Group-Specific Inflation Rates for Austrian Households

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The consumer price index commonly computed by national statistical agencies can be interpreted as a weighted average of price indices for individual households, with the weights proportional to the total consumption expenditure of each household. In other words, the aggregate consumer price index is usually not a perfect indicator of the inflation experience of individual households. The extent to which household-specific inflation rates diverge from headline inflation generally depends on three things: 1) the divergence of consumption patterns across consumer units; 2) the divergence of expenditure budgets across households; and 3) the divergence of price developments across expenditure items. To estimate the divergence of group-specific consumer price indices across Austrian households, we construct group-specific inflation rates for the period from 2000 to October 2008 and evaluate consumption patterns across household groups. Households were grouped using a mix of two characteristics: a) household composition (i.e. male/female singles; two adults; three or more adults; lone parents; three or more persons, including children); b) low, medium or high household income.

The study finds households with lower total spending to have experienced a higher inflation rate than the "average" consumer in the period under review. The average gap was about −0.1 percentage points annually. Second, the inflation contribution of housing and food (including nonalcoholic beverages) was higher for lower-income groups. Third, higher-income households usually have a higher inflation share of transport than lower-income households. Fourth, households with children and larger households do not necessarily suffer above-average inflation.

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1 Introduction

The Harmonised Consumer Price Index (HICP) or other consumer price indices commonly computed by statistical agencies can be interpreted as aggregate weighted averages of price indices for individual households. The weight of individual households in the aggregate price index is determined by their consumption expenditures. Hence, inflation measured by an aggregate consumer price index is an imperfect indicator of inflation at the individual household level. Furthermore, the aggregate consumer price index might be a better reflection of price developments for households with higher consumption expenditures than for those with lower consumption expenditures. Deaton (1998) reports that, at the beginning of the 1990s, the ("usual") consumer price index weights were correct for households at the 75th percentile of the expenditure distribution (he refers to the U.S.A.). Although a similar bias towards the higher expenditure groups cannot be granted across countries and across time, it can be stated as a bottom line that the consumer price index is unable to correctly reflect the changes in the cost of living across households, i.e. that it will either overstate or understate their true inflation experiences.

An increasing number of studies have investigated differences of group-specific inflation rates. For the United States, the Bureau of Labor Statistics

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produces experimental consumer price indices for the elderly and the poor (Moulton and Stewart, 1999). Several studies have pointed to inflation differences among U.S. population groups, the most recent being Hobijn and Lagakos (2005), who report higher inflation rates in particular for the elderly and the poor from 1987 to 2001. However, group-specific inflation differentials do not seem to be persistent over time. For Austria, the national statistical office has recently constructed an index for retirees,[2] and Russinger (2004) derived group-specific inflation rates for different income groups and groups of households with different socio-economic characteristics – without mixing household characteristics, though. Put in another way, when singling out one characteristic (for instance, income) he neglects any other possibly interacting features (for instance, household composition or education). His results point to small divergences of group-specific inflation rates among Austrian households.

Our interest was to identify those Austrian household groups in terms of socio-economic characteristics for which the headline (harmonised) consumer price index is a good measure of inflation, as well as those for which the headline index over- or underestimates inflation.

To this end, section 2 describes the data we used and discusses some conceptual issues with respect to the construction of the group-specific price indices. Section 3 provides an empirical estimate of the heterogeneity of group-specific inflation rates, the so-called plutocratic bias. Section 4 discusses those results, and section 5 concludes.

2 Data and Conceptual Issues

The construction of our group-specific consumer price indices is based on data from two Austrian consumer expenditure surveys (CEX 1999/2000 and CEX 2004/2005) and the price indices constructed by the national statistical office.

The level of disaggregation we were able to consider is the 4-digit COICOP level.[3] Hence, we are dealing with in total 95 subindices.[4]

To calculate group-specific price indices, we use the formula

$$I^{hg,t} = \sum_{i=1}^{N} w_i^{hg,t} I_i^t, \ \sum_{i=1}^{N} w_i^{hg,t} = 1 \quad (2.1)$$

where hg denotes the household group, i the COICOP subclass and t the time period. Hence $I^{hg,t}$ is the overall HICP of household group hg in period t, and I_i^t denotes the HICP for COICOP subclass i in period t. Finally $w_i^{hg,t}$ are the weights for subclass i of household group hg in period t.

In equation (2.1) we assume – as is commonly done – that every household group faces the same price indices I_i^t. This assumption has to be made due to data constraints.[5]

To construct the weights $w_i^{hg,t}$, we used the consumer expenditure survey (CEX) data referred to above as well as

[2] *The price index for the elderly (Preisindex für Pensionistenhaushalte, PIPH) was constructed on behalf of the legal lobby of retirees in Austria (Österreichischer Seniorenrat) with financial support from the Federal Ministry for Social Security, Generations and Consumer Protection.*

[3] *COICOP = Classification Of Individual Consumption by Purpose. For instance, the COICOP 4-digit level 01.1.1 is bread and cereals.*

[4] *For comparison: the lowest level of aggregation in the Austrian national CPI 2005 consists of 770 elementary price indices, and the harmonised CPI 2005 of 759 elementary price indices (Statistics Austria, 2006).*

[5] *Prices paid by consumers for the same good/service can differ. For instance, price differences may reflect discounts for specific consumer groups; services and goods may also sell at different prices in rural and urban areas.*

the official HICP weights for the total population as published by Statistics Austria (see also equation 2.3).

