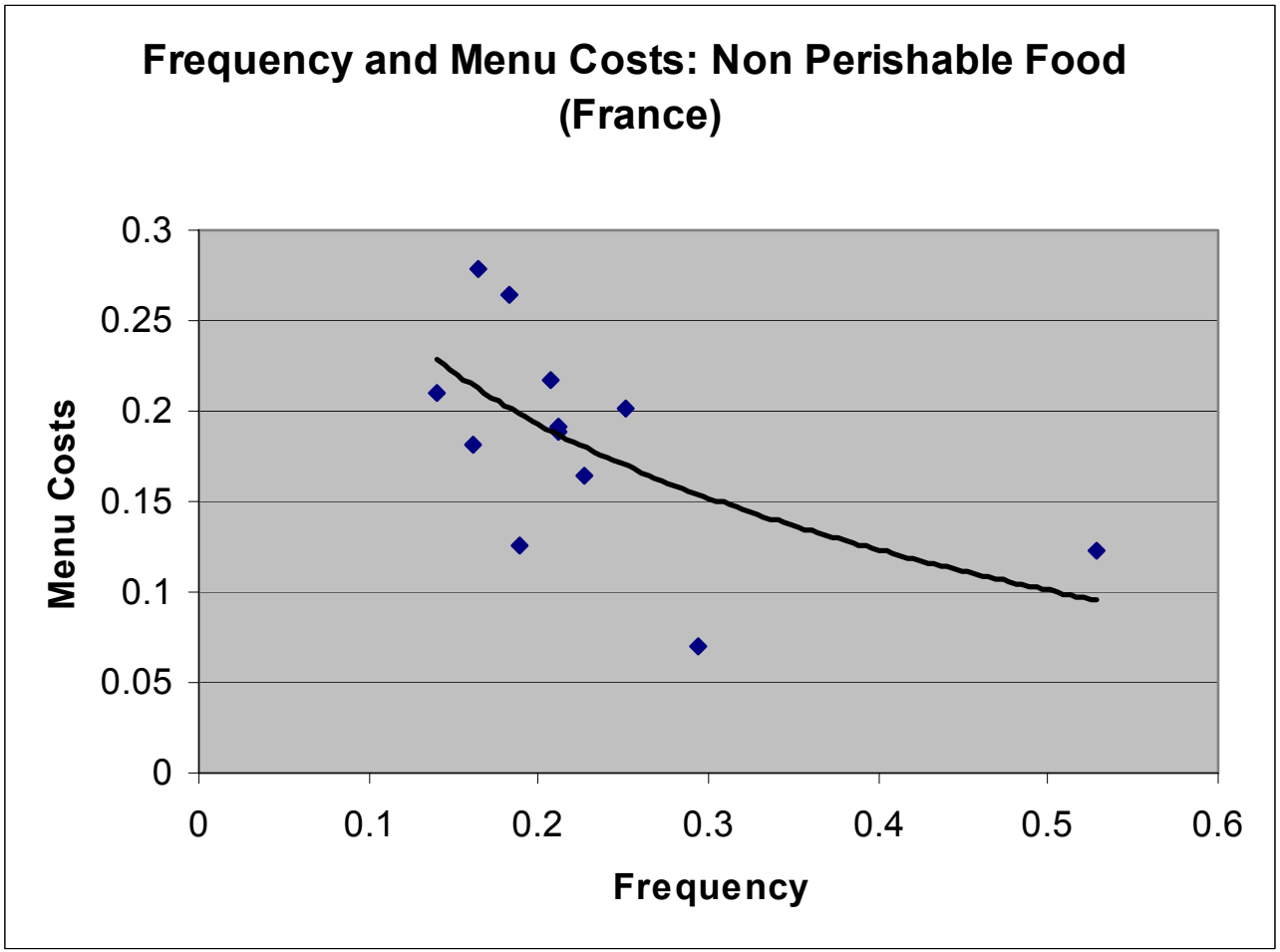
Price Adjustment Cost Estimates 2

- The relative size of the estimates makes sense in the extreme cases:

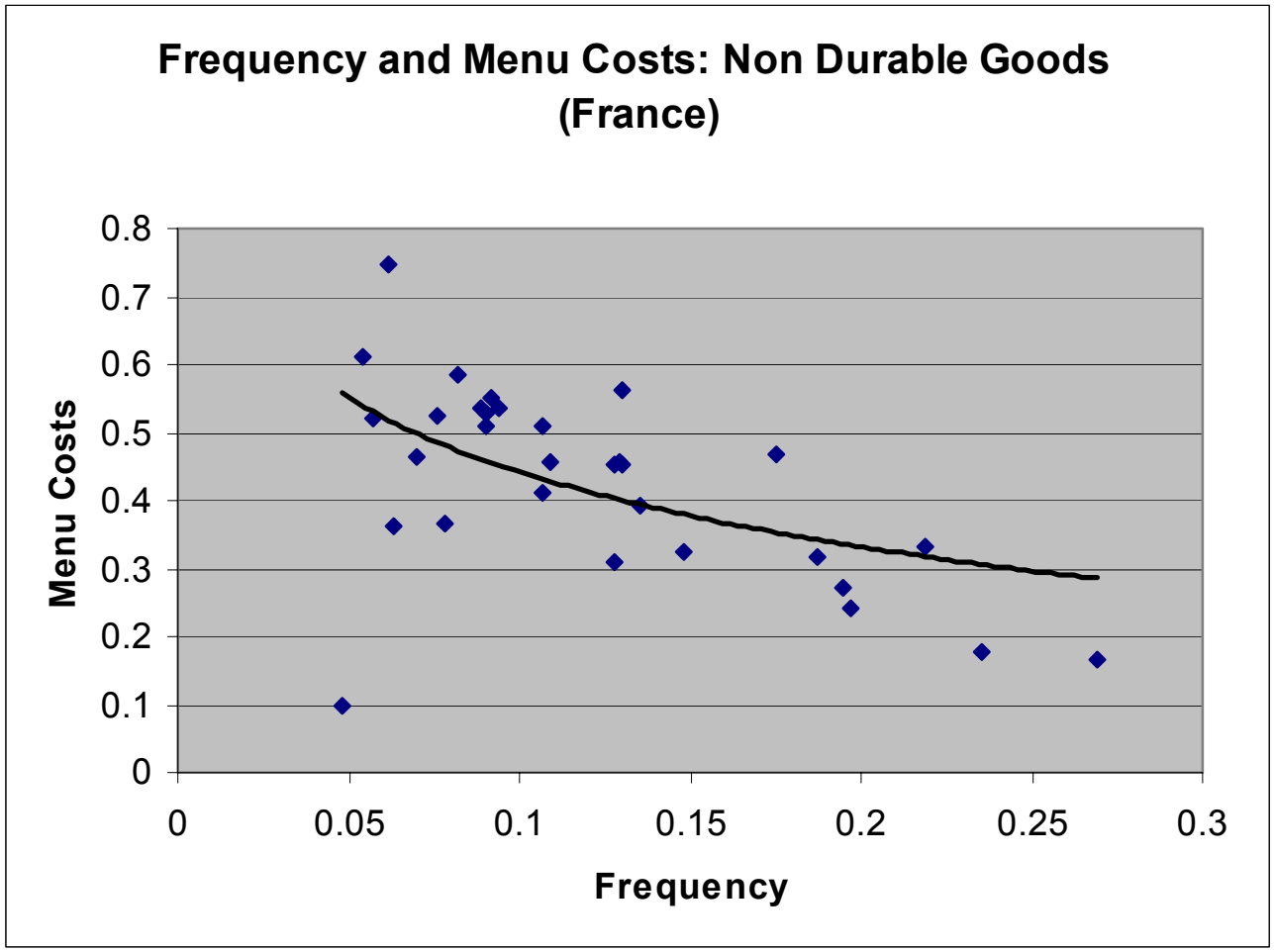
  The products with the most frequent price changes tend to have lower costs of price adjustment: energy

