Menu Costs, Multi-Product Firms, and Aggregate Fluctuations

Virgiliu Midrigan

Discussion by Kirstin Hubrich (ECB)

International Research Forum for Monetary Policy

Washington, December 2006

What the paper is about

- Stylised facts for 2 US scanner data sets
  - substantial number of price changes ($\sim$ 30%) are small
  - stores tend to adjust prices simultaneously
  - Prices adjust frequently: average price spell 4 (5.2) months
- Stylised facts inconsistent with single-product menu cost models, where fixed adjustment costs imply that firms only reprice in case of large losses
- Model extension to replicate stylised facts and analyse real effects of monetary shocks
  - two-product instead of single-product setting
  - idiosyncratic shocks drawn from leptokurtic instead of Gaussian normal distribution

Theory

Paper extends standard menu cost model to multi-product setting

- firms face economies of scale in technology of adjusting prices
- large number of small price changes can be reconciled with state-dependent models if multi-product firms adjust prices of different products simultaneously
- confirmed by empirical finding of price adjustment synchronisation
- multi-product menu-cost model calibrated to micro-economic evidence can generate business cycle fluctuations almost as large as in Calvo-style time-dependent models

Time- vs State-dependent pricing

Models to understand the main features and determinants of the behavioural mechanisms underlying price-setting

- **time-dependent pricing models:** timing of price changes exogenous, firm does not respond to the state of the world (recent contributions e.g. Coenen, Levin and Christoffel, 2006)
- **state-dependent pricing models:** agents solve fully specified problems, nominal rigidities arise endogenously due to fixed physical menu costs (Sheshinski and Weiss, 1977,1983; Gertler and Leahy, 2005; Caballero and Engel, 2006, Burstein, 2005)

Time- vs State-dependent pricing

- **Implications of nominal rigidities** in models with state-depending for response of economy to nominal shocks: *monetary neutrality* (e.g. Goloslov and Lucas, 2004: small real effects of monetary disturbancies) or *real effects* as large as in models with time-dependent pricing (e.g. Klenow and Kryvtsov, 2004, Dotsey, King and Wolman, 1999)

Data

- AC Nielsen
  - purchasing practices of panel households in 2 locations
  - weekly price series constructed, 1985-1987 (113 weeks)
  - 31 stores, 115 products, 6 product categories: ketchup, tuna, margarine, peanut butter, sugar and toilet tissue
- Dominick's Finer food retail chain
  - 9 years of price level data: 1989 - 1997, weekly (aggregated to monthly), Chicago area
  - 86 stores, more than 4500 products
  - this paper: representative single, chain-wide price from store with largest number of observations, chosen from medium-price stores as they account for largest share of Dominick's stores
  - product categories: broad range, from non-perishable foodstuffs to pharmaceutical and hygienic products

Data Set Construction: Treatment of Sales

- Data for analysis: temporary price cuts (less than 4 weeks: sales) filtered out
- Does filtering sales leave out interesting information? Firms take sales into account in pricing strategy over the whole year
- Stylised facts on data with sales for comparison:
  Scanner data sets, this paper: no change, 34% and 40% of price changes are small
- Absolute size of sales price changes is more than twice as that of regular price changes; excluding sales will affect frequency of price changes (Nakamura and Steinsson, 2006), i.e. features of the model in multi-product menu cost model
- However: Some consensus in current literature that features of price changes due to sales are difficult to model

Data Set Construction: Product Replacement

- Does the introduction of new goods affect the pricing of the existing products? How to account for introduction of new products, replacement?
- see e.g. Klenow and Kryvtsov (2005) for computing frequency of price changes with and without product replacement
- Dhyne et. al. (2005): replacement is counted as price change for comparison across euro area countries; in some countries data do not discriminate from observed price change; some sectors have regularly recurring replacements of almost all items
- How is the introduction of new goods treated in the scanner data sets?

Scanner data: How representative are they?