The latter was used to correct for over-/underreporting in the consumer expenditure surveys. To achieve this we require the aggregated group weights calculated from (adjusted) CEX data to match the officially published HICP weights. Using the CEX data, we can calculate preliminary weights for the commodities

$$\hat{w}_i = \frac{x_i}{\sum_{i=1}^{N} x_i} \qquad (2.2)$$

where x_i reflects the total expenditure of all Austrians on subclass i. These weights diverge from the official HICP weights w_i^t. Next we calculate the ratios between the (average) HICP weights and the preliminary weights $f_i^t = w_i^t / \hat{w}_i^t$ and correct the expenditure of each household group on i (x_i^{hg}) with these factors to get adjusted expenditures $\tilde{x}_i^{hg,t} = x_i^{hg} \cdot f_i^t$. With the adjusted expenditures we get our final weights for the commodities

$$w_i^{hg,t} = \frac{\tilde{x}_i^{hg,t}}{\sum_{i=1}^{N} \tilde{x}_i^{hg,t}} \qquad (2.3)$$

In cases where the average correction factor for the period from 1999 to 2008, i.e. $1/10 \sum_t f_i^t$, is so extreme that it would lead to heavy distortions we exclude the corresponding commodities from further analysis. The boundaries for exclusion are set arbitrarily at ⅓ and 3. Thus the sum of the weights of the excluded commodities (17 COICOP groups) remain below 10% of the total weights.

3 The Plutocratic Bias – A Measure of Heterogeneous Group-Specific Inflation Rates

National statistical offices calculate the consumer price indices as weighted averages of prices for goods and services,[6] with the price weights reflecting the importance of the corresponding expenditure items. Like other national CPIs, the Austrian CPI is based on a so-called "plutocratic weighting scheme,"[7] which means that household expenditures are not treated equally in the weighting scheme: The price index of expenditure category i is weighted by the share of expenditure subclass i in the expenditures of the entire population: $w_i = x_i / X$. This implies that the importance of households in the construction of the consumer price index is proportional to their expenditure share in aggregate expenditures. In other words, even if households were to spend equal shares on good i, those with higher total expenditures count more in the consumer price index. This is evident from the following reformulation of the weights:

$$w_i = \frac{x_i}{X} = \frac{1}{X}\sum_{h=1}^{H} x_i^h = \frac{1}{X}\sum_{h=1}^{H} x_i^h \frac{x^h}{x^h} = \sum_{h=1}^{H} \left(\frac{x^h}{X}\right)\frac{x_i^h}{x^h} \qquad (3.1)$$

i.e. individual households' expenditures are incorporated into the CPI weights proportional to household h's total expenditures: x^h/X.

An alternative weighting scheme would be to assign equal ("democratic") weights to all households. Households

[6] *With prices for goods and services we mean elementary aggregates, i.e. the lowest-level aggregates for which detailed quantity and price information is available (see also footnote 4).*

[7] *The terms "plutocratic" and "democratic" in the context of index number weighting schemes were coined by Prais (1959) and are now commonly used.*

have equal weights in the overall consumer price index if the share of their expenditures on good i x_i^h / x^h is averaged over all households H, i.e.:

$$w_i^D = \frac{1}{H} \sum_{h=1}^{H} \frac{x_i^h}{x^h} \qquad (3.2)$$

Because a plutocratic index attaches a higher weight to households with higher consumer expenditures than a democratic index, the difference between a CPI based on plutocratic weights w_i (equation 3.1) and a CPI based on democratic weights w_i^D (equation 3.2) is a good indicator of the heterogeneity of inflation rates across households. The difference

$CPI_t - CPI_t^D = \Sigma_{i=1}^N w_i^t I_i^t - \Sigma_{i=1}^N w_i^{t,D} I_i^t$

is also called the plutocratic bias. Ley (2005) has shown[8] that this difference can be expressed with a single scalar, namely

$$CPI_t - CPI_t^D = \sum_{i=1}^{N} w_i^t I_i^t - \sum_{i=1}^{N} w_i^{t,D} I_i^t = \\ = \xi N \, Cov(\hat{\beta}_i, I_i^t) \qquad (3.3)$$

where $\hat{\beta}_i = Cov(x^h, x_i^h/x^h)/Var(x^h)$, $\xi = Var,(x^h)/\bar{X}$ and $\bar{X} = \sum_{h=1}^{H} x^h/H$ is the mean of the population's aggregate expenditures. As ξ (the scaled variance of household's total expenditures) and N (the number of goods and services) are positive, the sign of the gap in period t depends on the sign of the covariance of (an estimate of) expenditure elasticities $\hat{\beta}_i$ with price indices I_i^t.

Hence, the components which contribute to the heterogeneity of inflation rates across households are:

First, a measure of inequality of household expenditure given by

$$\xi = \frac{Var(x^h)}{\bar{X}} \qquad (3.4)$$

Equation (3.3) implies that the plutocratic gap increases with the variation of expenditures across households (ξ).

Second, the consumption pattern of consumers must differ. A measure of how much the expenditure share of good i varies across households in line with a household's total expenditure is given by

$$\hat{\beta}_i = \frac{Cov(x^h, x_i^h / x^h)}{Var(x^h)} \qquad (3.5)$$

where $\hat{\beta}_i$ may be interpreted as the ordinary least squares (OLS) estimate of β_i in the following regression

$$\frac{x_i^h}{x^h} - \bar{x}_i = \beta_i \left(\frac{x^h - \bar{X}}{\bar{X}}\right) + \varepsilon_i^h \qquad (3.6)$$

$\bar{x}_i = 1/H \, \Sigma_{h=1}^{H} x_i^h / x^h$ denotes the sample mean of the budget share of good i across all households. $\bar{X}$ is, as defined, above the mean of total population expenditures.

β_i is a measure of a household's demand behavior, i.e. β_i is the expenditure elasticity of good i. If households do not differ in their demand behavior, household-specific price indices would not differ, even if some households spend more than others. Put another way: if the expenditure share of good i is x across households and hence constant, irrespective of how much households spend overall, then the weight of good i will also equal x in both the plutocratic and democratic index.[9]

[8] *A similar result – however based on more restrictive assumptions (constant expenditure elasticity of goods and a log-normal expenditure distribution in the population) – was already derived in Prais (1959).*

[9] *In case each household, irrespective of what it spends in total (x^h), spends the same percentage share on each good i, i.e. $x_i^h/x^h = x_i$ for all households h, then the weights for the plutocratic index are $w_i = \sum(x^h/X)x_i^h/x^h = \sum(x^h/X)x_i = x_i$. For the democratic index we get $w_i^D = 1/H \sum x_i^h/x^h = 1/HHx_i = x_i$. Hence, the weights in both indices are the same and consequently price indices cannot differ, provided – as is commonly assumed – households pay the same prices for the same expenditure categories.*

Third, prices must vary for (some) consumer goods and services.