  The products with the least frequent price changes tend to have higher costs of price adjustment: **services and durable goods**

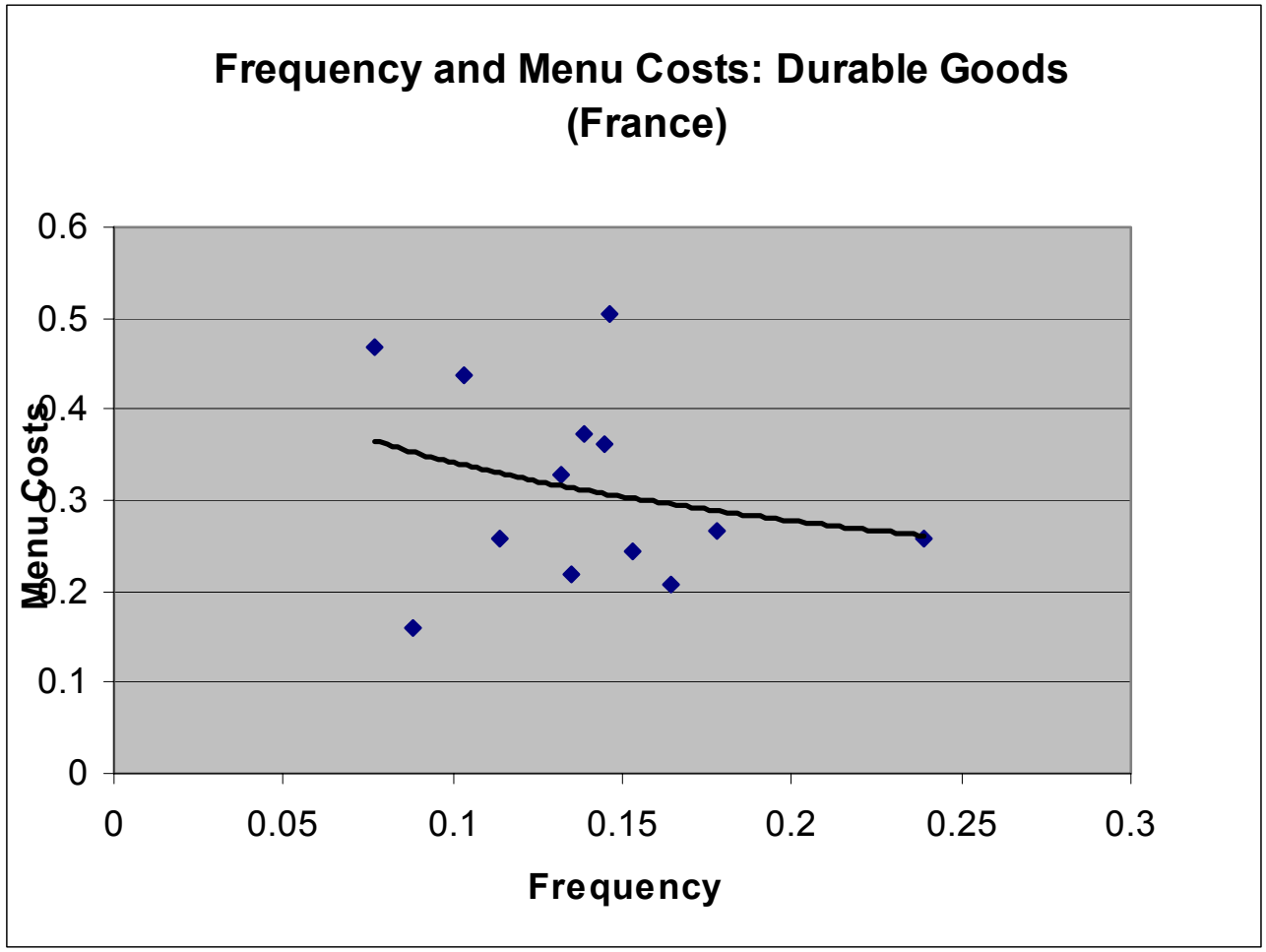
