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ABSTRACT

The Gendered Nature of the Cost-of-Living Crisis in Europe

This paper investigates the gendered effects of the cost-of-living crisis on households across six European countries using household consumption data linked to price changes between April 2021 and July 2023. It examines how different consumption patterns between male- and female-headed households influence their exposure to inflation. Exploring the full distribution of inflation rates, employing quantile regressions and a decomposition approach, this research uncovers gender-specific disparities in inflation exposure and inequality. Going beyond the immediate economic index adjustments, it also evaluates the welfare changes attributable to inflation by estimate a behaviourally-adjusted welfare effect of the cost-of-living crisis. Building on the foundational Atkinson welfare measure, this paper innovates by decomposing the change in welfare into equity and efficiency components, differentially for male- and female-headed households. This contribution enriches the consumption literature by providing a detailed gendered analysis of inflation's distributional and welfare effects, aiding policymakers in addressing the nuanced challenges of the cost-of-living crisis.

JEL Classification: D12, D31, D60, E31, I30, J16

Keywords: inflation and gender, inflation inequality and gender, distributional effect and gender, welfare effect and gender

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1 Introduction

Gender budgeting is becoming a widely used tool in evaluating the distributional impact of government policy. Apart from complications such as joint taxation and income sharing between couples, which the researcher must make modelling decisions about, it is straightforward to estimate the gender impact of reforms which affect disposable income using a microsimulation model linked to representative survey data. More difficult is estimating how indirect taxation or other price changes (such as inflation) affect men and women separately. This is due to how consumption data is typically collected, at the household level, with little indication of which individual consumes the good or service in question. While much household level spending - such as rent, childcare and utility bills - may be considered as benefiting the household as a whole, some spending - such as that on personal hobbies, clothing and travel - may be more usefully attributed to one person in the household.

Wages, tax and welfare benefit men and women differently due to the gender wage gap and traditional gender divisions of work and caring roles. There is also reason to believe that inflation affects men and women differently due to their systematically different income levels, consumption needs, preferences and savings behaviour. These differences may become pronounced in a period of high inflation such as that experienced by most OECD countries after the Covid-19 pandemic. In the spirit of gender budgeting, policy makers may wish to adapt the compensation mechanisms they use to address the cost-of-living crisis to reflect these differences.

This paper evaluates the effect of the recent inflation surge on household consumption and welfare in six European countries. Building on previous work by Sologon et al. (2022), which evaluated inflation across the income distribution over a twelve-month period, in this research, we investigate its effect by gender over a longer timeframe (27 months). As household level consumption is tricky to attribute to individuals within the household, we cannot estimate the effect of inflation on men versus women per se. However, distinguishing between households headed by a man and headed by a woman sheds light on this issue. Comparing single male households to single female households provides a neat comparison of the gendered nature of the cost-of-living crisis. Equally however, comparing female headed households to male headed households, where the household head is defined as the adult with the highest earnings, shows how inflation is affecting households in which bargaining power is skewed towards a particular gender.

Our contribution to the consumption literature is fourfold. First, we build on the body of work which explores the distributional impact of inflation by adding a gender lens. We evaluate the distributional impact of prolonged high inflation between 2021 and 2023, distinguishing between its effect on low and high income households, on different types of family and by gender of the household head. This advances our understanding of consumption inequalities during economic crises (e.g. Meyer (1988); Ballester et al. (2015); Bono et al. (2017)). Analysing the full distribution of inflation rates using quantile regression techniques, and estimating how they vary by gender gives new insight into the gender-specific economic burdens imposed by inflation. In order explore the sources of inflation inequality, we adapt a decomposition approach from the inequality literature to determine how each inflation source (necessities, non-necessities contributes to overall inflation and to inequality in inflation rates by gender.

Second, this paper goes beyond the immediate economic index adjustments and evaluates the welfare changes attributable to inflation, which take into account behavioural responses to price changes, differentiated by gender. The differentiation by gender in welfare responses is a novelty of our paper. Welfare is evaluated using the concept of equivalent income: the value of income, which at some reference set of prices, gives the same utility as actual income (Creedy, 2000). We quantify these behavioral adaptations by estimating a demand system in order to describe household consumption behaviour. The resulting budget and price elasticities are used to estimate consumer welfare. In order to differentiate these effects between female- and male-headed households, we extend the demand system described in Sologon et al. (2022) with a gender component. By incorporating a gender perspective, we recognize and quantify the varied impacts of inflation on different genders, stemming from their distinct income levels, consumption

patterns, behavioural responses to price changes and roles in the economy. Thus, our analysis not only addresses the direct effects of inflation but also enriches this understanding with an examination of the behavioral-adjusted welfare changes.

Third, this paper introduces a novel approach to decomposing welfare changes into equity and efficiency components, building upon the foundational Atkinson welfare measure, and uniquely extends this analysis to incorporate gender differences. This methodological innovation represents an advancement in our understanding of the multifaceted impacts of economic policies and market fluctuations, especially in highlighting how these impacts are differentiated across genders. By disentangling the intertwined effects of equity - the fair distribution of resources - and efficiency - the optimal allocation of resources - and examining these through a gender lens, our approach provides a more nuanced and comprehensive analysis of welfare dynamics. This decomposition framework enables us to assess the individual contributions of equity and efficiency to overall welfare changes, offering deeper insights into the complex trade-offs that policymakers face, and how these trade-offs vary between men and women. This is particularly pertinent in the context of price fluctuations, where the differential impacts on various social groups are often obscured in aggregate welfare analyses. Our methodology, therefore, not only extends the traditional application of the Atkinson measure but also enriches the discourse on welfare economics by incorporating a detailed examination of how changes in economic conditions differentially affect equity and efficiency by gender, thereby contributing to a more informed and targeted policy-making process.

Fourth, the comparative focus of this research demonstrates how the demographic and cultural background of different EU countries, such as the economic situation of lone parent households, can significantly influence their experience of inflation. It also sheds light on which groups of the population the burden falls upon and results are heterogeneous across countries. Country-specific responses to these types of crises therefore remain of vital importance. We choose six countries that experienced varying inflation trajectories during the cost-of-living crisis: Finland, Hungary, Ireland, Poland, Germany, and Portugal.[1]

In what follows, Section 2 discusses existing empirical evidence on the gendered nature of consumption. Section 3 discusses the methodology, the consumption data and the information on price changes for various commodity groups. Section 4 assesses the distributional and welfare consequences of inflation and section 5 concludes.

2 The gendered nature of consumption

Despite difficulties in estimating consumption at the individual level using household survey data, many studies have attempted to do just this, either by exploiting exogenous changes to income of men or women to estimate their pass-through to household consumption, by comparing single male households to single female households in household survey data or by using less widely available individual level consumption data. Indeed, Case and Deaton (2003) argue that to truly understand individual level poverty and the fact that women and men may be differentially poor, individual level consumption data is a key part of the picture. Detailing some reasons for consumption differences by gender, they find income, life expectancy and fertility to be important determinants in a development context. Couprie et al. (2010) analyse the impact of redistributive transfers between households on individual welfare, taking into account both public and private consumption within the household and using assignable goods to build their identification strategy.

Early, somewhat indirect evidence on the gendered nature of spending comes from an examination of income receipt. A seminal paper by Browning et al. (1994) developed a method of identifying how incomes affect outcomes given conventional family expenditure data. Applying the method to a sample of Canadian couples with no children, they found that expenditure choices were influenced by the relative incomes of the partners, and by their relative ages. Lundberg et al. (1997) added to this evidence using a natural

[1] See Esping-Andersen (1990); Ferrera (1996); McCashin and O'Shea (2009); Aidukaite (2009); Tausz (2009), among others, for a description of the welfare systems of the selected countries.

experiment. They found there was a significant increase in expenditure on women's and children's clothing, relative to male clothing, following a legislative change in the UK which saw child tax allowances (typically received by fathers) replaced by child benefit (usually received by mothers).

More explicit and recent literature has documented important differences in the consumption patterns of men and women. Many studies have considered gender differences for individual consumption bundles. Some focus on necessities such as food (Emanuel et al., 2012; Rosenfeld and Tomiyama, 2021) or energy or "bads" (Yen, 2005) such as alcohol and cigarettes. Men are likely to consume more energy and red meat (Isenhour and Ardenfors, 2009; Leonardo Becchetti and Vásquez, 2018), and spend less on energy saving investments (Trotta, 2018). Consequently, when women have more input to household decision making, consumption of energy is lower and/or energy saving tactics are more often adopted (Tjørring et al., 2018). Comparing single male and female households, Räty and Carlsson-Kanyama (2010) find support for this hypothesis in two of the four European countries they study, showing that men consume more energy than women in Greece and Sweden (but not in Germany and Norway). Li et al. (2019) show that households in Chinese counties with greater gender inequality use less energy-efficient electric products and are less willing to save energy.

There are also significant variations in the consumption of leisure activities (Bihagen and Katz-Gerro, 2000). Men consume more alcohol than women, but with differences in the nature of consumption (more beer) (Dawson and Archer, 1992). However, this ratio shrinks once differential body weight is taken into consideration. More recently, Huber (2022) finds that men and women responded differently to the COVID-19 pandemic with women reducing consumption more than men, citing affordability constraints.

There is also likely to be a gender difference in savings. The gender wealth gap, of which the gender gap in savings is a component, is well documented in Europe (Schneebaum et al., 2018; Meriküll et al., 2021). It is correlated with gender patterns of labour market behaviour and income (Agunsoye et al., 2022) but may also be linked to gender differences in risk taking Sunden and Surette (1998). Seguino and Floro (2003) find that as the income of women increase and their economic power increases, so does the savings rate.

These empirical findings for consumption and savings patterns by gender have implications for the incidence of inflation. More generally, given the existence of a substantial gender gap in income in Europe (Doorley and Keane, 2023), female-headed households are likely to devote a higher share of their budget to essentials such as food and fuel, following Engel's Law (Engel, 1895) . As shown by Sologon et al. (2022), inflation was heterogeneous across consumption bundles but also across countries. For example, food inflation made up a substantial component of overall inflation in Hungary while inflation of heating and electricity was more important in Ireland. To the extent that male and female headed households have systematically different income levels and consumption bundles, this has implications for the incidence of inflation by gender and by country.

3 Methodology and Data

We envisage a two-step methodology. First, we evaluate the distributional impact of inflation by source and by gender of the household head. We then use microsimulation modelling to assess the welfare impact of price changes by incorporating gender-specific consumption behavioural responses to these changes, following (O'Donoghue, 2021; Sologon et al., 2022).

3.1 Assessing the distributional impact of inflation

We first estimate the composition of household consumption across household types and across countries and how this translates into the CPI inflation faced by different household types, differentiated by the gender of the head of household. This allows us to assess the role of each commodity item in driving inflation for male- and female-headed households and to identify the largest contributors towards inflation

in the six countries.

In order to gauge the distributional impact of inflation, we examine the distribution of inflation rates for the main commodity sub-components and their differences by gender.

To delve deeper into how inflation rates for essential commodities affect households, and how this impact varies according to gender, income, and other household characteristics, we use two statistical methods: Ordinary Least Squares (OLS) and quantile regression. OLS serves as a useful tool for assessing the average influence of each independent variable, such as gender or income, on the dependent variable, which in this case is the household-level inflation rate. This approach helps us identify general trends in how demographic and economic factors correlate with inflation.

OLS, however, has its limitations, particularly in assuming a uniform impact of each variable across all data points, an assumption that often oversimplifies the reality. This is why we also employ quantile regression, which enhances our analysis by exploring these relationships across different percentiles of the inflation rate distribution, not merely at the average. The quantile regression model for the τ-th quantile is mathematically represented as:

$$Q_Y(\tau|X) = X\beta(\tau), \tag{1}$$

where $Q_Y(\tau|X)$ is the τ-th conditional quantile of the response variable Y given the predictors X; $\beta(\tau)$ represents the vector of coefficients for the τ-th quantile and X is the matrix of regressors. The quantiles of interest are 0.25, 0.5 and 0.75.

Such an approach is crucial for capturing the varied experiences of households under differing inflationary pressures, whether those are mild, moderate, or severe. For example, while the average impact of inflation might seem manageable, quantile regression can reveal that the burden may be acutely felt by specific groups, such as low-income households or single-parent families, especially at higher levels of inflation.

By leveraging both OLS and quantile regression methods, we achieve a distributional view into how gender, income and other household characteristics intersect with household-level inflation, thereby allowing for a more intricate and complete understanding of the issue.

We estimate five models at the household level having as dependent variable the household-level inflation from (1) heating and electricity, (2) food, (3) motor fuels, (4) other goods and services and (5) entire consumption basket. The explanatory factors included in the regressions are dummies for gender of the household head (female =1), log of income, presence of a child, single vs. other households, number of children and adults. We also interact the gender of the household head with income and with the presence of children to capture heterogeneity in these effects..

3.2 Decomposition of the distribution of inflation by source

In order to further explore the distribution of inflation by gender, we apply a decomposition by sources adapted from the inequality literature to determine how each source of inflation (necessities, non-necessities) contributes to overall inflation and to inequality in inflation rates by gender (Cowell and Fiorio, 2011; Sologon et al., 2023). This approach adapts the classical decompositions of inequality by income sources (Shorrocks, 1982; Lerman and Yitzhaki, 1985) to inflation.

For each country, we estimate by gender of the household head (i) the contribution of each commodity group to overall inflation, s; (ii) the inequality of inflation by component, as measured by the Gini coefficient g; (iii) the correlation between inequality of inflation by source and inequality in overall inflation, r; (iv) the contribution of inequality of inflation by source to overall inflation inequality, $s * g * r$ and (v) the relative contribution of inequality of inflation by source to overall inflation inequality, $(s * g * r)/G$.

The decomposition follows the standard formula:

$$G_{Inflation} = \sum_{k=1}^{K} C_k = \sum_{k=1}^{K} s_k g_k r_k \tag{2}$$

where $G_{Inflation}$ is the Gini index for overall inflation measured as the change in the cost-of-living (change in overall expenditure due to price changes) and k represents each consumption group (food, heating and electricity, motor fuels and other goods and services). C_k is the contribution of inflation from each consumption group k to the overall inflation inequality; it equals the product between S_k, the share of consumption group inflation in overall inflation, G_k, the inflation inequality for each consumption group k, and, R_k, the correlation between the overall inflation and consumption group k inflation.

3.3 Welfare effects and the LES

Next, we discuss the methodology for evaluating the welfare impact of price fluctuations on households, specifically distinguishing them by gender. This technique accommodates the secondary consequences of inflation by factoring in changes in consumption behavior as a response to price adjustments. We aim to acquire a monetary metric that quantifies the shifts in welfare that individuals experience as a result of these price changes, by extending the approach in Creedy (2000) and more recently Sologon et al. (2022) to incorporate a gender dimension in the behavioural responses. Our method is designed to account for the diverse characteristics in the population, acknowledging the inherent heterogeneity of households along the income distribution.

3.3.1 The expenditure function

The core element in assessing welfare is the notion of expenditure function , $E(p, U)$, which gives the minimum expense needed to obtain utility level U for a set a prices $p = (p_1, \ldots, p_n)$. The expenditure function is derived by defining first the direct utility function. We use the linear expenditure system (LES), which has an additive utility function representation:

$$U = \sum_{i=1}^{n} \phi_i log\left(x_i - \gamma_i\right), \tag{3}$$

where x_i is consumption for each good, γ_i is committed consumption for each good and ϕ_i represents marginal budget shares, with $0 \leq \phi_i < 1, \sum_i \phi_i = 1$. Maximizing utility subject to the budget constraint, $y = \sum p_i x_i$, we obtain the linear expenditure functions for each good i (or group of goods):

$$p_i x_i = p_i \gamma_i + \phi_i \left(y - \sum_{j=1}^{n} p_j \gamma_j \right). \tag{4}$$

Differentiating (4) with respect to y and multiplying by $y/p_i x_i$, we obtain the budget elasticities e_i, from which we obtain ϕ_i:

$$e_i = \frac{\phi_i y}{p_i x_i} => \phi_i = e_i w_i, \tag{5}$$

where w_i is the budget share of commodity group i.

Applying the implicit function theorem to (4) and multiplying by p_i/x_i, we get the own-price elasticities e_{ii}, from which we obtain γ_i:

$$e_{ii} = \frac{\gamma_i \left(1 - \phi_i\right)}{x_i} - 1 => \gamma_i = \frac{\left(e_{ii} + 1\right) x_i}{\left(1 - \phi_i\right)}. \tag{6}$$

In order to obtain ϕ_i and γ_i, we need first to estimate the budget and price elasticities, e_i and e_{ii}. To this end, we estimate a full expenditure system on cross-sectional data (Cornwell et al., 1995; Creedy, 1998).

Budget elasticities, e_i, which show how the budget shares of each expenditure group, w_i, vary with income, are estimated using consumption data from in the Household Budget Survey (HBS). Following Creedy (1998), we estimate the LES parameters for each commodity group, i, using Engel functions, extended to incorporate interactions between the gender of the household head and expenditure:

$$w_i^h = \alpha_i + \beta_{1i} \ln y^h + \beta_{2i} \ln y^h female_i + \varphi_{1i} \left(\ln y^h\right)^2 + + \varphi_{2i} \left(\ln y^h\right)^2 female_i + \delta_i X^h \tag{7}$$

where w_i^h is the household's h budget share of commodity group i in total household consumption y^h, and X^h are a set of individual and household characteristics of household h. The goods are split into 19 commodity groups ($i = 1, \ldots, 19$).[2] Based on parameters of the Engel functions in (7) estimated via pooled ordinary least squares at the household level, we obtain the budget elasticities e_i :

$$e_i = 1 + \frac{dw_i}{dy} \frac{\ln y}{w_i} = 1 + \frac{\beta_{1i} + 2\varphi_{1i} \ln y + female_i(\beta_{2i} + 2\varphi_{2i} \ln y)}{w_i} \quad \text{if } \varphi_i \neq 0. \tag{8}$$

The budget elasticities e_i are evaluated at population sub-group average incomes $\overline{\ln y}^{pg}$ and budget shares $\bar{w}_i^{pg}$. We obtain population sub-group specific elasticities for 20 population sub-groups defined by household types and gender; in total a matrix of 20×19 budget elasticities. The expectation is that budget elasticities are positive: all expenditure types rise with income. Values between $(0, 1)$ indicate inelastic goods whose budget shares decrease with income (expected for necessity items, such as food and fuel). Values above 1 indicate elastic goods or luxuries whose budget shares are expected to increase with income.