To sum it up, expenditure inequality as measured in equation (3.4), and higher expenditure elasticity as measured in equation (3.5) plus the variation of prices across expenditure categories determine the degree of heterogeneity of inflation rates across households.

For the purpose of this paper, we calculated the plutocratic bias for Austria for the period from 2000 to 2008:

Table 1

The Plutocratic Bias in Austria

Period	Plutocratic inflation rate (= HICP-Inflation)	Democratic inflation rate	Plutocratic bias	Bias as share of plutocratic inflation
	%		*percentage points*	%
2000	1.9	1.8	0.09	4.6
2001	2.2	2.3	−0.11	−4.9
2002	1.6	1.7	−0.03	−2.2
2003	1.3	1.4	−0.08	−6.1
2004	1.8	2.0	−0.13	−7.0
2005	2.0	2.3	−0.28	−13.4
2006	1.7	1.8	−0.18	−10.8
2007	2.5	2.7	−0.17	−6.9
2008	3.6	3.8	−0.20	−5.6
Average	2.1	2.2	−0.12	−5.8

Source: Author's calculation.

Note: The HICP inflation does not include all expenditure categories (see explanations in section 2). Hence the plutocratic inflation rates do not necessarily match the official data releases.

The main findings are the following. First, in the period from 2000 to 2008 the annual bias ranged from –0.28 to 0.09 percentage points and averaged about –0.12 percentage points. Second, the plutocratic bias was always negative except in 2000. Hence, in all years except 2000 households with lower total spending experienced a higher inflation rate than the "average" as measured by the headline consumer price index. Third, the negative gap widened slightly after 2005, i.e. the underestimation of headline inflation for households with comparatively lower spending was higher after 2005. Fourth, the plutocratic bias did not increase significantly when inflation rates increased in 2007 and 2008.

The most recent empirical evidence on the plutocratic bias for other European countries is from Chelli and Mattioli (2007). They measure the plutocratic bias for a number of Italian household groups during the period from 1995 to 2002 and find an average bias of about 0.3 percentage points. Another fairly recent empirical estimate for Spain can be found in Izquierdo et al. (2003). They estimate that from 1992 to 1997 the plutocratic bias for Spain averaged 0.055 percentage points a year. However, the Spanish CPI during that period was markedly higher (between 2.5% and 7%) than the Austrian CPI for the period from 2000 to 2008 for which we estimated the Austrian plutocratic bias, and stronger price developments tend to widen the plutocratic bias. For instance, Ley (2005) reports that empirical estimates of the plutocratic bias in the U.K. during the period from 1975 to 1976 – when annual inflation rates recorded almost 15% – the plutocratic bias amounted to –2 percentage points per year. See Ley (2005) for a compilation of further empirical estimates of the plutocratic bias.[10]

[10] *For instance, according to references in Ley (2005) empirical estimates of the plutocratic bias for Argentina during the period from 1989 to 1991 recorded a plutocratic bias between +2.3 and +663.4 percentage points per year (hence inflation was "anti-rich," i.e. more detrimental to households with higher spending). During that time the annual inflation rates fluctuated between about 10% and more than 200%.*

4 Group-Specific Price Indices

Which socio-economic characteristics are relevant for grouping households? Should we construct price indices for the elderly or the young, the rich or the poor, urban or rural households? Our approach was to group households across several dimensions that are likely to go hand in hand with different consumption patterns. At the same time, the sample size of the groups should be large enough to keep the sampling error of the CEX results reliable. Therefore we selected two socio-economic characteristics,[11] i.e. we combined family types in terms of household composition with income (see table 2 for an overview of household groups and sample sizes). Other characteristics thought to be important for the question of inflation inequality, like for instance age or rural/urban residence or education, were not considered either because of (partly) already existing work for Austria (the price index for pensioners), lack of information (information on regional prices is not available to the authors) or practical reasons mentioned in footnote 11.

4.1 Household Groups and Group-Specific Inflation Rates

The two household groups with the lowest numbers of consumer units surveyed are low-income households with three or more adults, as well as lone parents with high income, for which 40 to 48 consumer units were interviewed during the CEX 1999/2000 and the CEX 2004/2005 (table 2). Whereas the results for these two household groups should thus be interpreted with caution, the results of the experimental price indices for all other groups can be considered as reliable, given that their sample size amounts to at least 100 units.[12]

Income categorization of households: Household welfare depends on income and size as well as composition. Hence we equivalize total household net income (including imputed rents) by the internationally recommended EU scales, i.e. we adjust income with the following parameters: 1 (for the first adult), 0.5 (for every additional person above 14 years of age) and 0.3 (for persons below 14 years of age). The largest variation of total expenditure of households arises between the 1st and 2nd as well as the 9th and 10th income decile.[13] Such a division of households along income scales might be more promising given our objective to identify inflation inequality (section 3). However, to keep group sizes large enough we decided to categorize households as follows:

- Low-income households: 1st to 3rd of (equivalized) income deciles.
- Medium-income households: 4th to 7th of (equivalized) income deciles.
- High-income households: 8th to 10th of (equivalized) income deciles.

Table 3 provides the inflation rates and table 4 the difference of group-specific inflation rates to headline HICP inflation.

