Price-Setting in the Euro Area: Some Stylized Facts from Individual Producer Price Data

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EU Institute Japan, July 3 2007

\[1\] The views expressed here are those of the authors and do not necessarily reflect the views of the institutions to which they are affiliated.
Research network studying:

- Degree of **inflation persistence**: "The tendency of inflation to converge slowly to its long-run value following shocks"
- Patterns and determinants of **price setting** underlying the euro area inflation dynamics
Inflation Persistence Network
Structure

- Collaborative Eurosystem research network
- 12 European countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain
- Main activities from 2003 to 2005
- Over 60 papers, more than 30 released as NCB and ECB working papers
- For a comprehensive list, see: http://www.ecb.int/home/html/researcher_ipn.en.html
IPN datasets/research lines:

- Macro time series
- Micro CPI data
- **Micro PPI data**
- Firm-level surveys
- Structural models
Altissimo et al., 2006, Sectoral and Aggregate Inflation Dynamics in the Euro Area, *Journal of the European Economic Association*, N° 4


We document five **facts:**

1. Prices change infrequently (compared to flex price economy)
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2. No downward nominal rigidity
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3. Substantial cross-sector heterogeneity
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4. Countries have similar sectoral ranking
Preview of Findings

We document five facts:

1. Prices change infrequently (compared to flexible price economy)
2. No downward nominal rigidity
3. Substantial cross-sector heterogeneity
4. Countries have similar sectoral ranking
5. Price changes are large (compared to aggregate inflation rate)
We investigate five **driving factors** of price stickiness:

1. **Cost structure**: share volatile input prices **positively correlated** with price adjustment frequency
We investigate five driving factors of price stickiness:

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2. **Inflation**: inflation positively correlated with price adjustment frequency
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2. **Inflation**: inflation positively correlated with price adjustment frequency
3. **Competition**: higher competition positively correlated with price adjustment frequency
Preview of Findings

We investigate five **driving factors** of price stickiness:

1. **Cost structure**: share volatile input prices *positively correlated* with price adjustment frequency
2. **Inflation**: inflation *positively correlated* with price adjustment frequency
3. **Competition**: higher competition *positively correlated* with price adjustment frequency
4. **Seasonality**: timing of price changes *correlated* with price adjustment frequency
We investigate five driving factors of price stickiness:

1. **Cost structure**: share volatile input prices positively correlated with price adjustment frequency
2. **Inflation**: inflation positively correlated with price adjustment frequency
3. **Competition**: higher competition positively correlated with price adjustment frequency
4. **Seasonality**: timing of price changes correlated with price adjustment frequency
5. **Attractive pricing**: share of prices ending in "attractive" digits and price adjustment frequency negatively correlated
**Countries:** Belgium, France, Germany, Italy, Portugal and Spain

**Monthly price records on individual products (PPI)**

**Time period:** 1991 to 2005 (differences across countries)

**Low inflation environment** (average annual rates from 0.7% (FR) to 2.1% (ES))

**87% of euro area manufacturing industry**
Belgium: Fresh or chilled whole chickens

Euro/Kilogram

Data
Sample Description
Belgium: Mattresses

Euro/Item

jan/01 | mrt/01 | mei/01 | jul/01 | sep/01 | nov/01 | jan/02 | mrt/02 | mei/02 | jul/02 | sep/02 | nov/02 | jan/03 | mrt/03 | mei/03 | jul/03 | sep/03 | nov/03 | jan/04 | mrt/04 | mei/04 | jul/04 | sep/04 | nov/04 | Jan/05
Data
Classification

- Industries: different levels (digits) of aggregation
- 6 Product Categories:
  - Food products
  - Non-durable non-food products
  - Durable products
  - Intermediate goods
  - Energy products
  - Capital goods
Facts
Fact 1: Prices Change Infrequently

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Price Increases</th>
<th>Price Decreases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>0.24</td>
<td>0.13</td>
<td>0.11</td>
</tr>
<tr>
<td>France</td>
<td>0.25</td>
<td>0.14</td>
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<tr>
<td>Germany</td>
<td>0.22</td>
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<tr>
<td>Italy</td>
<td>0.15</td>
<td>0.09</td>
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<tr>
<td>Portugal</td>
<td>0.23</td>
<td>0.14</td>
<td>0.10</td>
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<tr>
<td>Spain</td>
<td>0.21</td>
<td>0.12</td>
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</tr>
<tr>
<td>Euro Area</td>
<td>0.21</td>
<td>0.12</td>
<td>0.10</td>
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</tbody>
</table>
Facts
Fact 2: No Downward Nominal Rigidity

Frequency of Price Adjustment

<table>
<thead>
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<tr>
<td>Euro Area</td>
<td>0.21</td>
<td>0.12</td>
<td>0.10</td>
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</tbody>
</table>
**Facts**