- Empirical analysis on price changes in grocery stores
- Product categories - AC Nielsen data set: mainly food; Dominick's: food to pharmaceutical and hygienic products
- Different price setting behaviour in different sectors: depends on 1. different technologies (labour and energy input), 2. degree of competition, 3. nature and volatility of shocks, 4. elasticity of demand, 5. traded or non-traded goods sector, 6. consumer vs producer sectors
- Relevance of menu costs for other sectors than food? 'Clothing and Footwear' versus 'Housing'
- Weight of food sector in all items US CPI is about 15%, and 10-22% in euro area countries

Scanner data: How representative are they?

Relationship with other evidence (cited in the paper) for the US

- Klenow and Kryvtsov (2004): BLS collected price data covering all goods and services in CPI $\Rightarrow$ 40% of price changes less than 5% in absolute value (average price change 9.5%)
- Kashyap (1995): retail catalogue price changes 44% of price changes small than 5%
- Kackmeister (2005): 33% of retail store price changes less than 10%

Micro Evidence: US vs Euro area

Inflation Persistence Network (ECB and NCBs in the Eurosystem)
New micro-evidence (e.g. Alvarez et al, 2006; Dhyne et al, 2006)

- Euro area micro data on consumer and producer prices as well as survey information

$\Rightarrow$ Prices in the euro area are stickier than in the US;
$\Rightarrow$ Sectoral differences are more important than differences between countries

- Are there also many small price changes in the euro area?

Size of Price Changes: US vs Euro Area

- Mean of absolute price change $\Rightarrow$ large (relative to inflation)
  - US Scanner data: 10.4% (AC Nielsen), 7.7% (Dominick's)
  - US CPI: 8% (Klenow & Kryvtsov, 2005)
  - Euro area CPI: 8.8% (Dhyne et al, 2006)
  - France CPI micro-data: -10% price decrease, +12.5% price increase (Baudry et al, 2006)
- Fraction of small price changes $\Rightarrow$ large for US and Euro Area
  - US Scanner data: 0.28 ($< 5.2\%$), 0.35 ($< 3.8\%$)
  - US CPI micro-data: 0.40 ($< 5\%$)
  - France CPI micro-data: 0.42 ($< 4\%$) all items; 0.53 food ($< 6\%$); Spain: 0.46 ($< 5\%$) processed food, 0.18 unprocessed food