France: Non-Perishable Food



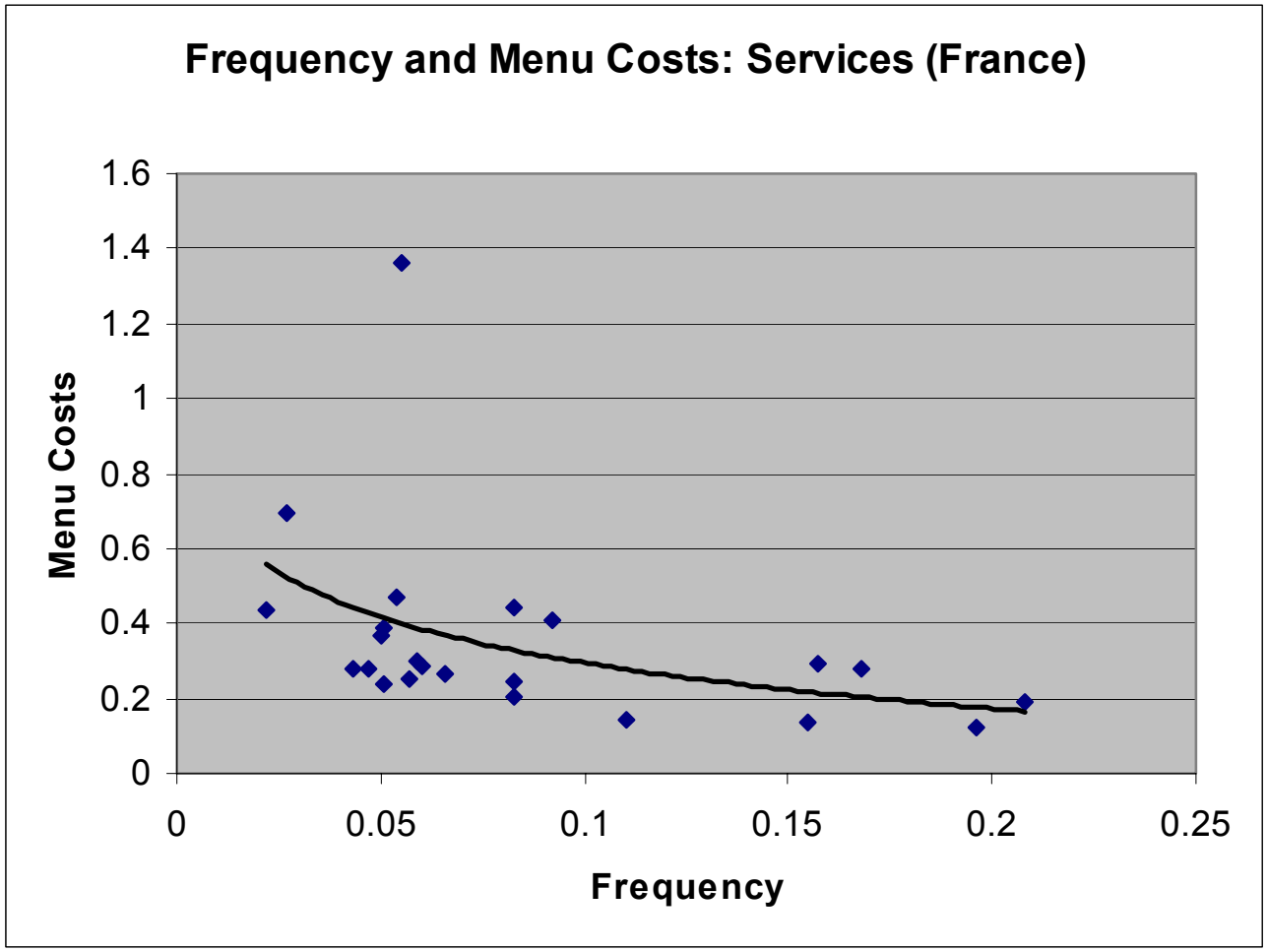
France: Non-Durable Goods



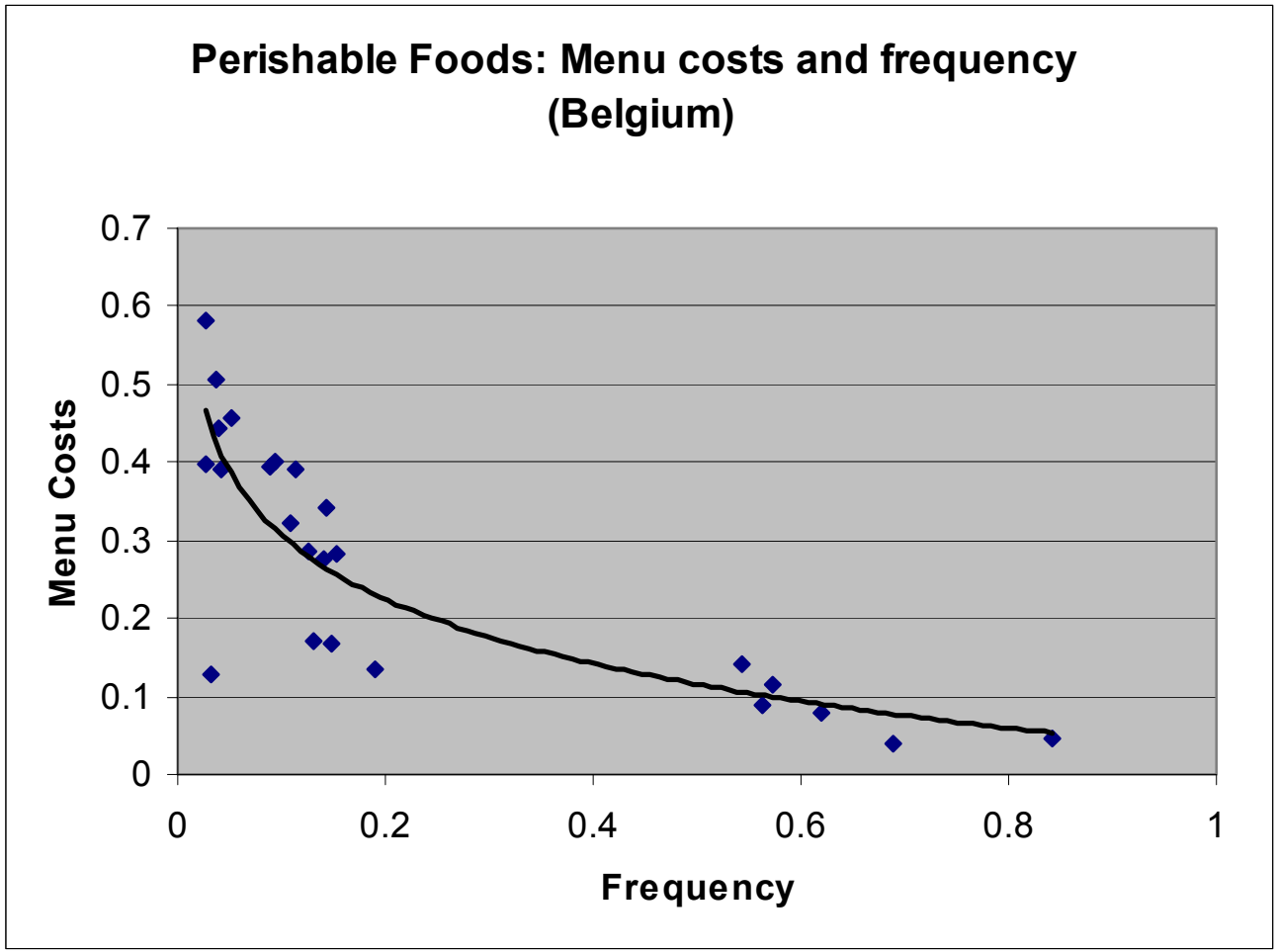
France: Durable Food