[11] *A larger mix of characteristics would also rapidly increase the number of household groups. In a first version of the paper we considered six types of household composition, three types of education of the reference person and three types of household income. However, as a complete grouping would have implied considering 54 household groups we had to consolidate groups (Fritzer and Glatzer, 2007).*

[12] *Statistics Austria as a rule does not publish CEX data on items where the sample size of surveyed consumer units is less than 50. We took this sample size as a benchmark for reliability.*

[13] *According to the Austrian consumer expenditure survey 2004/2005 the expenditures reported by households in the 1st income decile amounted to about one quarter of the expenditures of households in the 10th income decile. Furthermore, along the income scale the largest expenditure increments happen between the 1st and 2nd income deciles (+30% additional consumption expenditure) and the 9th and 10th income deciles (+23% additional consumption expenditure).*

Table 2

List of Household Groups

	Number of households	
	1999/2000	2004/2005
Total number of consumer units surveyed	7,092	8,400
Households not classified	6	1,517
Estimated number of classified households	3,235,036	2,921,291
1. Lone parents with low income	212 (89,232)	205 (61,877)
2. Lone parents with medium income	111(35,563)	132 (42,990)
3. Lone parents with high income	43 (10,731)	40 (11,684)
4. Three or more persons, including children, with low income	898 (288,810)	633 (199,553)
5. Three or more persons, including children, with medium income	1,402 (455,608)	1,092 (345,620)
6. Three or more persons, including children, with high income	666 (218,067)	573 (186,789)
7. Three or more adults with low income	42 (23,576)	48 (20,578)
8. Three or more adults with medium income	212 (104,620)	189 (87,527)
9. Three or more adults with high income	308 (148,532)	257 (128,582)
10. Male singles with low income	121 (102,793)	167 (109,212)
11. Male singles with medium income	144 (139,757)	255 (169,558)
12. Male singles with high income	158 (138,702)	274 (162,968)
13. Female singles with low income	478 (304,878)	397 (243,109)
14. Female singles with medium income	311 (193,753)	403 (248,617)
15. Female singles with high income	177 (96,508)	268 (139,464)
16. Two adults with low income	378 (170,436)	321 (123,380)
17. Two adults with medium income	657 (319,366)	717 (289,440)
18. Two adults with high income	774 (394,105)	912 (350,344)

Source: Author's calculation based on consumer expenditure surveys of Statistics Austria.

Note: Households not classified are those households that did not provide any information on income. The figures in brackets are the estimated numbers of total households, as derived from the weight of each household group.

Table 3

Group-Specific Inflation Rates

	2004	2005	2006	2007	2008[1]	2000 to 2008[1]
	%					
Headline HICP	1.8	2.0	1.7	2.5	3.6	19.9 (2.1)
1. Lone parents with low income	1.9	2.1	1.8	3.0	2.8	19.9 (2.1)
2. Lone parents with medium income	1.8	1.6	1.8	2.3	3.3	18.8 (2.0)
3. Lone parents with high income	1.8	1.8	1.9	2.5	3.4	20.7 (2.1)
4. Three or more persons, including children, with low income	1.8	2.0	1.6	2.6	3.6	19.6 (2.1)
5. Three or more persons, including children, with medium income	1.7	1.9	1.6	2.5	3.7	19.7 (2.1)
6. Three or more persons, including children, with high income	1.6	1.8	1.4	2.4	3.4	18.3 (1.9)
7. Three or more adults with low income	2.2	2.2	2.0	2.7	4.2	21.0 (2.2)
8. Three or more adults with medium income	2.0	2.1	1.8	2.5	4.2	21.0 (2.2)
9. Three or more adults with high income	1.9	1.9	1.7	2.5	4.1	20.4 (2.1)
10. Male singles with low income	2.2	2.5	2.1	2.6	3.5	20.7 (2.2)
11. Male singles with medium income	2.1	2.3	1.9	2.4	3.7	21.1 (2.2)
12. Male singles with high income	1.7	2.3	1.9	2.5	3.7	19.9 (2.1)
13. Female singles with low income	2.2	2.3	2.0	2.9	3.3	21.9 (2.3)
14. Female singles with medium income	1.8	2.0	1.6	2.5	2.8	18.4 (1.9)
15. Female singles with high income	2.1	2.0	1.7	2.5	3.1	20.3 (2.1)
16. Two adults with low income	2.1	2.3	2.0	2.9	3.8	22.0 (2.3)
17. Two adults with medium income	2.1	2.5	1.8	2.5	4.0	22.0 (2.3)
18. Two adults with high income	1.6	2.0	1.5	2.5	3.4	19.3 (2.0)

Source: Author's calculation based on consumer expenditure surveys of Statistics Austria.

[1] *The figures for 2008 have been compounded from January to October. The figures in brackets indicate the annual compound inflation rates from 2000 to October 2008.*

The general picture that emerges from table 3 is the following:

With some exceptions there is evidence that households with low to medium income face higher inflation rates than high-income households. Lone parents do not fit into this picture, yet the results for lone parents with high income might be affected by the small sample size as mentioned above. Additionally household composition also plays an important role. Larger households or households with children are not in general in a disadvantaged position, i.e. prone to suffer from more inflation. In contrast, the HICP seems to be a fairly good inflation measure for households with three or more persons, including children.

Going into more detail, the HICP for all households[14] increased by 19.9% during the period from 1999 to October 2008, which is equivalent to a compound annual growth rate of 2.1% (table 3). The households most affected by inflation were the two-adult households with low to medium income (household groups 16 and 17) as well as female singles with low income (household group 13). Their consumption basket recorded a cumulative inflation rate of 22.0% from 2000 to October 2008, which is equivalent to a compound annual growth rate of 2.3% and exceeds annual inflation as measured by headline HICP by 0.2 percentage points on average (see table 4 for the differences to headline inflation).

There are five other groups with a higher-than-average inflation experience (against the benchmark of headline HICP inflation): Male singles with low to medium income (household groups 10 and 11), three or more adult persons and low to medium income (household groups 7 and 8) and finally lone parents with high income (household group 3).[15]

Low-income lone parents (household group 1) as well as households with three or more persons, including children, in the low- to medium-income spectrum (household groups 4 and 5) experienced group-specific inflation rates similar to overall HICP inflation – as do high-income households with three or more adults as well as high-income male and female singles (household groups 9, 12 and 15).

Below-average inflation is recorded by three or more persons, including children, with high income (household group 6), medium-income lone parents and medium-income female singles (household groups 2 and 14) as well as two-adult households with high income (household group 18). HICP inflation was on average 0.1 to 0.2 percentage points below headline HICP inflation over the considered period.