Size of Price Changes: US vs Euro Area

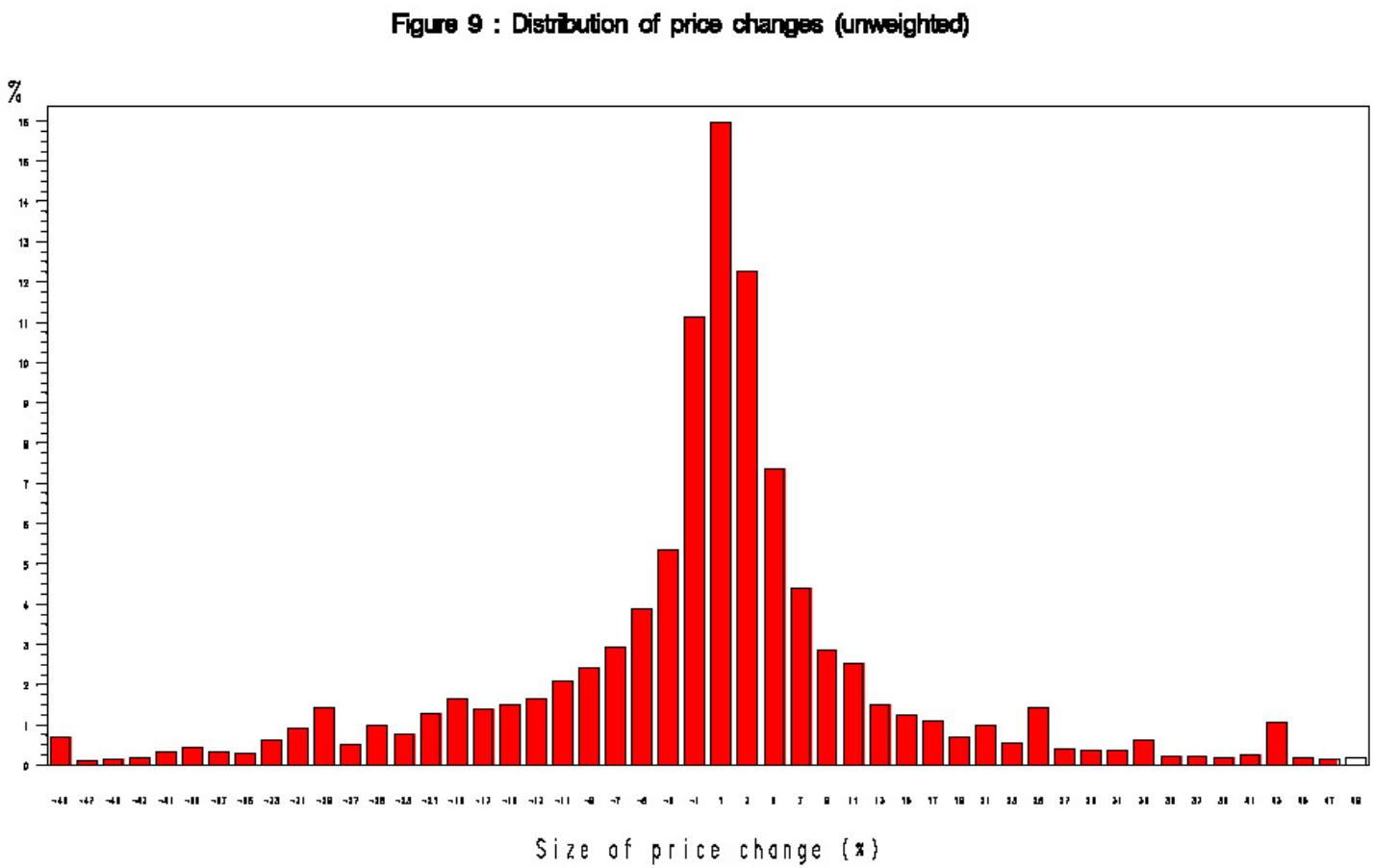
- Mean of absolute price change $\Rightarrow$ large (relative to inflation)
  - US Scanner data: 10.4% (AC Nielsen), 7.7% (Dominick's)
  - US CPI: 8% (Klenow & Kryvtsov, 2005)
  - Euro area CPI: 8.8% (Dhyne et al, 2006)
  - France CPI micro-data: -10% price decrease, +12.5% price increase (Baudry et al, 2006)
- Fraction of small price changes $\Rightarrow$ large for US and Euro Area
  - US Scanner data: 0.28 ($< 5.2\%$), 0.35 ($< 3.8\%$)
  - US CPI micro-data: 0.40 ($< 5\%$)
  - France CPI micro-data: 0.42 ($< 4\%$) all items; 0.53 food ($< 6\%$); Spain: 0.46 ($< 5\%$) processed food, 0.18 unprocessed food