Having obtained e_i, we calculate next ϕ_i in (5), where $\bar{w}_i$ are population sub-group specific . We obtain a matrix with 20×19 estimates for

$$\phi_i^{pg} = e_i^{pg} * \overline{w_i}^{pg}. \tag{9}$$

In order to calculate γ_i in (6), we also need the own-price elasticities of demand e_{ii}. For estimating price elasticities we follow an approximate method described in Creedy (2001). The price elasticities can be obtained using a result established by Frisch (1959) for directly additive utility functions, which relies on the Frisch parameter, ξ, known as the elasticity of marginal utility of expenditure with respect to total expenditure. Own and cross-price elasticities are formulated:

$$e_{ij} = -e_i w_j \left(1 + \frac{e_i}{\xi}\right) + \frac{e_i \delta_{ij}}{\xi}, \tag{10}$$

where $\delta_{ij} = 1$ if i = j and 0 otherwise. Own-price elasticities are anticipated to be negative, as increases in price are likely to lead to a reduction in demand for the good. . The closer e_{ij} is to -1 , the more elastic the demand reaction is to price increases. The e_i and w_j used here are the population sub-group budget elasticities e_i^{pg} and the commodity groups average shares by population sub-groups $\overline{w_i}^{pg}$. Therefore the e_{ij} will also be estimated by population sub-groups, e_{ij}^{pg}:

$$e_{ij}^{pg} = -e_i^{pg} \bar{w}_j^{pg} \left(1 + \frac{e_i^{pg}}{\xi}\right) + \frac{e_i^{pg} \delta_{ij}}{\xi}. \tag{11}$$

The estimates of ξ are obtained following the approach in Lluch et al. (1977) and Creedy (1998), which

[2]The equation representing the Engel function deviates from the standard form of the Engel curve associated with the Linear Expenditure System (LES) as it includes quadratic terms for the logarithm of consumption, as well as a set of household characteristics. The incorporation of these terms serves to improve the model's fit to the data and capture possible nonlinearities and heterogeneities across household types that would otherwise be unaccounted for.

model the relationship between ξ and total expenditure as:

$$\ln(-\xi) = \phi - \alpha \ln\left(\frac{y}{ER} + v\right), \tag{12}$$

where y is the country mean total expenditure and ER the exchange rate relative to the dollar.

Finally, we estimate the subsistence consumption γ_i for each household:

$$\gamma_i^h = \frac{(e_{ii}^{pg} + 1)\, x_i^h}{(1 - \phi_i^{pg})}. \tag{13}$$

3.3.2 Welfare Effects of Price Changes

A money metric change in welfare is defined as the difference in minimal expenditures evaluated at a set of reference consumer prices p_r to reach the pre- and post-change utility levels (Deaton, 2003). From equation (4), we derive the Marshallian demand functions, $x_i^h = \gamma_i^h + \left(\phi_i^{pg}\left(y^h - \sum_j p_j \gamma_j^h\right)\right)/p_i$, which we substitute into U to obtain the indirect utility function, V :

$$\begin{aligned} V\left(p, U^h\right) &= \frac{y^h - A}{B} \\ A = \sum_i p_i \gamma_i^h; B &= \prod_i \left(\frac{p_i}{\phi_i^{pg}}\right)^{\phi_i^{pg}}. \end{aligned} \tag{14}$$

The expenditure function $E(p, U)$ is then given by:

$$E\left(p, U^h\right) = A + BU^h \tag{15}$$

This is the fundamental ingredient in the construction of our welfare function: it gives the minimum cost of achieving the utility level U for a set of prices defined by the vector p.

3.3.3 Equivalent income

The measurement of welfare effect of price changes is evaluated using the distribution of equivalent incomes. The equivalent income is defined as the value of income, y_e, which at some reference set of prices, p_r, gives the same utility as the actual income level. Formally this implies: $V\left(p_{r'} y_e^h\right) = V\left(p, y^h\right)$. An important feature of equivalent income is that it allows the comparison of alternative policies using a common set of reference prices.

The welfare change is measured as the change in equivalent income between before $\left(y_{e0}^h\right)$ and after price changes $\left(y_{e1}^h\right)$. In our context, where $p_r = p_0$, this implies that before price changes:

$$V\left(p_{o'}, y_{e0}^h\right) = V\left(p_0, y_0^h\right) => y_{e0}^h = y_0^h \tag{16}$$

After price changes:

$$V\left(p_{o'}, y_{e1}^h\right) = V\left(p_1, y_1^h\right) \tag{17}$$

$$\frac{y_{e1}^h - A_0}{B_0} = \frac{y_1^h - A_1}{B_1} \tag{18}$$

The minimum expenditure to achieve this utility level at the reference prices is:

$$y_{e1}^h = A_0 + \frac{B_0}{B_1}\left(y_1^h - A_1\right) \tag{19}$$

Expanding the formula, we obtain equivalent incomes:

$$y_{e1}^h = \sum_i p_{0i}\gamma_i^h + \left\{\prod_i \left(\frac{p_{0i}}{p_{1i}}\right)^{\phi_i^{pg}}\right\}\left\{y_1^h - \sum_j p_{1j}\gamma_j^h\right\} \tag{20}$$

The welfare effect for each household ΔW^h equals:

$$\Delta W_{y_e}^h = y_{e1}^h - y_{e0}^h = \left[\sum_i p_{0i}\gamma_i^h + \left\{\prod_i \left(\frac{p_{0i}}{p_{1i}}\right)^{\phi_i^{pg}}\right\}\left\{y_1^h - \sum_j p_{1j}\gamma_j^h\right\}\right] - y_0^h \tag{21}$$

3.3.4 Social welfare evaluations based on y_{e1}^h and y_{e0}^h

The distributions of values of y_{e1}^h and y_{e0}^h can be used to calculate values of a social welfare function for population sub-groups or for the whole population. The change in welfare can then be evaluated in terms of its overall effect according to the value judgments implicit in the welfare function.

Following Creedy (2001), we utilize a variant of the Atkinson et al. (1970) social-welfare function:

$$W(e) = \frac{1}{H}\sum_h \frac{\left(y_e^h\right)^{1-e}}{1-e} \tag{22}$$

where H is the number of households, e is the inequality aversion parameter and y_e^h is equivalent income obtained above. This can be expresses as $W(e) = \frac{y_{ede}(e)^{1-e}}{1-e}$, where y_{ede} is the equally distributed equivalent income value which, if distributed to the entire population, would give the same value of social welfare as the existing distribution of income. A more convenient abbreviated form of the welfare function is simply captured by y_{ede},

$$W(e) = y_{ede}(e) = \bar{y}_e^*(1 - A(e)) \tag{23}$$

where $\bar{y}_e$ is mean equivalent income and $A(e)$ is the Atkinson's measure of inequality evaluated for the distribution of equivalent incomes y_e^h. This form expresses a classical trade-off between efficiency and equity in its distribution across households: average equivalent income captures efficiency, whereas (1-inequality) captures equity. Since the overall welfare evaluation combines different household types, we introduce equivalent incomes y_e^h, expressed per equivalent adult by dividing the household income by the squared root of the household size. The SWF introduced above assigns the same weight to households with different sizes. To check the robustness of our results to this assumption we also consider a SWF in which the weight of each household is given by its size. These two cases represent the extreme values of a weight range that includes the number of equivalent individuals (see Edbert (2003) for a general discussion).

The social welfare function above is used to evaluate the change in welfare due to the increase in prices, relative to the initial situation pre-price changes.

$$\Delta W = \left(y_{ede_1} - y_{ede_0}\right)/y_{ede_0}. \tag{24}$$

We propose a novel decomposition of the welfare change into the contribution of the efficiency and equity components of welfare and their interaction, differentiated by gender. By expanding and manipulating

the difference in (23), we obtain:

$$\Delta W = \left[\overline{y_{e_1}}\left(1 - A_1(e)\right) - \bar{y}_{e_0}\left(1 - A_0(e)\right)\right] / \bar{y}_{e_0}\left(1 - A_0(e)\right) \tag{25}$$

$$\begin{aligned}\Delta W = &\left(\bar{y}_{e_1} - \bar{y}_{e_0}\right) / \bar{y}_{e_0} + \left(\left(1 - A_1(e)\right) - \left(1 - A_0(e)\right)\right) / \left(1 - A_0(e)\right) \\ &+ \left(\bar{y}_{e_1} - \bar{y}_{e_0}\right) / \bar{y}_{e_0} \left(\left(1 - A_1(e)\right) - \left(1 - A_0(e)\right) / \left(1 - A_0(e)\right)\right.\end{aligned}$$

In a simplified form, this becomes:

$$\Delta\%W = \Delta\%\bar{y}_e + \Delta\%(1 - A(e)) + \left(\Delta\%\bar{y}_e * \Delta\%(1 - A(e)\right). \tag{26}$$

The change in mean equivalent income captures the efficiency component - the optimal allocation of resources - whereas the change in inequality captures the equity component - the fair distribution of resources. The third term in eq. (26) represents the interaction between the two components. This decomposition will be evaluated separately for male- and female-headed households.

This approach offers a detailed exploration of welfare dynamics, uniquely distinguished by its decomposition of equity and efficiency effects through a gendered perspective. T This technique sheds light on the nuanced variations in these trade-offs between men and women, which is particularly salient in the backdrop of price fluctuations.

3.4 Data

We use the European Union Household Budget Survey (HBS) Survey for each country. Although the 2020 wave is available for some countries, the consumption patterns are not representative as the data collection was undertaken during the Coronavirus Pandemic and is not available for all countries. As a result we choose the 2015 wave of the Harmonised Eurostat HBS. The HBS provides a representative sample of the population (Eurostat, 2020). The structure of the data is consistent across each country, and it includes detailed information on household expenditure by item. In addition, it encompasses comprehensive demographic data, which covers the composition of households, socio-economic attributes of household members, and the disposable incomes of households. The EU-HBS comprises 298 distinct expenditure items.

In modelling price increases on the distribution of the population, in order to reflect the most important price changes, we use dis-aggregated expenditures rather than the high level COICOP categories. For example, we are disaggregating Household Fuels, Electricity and Motor Fuels from Public Transport and other Private Transport costs, as well as Durables and Child Care Costs. The dis-aggregation is detailed in Table 1.

The unit of observation across datasets is the household.[3]. Although there may be small cross-country differences in sampling arrangements and survey methodology, national statistical offices and Eurostat harmonize the resulting data and improve data comparability (for a detailed description of the differences across countries see Eurostat (2020)).

We estimate changes in the cost of living at the household level by applying price changes to each item of consumption and re-estimating the cost of the household's consumption basket. Price changes are taken from the Harmonised Consumer Price Index (HCPI) published by Eurostat. Using the HCIP, we compute price changes for the period April 2021 to July 2023 for each item and country. These inflation rates are detailed in Table 1 by expenditure item and country. After applying item-specific inflation rates, we create 19 expenditure groups, illustrated in Table 1.

To also allow for heterogeneity in welfare effects by gender, we construct 20 household types based on

[3]Sample sizes by country are as follows: Portugal (11,394 households); Hungary (7,140 households); Ireland (6,828 households); Finland (3,667 households); Poland (36,715 households) and Germany (52,299).

demographic characteristics and disposable income. There are five household types based on demographic characteristics: 1) singles, 2) singles with children, 3) couples, 4) couples with children, 5) other households. Each household type is further split into low and high income (above and below median equivalised disposable income). We distinguish between households with a male or female head where the head of the household is defined as the adult with the highest income in the household. The head of the household is defined as the adult with the highest income in the household.

Table 1: Price changes from April 2021 to July 2023 (%)

		HCPI Price Change (%)					
Expenditure item	Aggregated group	DE	FI	HU	IE	PL	PT
All items		1.169	1.127	1.368	1.154	1.270	1.143
Food	Food	1.272	1.206	1.580	1.178	1.336	1.234
Alcoholic beverages	Alcoholic beverages	1.162	1.057	1.345	1.130	1.244	1.077
Tobacco	Tobacco	1.141	1.174	1.220	1.118	1.111	1.067
Clothing & footwear	Clothing & footwear	1.030	1.016	1.135	0.979	1.078	0.868
Gas	Heating Fuels	1.896	1.451	1.489	2.364	1.711	1.499
Liquid fuels	Heating Fuels	1.659	1.451	1.489	1.489	1.532	1.305
Natural gas & town gas	Heating Fuels	1.911	1.451	1.471	2.471	1.727	1.812
Coal	Heating Fuels	1.947	1.451	1.531	1.722	2.233	1.437
Heat energy	Heating Fuels	1.392	1.151	1.000	2.364	1.565	1.499
Other solid fuels	Heating Fuels	1.762	1.151	1.636	1.321	1.464	1.220
Liquefied hydrocarbons	Heating Fuels	1.659	1.451	1.489	1.489	1.532	1.305
Solid fuels	Heating Fuels	1.745	1.451	1.631	1.598	2.146	1.230
Electricity	Electricity	1.346	1.524	1.264	1.874	1.285	1.120
Actual rentals for housing	Rents	1.041	1.033	1.284	1.191	1.289	1.081
Water supply/dwelling serv.	Household goods & serv.	1.067	1.089	1.070	1.077	1.160	1.078
Health	Health	1.047	0.971	1.219	0.996	1.197	1.014
Maintenance pers. transp. equip.	Private transport	1.168	1.078	1.444	1.107	1.336	1.149
Transport services	Public Transport	1.029	1.181	1.313	1.408	1.386	1.203
Communications	Communication	1.005	1.146	1.105	1.057	1.131	1.068
Recreation and culture	Recreation and culture	1.194	1.136	1.307	1.178	1.249	1.104
Education	Education	1.055	1.034	1.168	0.930	1.175	1.042
Restaurants & hotels	Restaurants & hotels	1.194	1.156	1.537	1.168	1.378	1.338
Miscellaneous goods/services	Miscellaneous gs	1.105	1.064	1.270	0.994	1.188	1.045
Child care services	Childcare	1.074	0.931	1.165	0.790	1.382	1.003
Petrol	Motor fuels	1.074	0.931	1.165	0.790	1.382	1.003
Diesel	Motor fuels	1.236	1.208	1.343	1.140	1.196	1.118
Petrol	Motor fuels	1.214	1.157	1.369	1.122	1.230	1.072
Household appliances	Durables	1.180	1.098	1.188	1.203	1.143	1.118
Furnishings/household equip/mainte.	Durables	1.180	1.098	1.188	1.203	1.143	1.118
Purchase of vehicles	Durables	1.180	1.098	1.188	1.203	1.143	1.118
Other fuels personal transport equip.	Private transport	1.168	1.078	1.444	1.107	1.336	1.149

Notes: Price changes are sourced from EUROSTAT.

4 Results

In this section, we first present an analysis of female- vs. male headed households. We then describe the consumption patterns of different types of household in each country, grouping consumption into broad categories. We follow this with an illustration of how exposed each type of household was to rising inflation over the two-year period of our analysis. We then investigate the distributional impact of inflation by commodity group. Finally, we incorporate behavioural responses to inflation and how how this affects welfare losses due to rising prices

4.1 A profile of female-headed households

Table 2 explores the composition and characteristics of female-led households in the six countries of our analysis. We model the probability of a household having a female head using a logit specification. [4] Some patterns are relatively consistent across countries. Female-headed households have lower household income, on average although this effect is not statistically significant in Finland, Hungary or Ireland. In most countries, the female head of a household is less likely to be married, less likely to be under forty years of age and is more likely to have university education than the male head of a household. Low income single parent households are more likely to be headed by women. Couple households, particular low income ones, are less likely to be headed by women. "Other" low income households are also more likely to be headed by females (apart from in Germany and Portugal). Female headed households are also less likely to be self-employed than male headed households, apart from in Hungary.

[4] Explanatory variables include household income and size, the number of earners in the household, a polynomial of the age of the household head, marital and employment status of the household head, the education level of the household head, the number of children aged under 4 and aged 5-24 in the household, the number of other adults in the household, an urban/rural indicator and the and the family type, grouped into singles or couples, with or without children, with equivalised household income above or below the median.

Table 2: Logit estimates: Men vs. Women (Female=1)

	DE	FI	HU	IE	PL	PT
Log hh. income	-0.185***	-0.121	-0.0792	-0.166	-0.272***	-0.147*
	(-4.41)	(-0.82)	(-0.87)	(-1.88)	(-6.59)	(-2.13)
No. earners	-0.181***	-0.106	-0.122*	-0.117	0.172***	-0.241***
	(-5.66)	(-1.02)	(-2.07)	(-1.92)	(6.30)	(-5.26)
Hh. size	-0.735***	0.0502	-0.147	-0.0211	-0.0181	0.0452
	(-16.17)	(0.39)	(-1.61)	(-0.24)	(-0.53)	(0.53)
Hh head < 40 y.o.	-0.225***	-0.629***	-0.398***	-0.267**	-0.289***	-0.339**
	(-5.24)	(-4.23)	(-3.44)	(-2.73)	(-6.35)	(-3.10)
Hh head >= 40 y.o.	0.0678	-0.475**	-0.0523	-0.171	0.107*	-0.156
	(1.49)	(-3.15)	(-0.45)	(-1.52)	(2.25)	(-1.43)
Hh head married	-1.301***	-0.557***	-1.118***	-0.964***	-1.872***	-1.137***
	(-36.10)	(-4.85)	(-13.64)	(-12.07)	(-51.06)	(-16.08)
Hh head employee	0.125	0.381	-0.216	-0.284*	-0.915***	-0.935***
	(1.80)	(1.53)	(-1.04)	(-2.10)	(-8.57)	(-5.72)
Hh head self-emp	-0.273**	-0.395	0.505*	-1.951***	-1.456***	-1.736***
	(-2.93)	(-1.33)	(2.25)	(-12.02)	(-10.87)	(-9.77)
Hh head pensioner	0.0106	-0.238	.	-0.720***	-0.375***	-0.901***
	(0.14)	(-0.89)	.	(-5.76)	(-3.48)	(-6.19)
Hh head unemp	-0.381***	-0.840**	.	-1.022***	-0.793***	0.0946
	(-4.69)	(-2.72)	.	(-6.88)	(-4.63)	(0.18)
Hh head univ	-0.0108	0.586***	0.485***	0.534***	1.184***	0.647***
	(-0.43)	(6.26)	(6.21)	(8.00)	(33.93)	(8.75)
No. children < 4 y.o.	0.0477	-0.642***	-0.440***	-0.192*	-0.246***	-0.203*
	(0.99)	(-4.59)	(-3.72)	(-2.22)	(-6.55)	(-2.10)
No. children 5-24 y.o.	0.651***	-0.102	0.347**	0.0335	0.154***	0.161
	(12.14)	(-0.63)	(3.16)	(0.36)	(3.81)	(1.54)
No. adults	0.363***	0.00645	0.208***	0.0127	0.0506	0.0886
	(10.36)	(0.06)	(3.38)	(0.17)	(1.88)	(1.61)
Single high inc	-0.263***	-0.288	-0.431***	-0.195	-0.600***	-0.555***
	(-5.23)	(-1.59)	(-3.31)	(-1.25)	(-8.92)	(-4.05)
Single low inc. w/child	1.227***	1.111**	1.041***	1.010***	0.470***	0.297
	(13.98)	(2.98)	(4.73)	(5.35)	(5.56)	(1.51)
Single high inc. w/child	0.197*	-0.560	0.509	0.0394	-0.142	-0.562*
	(2.24)	(-1.73)	(1.91)	(0.18)	(-1.46)	(-2.30)
Couple low inc.	-0.346***	-0.569**	0.0944	-0.216	0.00278	-0.777***
	(-6.53)	(-3.09)	(0.71)	(-1.60)	(0.05)	(-6.12)
Couple high inc.	-0.213***	-0.995***	-0.251	-0.183	-0.479***	-0.954***
	(-3.45)	(-4.90)	(-1.60)	(-1.10)	(-6.92)	(-6.13)
Couple low inc. w/child	0.308***	0.0483	0.475*	0.269	-0.0338	-0.404*
	(3.34)	(0.14)	(2.40)	(1.52)	(-0.43)	(-2.19)
Couple high inc. w/child	-0.386***	-0.934**	-0.239	0.243	-0.468***	-0.718***
	(-4.05)	(-3.02)	(-1.05)	(1.21)	(-5.35)	(-3.53)
Other low inc.	0.117	-0.357	0.123	0.0287	-0.226**	-0.912***
	(1.41)	(-1.27)	(0.60)	(0.16)	(-2.76)	(-4.59)
Other high inc.	-0.0801	-0.795**	0.123	0.106	-0.525***	-0.959***
	(-1.04)	(-2.99)	(0.58)	(0.53)	(-6.10)	(-4.67)
Rural	-0.0230	-0.102	-0.0706	0.154*	-0.111***	-0.263***
	(-0.58)	(-1.09)	(-1.09)	(2.43)	(-3.92)	(-4.19)
Constant	3.173***	1.745	1.112	2.409**	3.796***	3.328***
	(8.16)	(1.27)	(1.49)	(2.91)	(10.71)	(5.69)
N	52299	3667	7140	6828	36715	11394

Notes: The t statistics is in parentheses. The asterisks mark significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.2 Composition of expenditure and savings as shares in total income by household type

Figure 2 shows the average composition of consumption and the level of savings in each county by broad household type, distinguishing between low and high income and male and female headed households.