[14] *As mentioned in section 2 we excluded 17 COICOP items. As a consequence the numbers reported for headline inflation do not always coincide with the official HICP releases.*

[15] *As mentioned before the results for low-income households with three or more adults as well as lone parents with high income should be considered with caution due to the small sample size.*

Table 4

Difference between Group-Specific Inflation Rates and Headline HICP Inflation

	2004	2005	2006	2007	2008[1]	Annual average 2000 to 2008[1]
	Percentage points					
1. Lone parents with low income	0.1	0.0	0.1	0.5	−0.7	0.0
2. Lone parents with medium income	−0.1	−0.4	0.2	−0.2	−0.3	−0.1
3. Lone parents with high income	0.0	−0.3	0.2	0.0	−0.2	0.1
4. Three or more persons, including children, with low income	0.0	0.0	−0.1	0.1	0.0	0.0
5. Three or more persons, inclduding children, with medium income	−0.1	−0.1	−0.1	0.0	0.2	0.0
6. Three or more persons, including children, with high income	−0.2	−0.3	−0.2	−0.2	−0.2	−0.2
7. Three or more adults with low income	0.4	0.1	0.3	0.2	0.6	0.1
8. Three or more adults with medium income	0.1	0.0	0.1	0.0	0.6	0.1
9. Three or more adults with high income	0.1	−0.1	0.0	0.0	0.5	0.0
10. Male singles with low income	0.4	0.4	0.4	0.1	−0.1	0.1
11. Male singles with medium income	0.3	0.2	0.2	−0.1	0.1	0.1
12. Male singles with high income	−0.1	0.2	0.2	0.0	0.1	0.0
13. Female singles with low income	0.3	0.2	0.4	0.3	−0.3	0.2
14. Female singles with medium income	−0.1	−0.1	−0.1	0.0	−0.7	−0.1
15. Female singles with high income	0.3	0.0	0.0	−0.1	−0.5	0.0
16. Two adults with low income	0.3	0.3	0.3	0.4	0.2	0.2
17. Two adults with medium income	0.2	0.4	0.1	0.0	0.4	0.2
18. Two adults with high income	−0.2	0.0	−0.2	−0.1	−0.1	−0.1

Source: Author's calculation based on consumer expenditure surveys of Statistics Austria.

[1] *The figures for 2008 have been compounded from January to October. The annual average 2000 to 2008 indicates the difference between the average HICP inflation rate and the group-specific annual compound inflation rates for that period. A positive sign indicates a rate above headline inflation; a negative sign a rate below headline inflation.*

Given the divergence of inflation experience across groups, the next step is to identify the expenditure categories responsible for inflation inequality, and to evaluate consumption patterns for any obvious relation with inflation.

4.2 Consumption Patterns – The Twelve Expenditure Groups

The inflation contribution of the twelve COICOP expenditure groups reveals some noteworthy features (see also chart 1). The four expenditure groups with the highest inflation contribution across household groups in the observation period are housing, food (including nonalcoholic beverages), transport services and restaurant services. The average inflation contribution of these expenditure groups amounts to about 80% of the group-specific average inflation rate (continuous line in chart 1), but there are two outliers: high-income male singles, for whom the inflation contribution of the mentioned expenditure items is much higher (about 94%); and high-income female singles, for whom this contribution is much lower (about 72%).

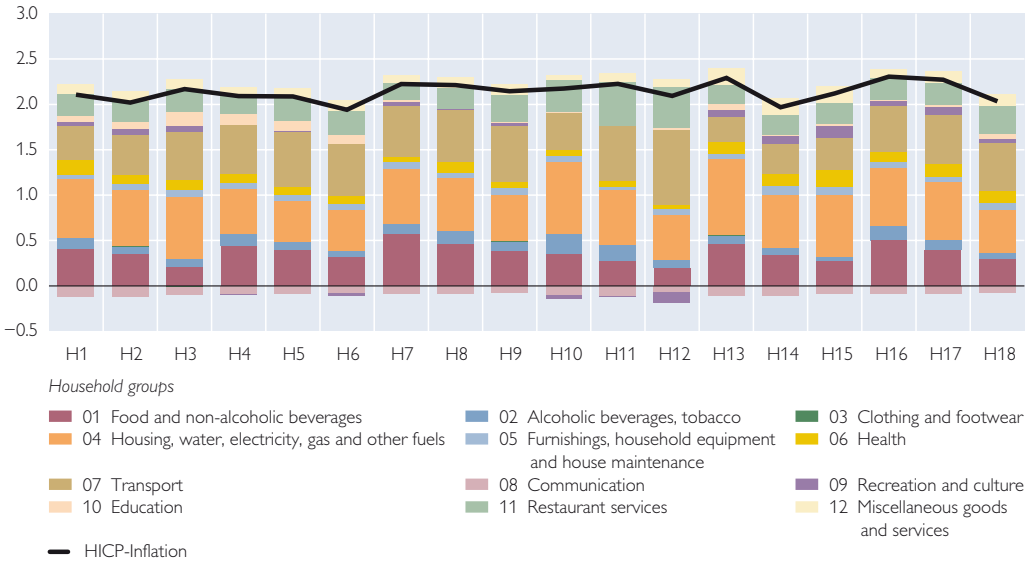
Furthermore, expenditure groups show considerable variation across households. In particular it seems that the contribution of housing and food broadly moves in synch with group-specific inflation rates. Additionally food in general contributes more to inflation for lower-income groups. For instance the inflation contribution of

Chart 1

Inflation Contribution of Expenditure Groups across Households

Average from 2000 to 2008

Percentage points



Source: Author's calculation based on consumer expenditure surveys of Statistics Austria.

Note: Household groups are defined as follows:
H1: Lone parents with low income
H2: Lone parents with medium income
H3: Lone parents with high income
H4: Three or more persons, including children, with low income
H5: Three or more persons, including children, with medium income
H6: Three or more persons, including children, with high income
H7: Three or more adults with low income
H8: Three or more adults with medium income
H9: Three or more adults with high income
H10: Male singles with low income
H11: Male singles with medium income
H12: Male singles with high income
H13: Female singles with low income
H14: Female singles with medium income
H15: Female singles with high income
H16: Two adults with low income
H17: Two adults with medium income
H18: Two adults with high income

food for lone parents in the low-income spectrum is the highest among lone parents whereas it is the lowest for those in the high-income spectrum. A similar pattern can be observed for housing. The lower the household income, the higher is the inflation contribution of housing.[16] Conversely, the inflation contribution of transport moves along with income, which implies that for higher-income groups we observe a higher inflation contribution of transport services.