Distribution of Price Changes

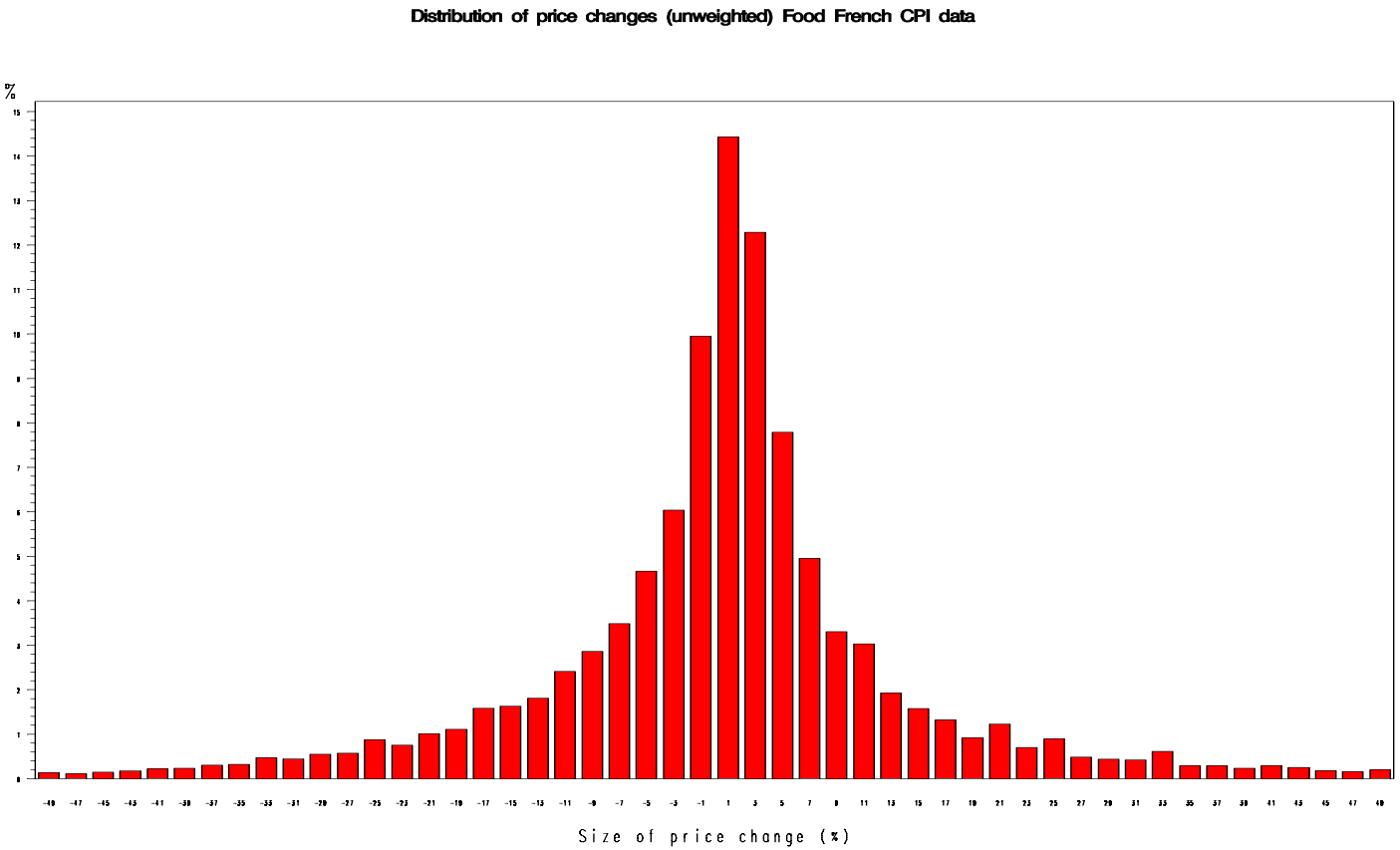
Distribution of size of price changes

- France CPI micro-data
  All items versus food (20% of CPI): very similar
- Price distributions differ across sectors;
  services are asymmetric due to wage stickiness (see e.g. Austria: Baumgartner et al, Germany: Hoffmann & Kurz-Kim, 2006)

