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**Research Report**

## Inflation inequality in Denmark

Economic Memo, No. 5

**Provided in Cooperation with:**

Danmarks Nationalbank, Copenhagen

*Suggested Citation:* Kuchler, Andreas; Renkin, Tobias; Weissert, Christoffer Jessen (2023) : Inflation inequality in Denmark, Economic Memo, No. 5, Danmarks Nationalbank, Copenhagen

This Version is available at:

<https://hdl.handle.net/10419/298499>

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# Inflation inequality in Denmark

We analyse differences in inflation rates between poor and rich households that arise from heterogeneity in household consumption baskets. Over the 1996 – 2020 period, inflation differences by income are small. From 2020 on, inflation has been about 3pp higher at the bottom of the income distribution than at the top, driven by large price increases in energy and food, which are more important for the consumption baskets of the poor.

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## In the past, inflation rates have been similar for poor and rich households

Inflation has been remarkably similar for households in different deciles on average between 1996 and 2020.



## In recent years inflation has been higher for poor households

Inflation has been higher among lower-income households since 2020. These households have larger expenditure shares for energy and food, and inflation rates for these goods have been particularly high recently.



## The inflation difference amounts to about 1.5 to 2pp per year since 2020

The difference between inflation at the bottom of the income distribution and the top income decile amounts to about 1.5 to 2pp per year since 2020.



## Key words

Inflation and price development

Consumption

Households and corporations

The rate of inflation in an economy is often summarized by a single statistic, the Consumer Price Index. This index measures the change in the cost of the consumption bundle of an average household, but individual households have different consumption bundles and are therefore exposed to heterogeneous inflation rates. It is well understood that lower-income households exhibit different consumption patterns than higher-income households. For example, the expenditure share for food and other necessities is higher for lower-income households. Lower-income households might consequently experience systematically different inflation rates than higher-income households.

In this note we explore differences between the inflation rates experienced by lower and higher-income households in Denmark over the last 25 years. We use budget survey microdata to determine the average consumption bundle for households in different deciles of the Danish income distribution and combine these consumption bundles with data on consumption category-specific inflation rates to study inflation inequality along the income distribution.

Our calculations yield two main results. First, inflation has been remarkably similar for different deciles of the Danish income distribution during the pre-Covid sample period from 1996 to 2020. Cumulated inflation has been highest for the top decile, but differences to other deciles are small and largely below 1pp over the whole period (or 0.05pp per year). However, larger differences of the opposite sign have emerged in the inflationary environment since 2020. Over the last two years, inflation has been lowest for the top decile, and higher for lower-income households. The difference to the top decile amounts to 3 to 4pp (1.5 to 2pp per year) for the three lowest income deciles, around 2pp (1pp per year) for households in the middle of the income distribution and around 1pp (0.5 per year) for households just below the top decile.

## Measurement and Methodology

We calculate consumption weights for each decile of equivalized household income using microdata on consumption by category from the Danish Household Budget Survey (Forbrugsundersøgelsen) collected by Statistics Denmark. We use data on household income from Danish tax data (the IND-register at Statistics Denmark) and demographic information from Danish register data (the BEF-register) to define households and equalize income. The Budget Survey data is linked to the registers through the personal registration number of the individuals participating in the survey.

We first calculate equivalized household income for Danish households as the sum of all income (including labour income, capital income and transfers) for all household members divided by the square root of the number of household members<sup>1</sup>. We then sort households into deciles of the income distribution using a three-year average of household income to reduce the influence of temporary income fluctuations.

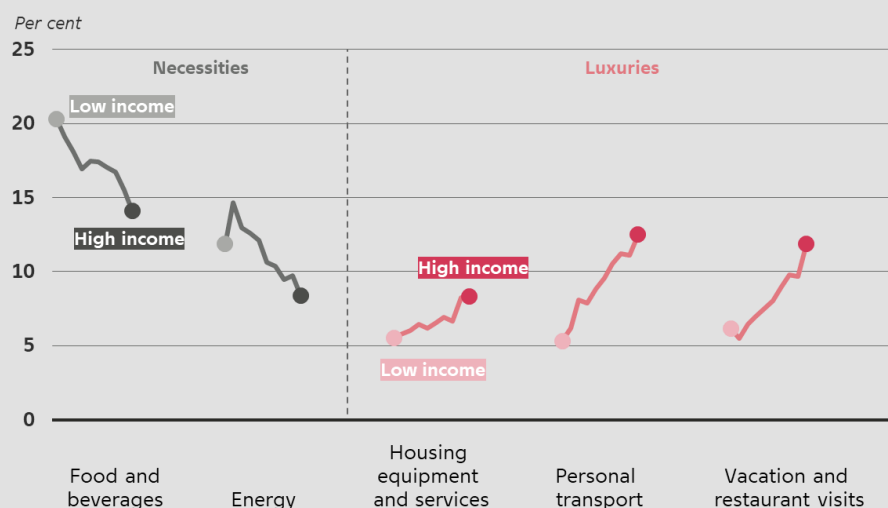
For each household participating in the Budget Survey, we calculate the share of each consumption category at the 3-digit COICOP level in total expenditures, excluding major durable purchases such as cars. Examples of 3-digit COICOP categories are "Food at home", "Clothing", or "Food and beverage serving services". Finally, we calculate the average expenditure share within each decile of the household income distribution in the 2010-2015 period.