Another noteworthy feature, which is similar across households, is the fact that the inflation contribution of communication services is on average negative over the whole period.

4.3 Going beyond the Twelve Expenditure Categories

Disaggregating expenditures to the COICOP 4-digit level, also known as COICOP subclasses, reveals additional noteworthy features of group-specific inflation rates.

Specifically, we identified the five COICOP 4-digit-level expenditure items with the biggest inflation contribution for each household group, and added up the inflation contributions of all other subclasses (charts 2 to 4).

Furthermore, we arranged the 18 household groups into the three broad categories discussed in section 4.1: those with an average annual inflation burden of at least 0.1 percentage points

[16] *Lone parents and female single households are exceptions from this pattern.*

above the total population (chart 2), a group whose inflation burden broadly matches the headline HICP inflation (chart 3) and a below-average inflation group (chart 4) whose average annual inflation is at least 0.1 percentage points below the headline HICP inflation.

From 2000 to 2008 the consumption baskets of eight household groups generated average annual inflation rates that exceeded the average headline rate of 2.1%. For readers' convenience we repeat the household groups mentioned in section 4.1:

– two adults with medium or low income (H17, H16),
– female singles with low income (H13),
– male singles with medium or low income (H11, H10),
– three or more adults with low or medium income (H7, H8) and
– lone parents with high income (H3).

Comparing the expenditure patterns of the two-adult households across income ranges, we observe that those with low to medium income suffer from a higher inflation contribution of liquid fuels (for housing) and tobacco than the households in the high-income spectrum (compare H17 and H16 of chart 2 with H18 of chart 4).

The inflation burden of singles strongly reflects the inflation contribution of restaurant services, fuels for personal transport as well as tobacco. Unlike male singles, female singles experience a lower inflation contribution of fuels for personal transport, restaurants and tobacco. Comparing the consumption pattern of singles and two adults, one outstanding feature is the expenditure share of rentals, which is considerably higher for singles.

The group whose inflation experience basically reflects the rise in the headline HICP comprises

– three or more adults with high income (H9),
– three or more persons, including children, with low to medium income (H4, H5),
– female and male singles with high income (H15, H12) and
– lone parents with low income (H1).

When comparing the consumption basket of low-income households with three or more persons, including children, (group 4) with that of high-income households with three or more adults (group 9) – the two groups with the largest inflation gap in this segment – one can note the following: the inflation burden of the latter was higher on average from 2000 to 2008 because in their case fuels for transport, restaurant services and liquid fuels (for housing) accounted for a higher share of inflation. A further difference in the consumption pattern is – not surprisingly – that three or more persons including children and low income spend more on educational services.

Comparing female and male singles with high income we can observe that the latter spend more on restaurant services as well as fuels for transport while we record a higher inflation contribution of dwelling-related services and liquid fuels for female singles.

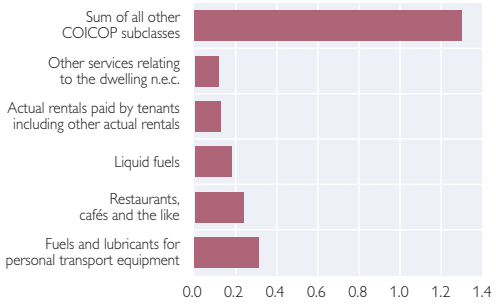
Comparing high-income lone parents in the above-average inflation group with low-income lone parents in the average-inflation group reveals: restaurant services, the maintenance and repair of personal transport equipment, dwelling-related services, fuels for transport and educational services are mainly responsible for the higher inflation burden of the high-income lone parents group.

Chart 2

Inflation Contributions of the Most Important Expenditure Categories: Above-Average Inflation Group

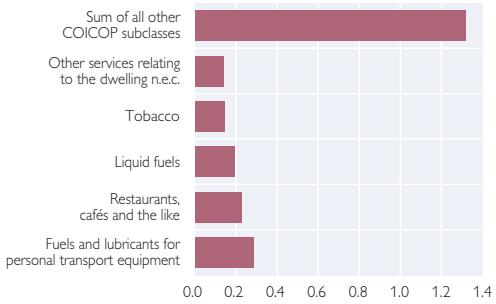
H17: Two adults with medium income

Percentage points



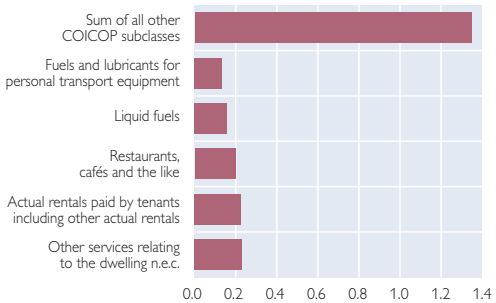
H16: Two adults with low income

Percentage points



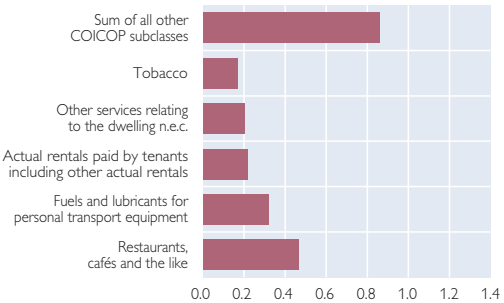
H13: Female singles with low income

Percentage points



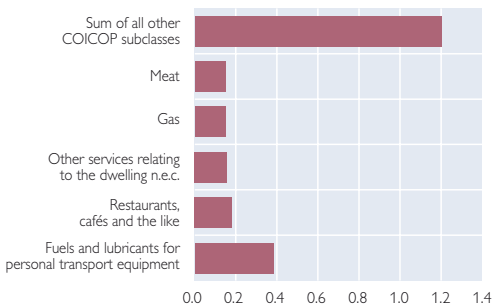
H11: Male singles with medium income

Percentage points



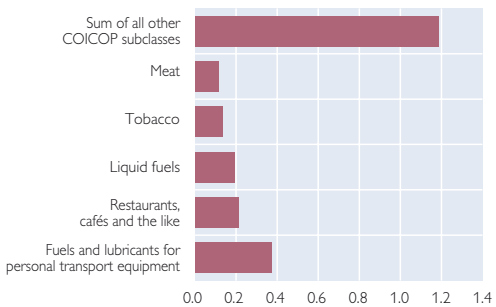
H7: Three or more adults with low income