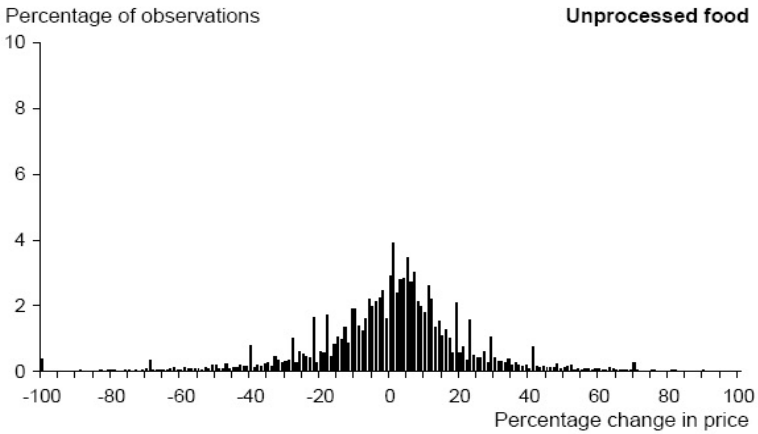
France: Distribution of Price Changes, All Items

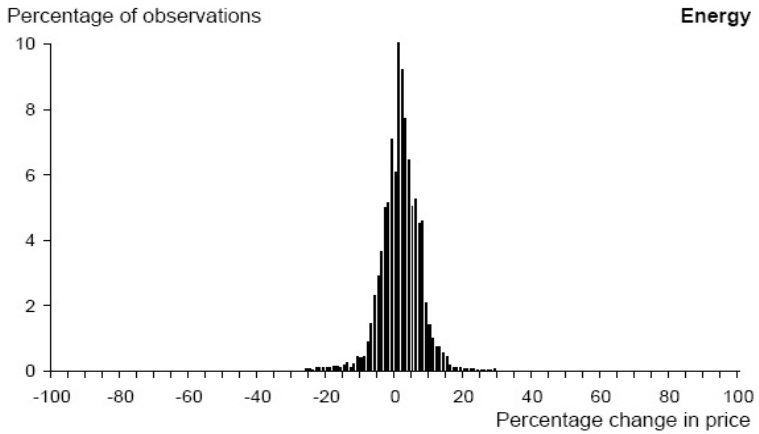


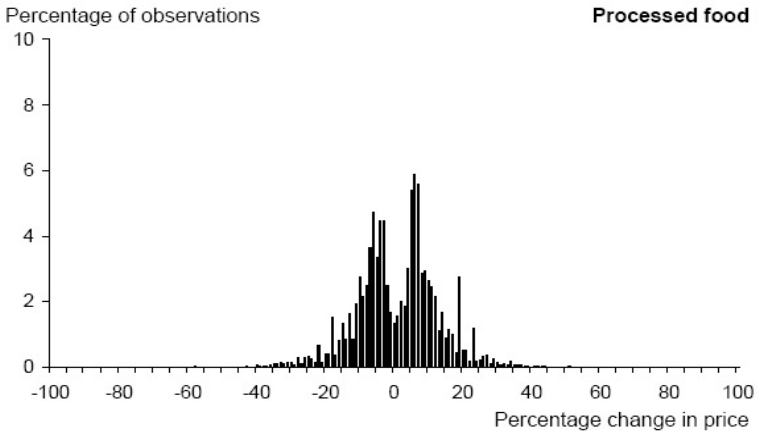
France: Distribution of Price Changes, Food

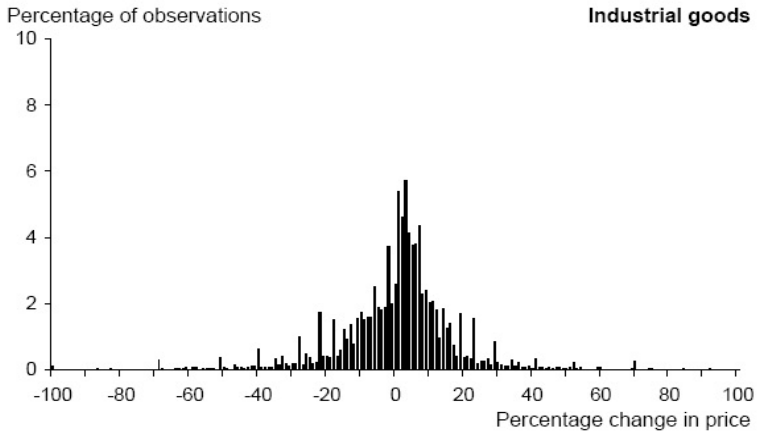


Germany: Price Changes Unprocessed Food, Energy, Processed food, Industrial Goods