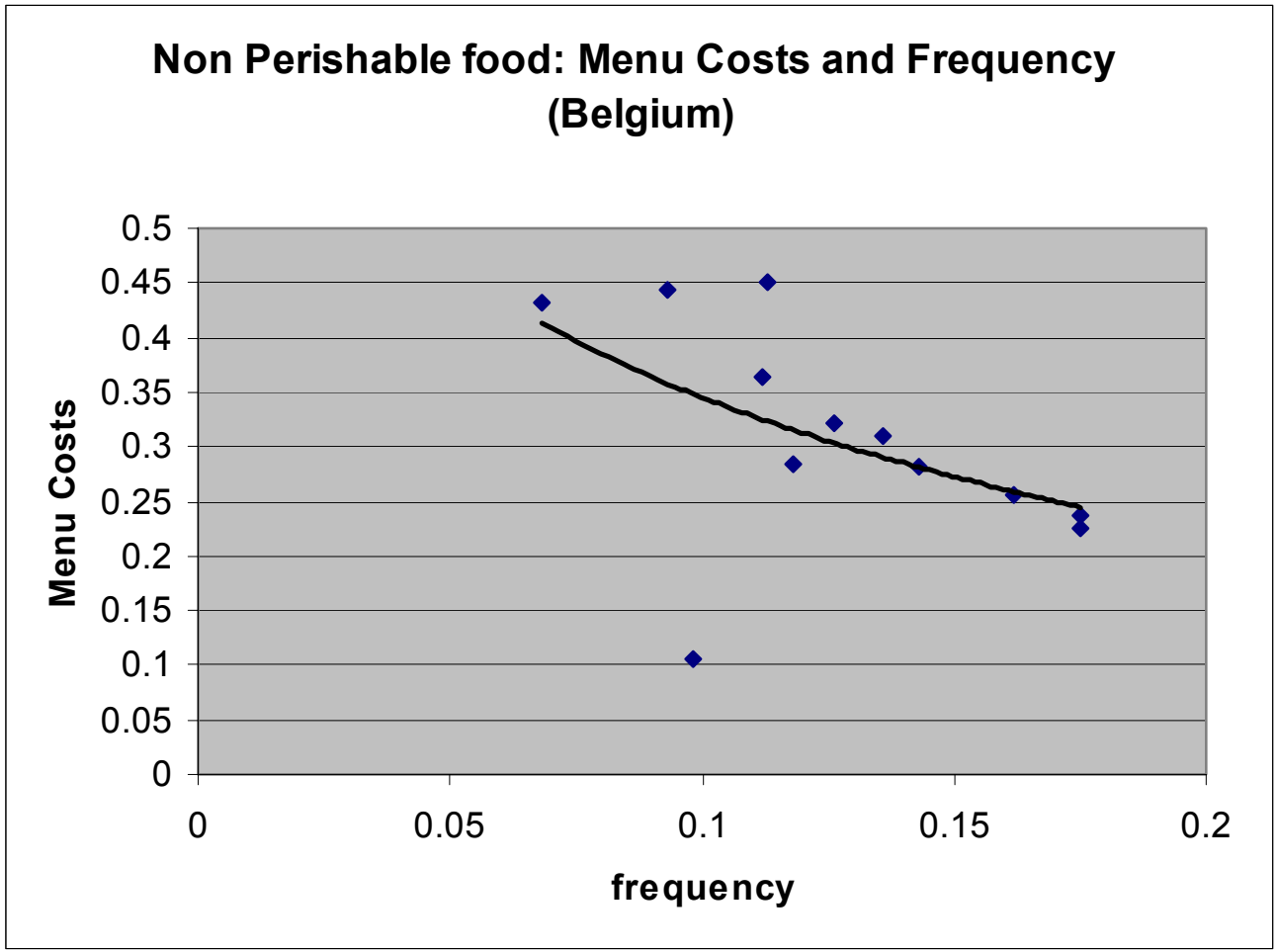
France: Services



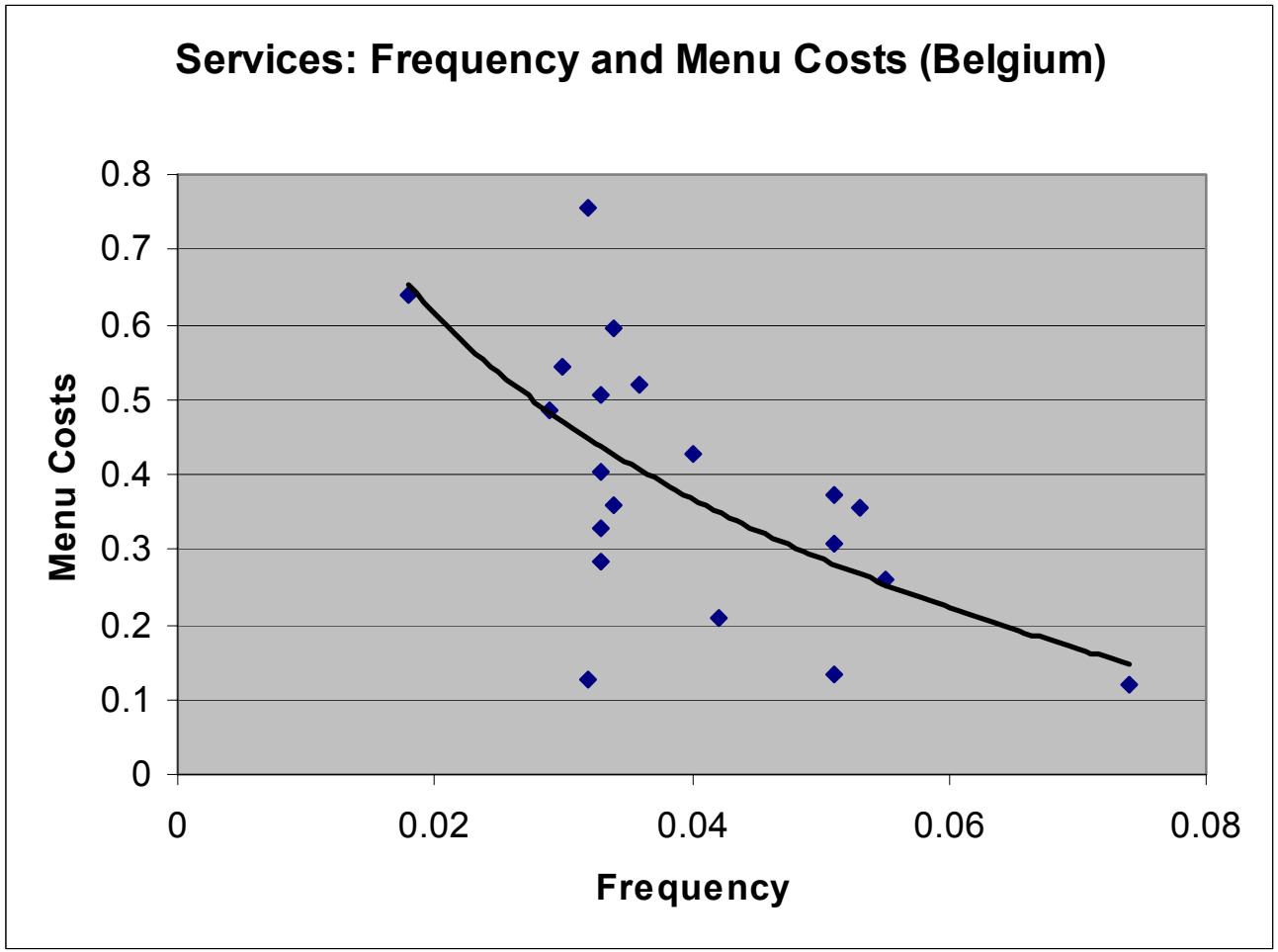
Belgium: Perishable Food



Belgium: Non-Perishable Food



Belgium: Services



