Inflation and Its Impact on Different Social Groups: The Case of the Czech Republic

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Abstract

This study aims to evaluate the impact of inflation on various social groups in the Czech Republic, with a focus on the contribution of rising energy prices. The paper analyzes data from the Czech Household Budget Survey and Consumer Price Index to create consumer price indices for different population subgroups. The findings indicate that low-income and single-parent households are particularly affected by inflation in housing, water, electricity, gas, and other fuels. Specifically, inflation due to increases in these costs represents a higher percentage of the overall inflation burden for single-parent and low-income households than for high-income and two-parent households. Single-parent households are particularly vulnerable unless the government provides support to mitigate the adverse effects of rising prices. The second part of the study examines Czech energy inflation in more detail using data from the Czech Statistical Office, Eurostat, and OECD. The analysis shows that the average Czech household suffered a significant loss due to energy inflation, which constitutes a percentage of the annual household net income. Moreover, the Czech Republic is the 4th most affected country in Europe. The paper identifies pensioners, poorest families, single parents, and households from the smallest municipalities as the most vulnerable socio-economic groups. Accordingly, the government should focus its support primarily on these groups in order to be the most effective.

Introduction

The first part of the paper aims to create contemporary consumer price indices (CPIs) for vulnerable (in terms of income and family composition) population groups in the Czech Republic. It is well known that households with differing incomes and family compositions differ in terms of the allocation of consumption expenditure between various commodities. For example, low-income households in the Czech Republic spend higher shares of their expenditure on housing and food than do high-income households. Hence, when housing or food prices rise, households that spend a relatively larger share of their expenditure on housing and food will be hit harder in terms of the increase in their living costs. Therefore, such differences in the share of expenditures between various population subgroups have the potential to result in inflation inequality. The measurement of the inflation experiences of vulnerable population groups assists in forming an understanding of whether the benefits provided by the Czech government are sufficient to mitigate the consequences of both the COVID-19 epidemic and, more recently, Russian-Ukrainian war-related inflation faced by vulnerable populations. A deeper analysis of group-specific inflation rates will also help policymakers better identify the most affected population groups and design and implement more efficient policies.

We employed data from the Household Budget Survey (HBS), which provides information on the share of expenditures of 12 broad product categories. It also includes information on a range of household characteristics, including income, education level, marital status, and number of children, which we used to measure the shares of expenditure of various product categories for the selected population subgroups. Unfortunately, HBS data provide information only on the annual average expenditure shares of specific product categories and not on the prices of the products considered. Therefore, we combined HBS data with detailed Consumer Price Index (CPI) data to track changes in the prices of the various product categories and calculate the inflation levels for each of the targeted population subgroups.

Based on the results of the first part, the second part of the study decomposes inflationary pressures by separating the impact of energy inflation. To evaluate the impact of inflation on Czech households, a contemporary dataset for the Czech Republic was constructed from several sources covering the period 2017-2023, with the latest data from March 2023. More specifically, the data includes disaggregated household spending and income for different socio-economic groups, as well as price levels of various sources of energy (i.e., electricity, gas, solid fuel, liquid fuel, heat, and automobile fuel). The data were collected from several

sources, including Eurostat, ONS, OECD, Czech Statistical Office, and Czech Household Budget Survey.

The proposed paper is predominantly based on previous studies by Aduts et al. (2022) and Mandys (2022).

2. Literature Review

2.1 Empirical Evidence of Inflation Inequality

The notion that different population subgroups experience different levels of inflation is not new. Amble and Stewart (1994) investigated whether the CPI differs for elderly people in the US, and found that the consumer price index was higher for elderly Americans than for other subgroups from 1987 to 1993. They attributed this difference to the fact that elderly people usually spend higher amounts on healthcare. Similarly, Hobijn and Lagakos (2003, 2005) investigated inflation inequality across households in the US between 1987 and 2001. They determined that elderly people experienced 0.38 percentage points higher inflation than the general population did. They also found that low-income households were particularly sensitive to changes in gasoline prices. In addition, the authors found that households with young children experienced lower inflation than other household types. According to Hobijn and Lagakos (2003, 2005), this finding is driven by lower average healthcare and education costs.

McGranahan and Paulson (2005) used Consumer Expenditure Survey data from 1982 to 2004 combined with item-specific Consumer Price Index data to construct monthly inflation measures for various demographic groups in the US. In line with the evidence provided by previous studies, they discovered that the elderly experienced higher inflation than the average population. They also found that the variability of inflation is lower for educated populations and higher for poor and uneducated populations. Garner et al. (1996) investigated whether inflation differs across households from different income groups. They find that during 1984–1994, there was no significant difference in inflation rates between the poor and the general population in the US. Crawford and Smith (2002) found that during 1976–2000, the poorest decile of the UK population experienced 0.3 percentage points lower inflation than the highest income decile. In contrast, Kaplan et al. (2017) used scanner data to estimate inflation across various types of households. They found that low-income households experience higher inflation than the general population in the US. However, the difference stems from the

variability in household-level prices relative to average prices rather than from the variability in aggregate inflation.

Argente and Lee (2021) constructed income-specific price indices for the period 2004 to 2016 in the US. They found that the lowest quartile of the income distribution range experienced a significantly higher annual inflation rate than did the highest quartile; moreover, the gap in inflation rates observed for these two income groups widened during the Great Recession period. The authors also found that product quality substitution and changes in shopping behavior explained almost half of the observed gap in inflation. Similarly, using scanner data from the US retail sector, Jaravel (2019) found that for the bottom income quintile, the retail product annual inflation was 0.66 percentage points higher than for the top income quintile. The author further determined that product innovations led to inflation inequality in the United States from 2004 to 2015.

In the context of the current surge in inflation, Claeys and Guetta-Jeanrenaud (2022) found that low-income households suffer from price increases to a disproportionate degree. Employing Household Budget Survey data from Belgium, Italy, and France, the authors concluded that the inflation rates faced by low-income individuals were 1.4, 1.7, and 0.3 pp. higher in December 2021 than those faced by high-income individuals.

2.2 Cross-Country Comparisons of Inflation Mitigation Policies

This section of the paper provides a review of the various measures introduced by the governments of EU member states, the UK, and Norway aimed at protecting their populations from the effects of the recent acceleration in inflation rates. EU countries have implemented a range of measures aimed at tackling the increase in food and energy prices, with expenditures on these policies amounting to almost €180bn over the period September 2021 to May 2022 (Březovská et al., 2022).

According to the classification proposed by Sgaravatti, Tagliapietra, and Zachmann (2022), seven main national policies can be identified targeted at protecting the population and businesses from price increases. They include transfers to vulnerable groups, reduced energy tax/VAT rates, retail price regulation, wholesale price regulation, mandates to state-owned firms, windfall profit tax/regulation, and support for businesses. Bethuyne et al. (2022) categorized inflation mitigation measures into two broad types of policies – price and income policies. Price policies aim to decrease the final energy price for households and/or firms, and include measures such as reductions in indirect taxation and levies, subsidies, direct price

regulation, and social tariffs. Income policies include transfers to vulnerable population subgroups, typically in the form of cash or energy vouchers. Other measures include support for firms operating in energy-intensive industries and windfall profit taxes. Table 1 presents a list of policies aimed at mitigating the effects of inflation together with the EU countries (supplemented by the UK and Norway) that have implemented or proposed the introduction of the respective policies.

Transfers to vulnerable groups are the most common measures introduced in EU countries to date[1]. The majority of EU member states began to introduce such transfers in the autumn of 2021, and supplemented them with support for firms following the Russian invasion of Ukraine. For instance, on September 15, 2021, the French government introduced a one-off €100 payment to 5.8 million households that had already received energy vouchers. A month later, the measure was extended to include households that earn less than €2,000 per month netto (around 38 million people). Similarly, in January 2022, the German government introduced targeted measures aimed at helping vulnerable households cover their heating bill. Furthermore, low-income households are entitled to receive one-off grants over the summer to help with the payment of energy bills (Sgaravatti, Tagliapietra, and Zachmann, 2021). Other transfers include an increased commuter allowance (a €135 lump-sum payment for students and vulnerable citizens), increased payments for the children of poor families (an extra €20/month per child), and a €100 subsidy for unemployed persons (Březovská et al., 2022).