Food makes up a higher proportion of consumption for low income compared to high income households but food makes up a similar proportion of consumption for male and female headed households in the same country. Heating and electricity also makes up a more substantial proportion of consumption for low income households in each country but Finland. The relative expenditure on heating and electricity is similar for low and high income households in Finland. In Portugal, female-headed low income households spend a larger proportion of their household budget on heating and electricity than do male headed households while the opposite is true in Finland. Motor fuels make up a relatively small proportion of the household budget in each country. There is no obvious cross-country pattern in expenditure for this item. High income households in Hungary and low-income households in Ireland devote more of their household budget to motor fuels. In the other countries in our sample, expenditure shares are relatively even between high and low income households. In all countries, male-headed households devote a higher proportion of their budget to motor fuels than female-headed households.

The remainder of household income is used for other goods and services and (dis-)saving. The level of savings (or dis-saving) is directly related to a household's ability to absorb price changes. In each country, we observe higher relative saving levels for high-income compared to low-income households. Indeed, in each country, low income households are, on average, dis-saving rather than saving. The exception is female headed low income households in Finland. High-income male-headed households tend to save more than high-income female-headed households while low-income male households tend to dis-save less than low-income female-headed households in Ireland and Portugal and dis-save more than low-income female households in Germany, Finland, Hungary and Poland. Relative consumption of other goods and services tends to be higher for low- compared to high-income households as the latter devote some of their income to savings.

Abstracting from savings, Figure 2 show the budget shares of the components of expenditure for the same groups of the population. The patterns of low income households devoting more of their budget to food, heating and electricity are clearer once savings are removed. Similarly, the propensity for female headed households to devote more of their budget to heating and electricity and less to motor fuels is apparent.

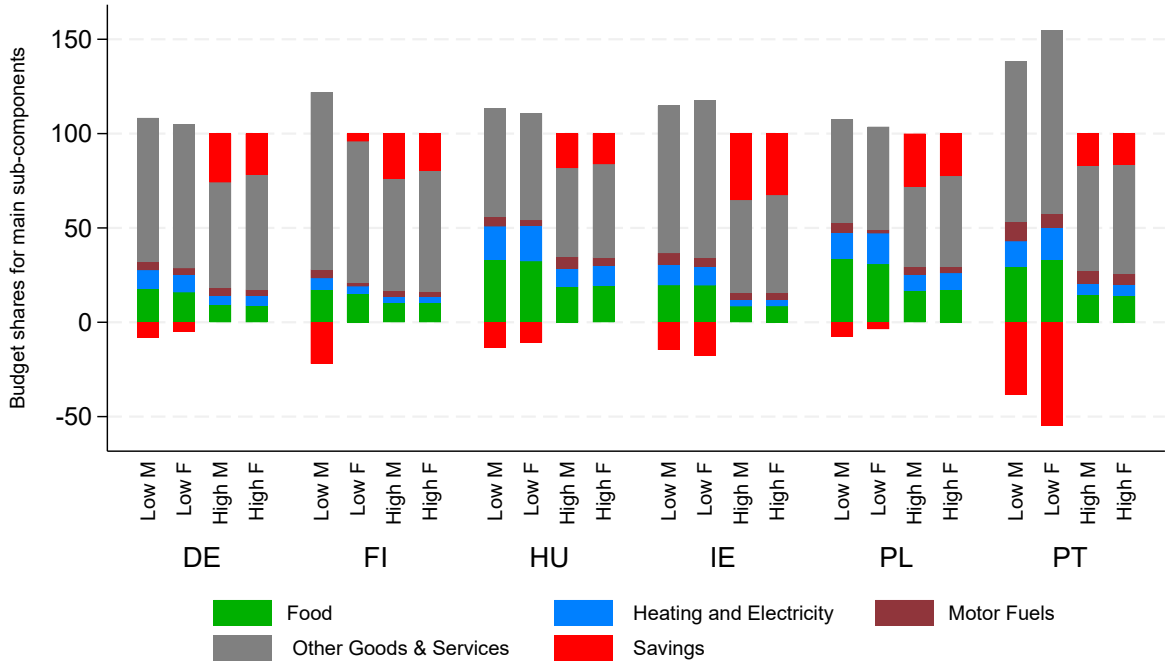


Figure 1: Budget and savings shares in household income across household types defined by income and gender of the household head

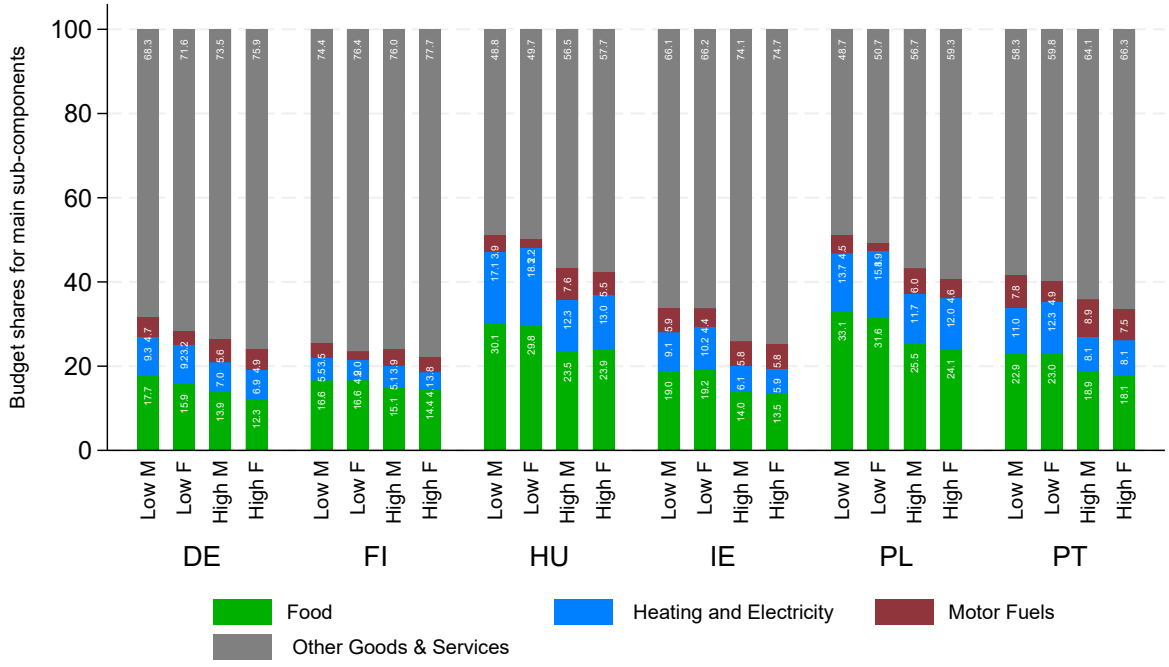


Figure 2: Budget Shares of expenditure components across main household types

4.3 Budget share for main commodity sub-components

Figure 3 explores these cross-country patterns in more detail by splitting the population in each country into more granular groups. We leave aside savings as it is not directly affected by inflation, apart from through behavioural responses to inflation. We focus on food, heating and electricity and motor fuels. The remainder of the household consumption bundle is made up of other goods and services. Low income households are represented in the top panel of Figure 3 while high income households are in the bottom panel.

Focusing first on low income households, there is variation in the budget share devoted to each commodity group within countries. The budget share for food is higher for households without children than for those with children, apart from in Germany. The budget share for heating and electricity is higher for those without children than for those with children.

Male-headed low-income households spend a larger share of their budget on motor fuels. This is true for virtually all household types in all countries. There is no obvious gender pattern in budget shares on food. Budget shares for heating and electricity are higher for single female-headed households than for single male-headed households, apart from in Finland.

Turning next to high-income households, among single households, those headed by a male spend a higher share of their budget on motor fuels. Among couple households, budget shares for this item are similar for male- and female-headed households. There is no obvious pattern of differential expenditure on food or heating and electricity for male or female headed households.

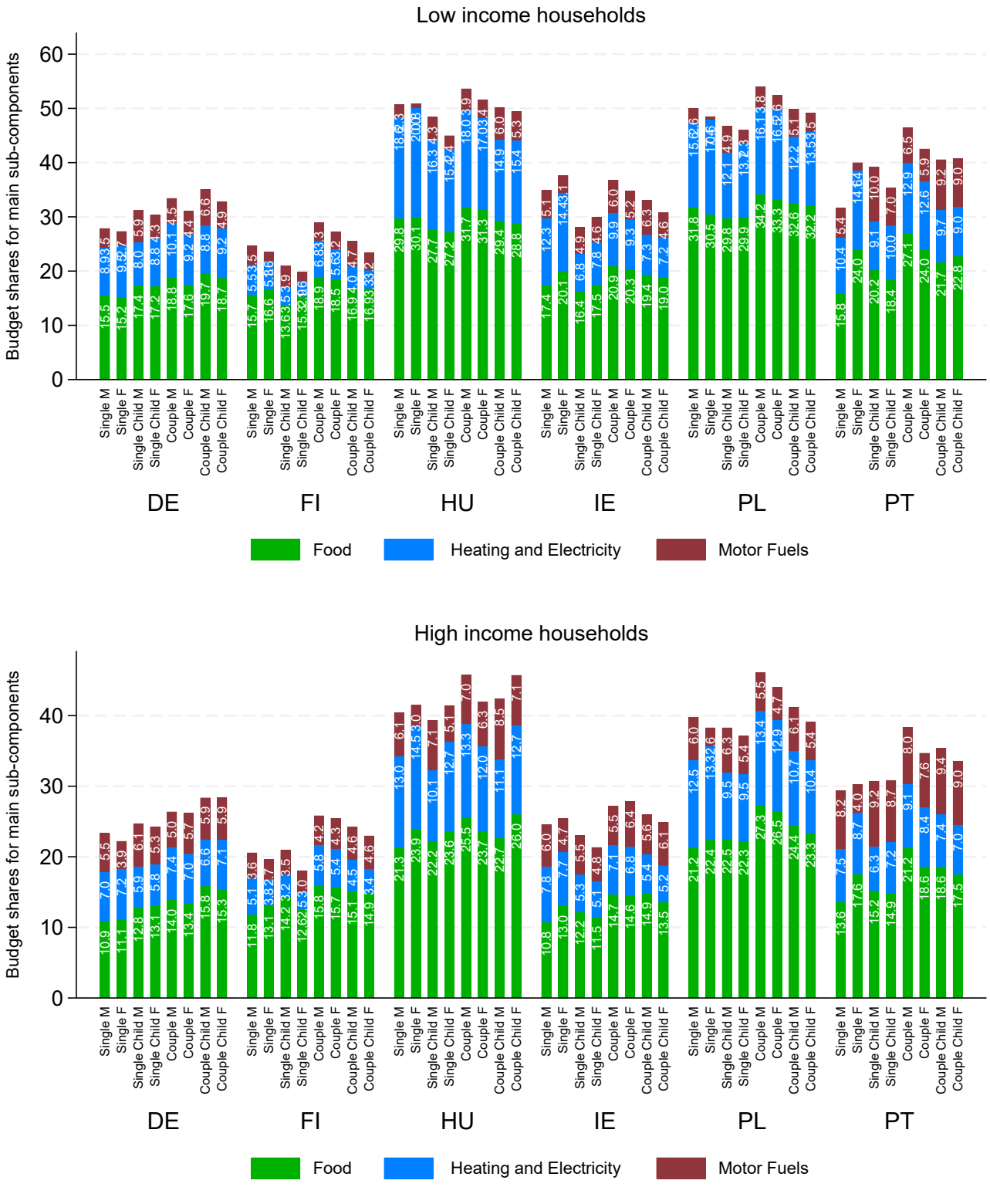


Figure 3: Budget Shares of expenditure components across heterogeneous household types

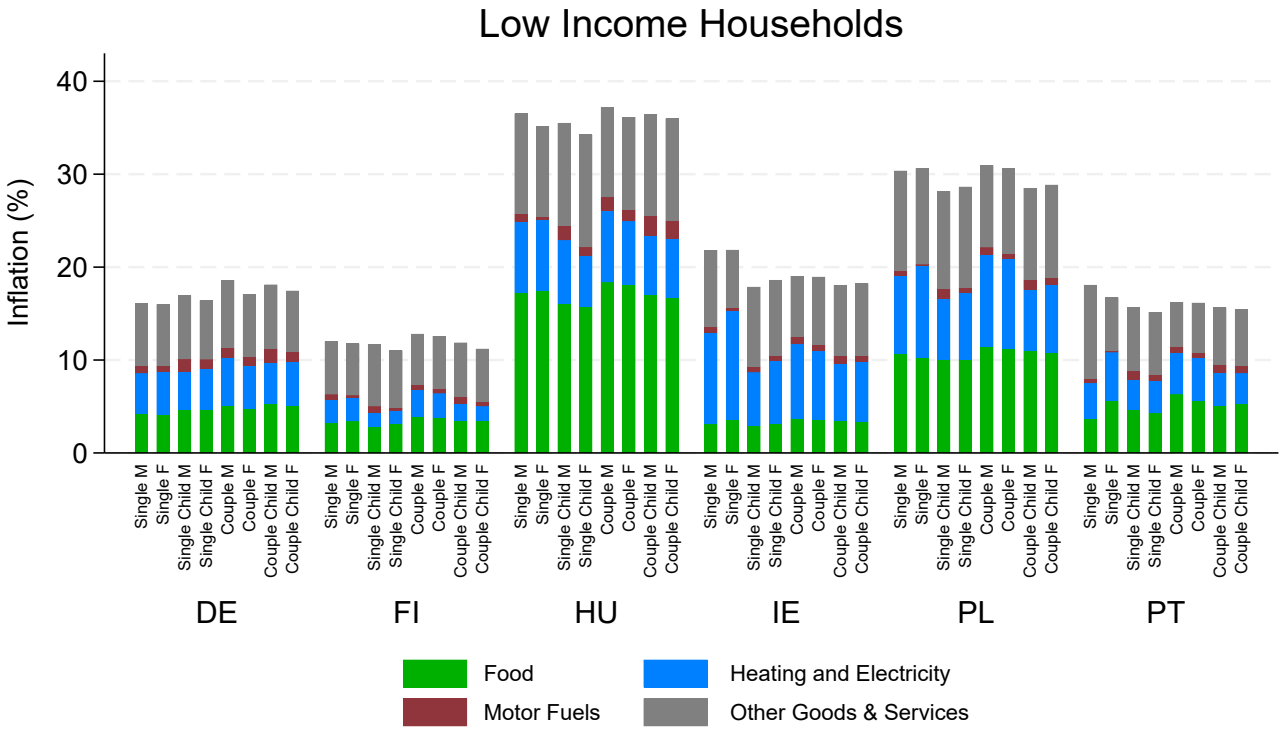
4.4 Drivers of inflation across households types

Next, we show the estimated average inflation rate applicable to each type of household, split into the source of price growth i.e. food, fuel, etc. Country and household specific inflation rates with fitted confidence intervals are documented in Tables A–1 to A–5 and Figure A–1[5] in the Appendix and summarised in Figure 4.

There is cross-country variation in the drivers of inflation. In line with expenditure patterns, food prices represent a large component of inflation in Hungary and Poland. Heating and electricity price changes make up a large component of inflation in Ireland and Poland. Motor fuel inflation represents a relatively small component of overall inflation, although its share in overall inflation is higher in Hungary than in the other countries studied. Other goods and services contribute between 30-60 per cent of overall inflation across the six countries studied.

Among low-income households, there is a gender pattern to the incidence of both heating and electricity and motor fuel inflation. Male-headed households are more affected by motor fuel inflation while female headed-households (particular singles) are more affected by heating and electricity inflation. These gender patterns are less visible for high-income households. In particular, the strong gender pattern to motor fuel inflation for low income households is largely absent from the profile of higher-income households. This is in line with the more similar expenditure patterns of high-income male- and female-headed households visible in Figure 3.

[5]All figures illustrating the inflation rates with confidence intervals for the main commodity sub-components for all household types can be provided upon request.