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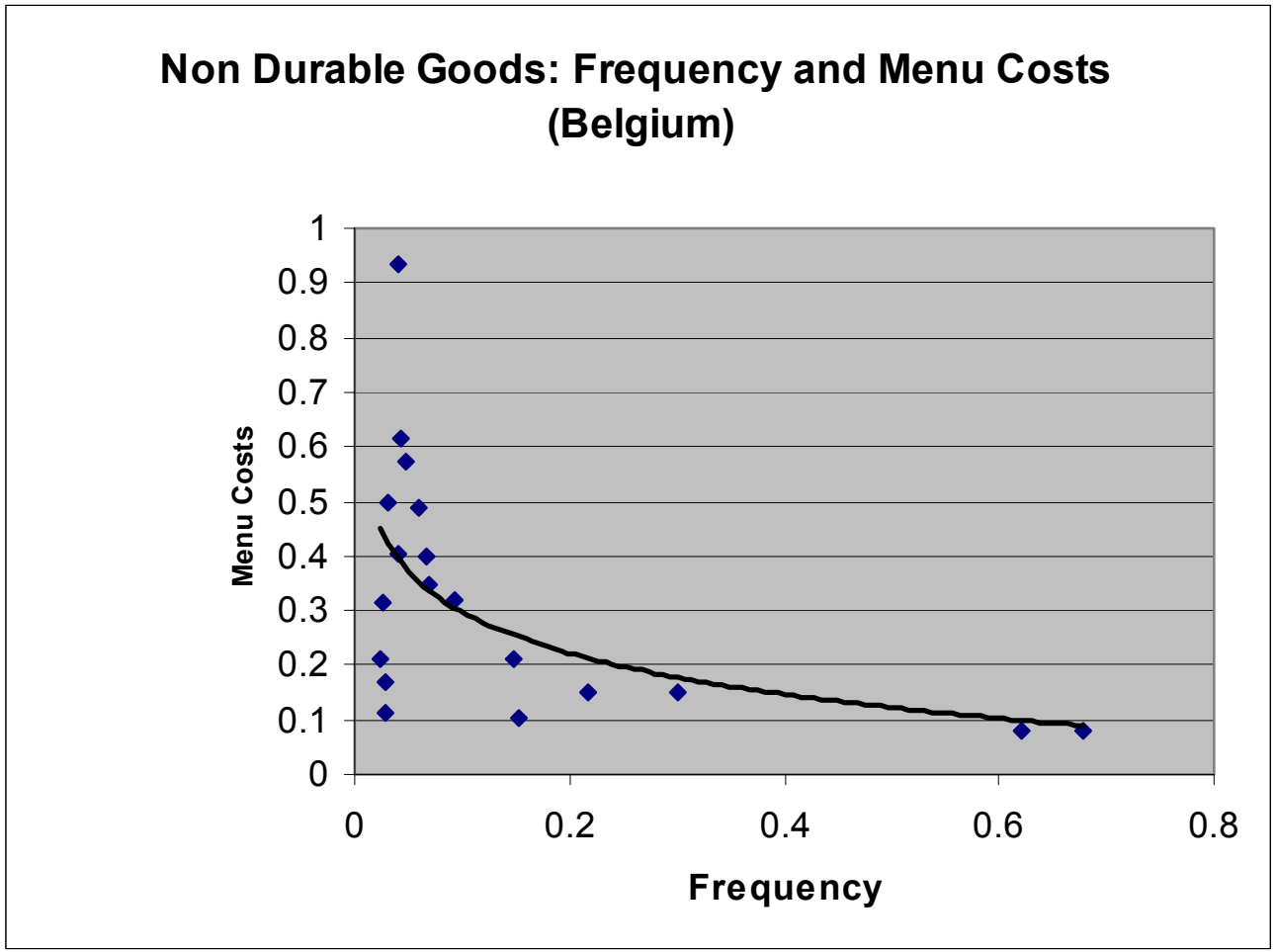

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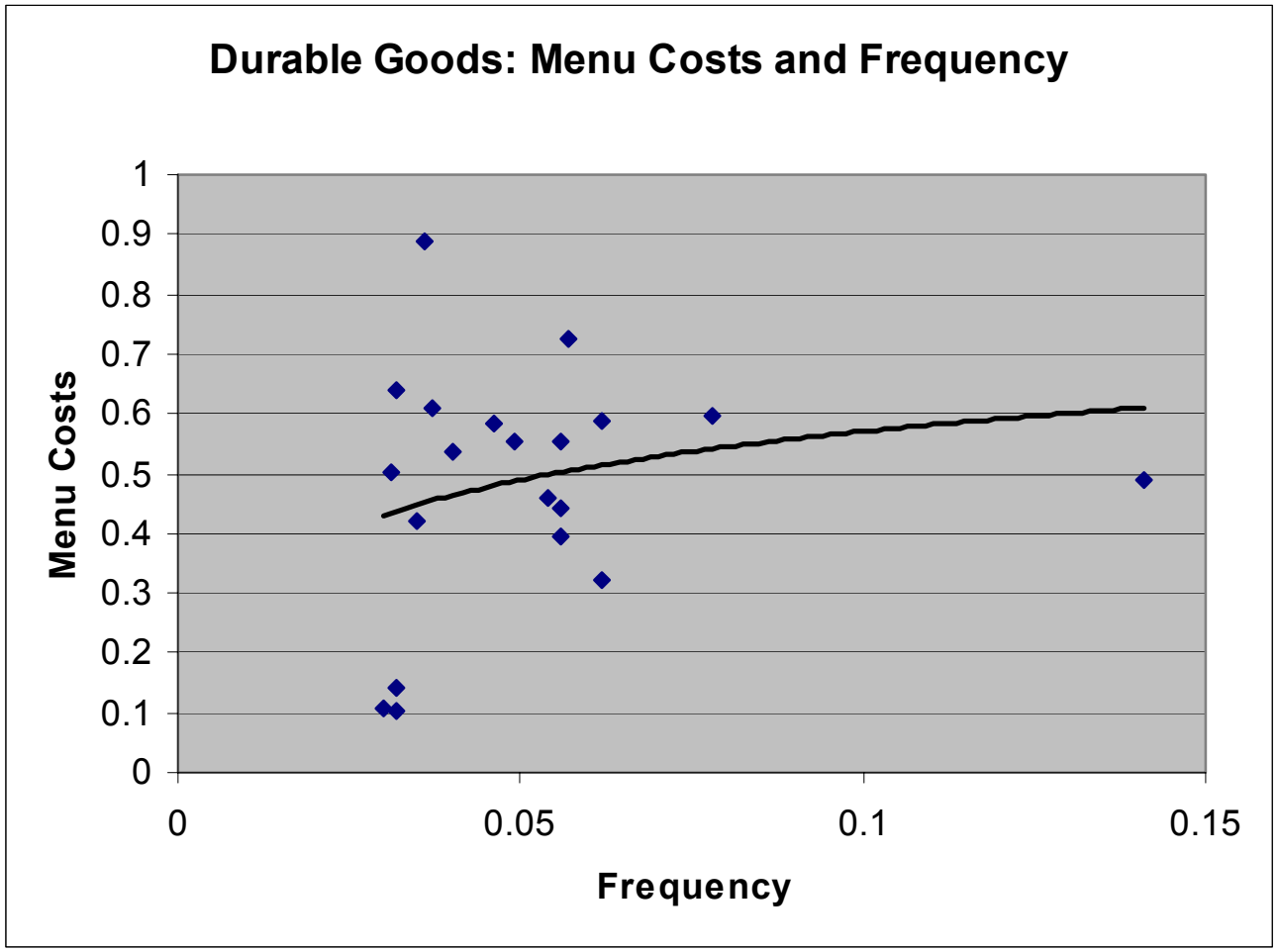