The regulation of retail and wholesale prices, introduced in seven and three EU member states, respectively, was less popular than income policies at the time. Belgium, Spain, and Portugal have proposed the introduction of a price cap for gas. Concerning Spain and Portugal, which are considered "energy islands" due to their low level of energy interconnection with Northern Europe, the European Commission agreed to a gas price cap at a fixed amount of €50/MWh for 12 months. As a result, the price of gas will be halved for 40 percent of Spanish and Portuguese consumers (Tidey, 2022). Additionally, certain countries (for example, Spain, Estonia, Greece and Norway) announced a subsidy for the electricity consumption of various groups of households. Many European countries (except Bulgaria, Denmark, Greece, Lithuania, and Luxembourg) introduced a reduction in energy taxation aimed at decreasing the costs incurred by companies and increasing the disposable income of households. For instance, the French government significantly reduced the tax on electricity (from 22.50 EUR per

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[1] However, in terms of the budgetary costs of the various inflation mitigation policies, the governments of EU member states have spent more, on average, on price policies than on income policies (Bethuyne et al., 2022).

megawatt hour to 1 EUR for households and 50 cents for businesses) from February 2022 to January 2023. However, it has been suggested that reducing energy taxes may act to decrease the level of motivation of households and companies to reduce their electricity and fuel consumption (Arnold, 2022), while putting extra pressure on national budgets that are already severely strained by the COVID-19 pandemic (Amaglobeli et al., 2022).

Both income and price policies have advantages and disadvantages. Compared to income policies, price policies may act to disincentivize consumers by increasing their energy efficiency or replacing traditional energy sources with alternative approaches. In addition, income policies can be more easily targeted to the needs of the most vulnerable households. However, it has been suggested that the implementation of targeted income policies is more difficult than price policies (Bethuyne et al., 2022). Using E-QUEST, a sector-disaggregated version of the Commission's QUEST model, Bethuyne et al. (2022) estimated the social and environmental impacts of price, targeted and non-targeted income policies. Their findings indicate that while all three types of policies are effective in mitigating inflation costs, income policy measures (targeted transfers) are preferable because of their significantly lower impact on greenhouse gas emissions than fuel tax cuts. In addition, the authors determined that tax reductions on fossil energy induce higher emissions from the burning of fossil fuels. Moreover, they also act to increase reliance on fossil fuels and encourage the consumption of fossil fuel-intensive durable goods. Consequently, tax reductions may result in an increase in the EU's reliance on fossil fuel imports, thus rendering the achievement of the climate targets of the European Green Deal significantly less feasible (Bethuyne et al., 2022).

3. Data and Methodology

Following McGranahan and Paulson (2005), we calculated the monthly consumer price indices (CPI) for each of the target population subgroups based on the shares of expenditure on various product categories, as reported by the Czech Household Budget Survey. We apply the following equation to measure inflation in month t for population subgroup k:

$$\pi_{t,k} = \sum_{j=1}^{m} W_{j,t-12,k}\pi_{j,t} \tag{1}$$

where j represents a specific product category, m signifies the various product categories, $\pi_{j,t}$ is the year-on-year inflation rate for item j and $W_{j,t-12,k}$ is the share of expenditure of item j for members of group k twelve months previously. Specifically,

$$W_{j,t-12,k} = \frac{X_{j,t-12,k}}{\sum_{j=1}^{m} X_{j,t-12,k}} \qquad (2)$$

where $X_{j,t-12,k}$ is the expenditure on the product category j by the population group k one year prior to time t. The expenditure weighting of each product category $W_{j,t-12,k}$ is readily available from the Czech Household Budget Survey for the years 2017 to 2021. The HBS is a nationally representative household survey that covers all regions of the Czech Republic. Unfortunately, the shares of expenditures published in the public-use HBS data are updated only yearly; therefore, we assumed that the product category shares remained constant over a given year. Figure 1 provides summary statistics on the shares of expenditure with respect to 12 broad product categories for the overall population.

Figure 1: Overall Shares of Expenditure
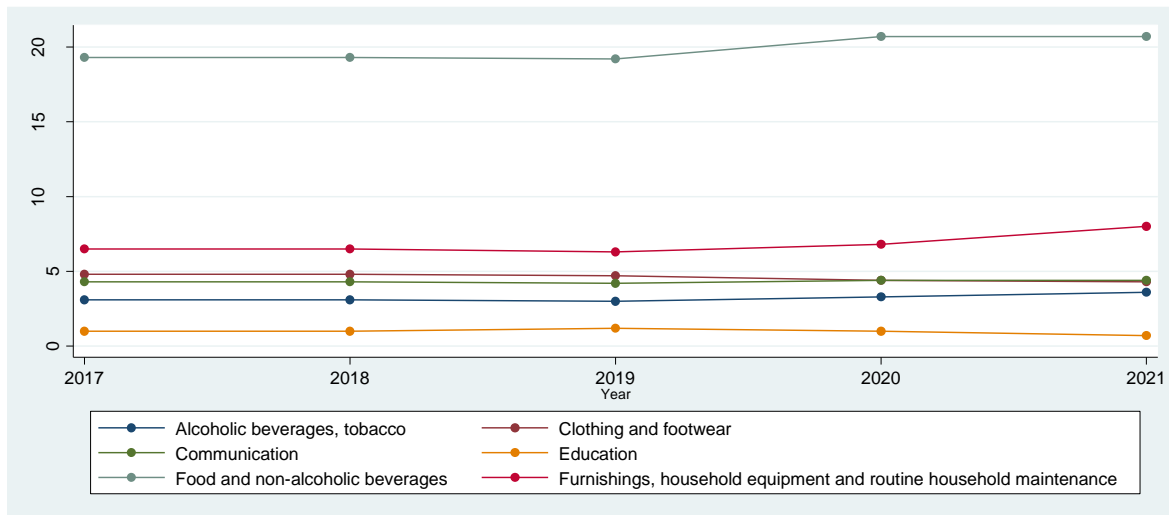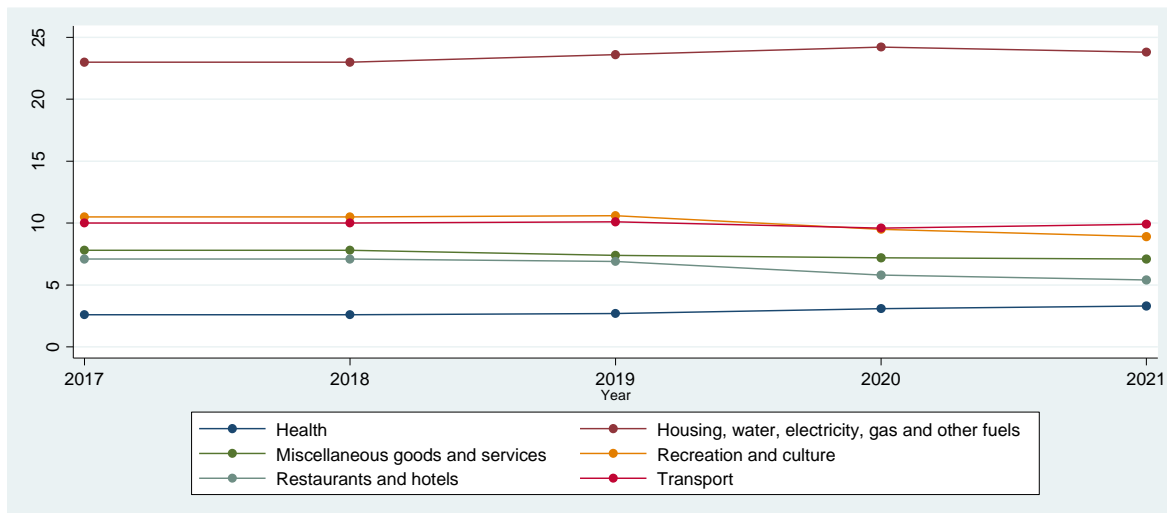
Source: Own calculation based on the Czech Statistical Office.