<sup>1</sup> See, e.g. Thesia I. Garner, Robert S. Martin, Brett Matsumoto, and Scott Curtin, Distribution of U.S. Personal Consumption Expenditures Using Consumer Expenditure Surveys Data: Methods and Supplementary Results, Consumer Expenditure Surveys Program Series Report, U.S. Bureau of Labor Statistics, December 2022, [link](#).

The expenditure shares we calculate differ across income deciles in expected and well-documented ways, see Chart 1. Important necessities – i.e. goods for which consumption shares are higher for low-income households – include food and beverages, with an expenditure share of 20% in the lowest and 14% in the highest income decile, as well as energy, with an expenditure share of 12% in the lowest and 7% in the highest decile. Important luxuries – i.e. goods for which consumption shares are higher for high-income households – include Housing equipment and services, with expenditure shares of 5% in the lowest and 8% in the highest income decile, Personal transport with expenditure shares of 5% in the lowest and 13% in the highest income decile, and vacation and restaurant visits with expenditure shares of 6% in the lowest and 12% in the highest income decile.

CHART 1

### Low-income households allocate a larger share of total expenditure to food and energy



Note: The figure shows how expenditure shares on different consumption categories vary across the income distribution. Grey-colored categories indicate necessity spending, red-colored categories indicate luxury spending.

Source: Own calculations based on data from Statistics Denmark.

We then use the expenditure shares for categories indexed by  $k$  as weights to calculate the inflation rate for income decile  $j$  in month  $t$ :

$$\pi_{t,j} = \sum_{k \in K} \omega_{j,k} \pi_{t,k}$$

This measure of decile specific inflation comes with two limitations. First, we calculate inflation for a fixed consumption basket defined by the 2010-2015 average weights. The correct interpretation of the inflation rates calculated is thus the change in the cost of purchasing the same basket that a given group bought in the 2010-2015 period. It is well-known that this type of measure overstates true changes in costs of living, because it does not take into account that households may substitute toward other consumption categories when relative prices change over time. However, this

problem is less of a concern in cross-household comparisons, as substitution patterns should bias indices for all groups in a similar way<sup>2</sup>.

The second limitation is that we do not consider heterogeneity in inflation rates that could arise from within-category differences in inflation rates. For example, lower-income households may consume different types of food than higher-income households, which could exhibit different inflation rates. Jaravel (2019)<sup>3</sup> finds that for groceries in the U.S., high-income households are exposed to a 0.6pp lower annual inflation rate than low-income households, since luxury groceries exhibit different inflation rates than basic groceries. Due to data limitations, we are not able to go to the same level of detail and only focus on inflation heterogeneity arising from differences in the consumption of broader categories.

Statistics Denmark provides inflation rates calculated by income bracket (and some other household characteristics) to address the topic of inflation heterogeneity. These brackets are fixed to the following values: below 250,000DKK, from 250,000 to 449,000DKK, from 450,000 to 699,999DKK, from 700,000 to 1,000,000DKK and above 1,000,000DKK. Our approach supplements these official statistics in several potentially important ways. First, the brackets defined by Statistics Denmark are of very different sizes. The first bracket (up to 250,000DKK) covers more than half of the population in many years (the Danish median disposable household income was below 250,000 before 2010, while higher income brackets are much smaller. Our decile-based inflation rates therefore allow us to study inflation inequality at a much more granular level. Second, the brackets are fixed over time in nominal amounts, which means their size and relative position in the income distribution varies. We use deciles of the income distribution of a given year instead, which have the same size and interpretation every year. Third, household income is not equivalized in the official statistics. This means that two households with a given level of income is treated in the same way irrespective of whether they consist of, e.g., a single earner, or two earners and three children. Our measure is based on the same underlying data as the official statistics (though the consumption weights are from a more limited period), but due to these differences our results differ from the official statistics.