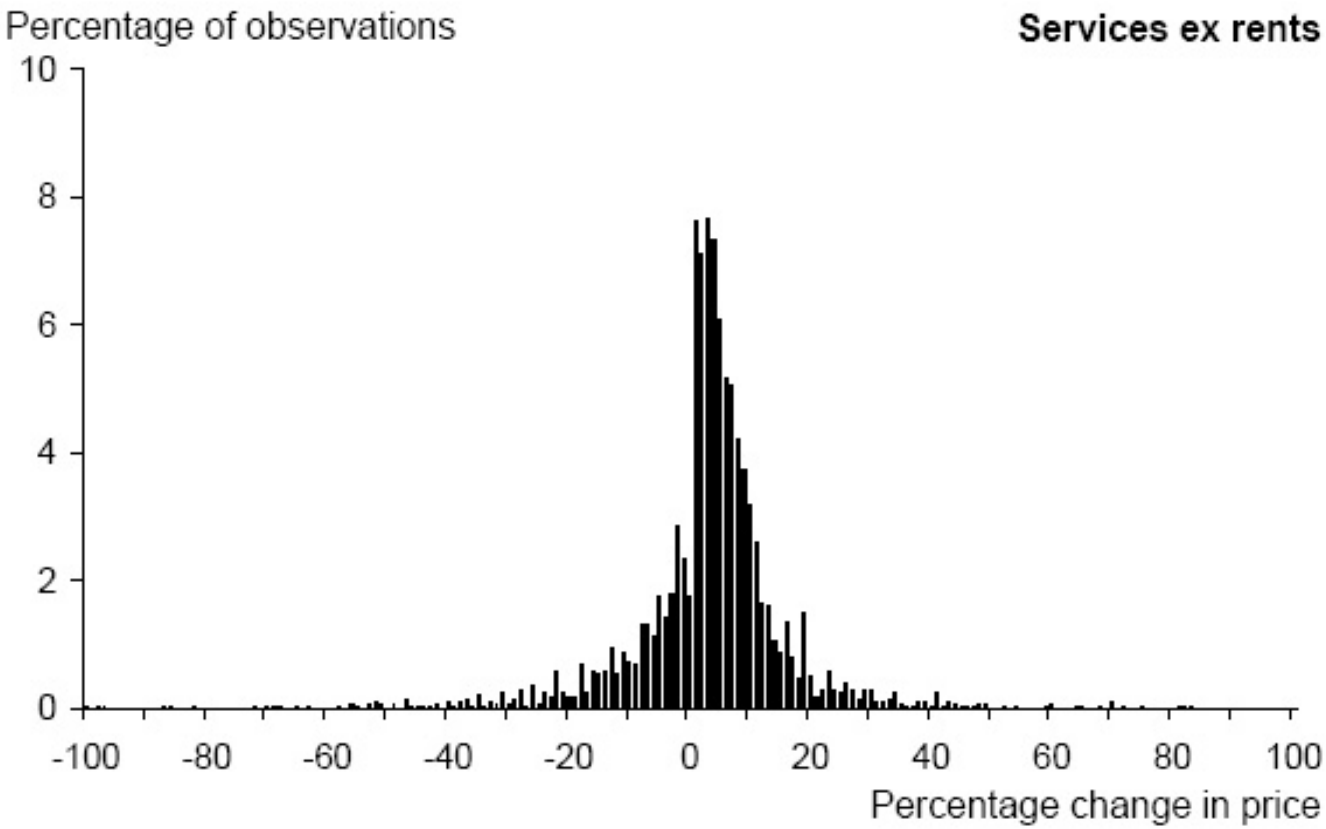








Germany: Distribution of Price Changes, Services



Duration of Price Spells: US vs Euro Area

Duration (in months) $\Rightarrow$ differs within US

- Scanner data: 3 [4] (AC Nielsen), 3 [5.2] (Dominick's) (median [mean])
- US CPI: 4.6 [6.7] (Bils & Klenow, 2004)
- New for US CPI, 8-11 (Nakamura & Steinsson, 2006)

Durations more similar between US and euro area than initial US evidence suggested?