Overall, the shares of expenditure remained relatively stable over time. From 2019 onwards, an increase is evident in the shares of expenditure on food, non-alcoholic beverages, housing, water, electricity, gas, and other fuels. In contrast, the shares of expenditure on restaurants, hotels, recreation and culture decreased. These changes in shares of expenditure were most likely driven by the temporary change in lifestyle caused by the COVID-19 pandemic and restrictions on movement between countries. We derived the CPIs for various product categories from Consumer Price Index data provided by the Czech Statistical Office (CZSO). We then matched the inflation rates and expenditure categories based on the 12 product category labels provided by CPI.

We employed the Household Budget Survey (HBS), which provides information on household characteristics including income, family type and the number of children, to measure the shares of expenditure on the various product categories for ten population subgroups that were defined on the basis of income quantiles, the number of children (households with children, households with one child and households with two children), and family types (single parent and nuclear families). It is important to note that for the purposes of our study, we assumed[2] that each population subgroup faced the same prices as all the other population subgroups for each product category. Admittedly, this is a restrictive assumption since it is likely that each of the broad product categories were characterized by significant price heterogeneity.

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[2] Similar assumptions are made by most previous studies that constructed group-specific inflation rates (see, for example, McGranahan and Paulson, 2006).

Furthermore, it is probable that some of the targeted population subgroups are more sensitive to price changes than others; hence, substitution bias may be more significant for the former group. For example, low-income households may be more sensitive to price changes than high-income households are. As a result, substitution bias may be greater for low-income households. Unfortunately, however, we were restricted to the use of just one set of price indices for all population subgroups because the Czech Statistical Office provides only one set of prices for each product category. More detailed analysis is possible when consumer-level scanner data are available. Since we applied only one set of prices for each product category, the differences in inflation rates across the population subgroups stemmed from differences in the average shares of expenditure.

4. Results on the Overall Inflation Inequality

As mentioned above, the only source of potential inflation inequality stems from differences in the shares of expenditure across population subgroups. Therefore, we began our analysis by investigating how the various population subgroups differed in terms of their shares of expenditure on defined product categories. Figure 2 presents the average yearly shares of expenditure on 12 product categories for five population subgroups based on the 2021 data income quantiles.

**Figure 2: Shares of Expenditure by Income Group, 2021**
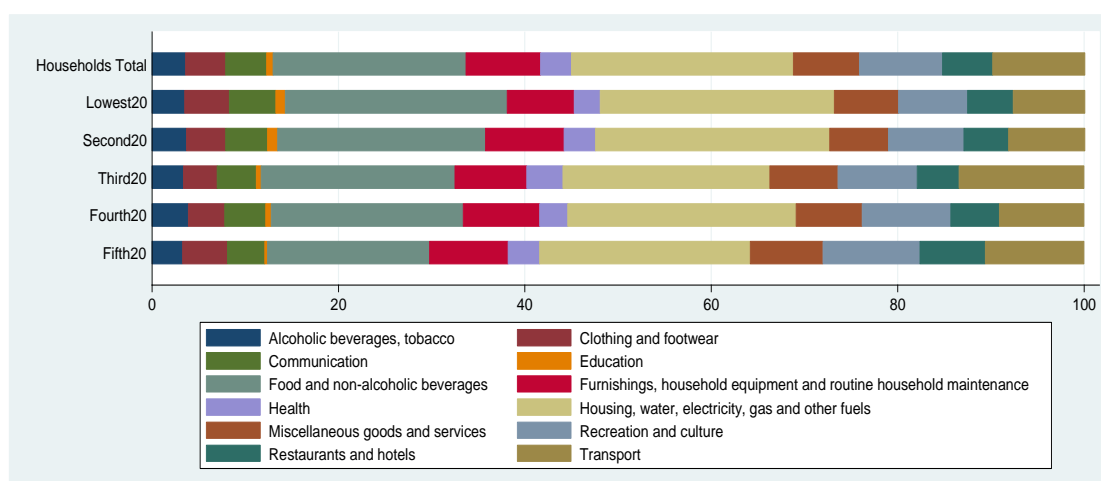
Source: Own calculation based on the Czech Statistical Office

The lowest and second-lowest household quantiles (in terms of income) spent relatively larger shares of their expenditure on food and non-alcoholic beverages and on housing, water, electricity, and other fuels than the fourth- and fifth-income quantiles. By contrast, high-income

households spent a relatively larger share of their expenditure on furnishing and household maintenance, restaurants and hotels, and recreation and culture. This suggests that an increase in the prices of essential goods, such as food, electricity, and gas, exerts a more negative effect on low-income households. In terms of family characteristics, single-parent households spent a significantly larger share of their expenditure on housing, water, electricity, and other fuels, suggesting that single-parent households will be more affected by recent increases in electricity and fuel prices (Figure 3).

Figure 3: Shares of Expenditure by Family Characteristics, 2020
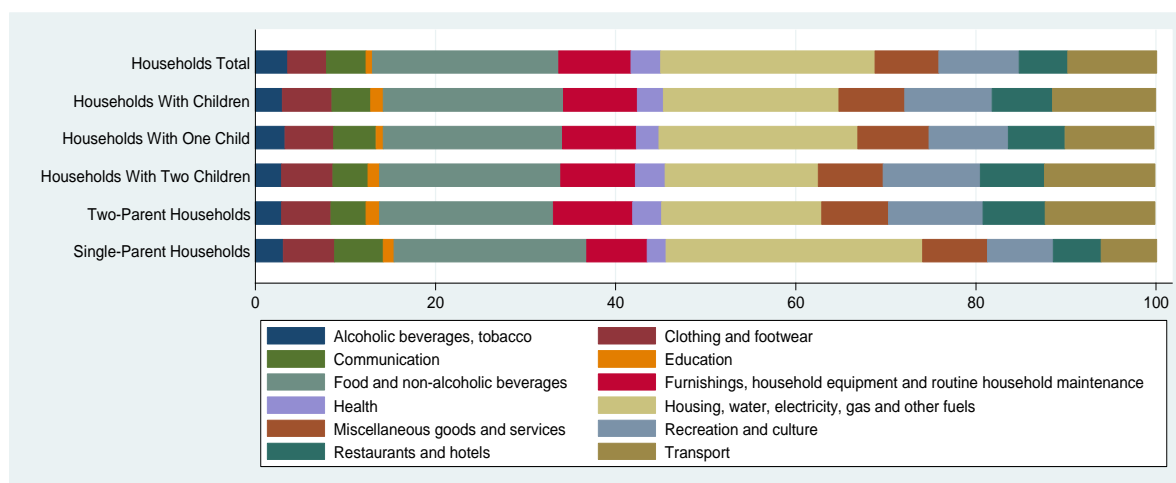
Source: Own calculation based on the Czech Statistical Office

  The next stage of the analysis consisted of calculating the year-on-year change in the CPI for each population subgroup and their comparison with the cumulative inflation rate for the total non-elderly population of the Czech Republic. Figure 4 presents the results in a graph form. It is clear that single-parent households experienced higher inflation in 2022 than two-parent households did. However, the difference was reasonably modest, at 0.618 percentage points. Overall, the population subgroup-specific inflation rates were found to be similar to