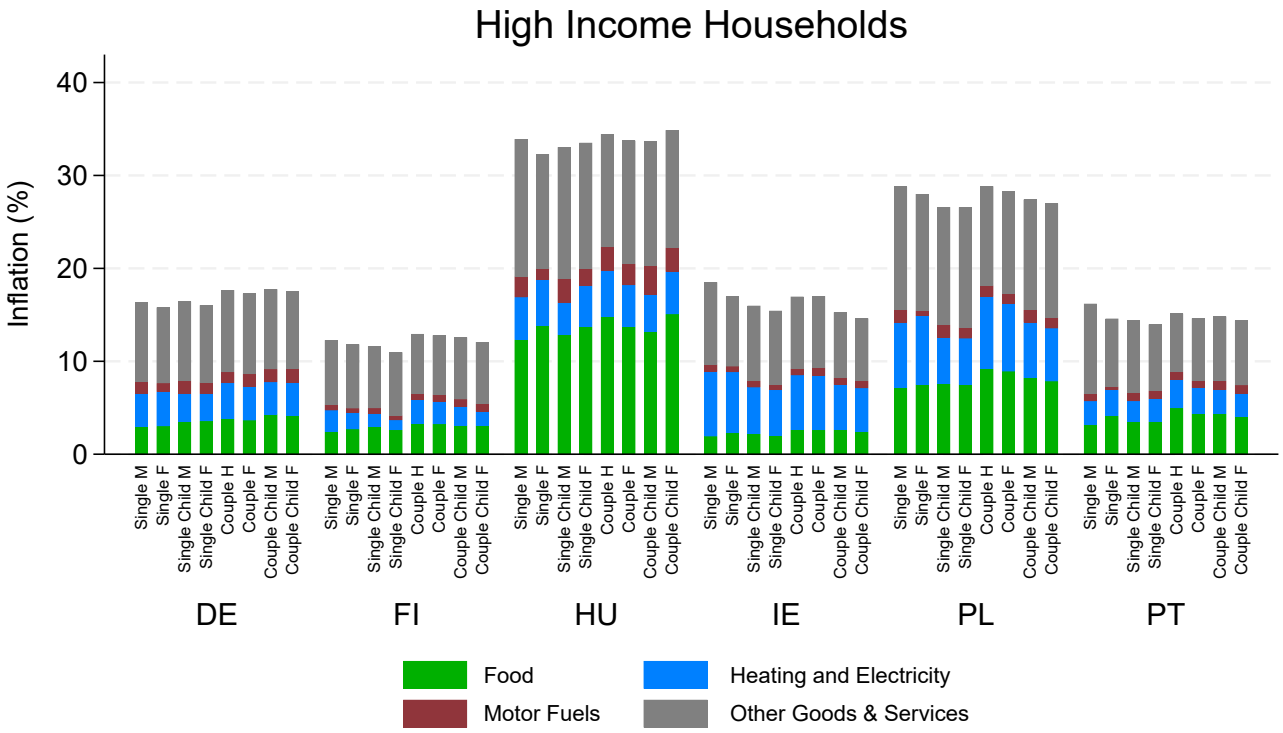


Figure 4: Estimated inflation by main commodity sub-components across heterogeneous household types

4.5 Distributional analysis of inflation rates

The analysis of budget shares and inflation for different commodity groups by household type indicates that the effect of price changes will not be homogenous by houshold type. For this reason, we next investigate the distribution of inflation faced by households between 2021 and 2023, identifying its incidence for different types of household, distinguished by income level, household composition and gender of the household head.

4.5.1 Quantile functions of inflation rates

Figure 5 depicts the gender difference in quantiles of the overall inflation rate experienced by households between 2021 and 2023. In Germany, Finland and Hungary, female-headed households experience lower inflation rates at almost all quantiles of the inflation distribution. This tells us that, for these given locations in the inflation distribution, female-headed households were less exposed to price changes. The quantile function slopes upward in each of these countries, apart from Germany, indicating that the inflation rate faced by male and female households converges somewhat at higher quantiles of the inflation distribution.

In Ireland and Portugal, female-headed households experience slightly lower inflation rates to male-headed households in the lower half of the inflation distribution but experience higher inflation at higher inflation quantiles. In Poland, female-headed households experience higher inflation rates throughout most of the inflation distribution.

Despite the gender gap in inflation being predominantly in favour of women in Germany, Finland and Hungary and in favour of men in Poland, the pattern of higher inflation for women at the upper end of the inflation distribution is present in all countries but Poland.

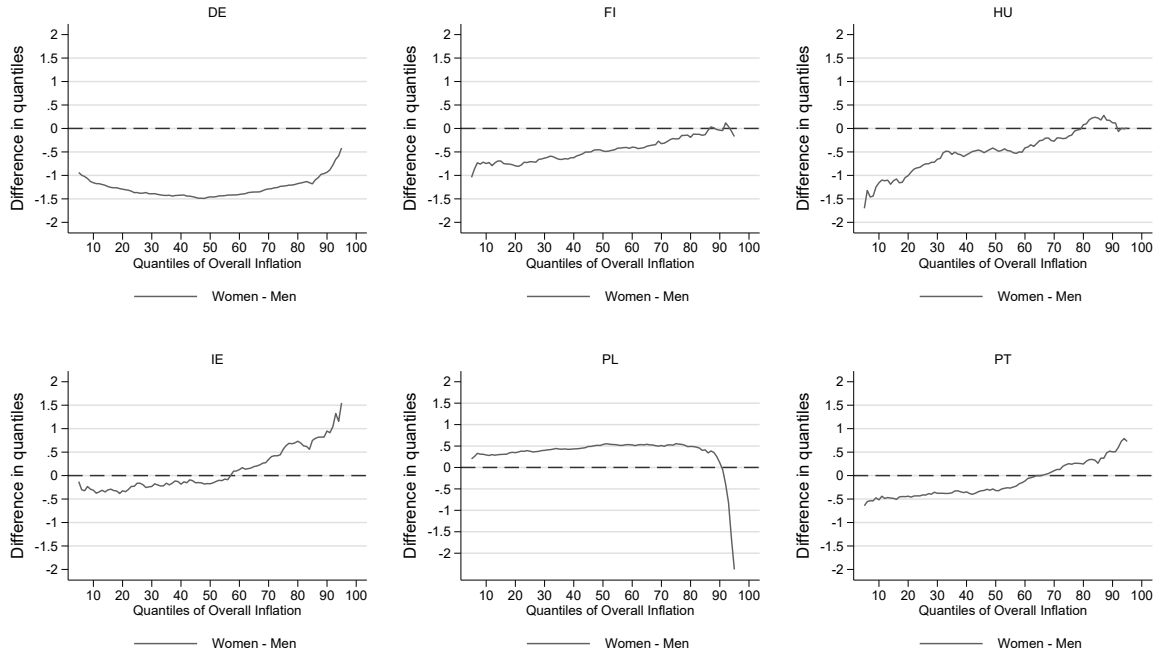


Figure 5: Gender difference in quantiles of overall inflation

Figures 6 to 9 also show the gender gap in inflation across quantiles of the inflation distribution, for particular commodity bundles: heading and electricity; food; motor fuels and other goods.

Female-headed households experience higher heating and electricity inflation in Germany, Hungary, Poland

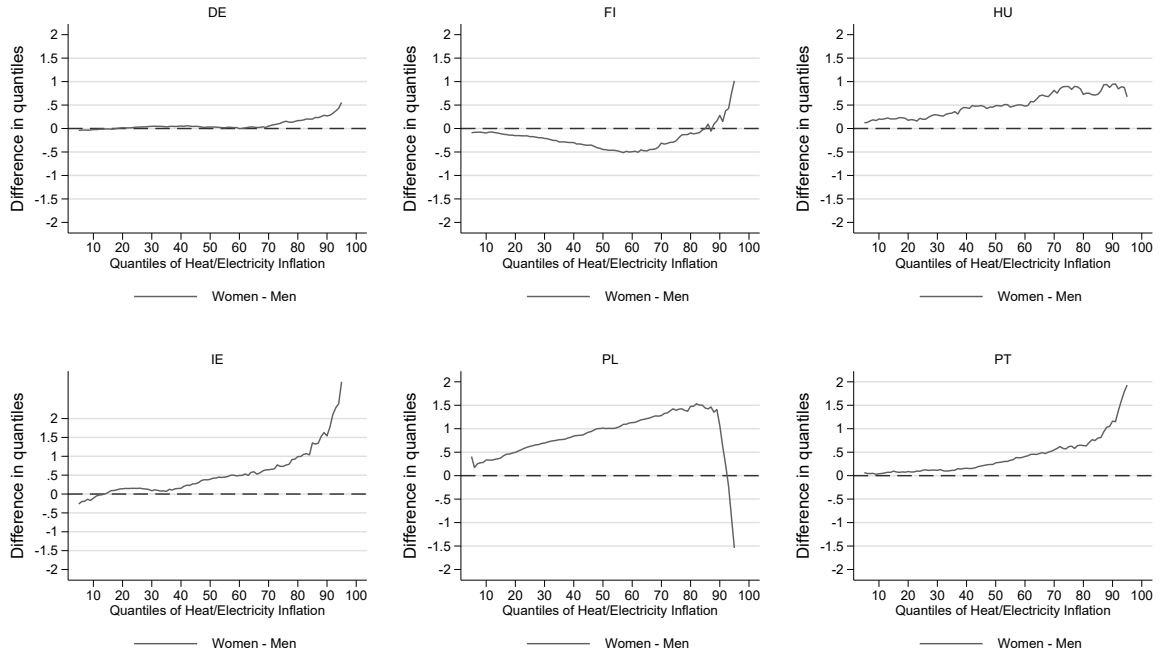


Figure 6: Gender difference in quantiles of heating/electricity inflation

and Portugal (Figure 6). In each of these countries, the gender gap in inflation is higher at the top of the inflation distribution, particularly so in Ireland and Poland. It is close to zero at the lower end of the distribution in Germany, Ireland and Portugal, but still substantial at lower inflation quantiles in Poland and Hungary. In Finland, the pattern is reversed with female-headed households actually experiencing lower heating and electricity inflation than male headed households, apart from at the very top of the inflation distribution.

These findings highlight how the impact of heat/electricity inflation is not uniform between genders or across the inflation distribution. In particular, the upward sloping shape of the quantile function across countries points to higher inequality in inflation incidence for women than for men. This information could be useful for energy policy, especially regarding subsidies and support programs aimed at mitigating the impact of energy inflation on more vulnerable groups.

Figure 7 shows how the gender gap in food inflation varies along the food inflation distribution. There is much variation across countries in this pattern. In Germany, female-headed households face lower food inflation across the distribution, but particularly at the top. In Finland, female-headed households face slightly higher food inflation at lower inflation quantiles but lower food inflation towards the top of the inflation distribution. In Ireland, Poland and Portugal, female-led households face slightly lower food inflation at lower inflation quantiles and higher food inflation at the top of the inflation distribution. Hungary displays the most substantial gender gap in food inflation with female-led households experiencing substantially higher food inflation across much of the distribution and particularly so at the top of the distribution.

Figure 8 shows how the gender gap in motor fuels inflation varies across the inflation distribution. There are many households with zero expenditure on motor fuels, which explains why this figure is not populated from the bottom of the inflation distribution. The cross-country pattern in consistent with men facing higher motor-fuel related inflation right across the distribution. The gap is particularly high in Hungary and Poland. The difference in motor fuel inflation faced by male- and female-headed households is upward sloping in all countries but Ireland, indicating that the gender difference is most pronounced at lower quantiles of inflation. This pattern could reflect differences in how men and women use and rely on

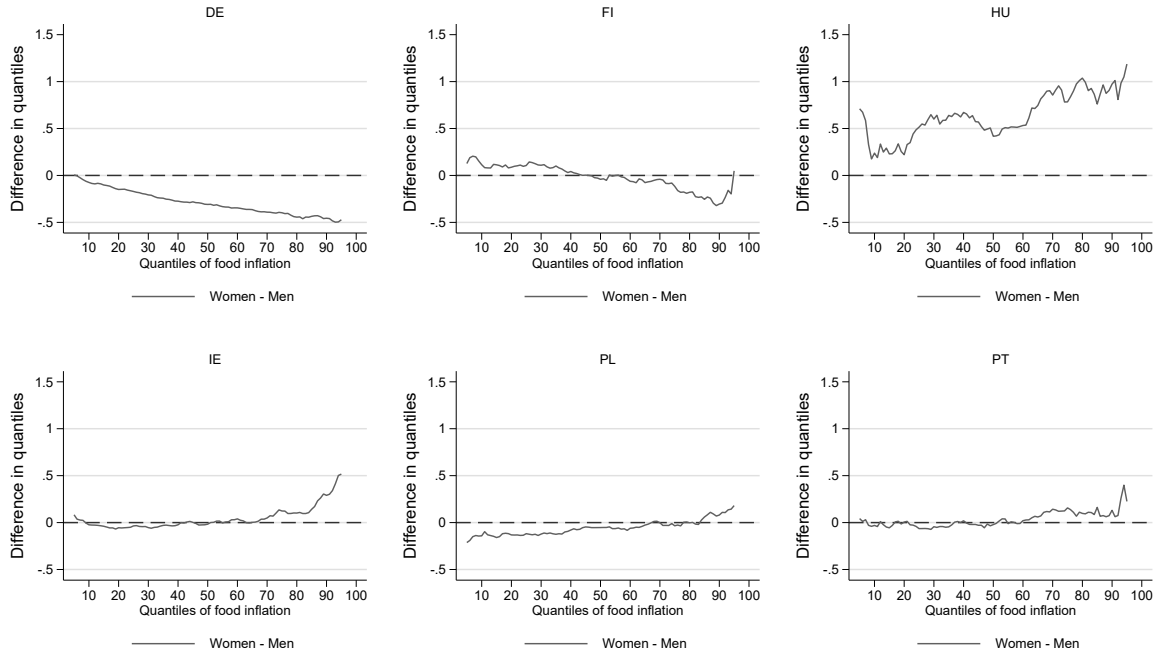


Figure 7: Gender difference in quantiles of food inflation

motor fuels. Understanding these dynamics can help in designing more effective and equitable energy and transportation policies.

Finally, Figure 9 illustrates the difference in inflation on "other" goods faced by male and female headed households across the inflation distribution. There are substantial differences in this pattern across countries. In Poland, female-headed households face slightly higher inflation from other goods than male-headed households. The opposite is true in the remaining countries. The quantile function is downward sloping in Germany, Hungary and Portugal, indicating that women face relatively lower inflation at the top of the inflation distribution than at the bottom.

To summarise, in Germany, Portugal, Finland and Hungary, we find that female-headed households face lower inflation than male headed households, particularly at lower inflation quantiles. In each country, this overall finding is composed of higher heating and electricity inflation for female-headed households at the top of the inflation distribution. This is counteracted by lower motor fuel and other goods inflation. The pattern of food inflation is less clear-cut. Food inflation is inflation increasing in Hungary and inflation decreasing in Germany for female-headed households compared to male-headed households.

In Ireland, we find that female-headed households face higher overall inflation than male-headed households at the top of the inflation distribution while, in Poland, we find that female-headed households face higher overall inflation throughout the inflation distribution. In Ireland, this pattern is driven by higher heating and electricity and food inflation for female-headed households at the top of the inflation distribution, slightly counteracted by lower motor fuels inflation and other goods inflation. In Poland, this pattern is driven by higher heating and electricity and other goods inflation for female-headed households throughout the distribution. This is slightly counteracted by lower food and motor fuels inflation.

These findings highlight how inflation's impact varies not only between genders but also across different types of goods and services, indicating the complexity of inflation's distributional effects. This data is crucial for understanding economic disparities and formulating targeted policies.

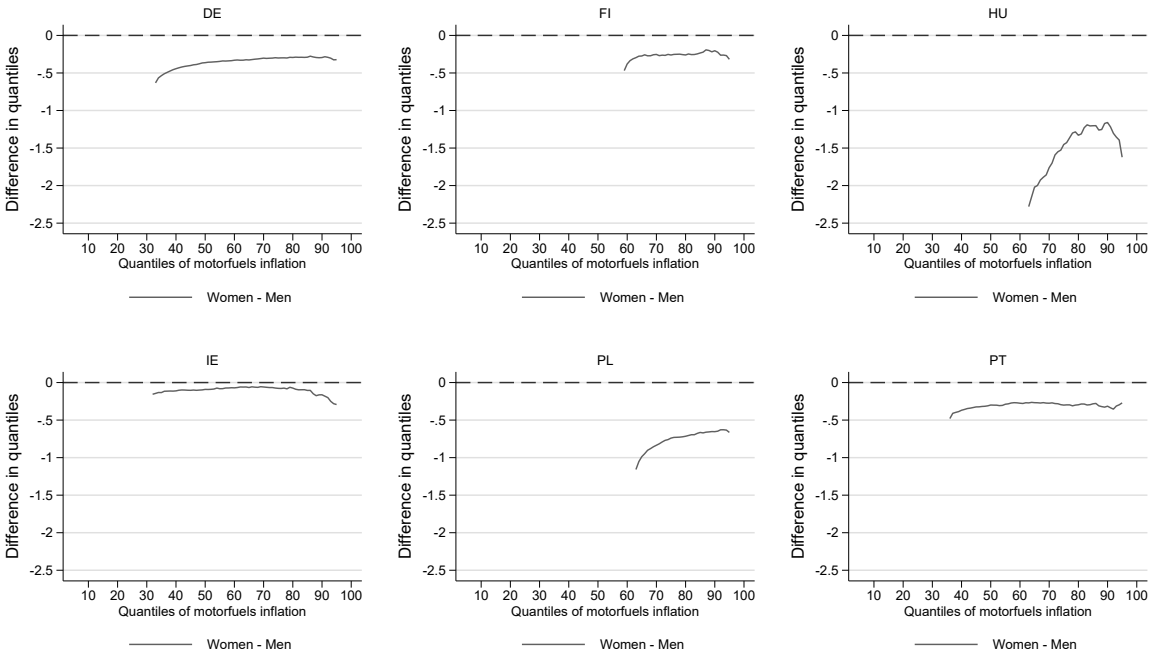


Figure 8: Gender difference in quantiles of motor fuels inflation

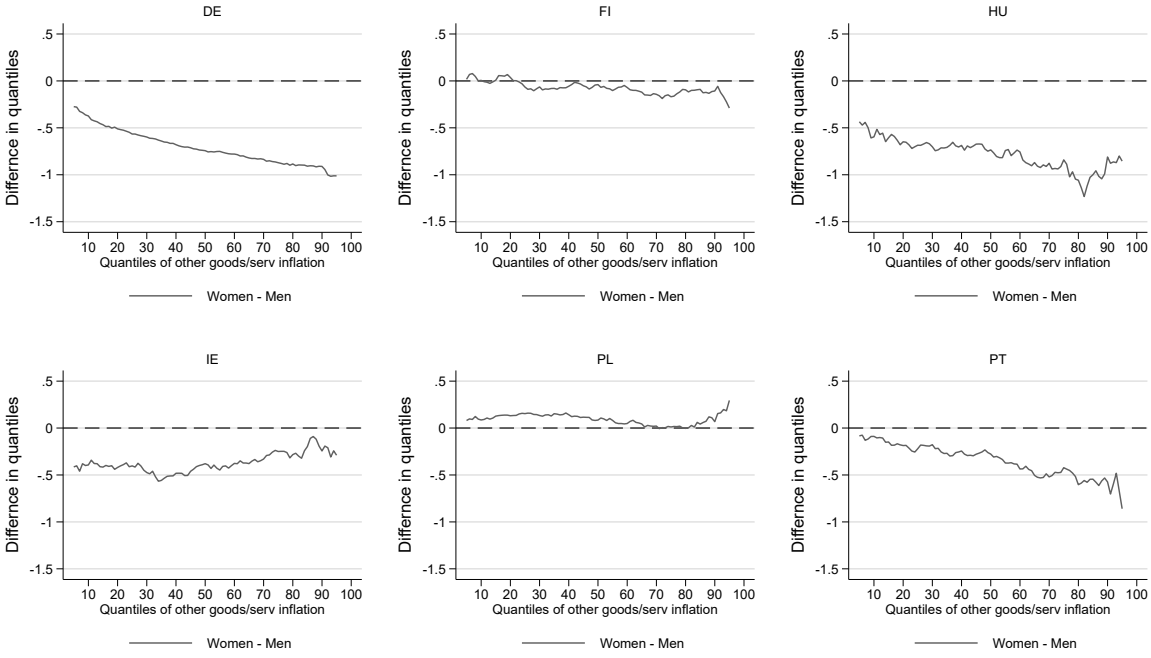


Figure 9: Gender difference in quantiles of other goods and services inflation

4.5.2 Quantile regressions

To further understand the incidence of inflation by commodity sub-components and how factors such as gender, income level, and household composition relate to differing levels of inflation experienced by households, we employ both Ordinary Least Squares (OLS) and quantile regression methods. Table 3 shows the estimation results for the overall inflation rate faced by households while Tables 4 to 7 show the same model specification for the inflation rate of specific commodity groups.