## Results

### **Inflation differences are fairly small over the 1996 to 2020 period**

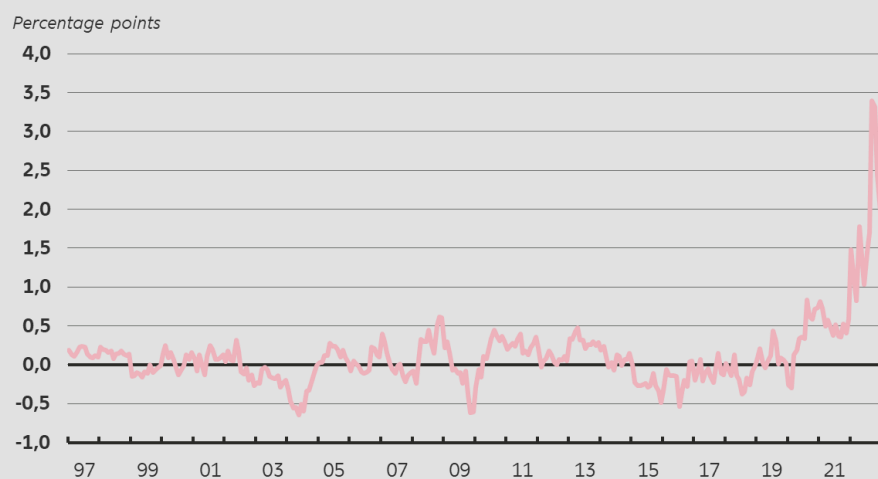
Over the first almost 25 years of our sample period, Danish inflation is very similar for households in different income brackets on average. Chart 2 illustrates this with an example of the difference between inflation for households in the first two income deciles and households in the top two income deciles. While inflation is naturally never exactly the same, differences remain small during the 1996 to 2019 period, and fluctuate between plus and minus half a percentage point. Chart 3 decomposes these differences into the contributions of the most important luxury and necessity components of consumption. It turns out these categories exhibit highly correlated inflation rates that are likely driven by underlying raw material prices for energy and food. Consequently, they largely offset each other in most years: variation in energy and food prices affects inflation more for low-income households through direct consumption of energy and food at home, and inflation for higher-income households more through personal transport, vacations and restaurant visits.

<sup>2</sup> This assumes that elasticities of substitution are constant over the income distribution. If the importance of substitution varies between household with different incomes, this might affect our measure of inflation differences.

<sup>3</sup> Xavier Jaravel, The Unequal Gains from Product Innovations: Evidence from the U.S. Retail Sector, The Quarterly Journal of Economics, Volume 134, Issue 2, May 2019, Pages 715–783, <https://doi.org/10.1093/qje/qjy031>.

CHART 2

**Inflation rates of high and low-income households are usually similar – but differences have been larger since 2020**

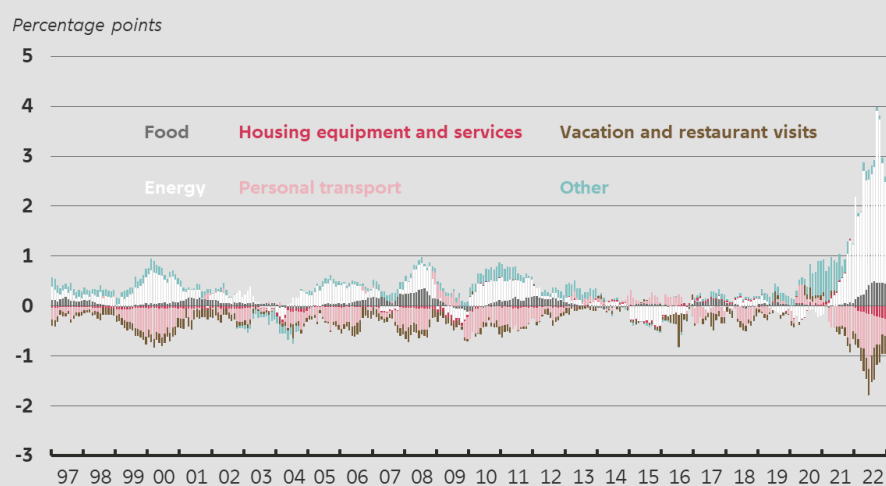


Note: Difference in inflation rates between households in the top 20% and the bottom 20% of equivalized household income.

Source: Own calculations based on data from Statistics Denmark.