Figure 4: Year-on-Year Changes in the Consumer Price Index by Household Income Quantiles and Family Characteristics, December 2022
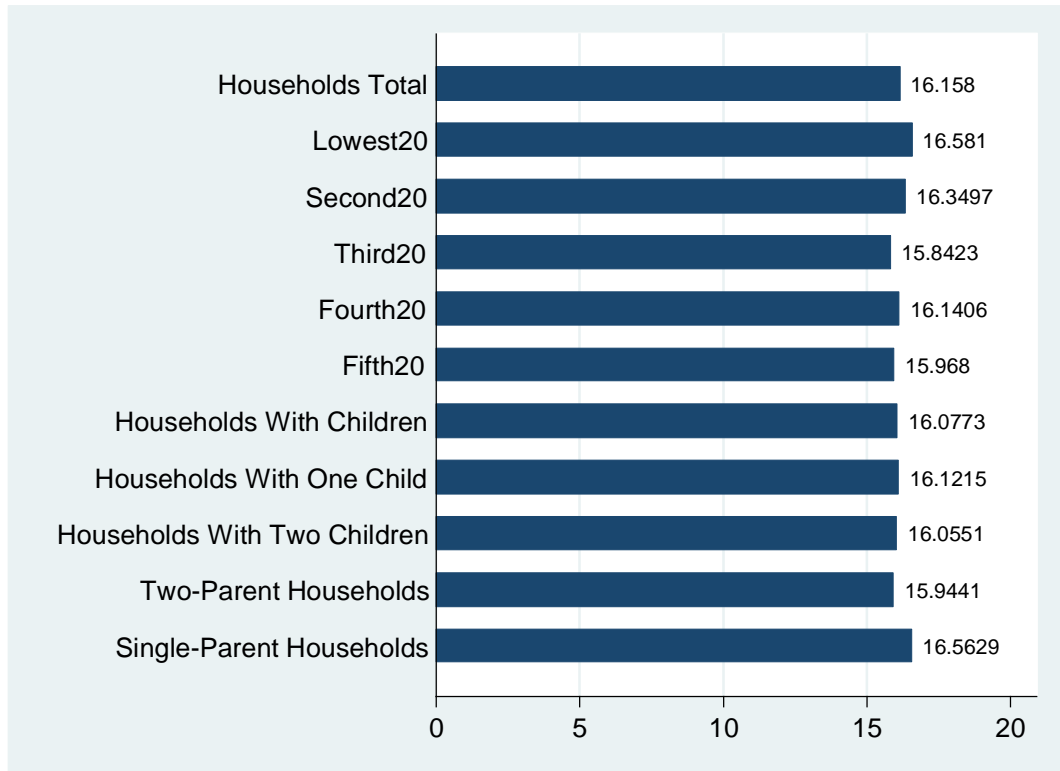
Following the methodology proposed by McGranahan and Paulson (2005), we subsequently apply Equation 1 to calculate the contributions to the CPI of the various product categories for the defined population subgroups. In this study, we defined 12 broad product categories. Specifically, the contribution of a given product category *c* to the CPI for population subgroup *k* can be calculated using the following formula:

$$\pi_{t,k,c} = \sum_{c=1}^{12} W_{c,t-12,k}\pi_{c,t} \tag{3}$$

Figures 5 and 6 illustrate the contributions to the year-on-year change in the CPI from 12 product categories for the population subgroups based on income and family characteristics, respectively. It is clear that inflation from food and non-alcoholic beverages was considerably higher for low-income households (those in the lowest and second-income distribution quantiles) than for high-income households. Conversely, the contributions to the year-on-year change in the CPI stemming from increases in the prices of non-essential goods and services

such as furnishings, household equipment, restaurants, and recreation were higher for high-income and two-parent households than for low-income and single-parent households.

Figure 5: Contributions to the Year-on-Year Change in the CPI from the considered Product Categories for Five Population Subgroups Based on Income Quantiles, December 2022
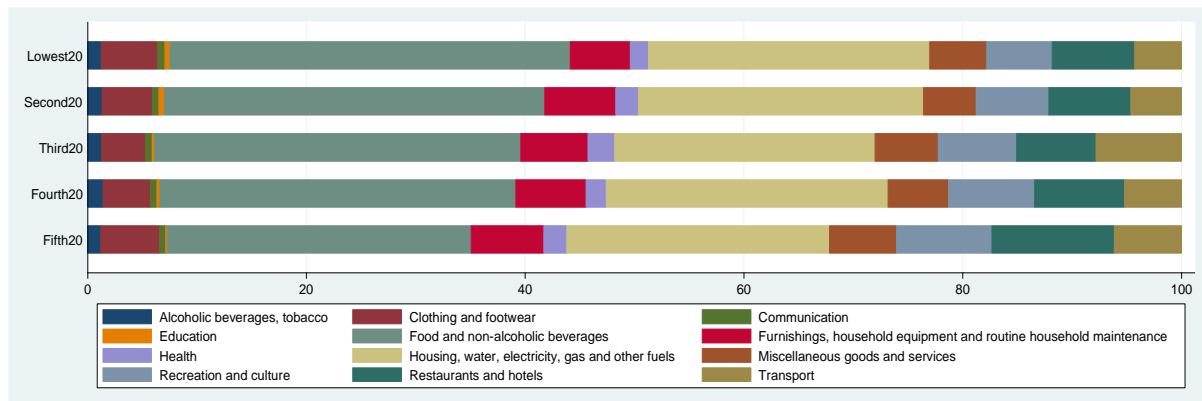
Source: Own calculation based on the Czech Statistical Office