**Fact 3: Substantial Cross-Sector Heterogeneity**

<table>
<thead>
<tr>
<th></th>
<th>Energy</th>
<th>Food</th>
<th>Intermediate Products</th>
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</thead>
<tbody>
<tr>
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<td>0.50</td>
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<td><strong>Germany</strong></td>
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<td><strong>Portugal</strong></td>
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<td><strong>0.27</strong></td>
<td><strong>0.22</strong></td>
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### Facts

**Fact 3: Substantial Cross-Sector Heterogeneity**

<table>
<thead>
<tr>
<th></th>
<th>Non-Durable Non-Food</th>
<th>Durable Products</th>
<th>Capital Goods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>0.11</td>
<td>0.14</td>
<td>0.13</td>
</tr>
<tr>
<td>France</td>
<td>0.10</td>
<td>0.13</td>
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<td>Germany</td>
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<td>0.10</td>
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<tr>
<td>Portugal</td>
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<td><strong>0.10</strong></td>
<td><strong>0.09</strong></td>
</tr>
</tbody>
</table>
Facts
Fact 3: Substantial Cross-Sector Heterogeneity

Distribution 2-digit Frequency of price adjustment

Frequency of price changes (in p.c.)
Density

[0;0.02] [0.04;0.06] [0.08;0.1] [0.12;0.14] [0.16;0.18] [0.2;0.22] [0.24;0.26] [0.28;0.3] [0.32;0.34] [0.36;0.38] [0.4;0.42] [0.44;0.46] [0.48;0.5] [0.52;0.54] [0.56;0.58] [0.6;0.62] [0.64;0.66] [0.68;0.7] [0.72;0.74] [0.76;0.78] [0.8;0.82] [0.84;0.86] [0.88;0.9] [0.92;0.94]
## Facts

**Fact 4: Countries Have Similar Ranking**

<table>
<thead>
<tr>
<th></th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Portugal</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>0.81</td>
<td>0.81</td>
<td>0.30</td>
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<td>France</td>
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<td>Spain</td>
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</tbody>
</table>
## Facts

**Fact 5: Price Changes are Large**

### Distribution Price Changes

<table>
<thead>
<tr>
<th></th>
<th>25th Percentile</th>
<th>Median</th>
<th>75th Percentile</th>
<th>p.m.: Average Mon. Inflation</th>
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</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>0.01</td>
<td>0.03</td>
<td>0.06</td>
<td>0.0013</td>
</tr>
<tr>
<td>France</td>
<td>0.01</td>
<td>0.03</td>
<td>0.05</td>
<td>0.0006</td>
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<tr>
<td>Germany</td>
<td>0.01</td>
<td>0.02</td>
<td>0.04</td>
<td>0.0008</td>
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<tr>
<td>Italy</td>
<td>0.02</td>
<td>0.03</td>
<td>0.05</td>
<td>0.0013</td>
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<tr>
<td>Portugal</td>
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<td>0.12</td>
<td>0.0014</td>
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<tr>
<td>Spain</td>
<td>0.01</td>
<td>0.03</td>
<td>0.06</td>
<td>0.0018</td>
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<tr>
<td>Euro Area</td>
<td>0.01</td>
<td>0.03</td>
<td>0.05</td>
<td>0.0010</td>
</tr>
</tbody>
</table>

⇒ Median price change 30 times larger than inflation rate
Driving Factors
Theoretical Background

- **Cost structure**: frequency of price adjustment is determined by number of (interdependent) manufacturing stages.
Driving Factors
Theoretical Background

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- **Cost structure**: frequency of price adjustment is determined by number of (interdependent) manufacturing stages.
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- **Attractive Pricing**: psychologically attractive prices for customers constrain the set of optimal prices and therefore create higher rigidity.
Differentiated approach across countries:

- Belgium, Germany and Spain: cross-sectoral analysis
- Germany and Spain: time series analysis
- France: conditional logit analysis
- Italy: correlation analysis

⇒ Despite methodological differences results are qualitatively homogeneous across countries.
Driving Factors
Factor 1: Cost Structure

- Higher labor share decreases frequency of price adjustment
- Higher share of non-energy intermediate inputs increases frequency of price adjustment
- Higher share of energy inputs increases frequency of price adjustment
Driving Factors
Factor 1: Cost Structure

![Graph showing the relationship between Labor Share and Frequency of Price Changes for Italy]
Driving Factors
Factor 1: Cost Structure

Spain

Share of non-energy inputs
Frequency of price changes

Conclusions
Driving Factors
Factor 1: Cost Structure

Germany

Frequency of price changes vs. Share of energy inputs
Driving Factors
Factor 2: Inflation