CHART 3

**Higher inflation among lower-income households largely due to large energy and food price inflation**



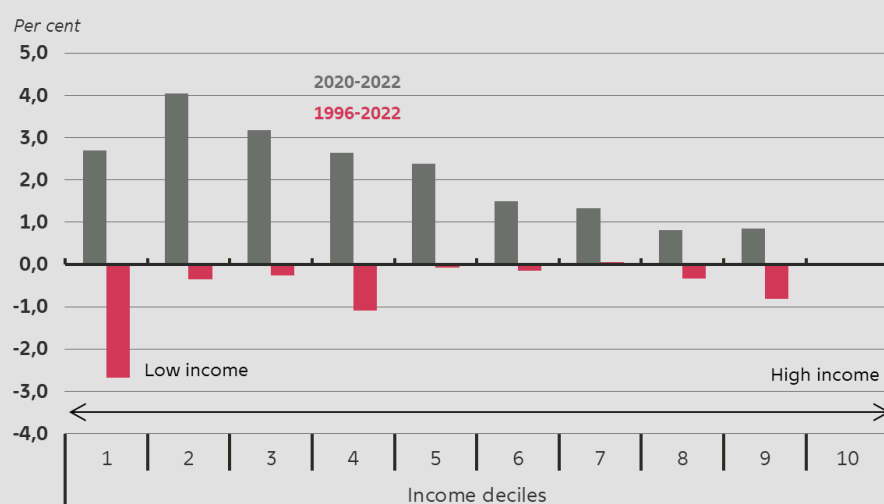
Note: Decomposition of the difference in inflation rates between households in the top 20% and the bottom 20% of equivalized household income. The decomposition uses the geometric form representation of the Laspeyres index which allows for an additive log-decomposition. The difference is therefore measured in log points which for large differences introduces an approximation error. The main point is however unchanged by this choice.

Source: Own calculations based on data from Statistics Denmark.

Chart 4 presents the cumulative inflation over the whole 1996 to 2019 period for each decile relative to the top decile. The increase in the price level is highest for the top decile. For most other deciles, the difference in cumulated inflation rates to the top decile is rather small and below 1% (i.e. below 0.05% per year) in absolute terms. The difference is somewhat larger only for the lowest decile, where it amounts to about -2.5% (or -0.125% per year). Given that the price level, as measured by the CPI, has risen by about 50% over this period, the heterogeneity in average inflation rates over this period can be considered small.

CHART 4

**Higher inflation rates for lower-income households in recent years – but very small differences in the longer run**



Note: Cumulated price increases for households in each decile of equivalized income (shown as difference to the highest decile of equivalized income).

Source: Own calculations based on data from Statistics Denmark.

### Inflation has been higher for low-income households since 2020

While inflation has been similar for different income brackets over the 1996 to 2020 period, low-income households have been hit more strongly by the increase in inflation over the last two years. This is clear from both the comparison of the first two deciles to the top two deciles in Chart 2, as well as in the decile-by-decile comparison of cumulated inflation to the top decile in Chart 4. Overall, prices for the lower-income deciles have risen by about 3pp (1.5 pp per year) more than for the top decile, by about 2pp (1 pp per year) more for the middle of the income distribution, and by about 1pp (0.5pp per year) more for households in the three deciles just below the top. Given a cumulated CPI price increase of about 12% from January 2020 to December 2022, the bottom to top decile difference is equal to about a quarter of the inflation for the average household.

This emerging difference can largely be explained by the fact that the price of direct energy consumption has risen more than what was offset by the increasing prices of personal transport and vacation and restaurant visits (see Chart 3). These recent developments dominate the total cumulated inflation over the 1996 to 2022 period. While pre- and post-Covid price developments relative to the top decile largely cancel



out for the lowest income decile, the remaining deciles have experienced slightly higher inflation rates over the whole period in combination.

## Conclusion

Our results indicate that the recent surge in inflation has affected households in a heterogeneous way. Prices for goods and services purchased by households in the lower-income deciles have risen by about 3pp (1.5pp per year) more than for the top decile since 2020. The corresponding difference between the middle of the income distribution and the top decile has been about 2pp (1pp per year) and for the three deciles just below the top it has been about 1pp (0.5pp per year). This difference in inflation rates across households experienced over the past few years has been substantial. Given a cumulated increase in the CPI of 12%, the heterogeneity we document amounts to between 8% and 25% of the total increase in the price level for the average household over the last two years. However, our results also demonstrate that this has been an exceptional period – in the longer run, inflation inequality tends to be small.

Our results provide an indication of inflation differences across groups of households but are an incomplete measure of the heterogeneous welfare impact of inflation. Poorer households might be exposed differentially to inflation through the development of their real incomes – for example, they might receive a larger share of their income from transfers that are indexed differently than wage income – or through their balance sheets – e.g., because inflation erodes the real value of their debt<sup>4</sup>. Without further analysis, it is therefore not possible to assess the importance of inflation inequality relative to other ways in which a given level of inflation affects different households differently.

<sup>4</sup> See for example, Miguel Cardoso & Clodomiro Ferreira & José Miguel Leiva & Galo Nuño & Álvaro Ortiz & Tomasa Rodrigo, 2022. "The Heterogeneous Impact of Inflation on Households' Balance Sheets," Working Papers 176, Red Nacional de Investigadores en Economía.

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