More importantly, the contribution of increases in the prices of housing, water, electricity, gas, and other fuels to the CPI was found to be significantly greater for low-income and single-parent households than for high-income and two-parent households. The difference was more pronounced for single-parent households, for which inflation from housing, water, electricity, gas, and other fuels accounted for approximately 29.2 % of the overall inflation burden, compared to approximately 18.9 % for two-parent households. This finding suggests that recent increases in electricity and gas prices may exert particularly harmful effects on single-parent households unless the government provides the support necessary to mitigate the adverse effects of rising prices.
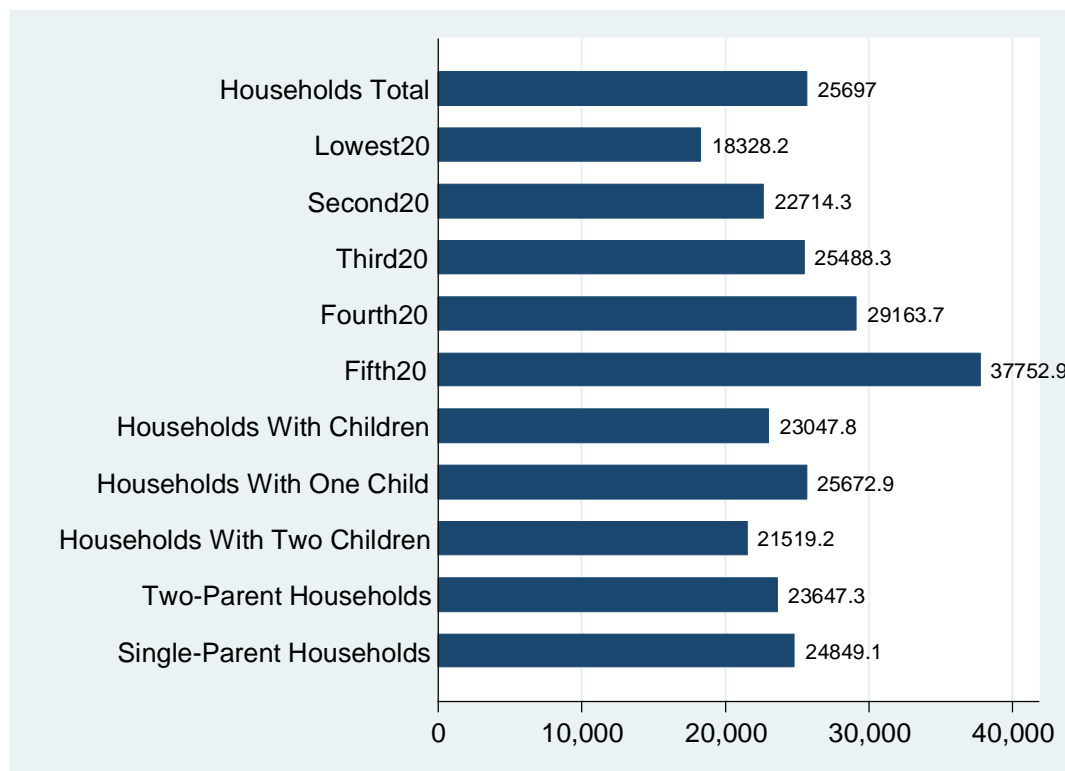
Figure 6: Contributions to the Year-on-Year Change in the CPI from the considered Product Categories for the defined Population Subgroups Based on Family Characteristics, April 2022
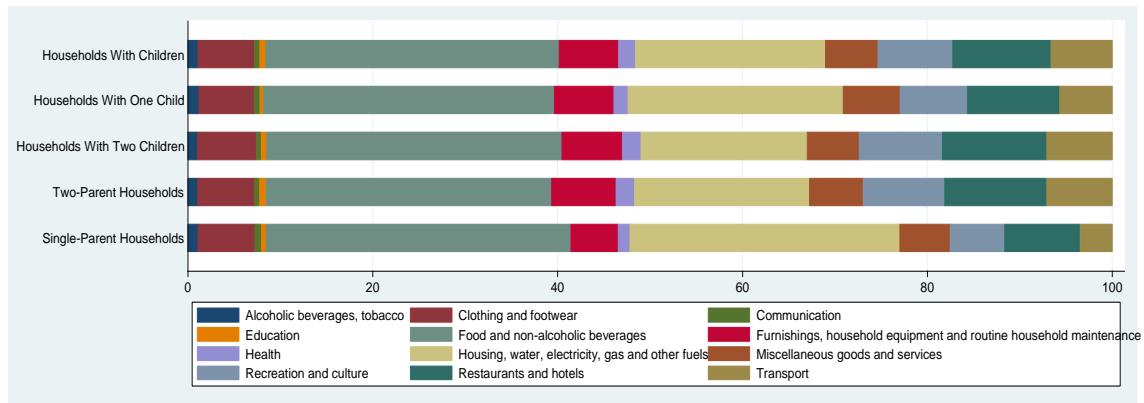
Source: Own calculation based on the Czech Statistical Office

We also calculated the extent to which inflation impacted the purchasing power of various population subgroups. Figure 7 presents the decline in purchasing power due to increases in overall prices and the prices of electricity, gas, and other fuels for the population subgroups, based on income quantiles and household characteristics. The results suggest that the average household lost 25,697 CZK in purchasing power between December 2021 and December 2022. In comparison, households with children lost 23,047 CZK in their overall purchasing power between December 2021 and December 2022. For low-income (lowest income quintile) and single-parent households, the loss of purchasing power was relatively modest; that is, 18,328 CZK, and 24,849 CZK, respectively. However, since low-income and single-parent households are more likely to live paycheck-to-paycheck, this relatively modest decrease in purchasing power may mean the difference between heating or buying healthy food.

Figure 7: Loss of Purchasing Power over the Last 12 months (from December 2021 to December 2022) by Income Group and Family Characteristics


Category	Value
Households Total	25697
Lowest20	18328.2
Second20	22714.3
Third20	25488.3
Fourth20	29163.7
Fifth20	37752.9
Households With Children	23047.8
Households With One Child	25672.9
Households With Two Children	21519.2
Two-Parent Households	23647.3
Single-Parent Households	24849.1

Source: Own calculation based on the Czech Statistical Office

5. Energy Inflation – Background and Data

In line with previous parts of this study, we can conclude that households distribute their disposable income across many different consumption areas, with energy typically being one of the most important. As seen in Figure 8, energy expenditure frequently represents over 11% of the total annual household expenditure and is approximately 14% for the Czech Republic, Slovenia, Poland, and Lithuania. This considerable energy share implies that any change in consumer energy prices significantly influences the overall consumer spending. Furthermore, using various energy sources involves ensuring necessities, such as cooking, heating, lighting, etc., and their consumption cannot be significantly reduced, even in the case of a considerable increase in prices. In situations with strong inflationary pressure, households would see their energy expenditure soar, and consequently, their disposable income and standard of living plummet, which is currently the case in Europe due to the Russian-Ukraine crisis, as well as governmental Covid-19 measures over the last two years (Kalíšková and Zapletalová, 2022).

Figure 8: The share of energy expenditure in total household expenditure, comparing 15 OECD countries with the highest energy share in 2021
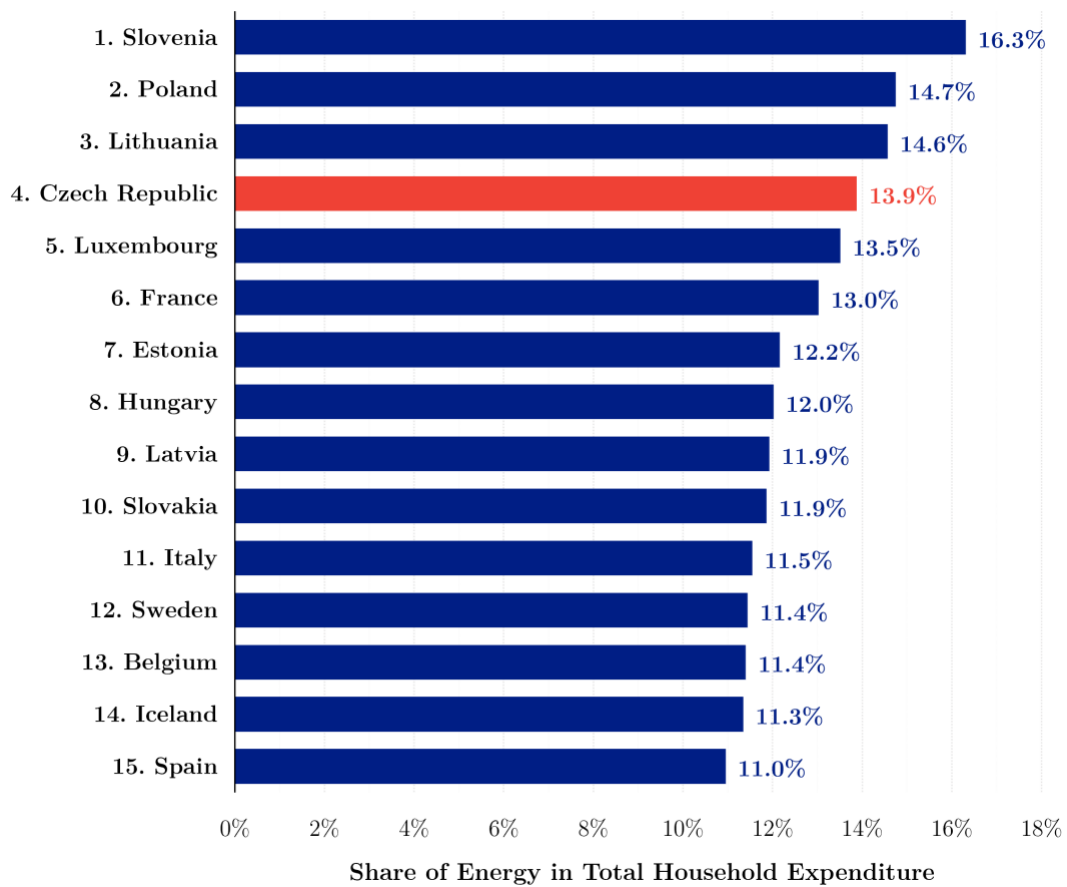
Source: Own calculation based on OECD (Final consumption expenditure of households)

The energy crisis is severe in the Czech Republic, which is currently experiencing one of the highest inflation rates in Europe, at 16.7 % in February 2023, compared with 9.9 % in the EU (Trading Economics, 2023). This high inflation rate notably contributed to the rapidly rising energy prices. Despite government action and the introduction of various policies (such as a price ceiling for energy prices), inflation has not significantly decreased. Furthermore, different socio-economic groups in the Czech Republic are likely to suffer from different energy inflation levels and, therefore, various losses of disposable income. This is because every group consumes a different amount of energy and each energy source has a different price.