Inflation vs. Difference frequency for France

[Graph showing a scatter plot with a linear trend line representing the relationship between Inflation and Difference frequency for France.]
Driving Factors
Factor 3: Competition

- Proxies for the degree of competition: from surveys on price-setting, four-firm concentration ratio, import penetration
- Belgium, Spain: higher degree of competition $\Rightarrow$ more frequent price adjustment
- France: higher degree of competition $\Rightarrow$ faster pass-through of shocks
- Italy: higher degree of competition $\Rightarrow$ less frequent price adjustment (caveat: quality of competition indicators)

Overall, higher degree of competition $\Rightarrow$ more frequent price adjustment.
Driving Factors
Factor 4: Seasonality

Euro Area

Frequency

January
February
March
April
May
June
July
August
September
October
November
December

Price-Setting in the Euro Area
Vermeulen Dias Dossche Gautier Hernando Sabbatini Stahl
Introduction
Data
Five Facts
Five Driving Factors
Factor 1
Factor 2
Factor 3
Factor 4
Factor 5
Consumer vs. Producer Prices
Conclusions
Driving Factors
Factor 4: Seasonality

- Frequency of price adjustment exhibits seasonal pattern
- Regular/time-dependent adjustment (Konieczny & Rumler, 2007)
- State-dependent adjustment to seasonal cost changes (Stahl, 2005)
Driving Factors
Factor 5: Attractive Pricing

- Evidence for Germany (19% of prices), Spain (31%) and Italy (43%)
- Italy: attractive prices change with frequency 0.16 (vs. 0.24 rest), and size 6.2% (vs. 4.6% rest)
- Germany and Spain: in cross-sectoral regression frequency of price adjustment lower for sectors with larger share of attractive prices.
Consumer vs. Producer Prices

- Generally, in macro models producer prices are sticky.
- We test difference in stickiness at three levels of aggregation:
  - Entire CPI and PPI basket
  - Sub-baskets of CPI and PPI
  - Individual products in CPI and PPI

⇒ At all three levels price stickiness higher for consumer prices than producer prices.
## Consumer vs. Producer Prices

### Entire Basket

<table>
<thead>
<tr>
<th></th>
<th>PPI</th>
<th>CPI</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>0.24</td>
<td>0.14</td>
<td>0.10</td>
</tr>
<tr>
<td>France</td>
<td>0.25</td>
<td>0.19</td>
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<tr>
<td>Germany</td>
<td>0.22</td>
<td>0.11</td>
<td>0.11</td>
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</tbody>
</table>

⇒ Caveats: comparability of baskets; type of price

**Caveats:** comparability of baskets; type of price
## Frequency of Price Adjustment

<table>
<thead>
<tr>
<th></th>
<th>Processed Food</th>
<th>Non-Food Non-Energy Consumer Goods</th>
</tr>
</thead>
<tbody>
<tr>
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<td><strong>0.13</strong></td>
</tr>
</tbody>
</table>
Consumer vs. Producer Prices

Individual Items

- COICOP/PRODCOM classification
- Non-coordinated across countries
- 240 pairs of products both present in CPI and PPI
Consumer vs. Producer Prices
Individual Items

Frequency of price adjustment

Consumer Prices vs. Producer Prices

- Frequency of price adjustment:
  - 0%
  - 10%
  - 20%
  - 30%
  - 40%
  - 50%
  - 60%
  - 70%
  - 80%
  - 90%
  - 100%

- Percentage distribution:
  - 0% to 10%
  - 10% to 20%
  - 20% to 30%
  - 30% to 40%
  - 40% to 50%
  - 50% to 60%
  - 60% to 70%
  - 70% to 80%
  - 80% to 90%
  - 90% to 100%

- Visual representation:

- Scatter plot showing the relationship between consumer prices and producer prices.
- The trend line indicates a strong positive correlation.
Consumer vs. Producer Prices

Size of price adjustment

- Consumer Prices
- Producer Prices

Size of price adjustment:
- 0%
- 2%
- 4%
- 6%
- 8%
- 10%
- 12%
- 14%
- 16%
- 18%
- 20%
We document five facts on producer price stickiness:

- Prices change infrequently (compared to flex price economy)
- No downward nominal rigidity
- Substantial cross-sector heterogeneity
- Countries have similar sectoral ranking
- Price changes are large (compared to aggregate inflation rate)

Moreover, producer prices are less sticky than consumer prices.
We investigate five **driving factors** of price stickiness:

- **Cost structure**: share volatile input prices *positively correlated* with price adjustment frequency
- **Inflation**: inflation *positively correlated* with price adjustment frequency
- **Competition**: higher competition *positively correlated* with price adjustment frequency
- **Seasonality**: timing of price changes *correlated* with price adjustment frequency
- **Attractive pricing**: share of prices ending in "attractive" digits and price adjustment frequency *negatively correlated*