Relation b-n $\hat{c}$ and Price Change Freq.

- The negative relationship is very robust.
- There is still a lot of variation in the frequency of price adjustment that remains unexplained, which means that extrinsic rigidity sources are important as well.
- Within a given product group, the effect of the common and idiosyncratic shocks is not large enough to completely overturn the negative relation between the price adjustment cost and the frequency of price changes (if their effect goes in the opposite direction).

Idiosyncratic vs Common Component

- The variance of idiosyncratic shocks exceeds the variance of the common component:

$$\hat{\sigma}_{\varepsilon} > \hat{\sigma}_{f}$$

- Confirms Lucas and Golosov's (2007) conclusion:

Individual price movements are primarily driven by idiosyncratic shocks

Look at the Data: Orange Prices

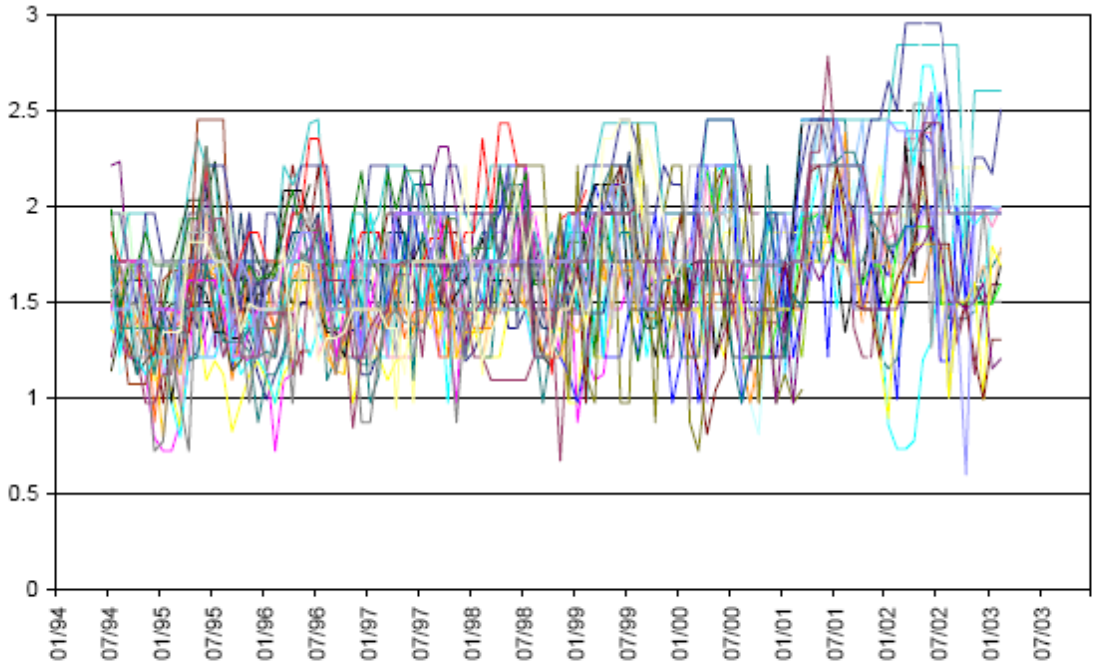
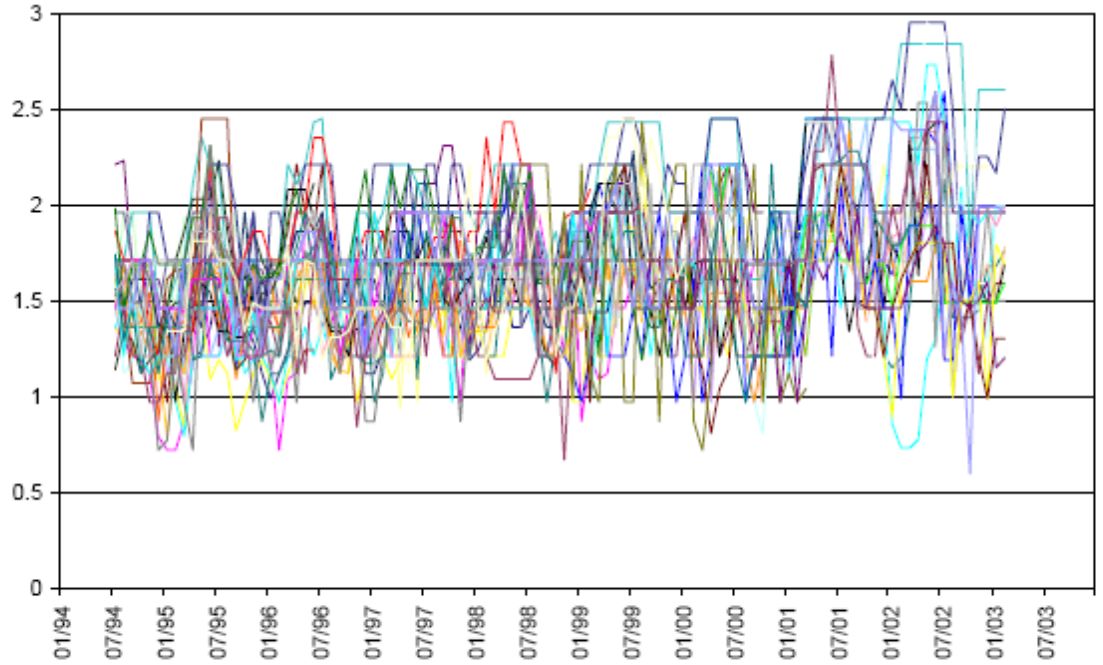


FIGURE 1.A. - 50 PRICE TRAJECTORIES - ORANGES (IN EUR/KG) - BELGIAN CPI

Look at the Orange Prices Again



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- What do you see?