- Euro area CPI: 10.6 [13](Dhyne et al, 2006)
- durations differ across sectors
- treatment of sales important

Synchronisation: US vs Euro Area

- US scanner data: synchronisation high within product and manufacturer categories
- Euro Area CPI: synchronisation not high across countries; but: high in Italian cities (Veronese et al, 2005)

$\Rightarrow$ Evidence that **regional** dimension matters

- Regional inflation dynamics in the euro area and the US (Beck, Hubrich, Marcellino, 2006a,b)
  - factor analysis of regional inflation rates with sectoral breakdown for each region in euro area

$\Rightarrow$ **region-specific** versus **sector-specific** factors: both matter

Regional Dimension

- market conditions are geographically segmented: different elasticities of demand, different mark-ups
- cost of input factors might differ across regions
- regional taxes
- regional laws
- (see e.g. Engel & Rogers, 1996, 2004)

$\Rightarrow$ ... and it's relevance for menu costs

- Item Pricing Laws (IPLs): require a price tag on every item sold by a retailer (Levy et al, 1997, Bergen et al 2006)
- different laws in different states
- menu costs of IPL stores much higher; fewer price changes
- number of small price changes lower in IPL stores $\Rightarrow$ How about AC Nielsen and Dominick's dataset?

Regional Dimension

- market conditions are geographically segmented: different elasticities of demand, different mark-ups
- cost of input factors might differ across regions
- regional taxes
- regional laws
- (see e.g. Engel & Rogers, 1996, 2004)

$\Rightarrow$ ... and it's relevance for menu costs

- Item Pricing Laws (IPLs): require a price tag on every item sold by a retailer (Levy et al, 1997, Bergen et al 2006)
- different laws in different states
- menu costs of IPL stores much higher; fewer price changes
- number of small price changes lower in IPL stores $\Rightarrow$ How about AC Nielsen and Dominick's dataset?

Explaining Large Number of Small Price Changes

This paper: menu costs in multi-product model

- mixed evidence on consistency of US data with menu cost model (Nakamura and Steinsson, 2006)

Alternative explanation:

- inattentive consumer (Reis, 2006): consumers may rationally choose to ignore small price changes (Levy et al, 2006)
- asymmetric price adjustment for small price changes since firms have incentive for small price increases
  $\Rightarrow$ asymmetry in Dominick's, but not in AC Nielsen dataset
- asymmetry varies over the business cycle

Alternative theories

- customer communication and negotiation costs important (Blinder et al, 1998); more important than physical menu costs for US manufacturing (Zbaracki et al, 2004)
- new survey evidence for euro area (see e.g. Alvarez et al, JEEA, 2006)
  - relevant theories for price stickiness from surveys: implicit or explicit contracts, marginal costs, competitors' prices
  - less relevant: menu costs and costs of gathering information

$\Rightarrow$ relevance of menu costs depends on sector

Summary and Further Research

- Very interesting paper: stylised facts, model extension calibrated to the features of the data and analysis of the transmission of monetary shocks
- Why scanner data here? Very rich information sets, but restricted sectoral and regional coverage; complements CPI
- Both US and euro area exhibit many small price changes; but: duration of price spells differ, even within US $\Rightarrow$ Implications of different calibration of the model?
- Relevance of menu costs might differ between sectors as well as between regions
- How to empirically discriminate between competing explanations for small price changes?