Is Inflation Heterogeneously Distributed Among Income Groups?*

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11th Ottawa Group Meeting
Neuchâtel, 27-29 May 2009

*This presentation represents the authors’ personal opinion and does not necessarily reflect the view of the Deutsche Bundesbank or its staff.
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2. Literature and Methodology
3. Income and Expenditure Survey
4. EVS 2003 Data
5. Heterogeneity Between Income Groups
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   2. Heterogeneity in the Inflation Rates
6. Conclusion
1. Introduction and Motivation

- Price increases in the spring and summer of 2008.
- In particular, food and energy prices have risen.
- With the financial and economic crisis, this period of continuous price growth came to a halt. Historically low interest rates and quantitative easing policies, lead some economists to predict risks of rising inflation rates in the near future.
- German social security and pension payments are not automatically adjusted to the growth rate of the CPI.
- Claims from both politicians and the unions for social measures.
1. Introduction and Motivation

- Whether or not this perception of different inflation burdens is legitimate, is not easy to answer.

- The German Federal Statistical Office (GFSO) calculated price indices for three household types up to the end of December 2002.

- Now only a single overall CPI is computed.

- The aim is to quantify the differences in the inflation rates by income grouped household types.

- We use household level micro data to calculate income group specific weighting schemes.
2. Literature and Methodology

- Brachinger (2008) focused on the very special case of a family with three children and a net monthly income between €2,600 and €3,600.

- This household type covers just 0.61% of the population’s households.

- Household does not consume tobacco products and spends only a small amount on alcohol products.

- Use of expenditure data from German sample survey of household income and expenditure (abbreviated by its German initials EVS, which stands for *Einkommens- und Verbrauchsstichprobe*).

- The EVS 2003 contains only 371 household datasets of this very specific household type.
Brachinger’s case study of household type specific inflation rates

Figure 1

[Graph showing inflation rates for different household types, with a vertical dashed line indicating the end of Brachinger’s case study in 2008.]

Family with three children
Overall CPI
End of Brachinger’s case study
2. Literature and Methodology

- Tober (2008) found somewhat less pronounced, yet significant differences between household specific inflation rates.

- Brachinger (2008) and Tober (2008) used publicly available EVS data for eleven broad consumption goods categories (corresponding approximately to the twelve two-digit COICOP divisions).
2. Literature and Methodology

- We calculate income group specific Laspeyres price indices (PIs) at a lower level of aggregation, the four-digit COICOP class level.

- We have access to EVS household level micro data.

- A further diversification of household types by other socio-demographic characteristics would reduce our sample sizes per household type and the representativeness of the results could not be guaranteed anymore.

- A lower level of commodity aggregation but a higher level of household aggregation.
3. Income and Expenditure Survey

- The EVS is a cross-section household survey, conducted every five years.
- A household is defined as a statistical unit with the provision that it is a group of persons whose command over income is shared.
- Households participate voluntarily.
- The EVS is a quota rather than a stratified random sample.
- Nearly the entire German population is covered.
3. Income and Expenditure Survey

- The EVS is divided into four parts:
  1. Initial household interview.
  2. An appendix to the initial household interview.

- Equal coverage of all month of the year is ensured.

- The EVS is the most important source to calculate the weighting scheme and to select the items of the German CPI.
4. EVS 2003 Data

- For research purposes, the GFSO provides so-called Scientific-Use-Files containing anonymised data from 42,744 household books and 11,831 detailed log books.

- We calculate weighting schemes for 13 different income groups according to the households’ monthly net income (which not only includes market income but also social assistance benefits of the household members).

- The expenditure categories follow COICOP at the four-digit level.