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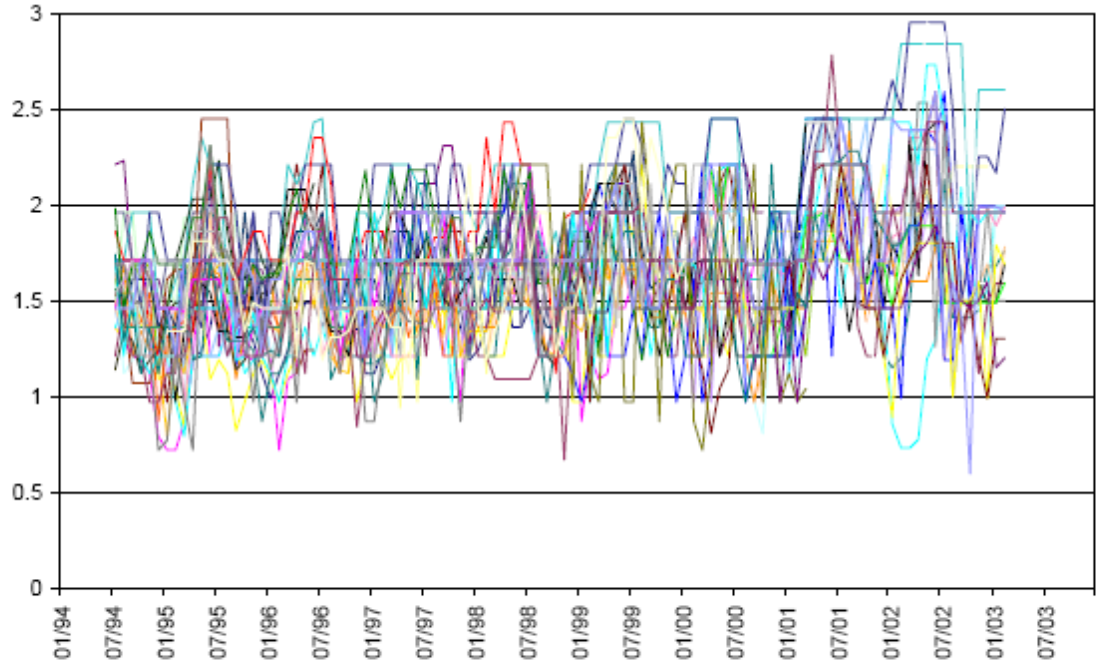

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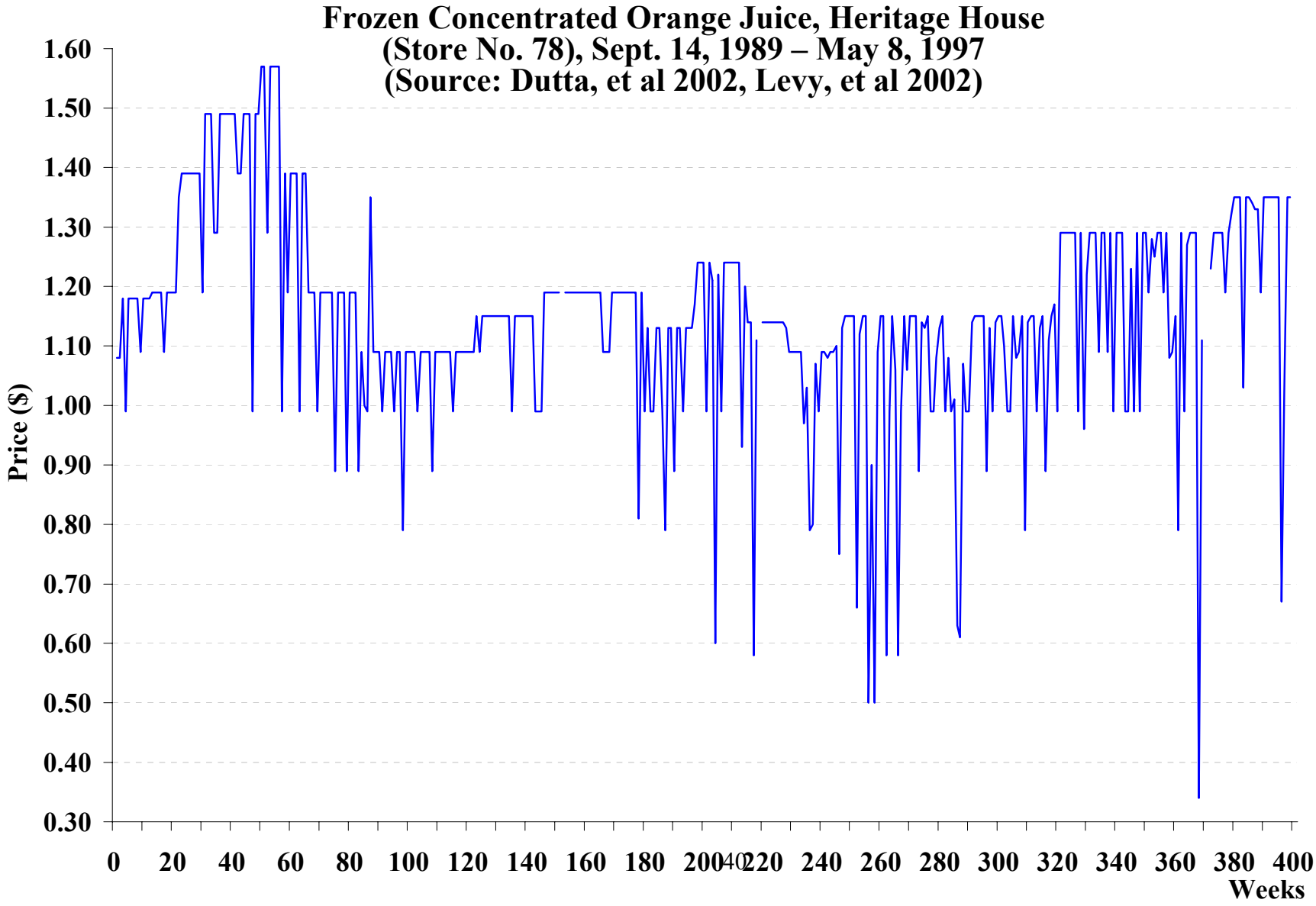
- That's right…Lots of paint.