In line with our observations from the inflation quantile functions, female-headed households face a higher average inflation rate in Ireland and Poland and a lower average inflation rate in Germany, Finland, Hungary and Portugal. However, interacting the gender of the household head with income shows that these effects moderate for higher income households. Households with children face lower average inflation rates in all countries. This effect is amplified for female-headed households with children in Ireland and moderated for female-headed households in Portugal, Poland and Hungary.

Looking across the inflation distribution reveals relative consistency in these patterns for most countries. Two exceptions are Ireland and Portugal. In Ireland, female-headed households in the lowest quartile of the inflation distribution actually face lower inflation rates while in Portugal, female-headed households in the top quartile of the inflation distirbution face higher inflation rates.

Looking at the detailed regression results in Tables 4 to 7 sheds some light on the provenance of these differential impacts. In all countries, female-headed households face lower average inflation on other goods and services and, in all countries but Hungary, they also face lower average inflation on motor fuels. These effects are relatively stable across the inflation distribution.

In all countries but Hungary, female-headed households face higher average inflation on heating and electricity, particularly at higher inflation quantiles. The results for food inflation are more mixed. In Germany, Hungary and Poland, female-headed households face lower food inflation than male-headed households while the opposite is true in Finland, Ireland and Portugal.

For all consumption categories, the differential effect of inflation for male and female-headed households is moderated by increasing income, suggesting that most of the gender differentials observed apply to lower income households. This is in line with the descriptive evidence on differences in consumption bundles by income level presented in Figure 3.

Table 3: Quantile regression - Overall Inflation Rates

Overall Inflation	Model			
DE	Q25	Q50	Q75	OLS
Female	-2.028**	-2.246**	-4.824***	-2.627***
Ln(Income)	-0.110	-0.256*	-1.020***	-0.580***
Female x Ln(Income)	0.150*	0.175*	0.423***	0.216**
With child	-0.554***	-0.604***	-0.724***	-0.619***
Female with child	0.268**	0.212*	0.200	0.158
Single	-1.743***	-1.972***	-2.181***	-1.938***
No. Children	0.153***	0.077	-0.030	0.063
No. Adults	0.285***	0.206***	0.066*	0.123***
FI	Q25	Q50	Q75	OLS
Female	-5.962**	-3.757**	-1.174***	-2.338***
Ln(Income)	0.253	0.178*	0.117***	0.264***
Female x Ln(Income)	0.558**	0.347*	0.101***	0.201**
With child	0.444***	0.026***	-0.300***	-0.439***
Female with child	-0.585*	-0.432*	-0.339	-0.234
Single	-0.713***	-0.964***	-1.057***	-0.777***
No. Children	-0.019***	0.010	0.009	0.018
No. Adults	-0.260***	-0.252***	-0.443***	-0.386***
HU	Q25	Q50	Q75	OLS
Female	-1.918**	-5.256*	-1.301***	-3.367***
Ln(Income)	-1.180**	-2.340***	-2.626***	-2.265***
Female x Ln(Income)	0.104**	0.507*	0.058***	0.275**
With child	-0.691***	-1.903**	-2.544***	-2.039***
Female with child	0.785*	0.774*	0.859*	0.859**
Single	-0.846***	-0.565**	-0.347***	-0.628***
No. Children	0.080***	0.761***	0.899***	0.712***
No. Adults	0.286***	0.300***	0.363***	0.364***
IE	Q25	Q50	Q75	OLS
Female	-0.556**	2.058*	5.123*	4.467***
Ln(Income)	-1.631***	-1.814***	-2.085***	-1.830***
Female x Ln(Income)	-0.019**	-0.243*	-0.535*	-0.473**
With child	-0.011***	0.139**	-0.374***	-0.181***
Female with child	0.106*	-0.128*	0.062*	-0.120**
Single	0.516**	0.457**	0.790***	0.698***
No. Children	-0.274*	-0.065***	-0.053***	-0.141***
No. Adults	-0.124***	-0.184***	-0.214***	-0.232***
PL	Q25	Q50	Q75	OLS
Female	2.639***	3.445***	3.905***	5.241***
Ln(Income)	-0.760***	-0.550***	-0.307***	-0.317***
Female x Ln(Income)	-0.332***	-0.425***	-0.483***	-0.651***
With child	-0.829***	-0.947***	-1.360***	-1.567***
Female with child	0.323**	0.316**	0.474***	0.434**
Single	0.227***	0.439***	0.633***	0.414***
No. Children	0.012*	-0.024***	0.010***	0.020***
No. Adults	-0.011***	0.017***	0.063*	0.057***
PT	Q25	Q50	Q75	OLS
Female	-2.099***	-0.446***	1.423***	-0.661***
Ln(Income)	-0.845***	-1.027***	-1.029***	-1.076***
Female x Ln(Income)	0.138***	-0.019***	-0.161***	0.014***
With child	-0.441***	-0.258***	-0.115***	-0.316***
Female with child	0.353**	0.117**	-0.155***	0.092**
Single	-0.115***	-0.056***	0.050***	0.016***
No. Children	-0.229***	-0.144***	-0.119***	-0.193***
No. Adults	0.030***	-0.071***	-0.140*	-0.036***

Notes: The asterisks mark significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4: Quantile regression - Food Inflation Rates

Food Inflation	Model			
DE	Q25	Q50	Q75	OLS
Female	0.114***	-0.609***	-1.109*	-0.441***
Ln(Income)	-0.888***	-1.268***	-1.576***	-1.226***
Female x Ln(Income)	-0.017***	0.048***	0.087*	0.027***
With child	-0.139***	-0.153***	-0.342***	-0.256***
Female with child	0.083**	0.106*	0.194**	0.163***
Single	-0.892***	-1.102***	-1.250***	-1.070***
No. Children	0.314***	0.327***	0.337***	0.298***
No. Adults	0.272***	0.298***	0.307***	0.271***
FI	Q25	Q50	Q75	OLS
Female	1.695***	1.646***	-0.463*	0.553***
Ln(Income)	-0.079***	-0.182***	-0.545*	-0.283***
Female x Ln(Income)	-0.144***	-0.145***	0.033*	-0.048***
With child	-0.003***	-0.286***	-0.435***	-0.390***
Female with child	-0.063**	-0.015*	-0.058**	0.008***
Single	-0.643***	-0.760***	-0.769***	-0.712***
No. Children	0.211**	0.214*	0.201*	0.202***
No. Adults	-0.015***	-0.016***	-0.094*	-0.089**
HU	Q25	Q50	Q75	OLS
Female	2.956***	0.598***	3.274*	-0.051***
Ln(Income)	-2.055***	-3.094***	-3.335***	-3.010***
Female x Ln(Income)	-0.319***	-0.050***	-0.419*	0.012***
With child	-0.055***	-1.381***	-2.515*	-1.418*
Female with child	-0.105**	0.320*	0.539**	0.096***
Single	-1.046***	-0.711**	-0.214***	-0.449*
No. Children	0.252**	0.662***	0.966**	0.821***
No. Adults	0.170***	0.220*	0.238*	0.273**
IE	Q25	Q50	Q75	OLS
Female	1.049***	1.188***	1.837*	1.623*
Ln(Income)	-0.345***	-0.590***	-0.910***	-0.538***
Female x Ln(Income)	-0.094***	-0.102***	-0.167*	-0.145*
With child	0.084***	0.105***	-0.253*	-0.049*
Female with child	-0.089**	-0.107*	0.028**	-0.059***
Single	-0.567***	-0.561***	-0.623***	-0.589***
No. Children	0.117***	0.099***	0.112**	0.083**
No. Adults	0.091***	0.072***	0.103***	0.042*
PL	Q25	Q50	Q75	OLS
Female	-1.110***	-0.470***	-0.991*	-0.686*
Ln(Income)	-2.512***	-2.762***	-3.187***	-2.663***
Female x Ln(Income)	0.107***	0.009***	0.053*	0.037*
With child	-0.593***	-1.105***	-1.341***	-0.984***
Female with child	0.046**	0.294**	0.398**	0.225*
Single	-1.171***	-1.152***	-0.927***	-0.954***
No. Children	0.457***	0.455***	0.468***	0.446***
No. Adults	0.475***	0.479***	0.519***	0.481***
PT	Q25	Q50	Q75	OLS
Female	1.117***	1.323***	0.279*	1.300*
Ln(Income)	-0.370*	-0.712***	-1.171***	-0.632***
Female x Ln(Income)	-0.108***	-0.123***	-0.034*	-0.123*
With child	-0.158***	-0.499***	-0.798*	-0.453***
Female with child	0.015**	0.004**	0.034**	-0.039*
Single	-1.046***	-1.251***	-1.161***	-1.116***
No. Children	0.001***	0.050***	0.027***	0.038***
No. Adults	0.040***	-0.046***	-0.130*	-0.102**

Notes: The asterisks mark significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5: Quantile regression - Heat/Electricity Inflation Rates

Heat/Electricity Inflation	Model			
DE	Q25	Q50	Q75	OLS
Female	0.822*	1.782**	1.349*	0.832*
Ln(Income)	-0.461***	-0.689***	-1.253***	-0.903***
Female x Ln(Income)	-0.076***	-0.173**	-0.128*	-0.079*
With child	-0.141***	-0.374**	-0.771***	-0.462***
Female with child	0.044**	0.068**	0.243**	0.066*
Single	-0.484***	-0.838***	-1.429***	-0.936***
No. Children	0.068*	0.138***	0.007***	0.015***
No. Adults	0.096***	0.133***	-0.014*	-0.046*
FI	Q25	Q50	Q75	OLS
Female	0.626*	-0.667**	0.552*	2.239*
Ln(Income)	0.070***	-0.023***	0.136***	0.241***
Female x Ln(Income)	-0.067***	0.044**	-0.079*	-0.237*
With child	-0.131***	-0.077**	-0.883*	-0.769**
Female with child	-0.066**	-0.228**	-0.194**	-0.052*
Single	-0.472***	-0.862***	-0.978***	-0.665***
No. Children	0.050*	0.067***	0.076***	0.085***
No. Adults	-0.077***	-0.100**	-0.276***	-0.339***
HU	Q25	Q50	Q75	OLS
Female	-1.822*	0.583**	1.979*	-0.081*
Ln(Income)	-1.429***	-2.029***	-2.614***	-2.037***
Female x Ln(Income)	0.208***	-0.061**	-0.246*	0.012*
With child	-0.244***	-1.215*	-1.570**	-0.848*
Female with child	-0.011**	0.449**	0.745*	0.209*
Single	-0.910***	-0.428**	-0.230***	-0.381**
No. Children	0.167*	0.241*	0.160***	0.176*
No. Adults	0.145*	0.246***	0.155*	0.125*
IE	Q25	Q50	Q75	OLS
Female	3.833**	7.515***	10.169***	7.725**
Ln(Income)	-0.396*	-0.632*	-1.106**	-0.947*
Female x Ln(Income)	-0.343**	-0.685***	-0.952***	-0.694**
With child	0.019***	-0.003*	-0.937**	0.006*
Female with child	-0.108**	-0.219**	-0.110*	-0.552*
Single	-0.417***	-0.377**	-0.302***	-0.128**
No. Children	-0.056*	-0.122*	-0.038***	-0.145*
No. Adults	-0.155***	-0.216***	-0.434***	-0.370***
PL	Q25	Q50	Q75	OLS
Female	3.504***	5.845***	9.882***	8.208***
Ln(Income)	0.073*	-0.087*	-0.010**	0.419*
Female x Ln(Income)	-0.358***	-0.627***	-1.082***	-0.922***
With child	-0.103***	-0.747***	-1.187***	-1.322***
Female with child	-0.081**	0.190**	0.295*	0.150*
Single	0.104***	0.180**	0.256*	0.231**
No. Children	-0.155***	-0.159***	-0.202**	-0.149*
No. Adults	-0.258***	-0.301***	-0.282***	-0.249***
PT	Q25	Q50	Q75	OLS
Female	0.471***	2.313**	3.333**	2.577**
Ln(Income)	-0.535***	-0.656***	-0.951***	-0.712***
Female x Ln(Income)	-0.048***	-0.226**	-0.311**	-0.230*
With child	-0.015***	-0.250***	-0.279***	0.183***
Female with child	-0.004**	-0.010**	-0.084*	-0.353*
Single	-0.381***	-0.522***	-0.665***	-0.591***
No. Children	-0.030***	-0.021***	-0.154**	-0.095*
No. Adults	-0.017***	-0.095***	-0.074***	-0.147***

Notes: The asterisks mark significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 6: Quantile regression - Motor Fuels Inflation Rates

Motor Fuels Inflation	Model			
DE	Q25	Q50	Q75	OLS
Female	-0.129***	-3.971***	-4.456***	-2.571***
Ln(Income)	0.123***	-0.272***	-0.465***	-0.169***
Female x Ln(Income)	0.013***	0.376***	0.416***	0.238***
With child	0.107***	0.011***	-0.013***	0.002***
Female with child	-0.076***	0.050**	0.090*	0.045*
Single	-0.363***	-0.136***	0.104***	-0.025***
No. Children	0.060***	0.058***	0.072***	0.054***
No. Adults	0.071***	0.157***	0.242***	0.164***
FI	Q25	Q50	Q75	OLS
Female	0.000***	0.503***	-6.066***	-2.459***
Ln(Income)	0.000***	0.191**	-0.549***	-0.194*
Female x Ln(Income)	0.000***	-0.055***	0.558***	0.226***
With child	0.000***	-0.036***	-0.260***	-0.114***
Female with child	0.000***	0.048**	0.063*	0.030*
Single	0.000***	-0.295***	-0.080***	-0.085**
No. Children	0.000***	0.021***	0.059***	0.027***
No. Adults	0.000***	0.041**	0.070*	0.045**
HU	Q25	Q50	Q75	OLS
Female	0.000***	4.085***	0.866***	0.172***
Ln(Income)	0.000***	1.193***	1.525***	1.011***
Female x Ln(Income)	0.000***	-0.501***	-0.217***	-0.078***
With child	0.000***	0.469***	-0.296***	0.229***
Female with child	0.000***	-0.206**	0.695*	0.095*
Single	0.000***	-1.211***	-0.853***	-0.479***
No. Children	0.000***	-0.076***	-0.219*	-0.192**
No. Adults	0.000***	0.111***	0.410***	0.164***
IE	Q25	Q50	Q75	OLS
Female	-0.167***	-1.909***	-2.723***	-1.641***
Ln(Income)	-0.010***	-0.142**	-0.409***	-0.202***
Female x Ln(Income)	0.018***	0.178***	0.257***	0.150***
With child	0.029***	-0.089***	0.019***	0.019***
Female with child	-0.029*	0.059**	-0.035*	0.007*
Single	-0.275***	-0.198***	-0.170***	-0.159***
No. Children	0.011***	-0.000***	0.003*	-0.023**
No. Adults	0.016***	0.048***	0.050***	0.034***
PL	Q25	Q50	Q75	OLS
Female	0.000***	1.171***	-3.704***	-2.038***
Ln(Income)	0.000***	0.386***	-0.118*	0.070*
Female x Ln(Income)	0.000***	-0.147***	0.350***	0.197***
With child	0.000***	0.246***	-0.265***	-0.015***
Female with child	0.000*	-0.108***	0.247***	0.063*
Single	0.000***	-0.605***	-0.495***	-0.222***
No. Children	0.000***	-0.016***	-0.006*	-0.017**
No. Adults	0.000***	0.052***	0.126***	0.070***
PT	Q25	Q50	Q75	OLS
Female	0.384**	-0.698***	-2.298***	-1.386***
Ln(Income)	0.144***	0.017***	-0.176***	-0.080*
Female x Ln(Income)	-0.045***	0.051**	0.206***	0.125***
With child	0.047***	-0.076***	-0.128***	-0.068***
Female with child	0.014*	0.182***	0.233***	0.142***
Single	-0.147***	-0.149***	-0.073**	-0.082***
No. Children	0.034***	0.012***	-0.031*	0.003**
No. Adults	0.074***	0.120***	0.170***	0.116***

Notes: The asterisks mark significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 7: Quantile regression - Other Goods/Serv Inflation Rates