Therefore, it is crucial to understand how high-energy inflation affects Czech families and how it varies across socio-economic groups. Data for the Czech Republic from 2017 to 2023, with the most recent data as of March 2023, have been compiled from multiple sources to create a modern dataset. The dataset comprises disaggregated information on the income

and expenditure of various socio-economic groups, as well as energy price levels for various sources, including electricity, gas, solid fuel, liquid fuel, heat, and automobile fuel. The data were gathered from various reputable sources, including Eurostat, ONS, OECD, Czech Statistical Office, and Czech Household Budget Survey. The analysis in this section primarily focuses on examining which socio-economic groups are the most affected by the ongoing energy price crisis in Europe and how the situation has developed in the last several months. This involves calculating the household-specific energy inflation rates, their annual loss in disposable income, and the financial loss in relation to household-specific income. The time period of the inflation analysis was specifically chosen to cover the annual change since the start of the Russian invasion of Ukraine, that is, from February 2022 to 2023. Second, the analysis compares the results from the Czech Republic with those from other European countries, allowing for an evaluation of the effectiveness of current Czech policies amidst the energy crisis. The use of the latest available data allows for an accurate analysis of the current situation in the Czech energy market, which has the potential to contribute to the development of relevant policy measures. Understanding how energy inflation varies across consumer groups is of particular interest to the government and policymakers. Such information enhances the overall knowledge of household energy consumption and is essential for the calculation of many important metrics (Abrahamse and Steg, 2009). Furthermore, analysing which consumer groups are most vulnerable to price shocks can allow for devising policies that effectively support the most affected groups (Druckman and Jackson, 2008; Belaïd and Rault, 2021). This may not only contribute to a move towards more innovative electricity networks (McLoughlin et al., 2012) and reduce the sensitivity of the most vulnerable socio-economic groups to subsequent energy price shocks, but also contribute to the European 2050 climate goals (Besagni and Borgarello, 2018; Belaïd and Rault, 2021). The annual household per capita energy expenditure for 2018-2021 can be seen in Table 1, in absolute terms in Czech crowns and as a percentage share of total household expenditure.

Table 1: Annual average per capita household energy expenditure, Czech Republic (2018-2021)

Consumer Group	2018 Perc.	2018 Value	2019 Perc.	2019 Value	2020 Perc.	2020 Value	2021 Perc.	2021 Value
All Households	17%	25 481 CZK	16%	25 131 CZK	14%	22 145 CZK	14%	22 077 CZK
EMPLOYMENT STATUS								
Employees	16%	24 692 CZK	15%	22 858 CZK	13%	19 880 CZK	13%	20 827 CZK
Self-employed	16%	25 527 CZK	16%	24 868 CZK	12%	19 328 CZK	12%	20 293 CZK
Pensioners	20%	26 481 CZK	18%	26 964 CZK	17%	25 706 CZK	18%	26 680 CZK
MUNICIPALITY SIZE								
< 10 000	19%	26 228 CZK	19%	26 757 CZK	18%	24 559 CZK	17%	24 983 CZK
10 000 - 49 999	16%	23 262 CZK	15%	22 082 CZK	13%	18 815 CZK	12%	19 627 CZK
50 000+	14%	23 875 CZK	12%	21 184 CZK	10%	17 557 CZK	10%	18 899 CZK
INCOME								
Quintile 1	17%	19 054 CZK	16%	18 283 CZK	14%	15 187 CZK	14%	15 816 CZK
Quintile 2	18%	22 290 CZK	18%	22 830 CZK	16%	20 154 CZK	15%	21 298 CZK
Quintile 3	17%	24 335 CZK	16%	24 876 CZK	15%	21 414 CZK	14%	22 950 CZK
Quintile 4	17%	27 963 CZK	15%	25 514 CZK	13%	23 740 CZK	13%	24 050 CZK
Quintile 5	15%	32 757 CZK	15%	33 196 CZK	13%	29 299 CZK	13%	30 031 CZK
FAMILY STATUS								
No children	18%	29 897 CZK	17%	29 482 CZK	16%	26 724 CZK	16%	27 515 CZK
Children	15%	19 895 CZK	14%	19 065 CZK	13%	16 378 CZK	12%	16 942 CZK
Two-parent	14%	20 069 CZK	14%	19 191 CZK	12%	16 318 CZK	11%	16 337 CZK
Single-parent	17%	21 548 CZK	13%	18 796 CZK	11%	15 769 CZK	12%	17 587 CZK

Note: The columns *Value* show the annual average per capita energy expenditure in CZK. The columns *Perc.* show the share of energy expenditure in total household expenditure (CZSO).
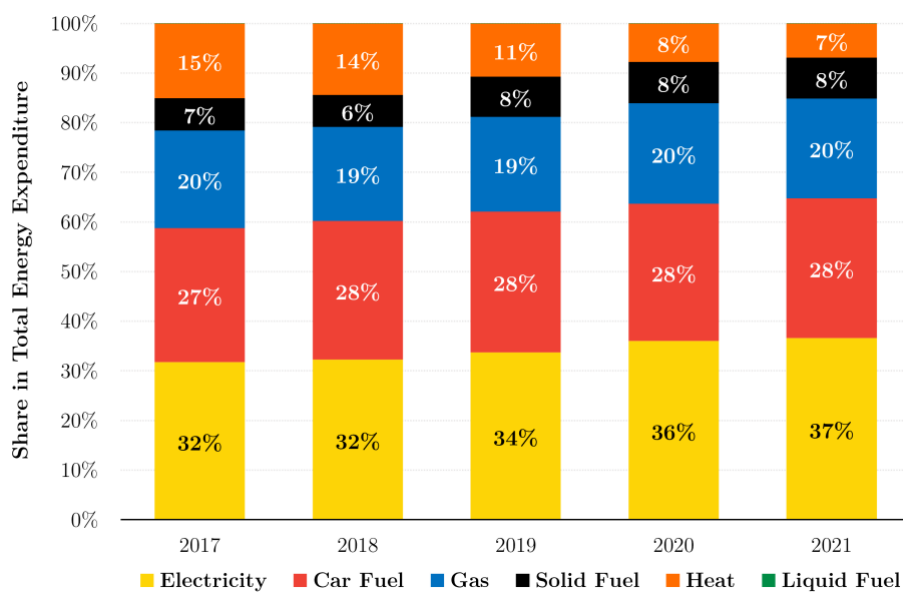
Source: Own calculation based on the Czech Statistical Office (CZSO), specifically the Czech Household Budget Survey

Energy expenditure has been disaggregated across various socio-economic groups, based on employment status, municipality size, income, and family status. The mean energy expenditure across all households fell by about three percentage points between 2018 and 2021, from almost 25 500 CZK to approximately 22 000 CZK. Almost 90 % of this drop occurred between 2019 and 2020, suggesting that the cause is likely to be the Covid-19 pandemic. For example, lockdowns and reduced driving opportunities would reduce household expenditure on automobile fuel. While the same pattern is evident for most socio-economic groups, there were significant variations in energy expenditure across the groups. According to 2021 values, pensioners spent almost 30 % more energy than employees, spending nearly 6 000 CZK more annually. Even more considerable differences are evident in terms of municipality size, where households in the smallest towns spend almost double the energy compared to households in the largest cities in percentage terms. The energy expenditure shares across income quintiles are relatively comparable; however, more prosperous groups spend considerably more energy

in absolute terms. The wealthiest families spend approximately double the amount of energy compared to the poorest families (15 800 CZK vs. 30 000 CZK). Furthermore, households with no children spent more than 60 % more per capita on energy than households with children, with no considerable difference between two-parent and single-parent households.