Look at the Data: Orange Juice Prices



The Role of Idiosyncratic Shocks

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  Average annual inflation rate: 4.9%

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  Average size of price change: 20%

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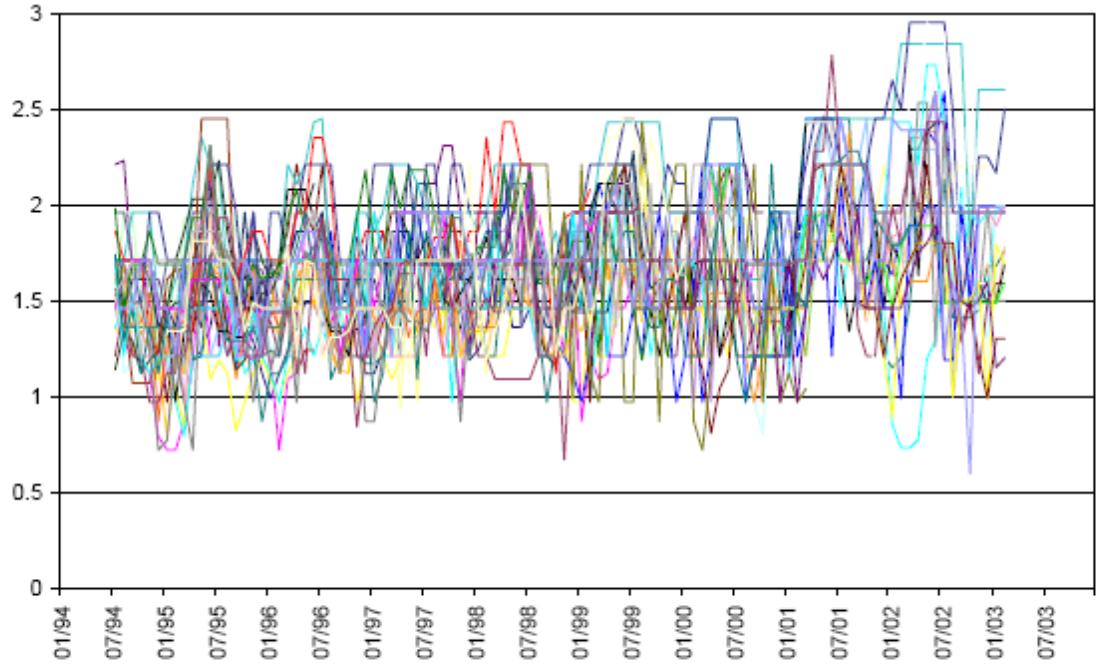
- It is hard to think of any standard monetary economy model that can generate this kind of data without idiosyncratic shocks

- Conversations with practitioners confirm this:
  They don't pay much attention to money supply announcements

Sampling Frequency

- The price setting cycle in the retail industry is weekly.
- CPI price data used by Dhyne, et al. are sampled monthly.
- The true price change frequency – likely higher
- The estimate of $\hat{c}$ could be affected

Look at the Orange Prices Again



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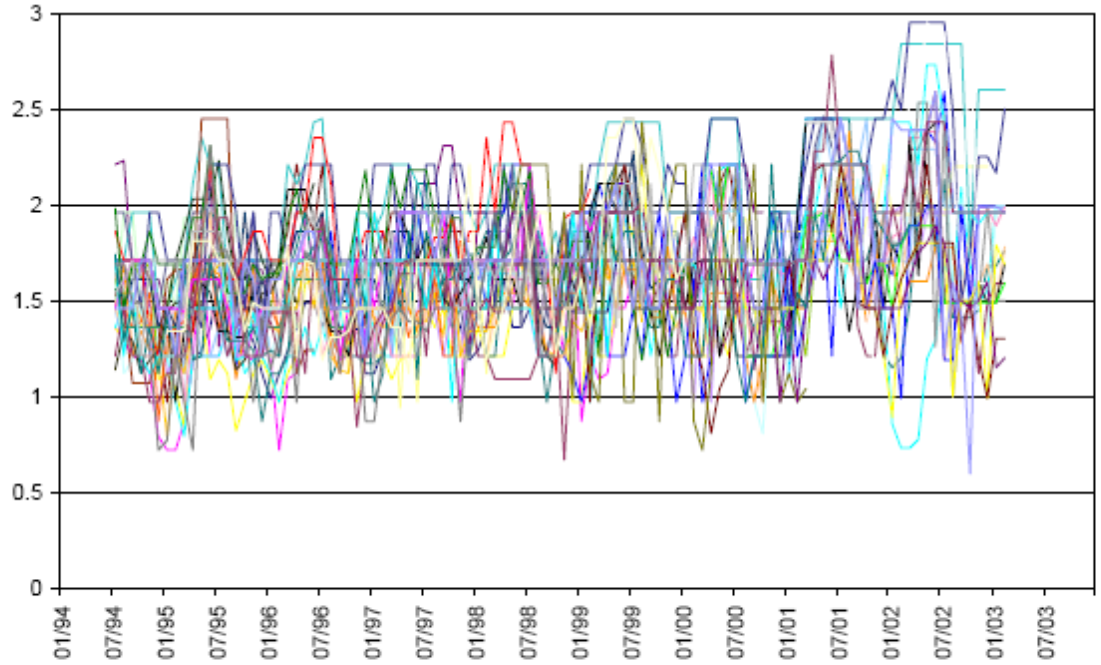

FIGURE 1.A. - 50 PRICE TRAJECTORIES - ORANGES (IN EUR/KG) - BELGIAN CPI

- Is this heterogeneity really surprising?

Is the Heterogeneity Surprising?

- I think not. Orange prices vary by
  - size (small, medium, large)
  - quality and freshness (top, average, low)
  - end use (table, orange juice)
  - flavor (bitter, sweet, blood, navel)
  - country of origin (Brazil, US, Israel, etc.)
  - type (Seville, Washington Navel, Trovita, Valencia, Lue Gim Gong, Rhode Red Valencia, Hamlin, Homosassa, Shamouti, Parson Brown, Pineapple, Queen, etc.)
- So, oranges are not as homogeneous as the authors believe.

Asymmetric Price Adjustment Costs

- Dhyne, et al. find no difference between the upward and downward price adjustment costs

  - If it was a simple menu cost, then that would be plausible.
  - However, here they use a broad notion of price adjustment cost (including managerial and customer costs, marketing, as well as other types of costs).
  - Some of these could be asymmetric.
  - E.g., people might get especially upset if the price goes up by a lot (Rotemberg, 2003, 2006).
  - I suspect that the result is due to the assumption on the shape of the profit function in the price change trigger condition.

A Possible Extension

- Allow the price adjustment cost to contain a variable component which depends on the size of the price change:

$$c_{i,t} = \bar{c}_{it} + g\left(p^*_{i,t} - p_{i,t-1}\right)$$

  - If $g = 0$, then we get the current model.
  - If, however, $g \neq 0$, then you can have a convex cost of adjustment (e.g., Slade, 1998)
  - This extension might create econometric difficulties. Might be too ambitious: you got price adjustment cost that varies across products, over time, and now by the size of the price adjustment.

Conclusion

- I like the paper a lot, enjoyed reading it.
- Nice contribution to the literature.
- Novel methodology. A lot of work.
- Find a way to assess the role of both intrinsic as well as extrinsic sources of price rigidity using only the price data
- Findings: interesting and useful indeed.
- Thank you.