Other Goods/Serv Inflation	Model			
DE	Q25	Q50	Q75	OLS
Female	0.186**	-0.199***	-0.935***	-0.447***
Ln(Income)	1.689***	1.838***	1.850***	1.718***
Female x Ln(Income)	-0.018***	0.005**	0.062***	0.030***
With child	0.348***	0.193*	-0.069***	0.097***
Female with child	-0.195***	-0.126*	-0.043***	-0.115*
Single	0.172***	0.117***	0.037**	0.093***
No. Children	-0.275***	-0.354***	-0.387***	-0.304***
No. Adults	-0.213***	-0.271***	-0.343***	-0.266***
FI	Q25	Q50	Q75	OLS
Female	-1.397**	-2.469***	-3.306*	-2.671*
Ln(Income)	0.697***	0.638***	0.479*	0.500*
Female x Ln(Income)	0.142***	0.244**	0.323*	0.260*
With child	0.650*	0.678*	0.739***	0.833**
Female with child	-0.142***	-0.126*	-0.283***	-0.220*
Single	0.593***	0.667***	0.723***	0.685***
No. Children	-0.233***	-0.345***	-0.313***	-0.296***
No. Adults	0.010***	-0.032***	-0.059***	-0.004***
HU	Q25	Q50	Q75	OLS
Female	-0.953**	-5.316*	-4.081*	-3.408*
Ln(Income)	2.070***	1.735***	1.804***	1.771***
Female x Ln(Income)	0.100***	0.574*	0.356*	0.329*
With child	-0.024*	0.419*	-0.244***	-0.002**
Female with child	0.198***	0.408*	0.752***	0.458*
Single	0.313***	0.365*	0.868***	0.680***
No. Children	0.207***	-0.144***	-0.221***	-0.093***
No. Adults	-0.191**	-0.189**	-0.153***	-0.197**
IE	Q25	Q50	Q75	OLS
Female	-3.976*	-4.674*	-3.235*	-3.241*
Ln(Income)	0.011***	-0.102***	-0.218***	-0.143***
Female x Ln(Income)	0.285***	0.333*	0.209*	0.216*
With child	-0.410*	-0.255*	0.074***	-0.157**
Female with child	0.586*	0.682**	0.421***	0.484*
Single	1.478***	1.846***	1.752***	1.575***
No. Children	0.060***	-0.013***	-0.157***	-0.056***
No. Adults	0.214***	0.128*	-0.049***	0.062**
PL	Q25	Q50	Q75	OLS
Female	-0.212*	-0.325*	-1.305*	-0.243*
Ln(Income)	1.676***	2.017***	2.081***	1.858***
Female x Ln(Income)	0.079***	0.063*	0.128*	0.037*
With child	0.973***	1.035***	0.734**	0.753***
Female with child	-0.231*	-0.167**	0.163***	-0.004*
Single	0.590***	1.255***	2.127***	1.359***
No. Children	-0.164***	-0.238***	-0.331***	-0.259***
No. Adults	-0.324***	-0.280***	-0.185***	-0.244***
PT	Q25	Q50	Q75	OLS
Female	0.017*	-1.375*	-3.328*	-3.152*
Ln(Income)	0.991***	1.011***	0.733*	0.348***
Female x Ln(Income)	-0.034***	0.084*	0.249*	0.241*
With child	0.364***	0.090***	0.339**	0.022***
Female with child	0.140*	0.309**	0.189***	0.342*
Single	1.088***	1.740***	2.062***	1.805***
No. Children	-0.064***	-0.044***	-0.166***	-0.139***
No. Adults	0.136***	0.221***	0.014***	0.096*

Notes: The asterisks mark significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.5.3 Decomposition of the distribution of inflation by source

In order explore further the distribution of inflation rates by gender, we apply a decomposition approach by source adapted from the inequality literature to determine how each source of inflation contributes to overall inflation and to inequality in inflation rates by gender. The results are displayed in Table 8. For each country, we estimate by gender of the household head (i) the contribution of each commodity group to overall inflation, s; (ii) the inequality of inflation by component, as measured by the Gini coefficient g; (iii) the correlation between inequality of inflation by source and inequality in overall inflation, r; (iv) the contribution of inequality of inflation by source to overall inflation inequality, $s * g * r$ and (v) the relative contribution of inequality of inflation by source to overall inflation inequality, $(s * g * r)/G$.

In all countries but Hungary, the largest contributor to inflation is other goods. This is unsurprising as the budget share for this group represents 48-78% of total expenditure (Figure 2). Food and heating and electricity tend to be the next largest contributors across countries although, in Hungary, food inflation is actually the largest contributor to inflation (41-43 ppt). In all countries but Finland, heating and electricity represents a larger share of inflation for female headed households while, without exception, motor fuels inflation represents a larger share of inflation for male-headed households.

In each country, the largest inequality in inflation rates, as estimated by the Gini coefficient, is found for motor fuels. This is likely to be due to the high number of households who have no expenditure on this item and are, therefore, not exposed to motor fuel inflation. Inequality in heating and electricity inflation and other goods inflation is also high across countries. Women are typically faced with similar or higher inequality than men in all inflation sources.

Lastly, looking at the relative contribution of each inflation source to overall inflation inequality, we find some consistent patterns across countries. Other goods inflation explains most of the inequality in inflation for both men and women in most countries. In Finland, Hungary and Portugal, food is the next largest contributor to inequality in inflation while in Poland, Ireland and Germany, heating and electricity provides the next largest contribution to inflation inequality. Inequality in inflation for food, heating and electricity and motor fuels is typically higher for female headed households while inequality in inflation of other goods is higher for male-headed households.

Table 8: Decomposition of the change in expenditure by expenditure source - Men vs. Women

Country	Component change	Men					Women				
		Share (s)	Gini (g)	Correlation (r)	Contribution (s*g*r)	Relative Contribution (s*g*r/G)	Share (s)	Gini (g)	Correlation (r)	Contribution (s*g*r)	Relative Contribution (s*g*r/G)
DE											
	Food	0.215	0.295	0.697	0.044	0.136	0.218	0.303	0.703	0.046	0.141
	Heating/Electricity	0.205	0.459	0.644	0.061	0.186	0.226	0.467	0.664	0.070	0.213
	Motor fuels	0.068	0.465	0.574	0.018	0.056	0.060	0.600	0.642	0.023	0.070
	Other	0.513	0.429	0.919	0.202	0.623	0.496	0.421	0.905	0.189	0.575
	Total	1.000	0.325	1.000	0.325	1.000	1.000	0.329	1.000	0.329	1.000
FI											
	Food	0.240	0.351	0.743	0.063	0.185	0.252	0.350	0.774	0.068	0.198
	Heating/Electricity	0.160	0.463	0.596	0.044	0.131	0.148	0.508	0.560	0.042	0.122
	Motor fuels	0.054	0.639	0.565	0.020	0.058	0.046	0.742	0.692	0.024	0.069
	Other	0.546	0.421	0.923	0.212	0.627	0.554	0.414	0.920	0.211	0.611
	Total	1.000	0.338	1.000	0.338	1.000	1.000	0.345	1.000	0.345	1.000
HU											
	Food	0.406	0.315	0.785	0.100	0.340	0.429	0.321	0.829	0.114	0.364
	Heating/Electricity	0.138	0.381	0.465	0.024	0.083	0.153	0.382	0.507	0.030	0.095
	Motor fuels	0.077	0.660	0.684	0.035	0.117	0.051	0.776	0.742	0.030	0.095
	Other	0.379	0.421	0.854	0.136	0.460	0.366	0.445	0.857	0.140	0.447
	Total	1.000	0.296	1.000	0.296	1.000	1.000	0.313	1.000	0.313	1.000
IE											
	Food	0.157	0.327	0.575	0.030	0.098	0.158	0.342	0.585	0.032	0.102
	Heating/Electricity	0.313	0.349	0.648	0.071	0.234	0.333	0.354	0.622	0.073	0.235
	Motor fuels	0.045	0.537	0.418	0.010	0.033	0.042	0.587	0.502	0.013	0.040
	Other	0.486	0.444	0.892	0.192	0.636	0.467	0.472	0.879	0.194	0.623
	Total	1.000	0.302	1.000	0.302	1.000	1.000	0.311	1.000	0.311	1.000
PL											
	Food	0.297	0.261	0.622	0.048	0.150	0.291	0.300	0.686	0.060	0.171
	Heating/Electricity	0.247	0.576	0.769	0.109	0.340	0.260	0.541	0.755	0.106	0.303
	Motor fuels	0.043	0.583	0.509	0.013	0.040	0.029	0.761	0.657	0.015	0.042
	Other	0.413	0.436	0.838	0.151	0.470	0.420	0.469	0.862	0.170	0.484
	Total	1.000	0.321	1.000	0.321	1.000	1.000	0.350	1.000	0.350	1.000
PT											
	Food	0.278	0.371	0.579	0.060	0.176	0.287	0.404	0.670	0.078	0.215
	Heating/Electricity	0.172	0.387	0.491	0.033	0.097	0.191	0.390	0.534	0.040	0.110
	Motor fuels	0.055	0.492	0.583	0.016	0.047	0.046	0.623	0.677	0.019	0.053
	Other	0.494	0.519	0.898	0.230	0.680	0.476	0.528	0.894	0.225	0.622
	Total	1.000	0.339	1.000	0.339	1.000	1.000	0.362	1.000	0.362	1.000

4.6 The welfare impact of inflation by gender

Finally, we evaluate the changes in welfare due to inflation, focusing on the behaviour-adjusted impacts. Central to our analysis is the recognition that the ramifications of price changes extends beyond the immediate adjustments to economic indices; they influence individual and household behaviours in their consumption patterns. These behavioral adjustments, often overlooked in conventional economic analyses, also affect welfare.

To this end, we employ the social welfare function associated with the Atkinson index, based on the distribution of equivalent incomes, before and after price changes. We estimate a fall in welfare as measured by the equally distributed equivalent income, which captures the trade-off between equity (assessed as 1 - inequality) and efficiency (mean equivalent income).

As shown in Table 9 (last column), these welfare losses vary by country and are highest in Hungary and Poland. The welfare losses are slightly higher for female-led households in Ireland, Poland and Portugal, whereas the opposite holds in Germany, Hungary and Finland.

Table 9: Changes in Welfare, Inequality and Mean Equivalent Income by Population Groups

	Atkinson Index(2)			Mean Ye			Y ede(2)		
Population group	Pre	Post	%change	Pre	Post	%change	Pre	Post	%change
DE									
Men	0.216	0.222	0.027	20261.609	17254.250	-0.148	15879.739	13421.469	-0.155
Women	0.191	0.196	0.023	17672.036	15150.544	-0.143	14293.946	12187.372	-0.147
FI									
Men	0.223	0.228	0.023	23024.430	20513.532	-0.109	17886.194	15830.085	-0.115
Women	0.212	0.218	0.030	20613.795	18428.511	-0.106	16251.618	14411.534	-0.113
HU									
Men	0.222	0.231	0.041	5182.994	3841.830	-0.259	4033.133	2954.711	-0.267
Women	0.205	0.213	0.039	4716.679	3507.481	-0.256	3749.931	2760.405	-0.264
IE									
Men	0.256	0.275	0.076	21068.295	17994.988	-0.146	15683.560	13047.218	-0.168
Women	0.258	0.283	0.095	19973.108	17010.572	-0.148	14810.800	12197.469	-0.176
PL									
Men	0.226	0.229	0.014	5350.775	4181.993	-0.218	4143.900	3225.671	-0.222
Women	0.238	0.242	0.019	5039.449	3929.715	-0.220	3842.281	2978.246	-0.225
PT									
Men	0.288	0.293	0.015	10838.171	9439.331	-0.129	7711.509	6674.038	-0.135
Women	0.307	0.316	0.027	9763.068	8509.657	-0.128	6763.983	5823.986	-0.139

Notes: %change captures the relative change in each indicator (post-pre)/post.

Decomposing these welfare losses into their efficiency and equity components in Figure 10 reveals that their main driver was efficiency losses, i.e. a decrease in mean equivalent income. These efficiency losses are similar for male and female headed households. Equity losses as a result of inflation also played a role however and are larger in Ireland, Hungary and Portugal. The drop in equity displays a larger gender differential across countries than the efficiency component. The drop in equity is larger for women than for men in four of the countries (Finland, Ireland, Poland and Portugal) and substantially so in Ireland and Portugal. This implies that, in these countries, the impact of inflation was more unequally distributed for women than for men.

The SWF assigns the same weight to households with different sizes. To check the robustness of our results to this assumption we also consider a SWF in which the weight of each household is given by its size. These two cases represent the extreme values of a weight range that includes the number of equivalent individuals. As illustrated in the Annex (see Table A–7 and Figure A–2), the welfare results are robust to considering individual or households weights.

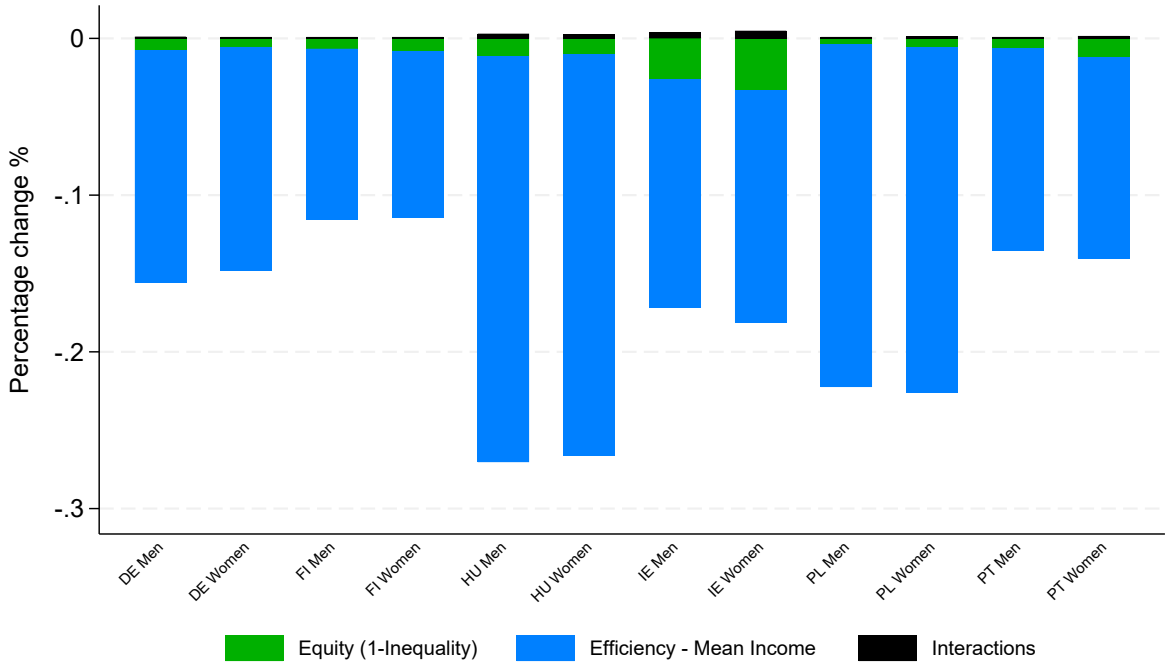


Figure 10: Drivers of welfare change: Equity versus Efficiency

5 Discussion and Conclusion

This research has investigated the gendered nature of consumption comparatively across six European countries and the resulting differential impact of the cost-of-living crisis on male- compared to female-headed households.

In the six EU countries that we study, we find that female-headed households, defined by households in which the highest earner is female, tend be be lower income, older and less-educated than male-headed households. Their consumption profiles are also different as female-headed households tend to devote a higher share of their budget to heating and electricity and a lower share to motor fuels. This is particularly true for lower-income female-headed households.

Different consumption patterns by country and gender have implications for the incidence of inflation by household type and gender. Our descriptive analysis reveals that male-headed households are more affected by motor fuel inflation while female-headed households (particularly those that are single and low-income) are more affected by heating and electricity inflation.

Delving into the distribution of inflation, we find that female-headed households face lower inflation rates in four of the six countries, particularly at the bottom of the inflation distribution. However, this composite finding is composed of higher inflation on heating and electricity and lower inflation on motor fuels and other goods. These effects moderate when we compare higher-income female- and male-headed households.

Decomposing the distribution of inflation by source, we find that female-headed households are typically faced with higher inequality than men in all inflation sources. Extending this analysis to study the welfare effects of inflation, we find that equity losses are higher for female- than for male-headed households in four of the six countries, and substantially so in two (Ireland and Portugal). These finding point to a more unequal distribution of inflation for female- compared to male-headed households.

Our approach to measuring the impact of inflation is novel in a number of ways and may provide alternative lenses through which researchers may wish to tackle this issue. First, we extend the body of work which explores the distributional impact of inflation by adding a gender dimension, thereby advancing the consumption literature with insight into the differential effects of economic crises on diverse societal groups. We examine the distributional effects of sustained high inflation from 2021 to 2023, by exploring the full distribution inflation rates and their sources. Employing quantile regression, we unveil the heterogeneous effects of inflation. Adapting a decomposition approach from the inequality literature, we explore the contributions of the sources of inflation to overall inflation and gender-specific disparities. Second, looking past the immediate financial implications of inflation, we examine its effects on welfare, taking behavioural responses differentiated by gender into account. Third, we employ a novel approach by decomposing these welfare changes into components attributable to equity and efficiency, and do so separately for male- and female-headed households.

These findings have implications for policies such as the income mitigation measures enacted during the cost-of-living crisis in many countries. First, the average effect of inflation on households masks countervailing distributional and compositional components. An understanding of the proportion of expenditure devoted to commodity groups, particularly essentials, for different types of household is crucial for the design of targeted policies. Second, a lower incidence of inflation for a particular group of the population - in this case, female-headed households - should be considered in tandem with a measure of the inequality of inflation. Low inflation incidence coupled with high inequality of this incidence might be best cushioned by very targeted policy. On the other hand, there might be a case for more universal support in the case of high inflation that is equally distributed.