The disaggregation of the average energy expenditure across all households for each fuel type between 2017 and 2021 is shown in Figure 9.

Figure 9: Disaggregated average household energy expenditure for all households in the Czech Republic between 2017 and 2021
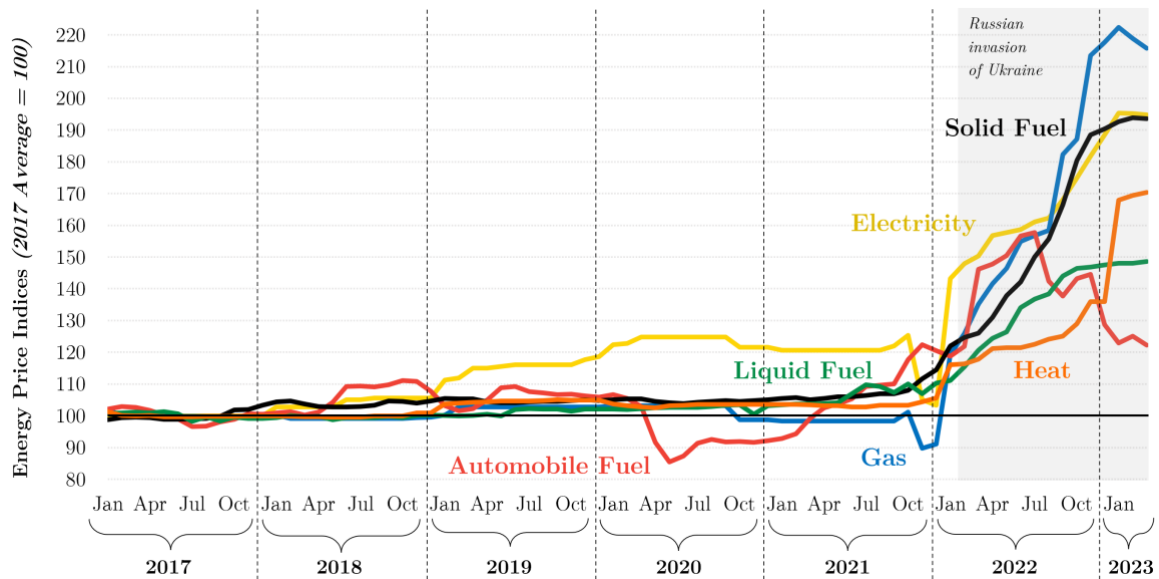

Source: Own calculation based on the Czech Statistical Office (CZSO).

The distribution of spending on different fuel types is relatively similar across time and various energy sources, with electricity, gas, and car fuel typically representing approximately 80 % of the overall energy expenditure. However, the share of the two fuels, in particular, goes through a significant change over the years examined. These are spending on electricity and spending on heat. The average expenditure on electricity increased from 32 % in 2017 to 37 % in 2021, whereas spending on heat decreased by over 50 % from 15 % to 7 % in the same period. Considering the remarkably stationary shares of the other fuels, it is possible that the trend for electricity and heat is caused by households gradually switching from central heating systems to family boilers heated by electricity.

The analysis of the price indices for various energy types (electricity, gas, solid fuel, liquid fuel, heat, and automobile fuel) showed that energy prices increased only gradually between 2017 and 2021 (Figure 10).

Figure 10: Development of monthly disaggregated energy price indices in the Czech Republic (2017–2023) – the prices of electricity, gas, solid fuel, liquid fuel, heat, and automobile fuel
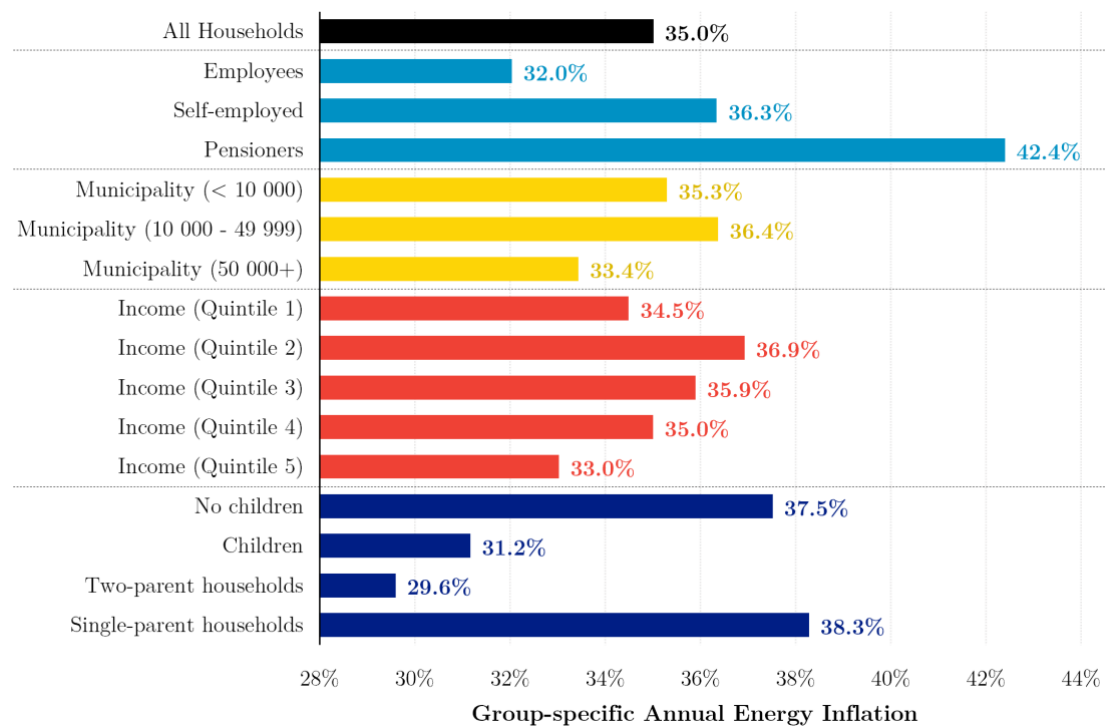

Source: Own calculation based on CZSO and Eurostat

In fact, a sharp dip in car fuel prices can be seen in early and mid-2020, owing to the decrease in driving caused by the Covid-19 pandemic. However, all fuel types have experienced a rapid price increase since early 2022 because of the current geopolitical situation, especially for electricity, gas, and solid fuels. The prices of electricity and solid fuels have increased by approximately 95 % since the start of 2022, while gas prices have increased by over 110 %. Automobile fuel also experienced a sharp rise in prices; however, an improvement can be seen since the summer of 2022, when the price index decreased from almost 160 in June 2022 to about 120 in March 2023.

6. Energy Inflation in the Czech Republic

The consumer group-specific total energy inflation between February 2022 and February 2023 is shown in Figure 11, showing that socio-economic groups are currently most affected by the high energy inflation rate in the Czech Republic.