Percentage points



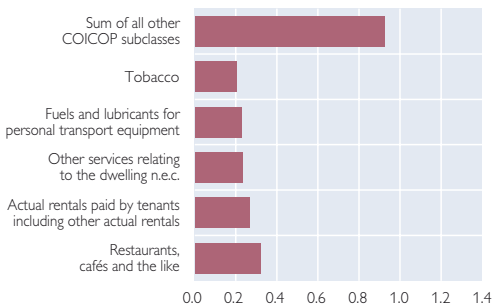
H8: Three or more adults with medium income

Percentage points



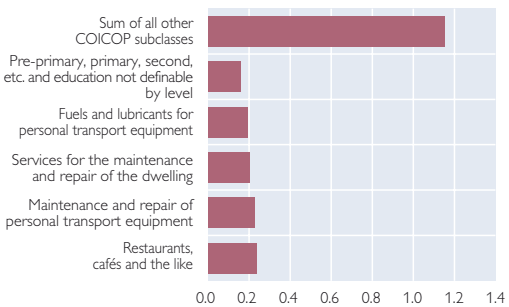
H10: Male singles with low income

Percentage points



H3: Lone parents with high income

Percentage points

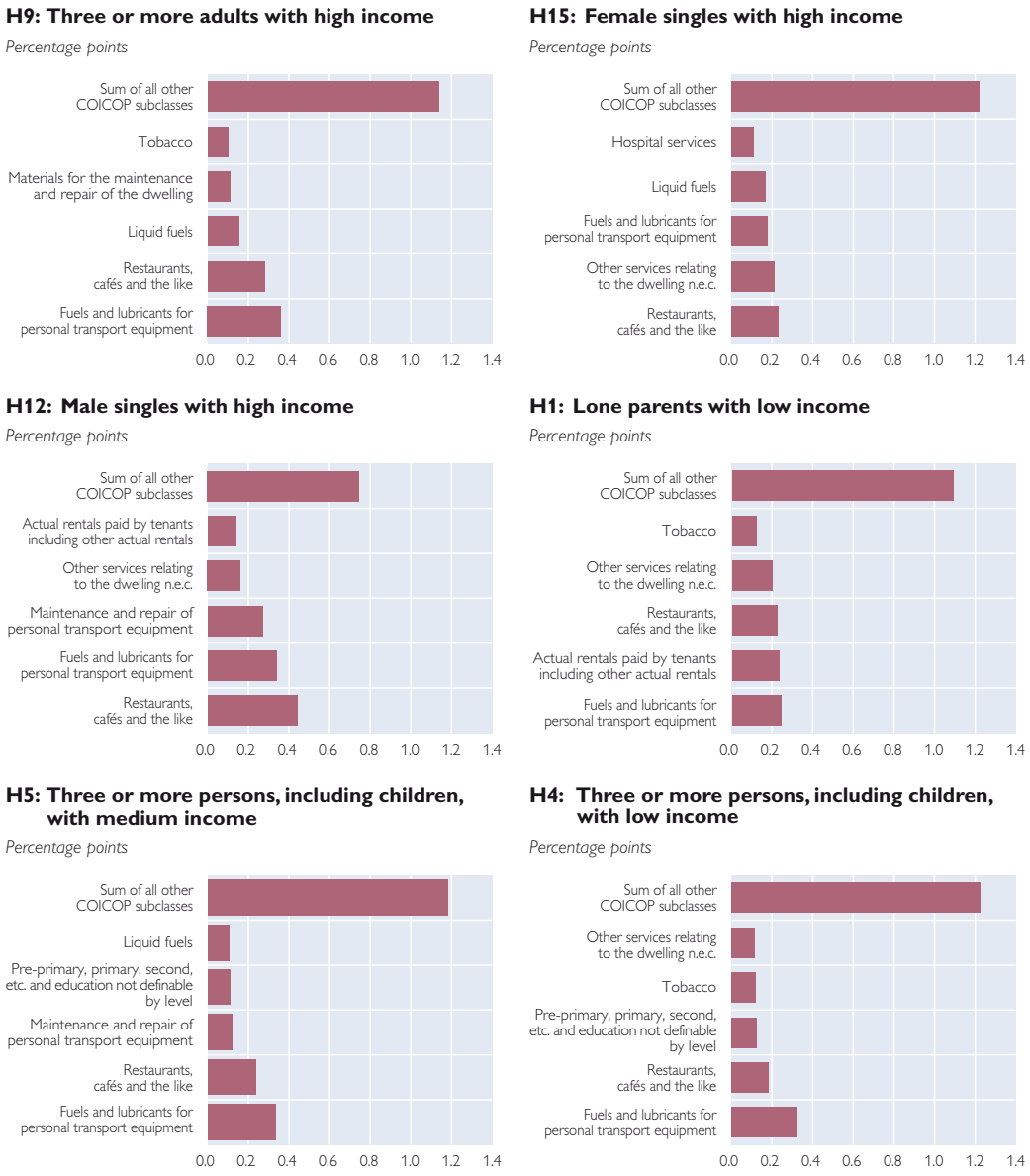


Source: Author's calculation based on consumer expenditure surveys of Statistics Austria.

Note: The charts show the average inflation contributions the five most important 4-digit COICOP items had in the period from 2000 to 2008. The largest bar reflects the inflation contributions of the remaining 72 COICOP items.