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A Appendix

A.1 Inflation rates by household types

Table A–1: Overall Inflation Rates

Household Types	DE	FI	HU	IE	PL	PT
Single Low Inc M	16.1 (16.0, 16.3)	12.0 (11.7, 12.3)	36.5 (36.0, 37.0)	21.8 (21.3, 22.4)	30.4 (30.0, 30.7)	18.1 (17.7, 18.5)
Single Low Inc F	16.0 (15.9, 16.1)	11.8 (11.5, 12.1)	35.1 (34.9, 35.4)	21.8 (21.3, 22.4)	30.6 (30.4, 30.9)	16.7 (16.5, 17.0)
Single Child Low Inc M	16.9 (16.7, 17.2)	11.7 (11.1, 12.3)	35.5 (34.7, 36.3)	17.9 (17.0, 18.8)	28.2 (27.8, 28.6)	15.6 (15.1, 16.2)
Single Child Low Inc F	16.4 (16.2, 16.6)	11.0 (10.5, 11.6)	34.3 (33.6, 35.0)	18.6 (18.0, 19.2)	28.6 (28.3, 29.0)	15.1 (14.8, 15.5)
Couple Low Inc M	18.6 (18.5, 18.7)	12.8 (12.5, 13.1)	37.2 (36.9, 37.5)	19.0 (18.7, 19.4)	31.0 (30.6, 31.3)	16.2 (16.1, 16.4)
Couple Low Inc F	17.1 (16.9, 17.3)	12.6 (12.1, 13.0)	36.1 (35.7, 36.6)	19.0 (18.5, 19.4)	30.7 (30.3, 31.0)	16.2 (15.9, 16.4)
Couple Child Low Inc M	18.1 (18.0, 18.3)	11.9 (11.5, 12.3)	36.4 (35.9, 36.9)	18.1 (17.6, 18.5)	28.5 (28.3, 28.8)	15.6 (15.4, 15.9)
Couple Child Low Inc F	17.5 (17.2, 17.7)	11.2 (10.4, 12.0)	36.0 (35.4, 36.6)	18.2 (17.6, 18.8)	28.9 (28.5, 29.2)	15.5 (15.2, 15.8)
Other Low Inc M	17.7 (17.5, 17.8)	11.5 (11.0, 11.9)	36.7 (36.3, 37.1)	17.6 (17.2, 18.0)	29.2 (29.0, 29.4)	15.5 (15.4, 15.7)
Other Low Inc F	15.8 (15.6, 16.0)	10.8 (10.2, 11.3)	36.3 (35.7, 36.8)	17.4 (16.9, 17.9)	29.1 (28.8, 29.4)	15.4 (15.2, 15.7)
Single High Inc M	16.3 (16.2, 16.4)	12.3 (11.9, 12.7)	33.9 (33.4, 34.4)	18.5 (17.9, 19.1)	28.8 (28.4, 29.2)	16.2 (15.8, 16.6)
Single High Inc F	15.8 (15.7, 15.9)	11.8 (11.5, 12.1)	32.3 (31.9, 32.7)	17.0 (16.5, 17.5)	28.0 (27.7, 28.3)	14.6 (14.3, 14.9)
Single Child High Inc M	16.4 (16.3, 16.6)	11.6 (11.3, 12.0)	33.0 (32.4, 33.7)	16.0 (15.4, 16.6)	26.6 (26.3, 26.9)	14.4 (14.0, 14.9)
Single Child High Inc F	16.0 (15.9, 16.2)	11.0 (10.4, 11.5)	33.5 (32.7, 34.3)	15.4 (14.7, 16.1)	26.6 (26.2, 26.9)	14.0 (13.6, 14.3)
Couple High Inc M	17.7 (17.6, 17.7)	12.9 (12.8, 13.1)	34.4 (34.2, 34.7)	17.0 (16.7, 17.2)	28.8 (28.6, 29.0)	15.1 (15.0, 15.3)
Couple High Inc F	17.3 (17.2, 17.4)	12.8 (12.6, 13.0)	33.7 (33.3, 34.2)	17.0 (16.6, 17.5)	28.3 (28.0, 28.6)	14.6 (14.3, 14.9)
Couple Child High Inc M	17.8 (17.7, 17.8)	12.6 (12.4, 12.8)	33.7 (33.3, 34.1)	15.3 (14.8, 15.7)	27.4 (27.2, 27.6)	14.8 (14.6, 15.0)
Couple Child High Inc F	17.5 (17.3, 17.7)	12.1 (11.6, 12.5)	34.9 (34.2, 35.6)	14.6 (14.1, 15.1)	27.0 (26.6, 27.4)	14.4 (14.1, 14.7)
Other High Inc M	17.7 (17.6, 17.8)	12.3 (12.1, 12.5)	34.3 (34.1, 34.6)	15.5 (15.3, 15.8)	28.6 (28.4, 28.8)	14.9 (14.7, 15.0)
Other High Inc F	16.3 (16.2, 16.5)	12.1 (11.8, 12.5)	34.2 (33.7, 34.6)	14.5 (14.1, 14.9)	28.2 (27.9, 28.5)	14.6 (14.4, 14.9)

Notes: Confidence intervals are reported in the parentheses.

Table A–2: Heating/Electricity Inflation Rates

Household Types	DE	FI	HU	IE	PL	PT
Single Low Inc M	4.4 (4.3, 4.5)	2.5 (2.2, 2.8)	7.6 (7.2, 8.0)	9.8 (9.2, 10.4)	8.4 (7.9, 8.8)	3.8 (3.6, 4.1)
Single Low Inc F	4.6 (4.6, 4.7)	2.5 (2.3, 2.8)	7.7 (7.4, 7.9)	11.7 (11.1, 12.3)	9.9 (9.6, 10.2)	5.3 (5.0, 5.5)
Single Child Low Inc M	4.0 (3.8, 4.2)	1.5 (1.1, 1.9)	6.8 (6.1, 7.5)	5.8 (5.2, 6.4)	6.6 (6.1, 7.1)	3.1 (2.8, 3.4)
Single Child Low Inc F	4.4 (4.2, 4.5)	1.4 (1.0, 1.9)	5.5 (5.0, 6.0)	6.8 (6.2, 7.3)	7.2 (6.8, 7.6)	3.5 (3.3, 3.7)
Couple Low Inc M	5.1 (5.0, 5.2)	2.9 (2.7, 3.2)	7.7 (7.4, 8.0)	8.0 (7.6, 8.4)	9.8 (9.4, 10.2)	4.5 (4.3, 4.6)
Couple Low Inc F	4.6 (4.5, 4.8)	2.6 (2.3, 2.9)	6.8 (6.5, 7.2)	7.4 (6.9, 7.9)	9.7 (9.3, 10.2)	4.6 (4.4, 4.9)
Couple Child Low Inc M	4.3 (4.2, 4.5)	1.8 (1.6, 2.1)	6.3 (5.9, 6.8)	6.2 (5.8, 6.6)	6.6 (6.3, 6.9)	3.5 (3.3, 3.8)
Couple Child Low Inc F	4.7 (4.4, 5.0)	1.6 (1.1, 2.0)	6.4 (5.9, 6.8)	6.5 (5.9, 7.0)	7.3 (6.8, 7.7)	3.3 (3.1, 3.5)
Other Low Inc M	4.2 (4.1, 4.4)	2.0 (1.7, 2.3)	6.4 (6.1, 6.7)	5.8 (5.5, 6.2)	7.2 (7.0, 7.5)	3.6 (3.4, 3.7)
Other Low Inc F	3.7 (3.5, 3.9)	1.3 (0.9, 1.7)	7.0 (6.5, 7.5)	5.8 (5.3, 6.2)	7.0 (6.7, 7.4)	3.7 (3.5, 3.9)
Single High Inc M	3.6 (3.4, 3.7)	2.3 (1.9, 2.7)	4.5 (4.1, 5.0)	7.0 (6.4, 7.6)	7.1 (6.6, 7.6)	2.5 (2.3, 2.7)
Single High Inc F	3.7 (3.6, 3.8)	1.8 (1.6, 2.0)	5.0 (4.7, 5.3)	6.5 (6.0, 7.0)	7.3 (7.0, 7.7)	2.8 (2.6, 3.0)
Single Child High Inc M	3.0 (2.9, 3.1)	1.4 (1.2, 1.6)	3.5 (3.0, 3.9)	5.0 (4.6, 5.5)	5.0 (4.7, 5.3)	2.2 (1.9, 2.4)
Single Child High Inc F	2.9 (2.8, 3.1)	1.1 (0.8, 1.3)	4.4 (3.7, 5.1)	4.9 (4.4, 5.4)	5.0 (4.6, 5.3)	2.5 (2.2, 2.7)
Couple High Inc M	3.9 (3.8, 3.9)	2.6 (2.4, 2.7)	5.0 (4.7, 5.2)	5.9 (5.6, 6.2)	7.8 (7.6, 8.0)	3.1 (3.0, 3.2)
Couple High Inc F	3.6 (3.5, 3.7)	2.4 (2.2, 2.6)	4.5 (4.2, 4.8)	5.9 (5.4, 6.4)	7.3 (7.0, 7.7)	2.8 (2.6, 3.0)
Couple Child High Inc M	3.5 (3.4, 3.5)	2.0 (1.8, 2.1)	4.0 (3.8, 4.3)	4.8 (4.6, 5.1)	6.0 (5.7, 6.3)	2.6 (2.4, 2.7)
Couple Child High Inc F	3.6 (3.4, 3.8)	1.5 (1.3, 1.8)	4.6 (4.1, 5.1)	4.7 (4.4, 5.0)	5.7 (5.3, 6.1)	2.4 (2.2, 2.5)
Other High Inc M	3.6 (3.5, 3.6)	2.0 (1.9, 2.2)	4.5 (4.3, 4.7)	4.9 (4.7, 5.1)	6.8 (6.6, 7.1)	2.6 (2.5, 2.7)
Other High Inc F	3.3 (3.2, 3.4)	1.5 (1.3, 1.7)	4.9 (4.6, 5.2)	4.5 (4.3, 4.7)	6.7 (6.3, 7.1)	2.9 (2.7, 3.0)

Notes: Confidence intervals are reported in the parentheses.

Table A–3: Food Inflation Rates

Household Types	DE	FI	HU	IE	PL	PT
Single Low Inc M	4.2 (4.1, 4.3)	3.2 (3.0, 3.4)	17.3 (16.6, 17.9)	3.1 (2.9, 3.3)	10.7 (10.5, 10.9)	3.7 (3.4, 3.9)
Single Low Inc F	4.1 (4.1, 4.2)	3.4 (3.3, 3.6)	17.4 (17.1, 17.8)	3.6 (3.4, 3.7)	10.3 (10.2, 10.4)	5.6 (5.4, 5.8)
Single Child Low Inc M	4.7 (4.6, 4.8)	2.8 (2.2, 3.4)	16.1 (15.0, 17.1)	2.9 (2.7, 3.2)	10.0 (9.8, 10.2)	4.7 (4.3, 5.1)
Single Child Low Inc F	4.7 (4.6, 4.8)	3.2 (2.9, 3.4)	15.8 (15.0, 16.6)	3.1 (3.0, 3.3)	10.1 (9.8, 10.3)	4.3 (4.0, 4.5)
Couple Low Inc M	5.1 (5.0, 5.1)	3.9 (3.7, 4.1)	18.4 (18.0, 18.8)	3.7 (3.6, 3.9)	11.5 (11.4, 11.6)	6.3 (6.2, 6.5)
Couple Low Inc F	4.8 (4.7, 4.8)	3.8 (3.6, 4.0)	18.1 (17.5, 18.7)	3.6 (3.4, 3.8)	11.2 (11.0, 11.3)	5.6 (5.4, 5.8)
Couple Child Low Inc M	5.3 (5.3, 5.4)	3.5 (3.2, 3.7)	17.0 (16.3, 17.7)	3.5 (3.3, 3.6)	11.0 (10.8, 11.1)	5.1 (4.9, 5.3)
Couple Child Low Inc F	5.1 (5.0, 5.2)	3.5 (3.0, 3.9)	16.7 (15.9, 17.5)	3.4 (3.2, 3.6)	10.8 (10.6, 11.0)	5.3 (5.1, 5.6)
Other Low Inc M	5.1 (5.0, 5.2)	3.4 (3.1, 3.7)	17.4 (16.8, 17.9)	3.3 (3.2, 3.4)	11.4 (11.3, 11.5)	5.4 (5.2, 5.5)
Other Low Inc F	4.3 (4.2, 4.4)	3.0 (2.6, 3.3)	17.0 (16.3, 17.7)	3.1 (3.0, 3.3)	11.3 (11.1, 11.5)	5.2 (5.0, 5.4)
Single High Inc M	3.0 (2.9, 3.0)	2.4 (2.2, 2.7)	12.4 (11.7, 13.0)	1.9 (1.8, 2.1)	7.1 (6.9, 7.4)	3.2 (2.9, 3.4)
Single High Inc F	3.0 (3.0, 3.1)	2.7 (2.5, 2.9)	13.9 (13.4, 14.3)	2.3 (2.2, 2.5)	7.5 (7.4, 7.7)	4.1 (3.9, 4.3)
Single Child High Inc M	3.5 (3.4, 3.5)	2.9 (2.7, 3.1)	12.9 (12.1, 13.6)	2.2 (2.0, 2.3)	7.6 (7.4, 7.7)	3.6 (3.3, 3.8)
Single Child High Inc F	3.6 (3.5, 3.7)	2.6 (2.3, 2.9)	13.7 (12.7, 14.7)	2.0 (1.9, 2.2)	7.5 (7.2, 7.7)	3.5 (3.2, 3.8)
Couple High Inc M	3.8 (3.8, 3.8)	3.3 (3.2, 3.4)	14.8 (14.4, 15.1)	2.6 (2.5, 2.7)	9.2 (9.1, 9.3)	5.0 (4.8, 5.1)
Couple High Inc F	3.6 (3.6, 3.7)	3.2 (3.1, 3.4)	13.7 (13.2, 14.3)	2.6 (2.5, 2.7)	8.9 (8.8, 9.1)	4.4 (4.2, 4.6)
Couple Child High Inc M	4.3 (4.3, 4.3)	3.1 (3.0, 3.3)	13.2 (12.7, 13.7)	2.7 (2.6, 2.8)	8.2 (8.1, 8.3)	4.4 (4.2, 4.5)
Couple Child High Inc F	4.2 (4.1, 4.3)	3.1 (2.9, 3.3)	15.1 (14.1, 16.0)	2.4 (2.3, 2.5)	7.8 (7.6, 8.1)	4.1 (3.9, 4.3)
Other High Inc M	4.1 (4.1, 4.1)	3.3 (3.1, 3.4)	13.5 (13.1, 13.8)	2.6 (2.5, 2.6)	8.7 (8.7, 8.8)	4.4 (4.3, 4.5)
Other High Inc F	3.5 (3.4, 3.5)	3.1 (2.9, 3.4)	13.7 (13.1, 14.2)	2.4 (2.3, 2.5)	8.3 (8.1, 8.4)	4.5 (4.3, 4.7)

Notes: Confidence intervals are reported in the parentheses.

Table A–4: Motorfuels Inflation Rates

Household Types	DE	FI	HU	IE	PL	PT
Single Low Inc M	0.8 (0.8, 0.9)	0.6 (0.5, 0.7)	0.8 (0.7, 1.0)	0.7 (0.6, 0.7)	0.6 (0.5, 0.6)	0.5 (0.5, 0.6)
Single Low Inc F	0.6 (0.6, 0.6)	0.3 (0.2, 0.3)	0.3 (0.3, 0.4)	0.4 (0.3, 0.4)	0.1 (0.1, 0.1)	0.1 (0.1, 0.1)
Single Child Low Inc M	1.4 (1.3, 1.5)	0.7 (0.4, 0.9)	1.6 (1.1, 2.0)	0.6 (0.5, 0.8)	1.0 (1.0, 1.1)	1.0 (0.9, 1.1)
Single Child Low Inc F	1.0 (1.0, 1.1)	0.3 (0.2, 0.4)	0.9 (0.6, 1.2)	0.6 (0.5, 0.7)	0.5 (0.4, 0.6)	0.6 (0.6, 0.7)
Couple Low Inc M	1.1 (1.1, 1.1)	0.6 (0.5, 0.6)	1.4 (1.3, 1.6)	0.8 (0.7, 0.8)	0.8 (0.8, 0.9)	0.6 (0.6, 0.7)
Couple Low Inc F	1.0 (1.0, 1.1)	0.5 (0.4, 0.6)	1.2 (1.1, 1.4)	0.7 (0.6, 0.7)	0.6 (0.5, 0.6)	0.6 (0.5, 0.6)
Couple Child Low Inc M	1.6 (1.5, 1.6)	0.8 (0.6, 0.9)	2.2 (1.9, 2.5)	0.8 (0.7, 0.9)	1.1 (1.1, 1.2)	0.9 (0.8, 0.9)
Couple Child Low Inc F	1.1 (1.1, 1.2)	0.5 (0.3, 0.7)	1.9 (1.6, 2.3)	0.6 (0.5, 0.7)	0.8 (0.7, 0.8)	0.8 (0.8, 0.9)
Other Low Inc M	1.4 (1.3, 1.4)	0.5 (0.4, 0.6)	1.9 (1.7, 2.1)	0.8 (0.8, 0.9)	1.1 (1.1, 1.2)	0.9 (0.9, 1.0)
Other Low Inc F	1.0 (1.0, 1.1)	0.4 (0.3, 0.6)	1.5 (1.2, 1.7)	0.8 (0.7, 0.8)	0.8 (0.8, 0.9)	0.9 (0.8, 0.9)
Single High Inc M	1.3 (1.3, 1.3)	0.6 (0.5, 0.7)	2.3 (1.9, 2.6)	0.8 (0.7, 0.9)	1.3 (1.2, 1.4)	0.8 (0.7, 0.9)
Single High Inc F	0.9 (0.9, 1.0)	0.4 (0.4, 0.5)	1.1 (0.9, 1.3)	0.6 (0.5, 0.7)	0.6 (0.5, 0.6)	0.4 (0.3, 0.4)
Single Child High Inc M	1.4 (1.4, 1.5)	0.6 (0.5, 0.7)	2.6 (2.1, 3.0)	0.7 (0.6, 0.8)	1.4 (1.3, 1.4)	0.9 (0.9, 1.0)
Single Child High Inc F	1.2 (1.2, 1.3)	0.5 (0.3, 0.7)	1.9 (1.3, 2.4)	0.6 (0.5, 0.7)	1.2 (1.1, 1.3)	0.9 (0.8, 1.0)
Couple High Inc M	1.2 (1.2, 1.2)	0.7 (0.7, 0.8)	2.6 (2.4, 2.7)	0.7 (0.7, 0.8)	1.2 (1.2, 1.2)	0.8 (0.8, 0.8)
Couple High Inc F	1.4 (1.3, 1.4)	0.8 (0.7, 0.8)	2.3 (2.1, 2.5)	0.8 (0.8, 0.9)	1.0 (1.0, 1.1)	0.7 (0.7, 0.8)
Couple Child High Inc M	1.4 (1.4, 1.4)	0.8 (0.7, 0.9)	3.1 (2.9, 3.4)	0.7 (0.7, 0.8)	1.3 (1.3, 1.4)	1.0 (0.9, 1.0)
Couple Child High Inc F	1.4 (1.3, 1.5)	0.8 (0.7, 1.0)	2.6 (2.2, 3.0)	0.8 (0.7, 0.9)	1.2 (1.1, 1.2)	1.0 (0.9, 1.0)
Other High Inc M	1.5 (1.4, 1.5)	0.6 (0.5, 0.7)	3.2 (3.0, 3.3)	0.8 (0.8, 0.8)	1.4 (1.3, 1.4)	1.0 (1.0, 1.0)
Other High Inc F	1.4 (1.3, 1.4)	0.8 (0.7, 1.0)	2.5 (2.3, 2.7)	0.8 (0.7, 0.8)	1.3 (1.2, 1.3)	0.9 (0.9, 1.0)

Notes: Confidence intervals are reported in the parentheses.