- The GFSO provides monthly sub-indices of the CPI at the COICOP four-digit level free of charge (data range from January 2005 to March 2009).
<table>
<thead>
<tr>
<th>Income group in €</th>
<th>Number of households</th>
<th>EVS share in %</th>
<th>CPI weight in %</th>
<th>(I^*) in €</th>
<th>(C^*) in €</th>
<th>(C/I^*) in %</th>
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</thead>
<tbody>
<tr>
<td>&lt;1,000</td>
<td>2,271</td>
<td>5</td>
<td>2</td>
<td>749</td>
<td>945</td>
<td>126</td>
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<td>1,000-1,500</td>
<td>3,901</td>
<td>9</td>
<td>5</td>
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<td>7</td>
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<td>11</td>
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<td>9</td>
<td>10</td>
<td>3,744</td>
<td>2,953</td>
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<td>4,000-4,500</td>
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<td>7</td>
<td>9</td>
<td>4,243</td>
<td>3,221</td>
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<td>8</td>
<td>4,737</td>
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<td>5,000-5,500</td>
<td>2,069</td>
<td>5</td>
<td>7</td>
<td>5,243</td>
<td>3,622</td>
<td>69</td>
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<td>5</td>
<td>5,738</td>
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<tr>
<td>6,000-7,000</td>
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<td>5</td>
<td>7</td>
<td>6,454</td>
<td>4,177</td>
<td>65</td>
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<tr>
<td>(\geq 7,000)</td>
<td>2,491</td>
<td>6</td>
<td>11</td>
<td>8,994</td>
<td>5,050</td>
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<tr>
<td>Total</td>
<td>42,744</td>
<td>100</td>
<td>100</td>
<td>3,474</td>
<td>2,661</td>
<td>77</td>
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</table>

* \(I^*\): Income, \(C^*\): Expenditures, \(C/I^*\): Consumption ratio
5.1 Heterogeneity in the CPI Weights

- The EVS is dominated by low and middle-income households.
- The major share of the CPI weight is assigned to middle and high-income households.
- The expenditure inequality is found to be moderate – Gini coefficient of 23.2%.
- Note that the Gini coefficient is a measure of expenditure inequality, instead of income inequality.
Expenditure shares by COICOP division

Figure 3

- Housing, water, electricity, gas and other fuels (04)
- Transport (07)
- Recreation and culture (09)
- Food and non-alcoholic beverages (01)
- Miscellaneous goods and services (12)
- Furnishings, household equipment and routine household maintenance (05)
- Clothing and footwear (03)
- Restaurants and hotels (11)
- Health (06)
- Alcoholic beverages, tobacco and narcotics (02)
- Communication (08)
- Education (10)
5.2 Heterogeneity in the Inflation Rates

- We calculate income group specific monthly Laspeyres price indices (PIs) and their year-on-year inflation rates with base year 2005 = 100 for each of the 13 income groups.

- No single income group shows the minimum or maximum inflation rate throughout.

- Minimum and maximum lie in a narrow band between income groups and hence, are very close to each other and thus to the overall CPI.

- Our recalculated CPI is very close to the official one.
Year-on-year inflation rates
Deviation measures

- Range of PIs
- MAD from CPI

Figure 5
Figure 6

Variation measures

- RMSE of Pls to CPI
- CV of Pls to CPI
5.2 Heterogeneity in the Inflation Rates

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Range in pp$^\times$</th>
<th>MAD in pp$^\times$</th>
<th>RMSE in %</th>
<th>CV*</th>
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<tbody>
<tr>
<td>Mean</td>
<td>0.4</td>
<td>0.2</td>
<td>0.12</td>
<td>0.06</td>
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<tr>
<td>Standard deviation</td>
<td>0.1</td>
<td>0.1</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.2</td>
<td>0.1</td>
<td>0.05</td>
<td>0.01</td>
</tr>
<tr>
<td>Median</td>
<td>0.4</td>
<td>0.3</td>
<td>0.11</td>
<td>0.05</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.7</td>
<td>0.4</td>
<td>0.18</td>
<td>0.16</td>
</tr>
</tbody>
</table>

$^\times$: percentage points; *: CV statistics adjusted for an extreme value in March 2009.
6. Conclusion

- The general inflation trend is almost the same, irrespective of the household’s net income.

- EVS data are from the year 2003, so that we have no information about potential adjustments in consumption.

- An alternative would be the use of income equivalence scales to classify the income groups.

- If one wants to calculate income group specific price indices, besides the weighting scheme itself, the basket of goods and the stores where the goods are bought need to be adjusted; quality adjustment must be performed separately.

- If price indices were calculated in this way, the results might change.