Chart 3

Inflation Contributions of the Most Important Expenditure Categories: Broadly Similar to Total Population



Source: Author's calculation based on consumer expenditure surveys of Statistics Austria.

Note: The charts show the average inflation contributions the five most important 4-digit COICOP items had in the period from 2000 to 2008. The largest bar reflects the inflation contributions of the remaining 72 COICOP items.

Finally, the households experiencing below-average inflation comprise

– two adults with high income (H18),
– lone parents with medium income (H2),
– female singles with medium income (H14) and
– three or more persons, including children, with high income (H6).

Among the high-income households, three or more persons including children record a higher inflation contribution than two adults alone from fuels (for transport and housing) and educational services. In contrast, the latter ex-

perience a slightly higher inflation contribution from restaurants, and other dwelling-related services as well as maintenance and repair of personal transport equipment.

With regard to two-adult households in the low- and medium-income range versus those in the high-income segment, the former bear a higher inflation contribution from liquid fuels (for housing) while the latter have a higher inflation contribution from restaurant services.

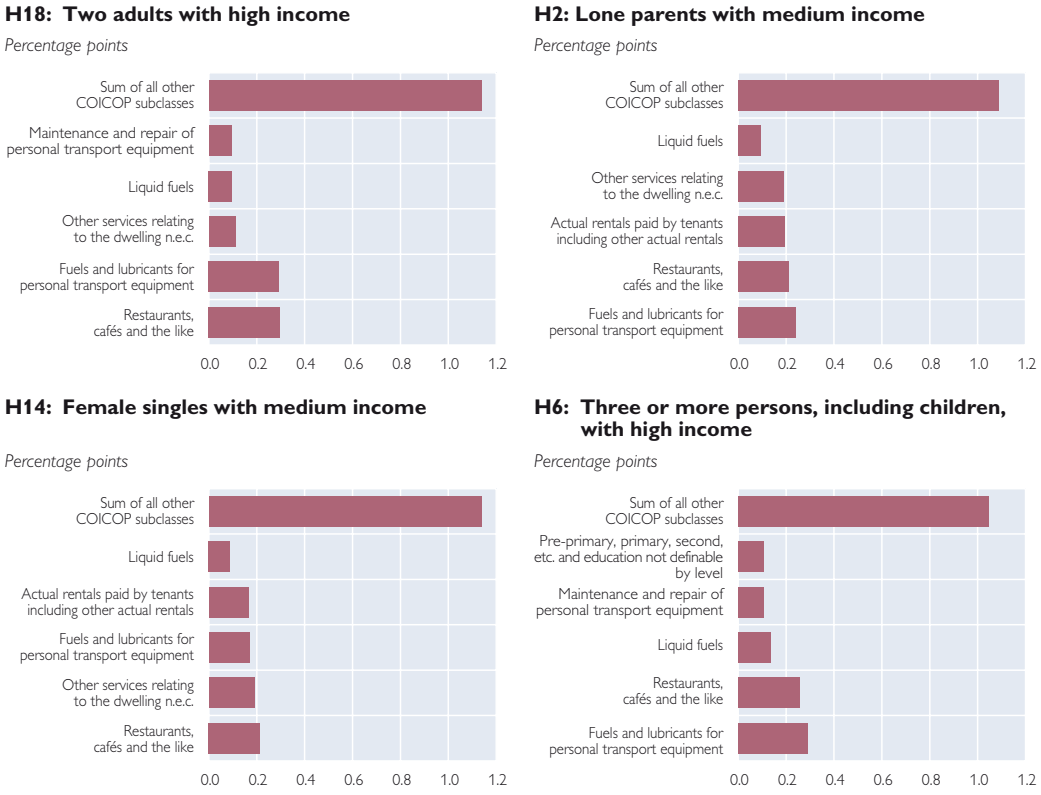
Finally, we find female singles in the medium-income spectrum (below-average inflation group; chart 4) to have a lower inflation contribution of rentals and other dwelling-related services than female singles with low income (above-average inflation group; chart 2).

5 Conclusions

The origin of the present paper was the conjecture that headline inflation is not necessarily a good indicator of the inflation experience of specific household groups. The Austrian national statistical office recently published a price index for pensioners that does indeed diverge from the headline consumer price index at times. Our interest was to identify the household groups defined in terms of size and income for which the headline (harmonised) consumer price index is a good measure of inflation, those for

Chart 4

Inflation Contributions of the Most Important Expenditure Categories: Below-Average Inflation Group



Source: Author's calculation based on consumer expenditure surveys of Statistics Austria.

Note: The charts show the average inflation contributions the five most important 4-digit COICOP items had in the period from 2000 to 2008. The largest bar reflects the inflation contributions of the remaining 72 COICOP items.

whom the headline index overestimates and those for whom the headline index underestimates inflationary developments. For this reason we constructed price indices for a total of 18 household groups which differ in composition and income. Furthermore we estimated an empirical indicator for the heterogeneity of inflation across households, called the plutocratic bias in the literature.

The main findings are the following: First, during the period from 2000 to October 2008 the plutocratic bias is negative except for 2000. Hence, households with lower total spending experienced a higher inflation rate than the "average" as measured by the headline (harmonised) consumer price index except in 2000. From 2000 to October 2008 the gap was on average about –0.1 percentage points annually.

Second, there is some evidence that households with lower income (1st to 3rd income decile) face higher inflation rates. Additionally households with children and bigger households did not necessarily suffer above-average inflation in the review period.

Third, the inflation contribution of housing and food (including nonalcoholic beverages) was in general higher for lower income groups. At the same time, higher-income households usually had a higher inflation share of transport than lower-income households.

Fourth, during the period from 2000 to October 2008 the four expenditure groups housing, food (including nonalcoholic beverages), transport and restaurant services made up about 80% of the group-specific inflation rates. At the most detailed level for which price indices are published (4-digit COICOP level), fuels for transport, liquid fuels, restaurant services, rentals and meat[17] appear to be the most important inflation drivers across households.

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[17] *The food expenditure group is composed of comparatively many 4-digit COICOP items. Hence, with the exception of meat, food items at the 4-digit COICOP level are not among the four items with the highest inflation contribution.*

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