Table A–5: Other Goods and Services Inflation Rates

Household Types	DE	FI	HU	IE	PL	PT
Single Low Inc M	6.7 (6.6, 6.8)	5.7 (5.5, 5.9)	10.8 (10.3, 11.2)	8.3 (7.9, 8.6)	10.7 (10.5, 10.9)	10.0 (9.5, 10.6)
Single Low Inc F	6.6 (6.5, 6.6)	5.6 (5.4, 5.7)	9.7 (9.5, 9.9)	6.2 (5.9, 6.4)	10.3 (10.2, 10.5)	5.7 (5.5, 6.0)
Single Child Low Inc M	6.8 (6.7, 7.0)	6.6 (6.1, 7.2)	11.0 (10.4, 11.7)	8.5 (7.8, 9.3)	10.5 (10.2, 10.7)	6.8 (6.2, 7.4)
Single Child Low Inc F	6.3 (6.3, 6.4)	6.2 (5.9, 6.4)	12.1 (11.5, 12.7)	8.1 (7.8, 8.5)	10.9 (10.6, 11.1)	6.7 (6.3, 7.1)
Couple Low Inc M	7.3 (7.2, 7.3)	5.4 (5.3, 5.6)	9.7 (9.4, 9.9)	6.5 (6.3, 6.8)	8.8 (8.7, 8.9)	4.8 (4.6, 5.0)
Couple Low Inc F	6.7 (6.6, 6.8)	5.6 (5.4, 5.8)	9.9 (9.6, 10.3)	7.3 (6.9, 7.6)	9.2 (9.0, 9.3)	5.4 (5.1, 5.6)
Couple Child Low Inc M	6.9 (6.8, 7.0)	5.8 (5.5, 6.1)	10.9 (10.4, 11.3)	7.6 (7.3, 7.9)	9.8 (9.7, 10.0)	6.1 (5.9, 6.4)
Couple Child Low Inc F	6.5 (6.4, 6.7)	5.7 (5.2, 6.1)	11.0 (10.5, 11.5)	7.8 (7.4, 8.2)	10.0 (9.8, 10.2)	6.1 (5.7, 6.4)
Other Low Inc M	7.0 (6.9, 7.1)	5.6 (5.3, 5.8)	11.0 (10.7, 11.4)	7.6 (7.4, 7.9)	9.4 (9.3, 9.5)	5.7 (5.5, 5.9)
Other Low Inc F	6.8 (6.6, 6.9)	6.1 (5.7, 6.5)	10.8 (10.3, 11.3)	7.7 (7.4, 8.1)	9.9 (9.8, 10.1)	5.7 (5.4, 6.0)
Single High Inc M	8.5 (8.5, 8.6)	6.9 (6.7, 7.2)	14.8 (14.1, 15.4)	8.8 (8.4, 9.3)	13.2 (12.9, 13.5)	9.7 (9.2, 10.1)
Single High Inc F	8.2 (8.1, 8.2)	6.9 (6.7, 7.1)	12.4 (12.0, 12.8)	7.5 (7.1, 7.9)	12.6 (12.3, 12.8)	7.3 (7.0, 7.6)
Single Child High Inc M	8.5 (8.4, 8.6)	6.7 (6.4, 7.0)	14.2 (13.4, 14.9)	8.1 (7.6, 8.5)	12.7 (12.4, 12.9)	7.8 (7.3, 8.3)
Single Child High Inc F	8.3 (8.2, 8.4)	6.8 (6.2, 7.3)	13.5 (12.7, 14.4)	7.9 (7.3, 8.5)	12.9 (12.6, 13.2)	7.1 (6.7, 7.5)
Couple High Inc M	8.8 (8.8, 8.9)	6.4 (6.3, 6.5)	12.1 (11.9, 12.4)	7.7 (7.5, 8.0)	10.7 (10.6, 10.8)	6.3 (6.1, 6.5)
Couple High Inc F	8.7 (8.6, 8.7)	6.4 (6.2, 6.5)	13.2 (12.8, 13.7)	7.7 (7.4, 8.0)	11.0 (10.8, 11.2)	6.7 (6.4, 7.0)
Couple Child High Inc M	8.6 (8.5, 8.7)	6.7 (6.5, 6.8)	13.4 (13.0, 13.8)	7.0 (6.7, 7.4)	11.9 (11.7, 12.0)	6.9 (6.7, 7.2)
Couple Child High Inc F	8.4 (8.2, 8.5)	6.6 (6.3, 6.9)	12.6 (11.9, 13.3)	6.7 (6.3, 7.1)	12.3 (12.0, 12.6)	6.9 (6.6, 7.2)
Other High Inc M	8.6 (8.5, 8.6)	6.4 (6.2, 6.6)	13.2 (12.9, 13.4)	7.3 (7.1, 7.5)	11.7 (11.6, 11.8)	6.8 (6.7, 7.0)
Other High Inc F	8.2 (8.1, 8.3)	6.6 (6.4, 6.9)	13.1 (12.7, 13.5)	6.8 (6.5, 7.1)	12.0 (11.8, 12.2)	6.3 (6.1, 6.5)

Notes: Confidence intervals are reported in the parentheses.

Heating and Electricity Inflation

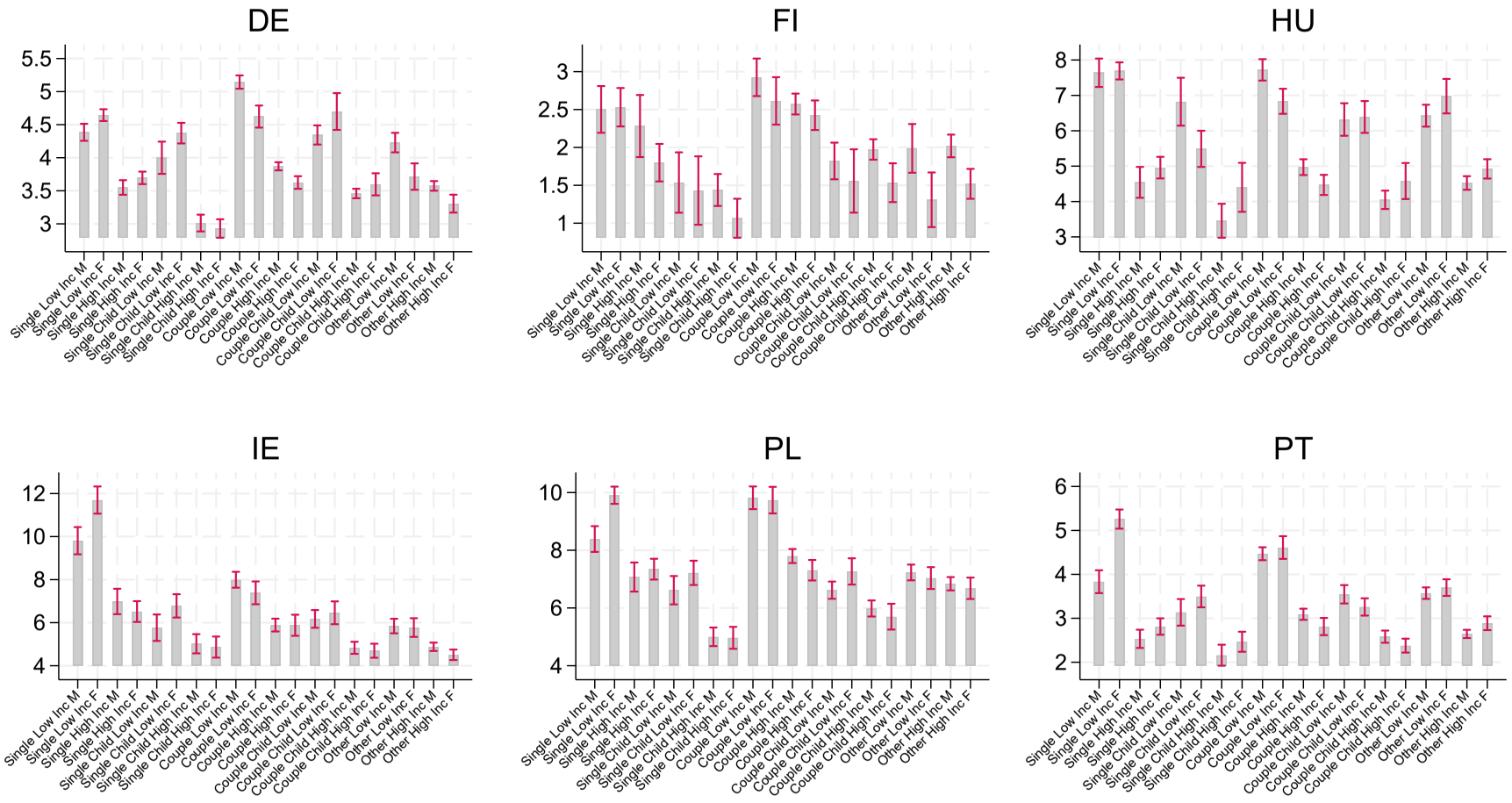

Figure A–1

A.2 Budget and Price Elasticities

Table A–6: Budget and Price Elasticities

Expenditure Category	DE		FI		HU		IE		PL		PT	
	Budget	Price	Budget	Price	Budget	Price	Budget	Price	Budget	Price	Budget	Price
						Men						
Food and Non-alcoholic beverages	0.353	-0.278	0.415	-0.334	0.766	-0.554	0.441	-0.342	0.447	-0.344	0.606	-0.443
Alcoholic Beverages	0.440	-0.305	0.615	-0.439	0.454	-0.271	0.509	-0.349	0.625	-0.371	0.464	-0.290
Tobacco	0.354	-0.245	0.249	-0.177	0.624	-0.374	0.685	-0.467	0.646	-0.384	0.297	-0.186
Clothing and Footwear	0.975	-0.686	1.113	-0.792	1.106	-0.666	1.101	-0.759	1.168	-0.705	1.127	-0.713
Home fuels	0.213	-0.150	0.110	-0.078	0.457	-0.297	0.367	-0.256	1.039	-0.639	0.636	-0.407
Electricity	0.514	-0.369	0.099	-0.073	0.515	-0.318	0.069	-0.048	0.261	-0.162	0.205	-0.135
Rents	0.649	-0.480	0.391	-0.298	1.369	-0.810	0.789	-0.561	1.182	-0.697	0.712	-0.453
Household services	0.634	-0.456	0.774	-0.575	0.843	-0.532	1.066	-0.733	0.848	-0.539	1.101	-0.706
Health	1.574	-1.074	0.711	-0.515	0.884	-0.540	1.173	-0.799	0.986	-0.600	0.751	-0.492
Private transport	1.015	-0.701	1.748	-1.211	0.960	-0.571	1.302	-0.882	1.185	-0.701	1.218	-0.765
Public Transport	0.927	-0.641	1.119	-0.795	0.576	-0.344	0.500	-0.342	0.814	-0.483	0.437	-0.275
Information & Communication	0.514	-0.364	0.289	-0.210	0.709	-0.446	0.303	-0.215	0.371	-0.233	0.269	-0.175
Recreation and culture	0.865	-0.618	0.971	-0.700	1.178	-0.707	1.090	-0.756	1.086	-0.652	1.017	-0.644
Education	0.725	-0.501	0.526	-0.371	0.977	-0.578	1.661	-1.116	0.958	-0.566	0.937	-0.591
Restaurants and hotels	1.329	-0.921	1.396	-0.985	1.184	-0.715	1.094	-0.765	1.104	-0.671	1.230	-0.796
Other goods and services	0.793	-0.570	0.687	-0.527	1.174	-0.716	0.802	-0.581	1.323	-0.791	0.885	-0.578
Chilcare costs	1.618	-1.108	0.648	-0.460	0.000	0.000	1.143	-0.776	1.237	-0.731	0.806	-0.502
Motor fuels	0.429	-0.308	0.405	-0.295	1.019	-0.624	0.405	-0.289	0.599	-0.370	0.568	-0.380
Durables	1.800	-1.168	1.800	-1.195	1.740	-1.020	1.736	-1.134	1.800	-1.048	1.800	-1.099
						Women						
Food and Non-alcoholic beverages	0.414	-0.324	0.468	-0.374	0.781	-0.563	0.357	-0.280	0.466	-0.358	0.547	-0.403
Alcoholic Beverages	0.815	-0.563	0.825	-0.587	0.571	-0.340	0.688	-0.470	0.808	-0.479	0.578	-0.361
Tobacco	0.372	-0.257	0.285	-0.202	0.641	-0.384	0.776	-0.528	0.682	-0.405	0.313	-0.197
Clothing and Footwear	0.869	-0.615	1.065	-0.759	1.031	-0.623	1.078	-0.744	1.164	-0.703	1.142	-0.721
Home fuels	0.202	-0.142	0.126	-0.090	0.470	-0.305	0.186	-0.131	0.960	-0.594	0.606	-0.388
Electricity	0.534	-0.383	0.021	-0.016	0.496	-0.307	0.141	-0.099	0.276	-0.172	0.231	-0.152
Rents	0.599	-0.444	0.463	-0.352	1.394	-0.825	0.846	-0.598	1.171	-0.691	0.739	-0.470
Household services	0.617	-0.444	0.298	-0.230	0.843	-0.532	1.063	-0.730	0.831	-0.528	1.107	-0.709
Health	1.547	-1.056	0.784	-0.566	0.896	-0.547	1.235	-0.840	0.885	-0.542	0.653	-0.431
Private transport	1.068	-0.737	1.666	-1.159	0.952	-0.566	1.385	-0.937	1.199	-0.709	1.226	-0.770
Public Transport	0.886	-0.613	1.087	-0.773	0.542	-0.324	0.527	-0.360	0.885	-0.524	0.457	-0.288
Information & Communication	0.551	-0.389	0.316	-0.229	0.634	-0.400	0.225	-0.161	0.386	-0.242	0.276	-0.180
Recreation and culture	0.824	-0.591	1.083	-0.777	1.129	-0.678	1.135	-0.785	1.030	-0.620	1.005	-0.637
Education	0.749	-0.517	0.508	-0.358	0.977	-0.577	1.717	-1.152	0.964	-0.569	0.958	-0.604
Restaurants and hotels	1.342	-0.929	1.378	-0.974	1.190	-0.718	1.223	-0.845	1.118	-0.679	1.280	-0.823
Other goods and services	0.756	-0.545	0.693	-0.531	1.182	-0.720	0.763	-0.555	1.303	-0.780	0.996	-0.645
Chilcare costs	1.746	-1.194	0.600	-0.426	0.000	0.000	1.191	-0.808	1.255	-0.741	0.700	-0.436
Motor fuels	0.532	-0.381	0.450	-0.328	0.986	-0.605	0.511	-0.363	0.615	-0.380	0.587	-0.392
Durables	1.800	-1.168	1.797	-1.194	1.800	-1.052	1.664	-1.097	1.800	-1.048	1.800	-1.099

A.2.1 Welfare analysis with weights based on household size

The SWF discussed in Section 4.6 assigns the same weight to households with different sizes. To check the robustness of our results to this assumption we also consider a SWF in which the weight of each household is given by its size. These two cases represent the extreme values of a weight range that includes the number of equivalent individuals.

As illustrated in Table A–7 and Figure A–2, the welfare results are robust to considering individual or households weights.

Table A–7: Changes in Welfare, Inequality and Mean Equvalent Income by Population Groups

	Atkinson Index(2)			Mean Ye			Y ede(2)		
Population group	Pre	Post	%change	Pre	Post	%change	Pre	Post	%change
DE									
Men	0.202	0.208	0.031	20461.594	17397.888	-0.150	16335.573	13779.747	-0.156
Women	0.191	0.196	0.023	18015.814	15418.144	-0.144	14566.816	12398.441	-0.149
FI									
Men	0.202	0.207	0.024	23899.596	21274.763	-0.110	19073.634	16874.252	-0.115
Women	0.203	0.208	0.026	21844.906	19520.210	-0.106	17412.920	15456.140	-0.112
HU									
Men	0.210	0.219	0.039	5127.531	3798.614	-0.259	4048.676	2967.922	-0.267
Women	0.223	0.231	0.036	4807.864	3570.753	-0.257	3735.677	2745.970	-0.265
IE									
Men	0.226	0.241	0.067	21568.076	18489.355	-0.143	16698.670	14033.826	-0.160
Women	0.232	0.252	0.085	20893.591	17901.897	-0.143	16041.121	13392.463	-0.165
PL									
Men	0.214	0.217	0.012	5265.400	4115.958	-0.218	4138.023	3224.312	-0.221
Women	0.239	0.243	0.017	5096.066	3980.281	-0.219	3879.920	3013.824	-0.223
PT									
Men	0.277	0.281	0.015	10945.053	9540.258	-0.128	7915.920	6860.129	-0.133
Women	0.290	0.297	0.024	10143.320	8849.043	-0.128	7198.416	6217.235	-0.136

Notes: %change captures the relative change in each indicator (post-pre)/post.

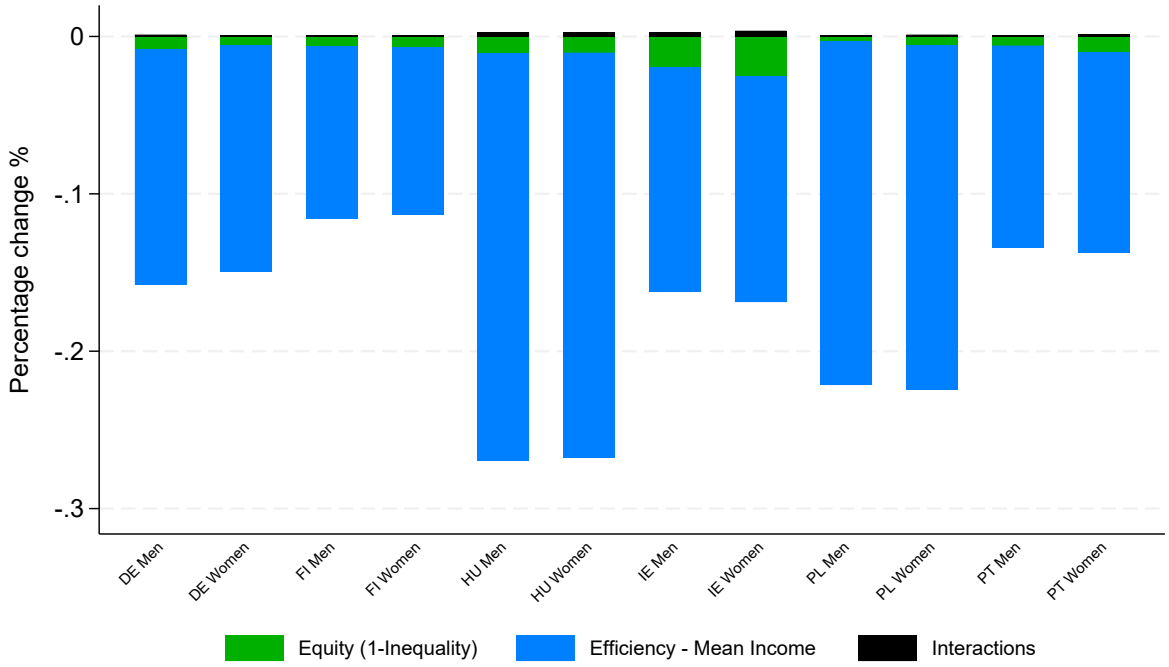

Figure A–2: Drivers of welfare change: Equity versus Efficiency