Figure 11: Percentage annual increase in energy prices by consumer socio-economic group between February 2022 and 2023
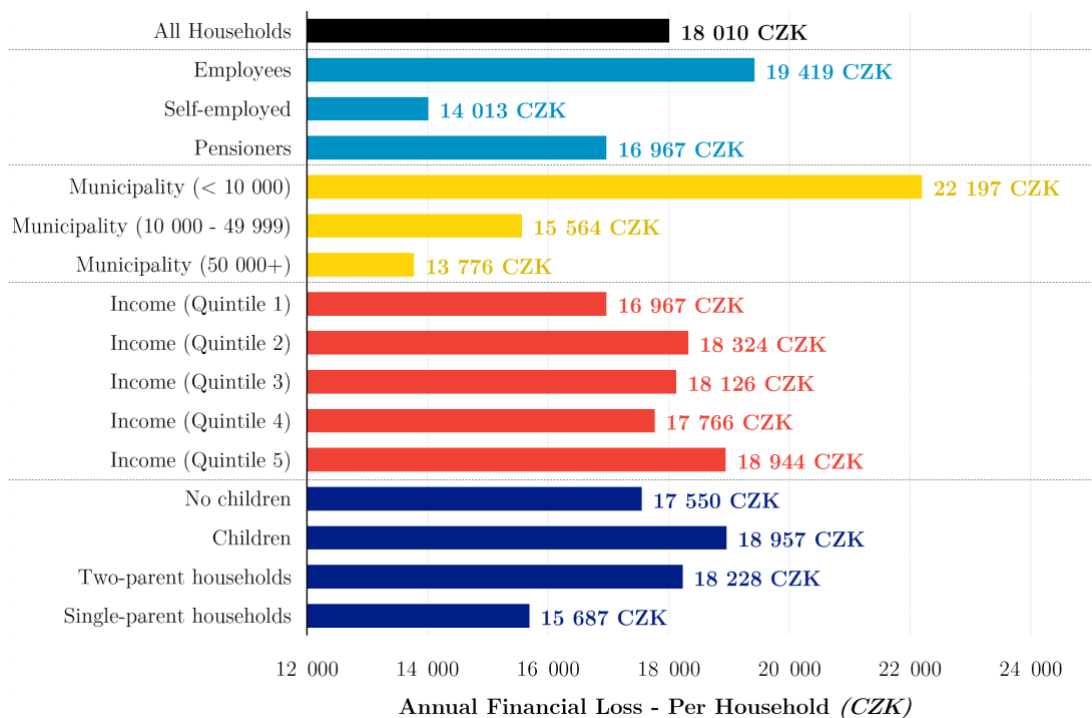

Source: Own calculation based on CZSO and Eurostat

The values represent the percentage increase in the total energy price level for each socio-economic group from February 2022 to February 2023. As the figure illustrates, all households experienced a very high level of energy inflation, with energy prices increasing by 35 % on average since the start of the Russian-Ukrainian crisis. This is 10 % lower than the inflation calculated by Mandys (2022) for the period June 2021 – June 2022; nevertheless, energy inflation in the Czech Republic remains very high. The results show that there are significant variations across socio-economic groups, with inflation ranging from just below 29 % for two-parent households to over 42 % for pensioners. Therefore, some socio-economic groups suffer from a considerably greater level of inflation and would need greater support. Pensioners, in particular, suffer from the highest level of energy inflation (42.4%), which is much higher than that of employees (32.0%) or the self-employed (36.3%). Similarly, the larger the municipality, the lower the overall energy inflation that households currently face. Energy inflation across income levels is reasonably similar; nevertheless, the most affluent families face, on average, slightly lower inflation. Furthermore, single-parent families and families with

no children suffer from higher-than-average energy inflation. On the other hand, two-parent households face the lowest level of energy inflation across all socio-economic groups (29.6 %).

While Figure 11 shows the average energy inflation faced by different socio-economic groups, it does not indicate which groups are the most affected financially by losing part of their purchasing power. Figure 12 shows the average annual financial loss per household in Czech crowns, considering the average household size of each socio-economic group.

Figure 12: Annual financial loss by consumer socio-economic groups in Czech crowns from February 2022 to 2023
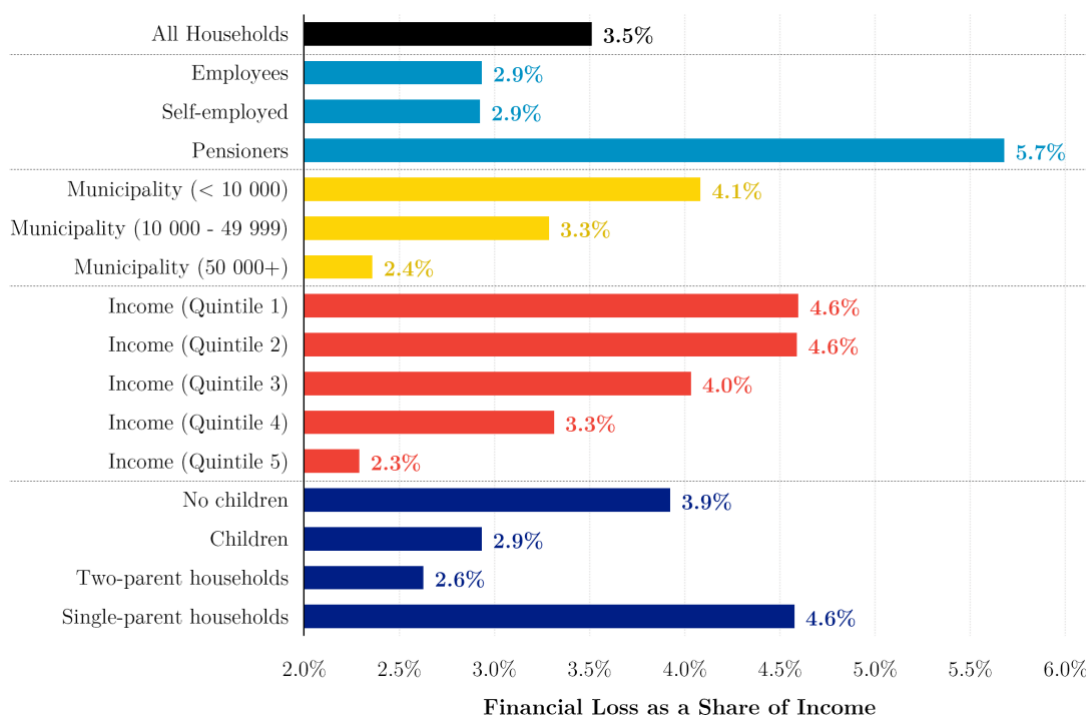

Source: Own calculation based on CZSO and Eurostat

The average household lost just over 18 000 CZK between February 2022 and 2023, solely because of rising energy prices. However, annual financial losses differ substantially across groups, ranging from approximately 14 000 CZK to over 22 000 CZK. In terms of employment status, employees suffer the greatest loss in disposable income, which is considerably larger than pensioners or the self-employed. However, the greatest difference in absolute financial losses can be observed for municipality size. Families in the smallest towns lost more than 60 % more disposable income than families in the largest cities. In terms of income, households generally experience higher financial losses and earnings. Households in the lowest income quintile lost 16 967 CZK on average compared with 18 944 CZK for the

highest quintile earners. Nevertheless, the poorest families are likely to have been more severely affected by the rising energy prices: for the poorest families, a loss of CZK 17 000 iscomparatively much more damaging than the loss of CZK 19 000 for the richest families. Furthermore, in terms of family status, households with children faced a higher-than-average financial loss in absolute terms, at 18 957 CZK.

While Figures 11 and 12 show the socio-economic groups that faced the most severe energy inflation and the largest absolute loss in disposable income, it is difficult to infer which groups are in fact the most affected by the ongoing energy crisis overall. This is because the level of damage caused by energy inflation (and the related absolute financial loss) causes different groups to depend heavily on the wealth/income of each particular group. Two socio-economic groups facing the same energy inflation and loss of disposable income may be unaffected if their income levels differ significantly. Figure 13 shows the average financial loss across socio-economic groups as a share of their average income.

Figure 13: Financial loss as a share of income across socio-economic groups between February 2022 and 2023
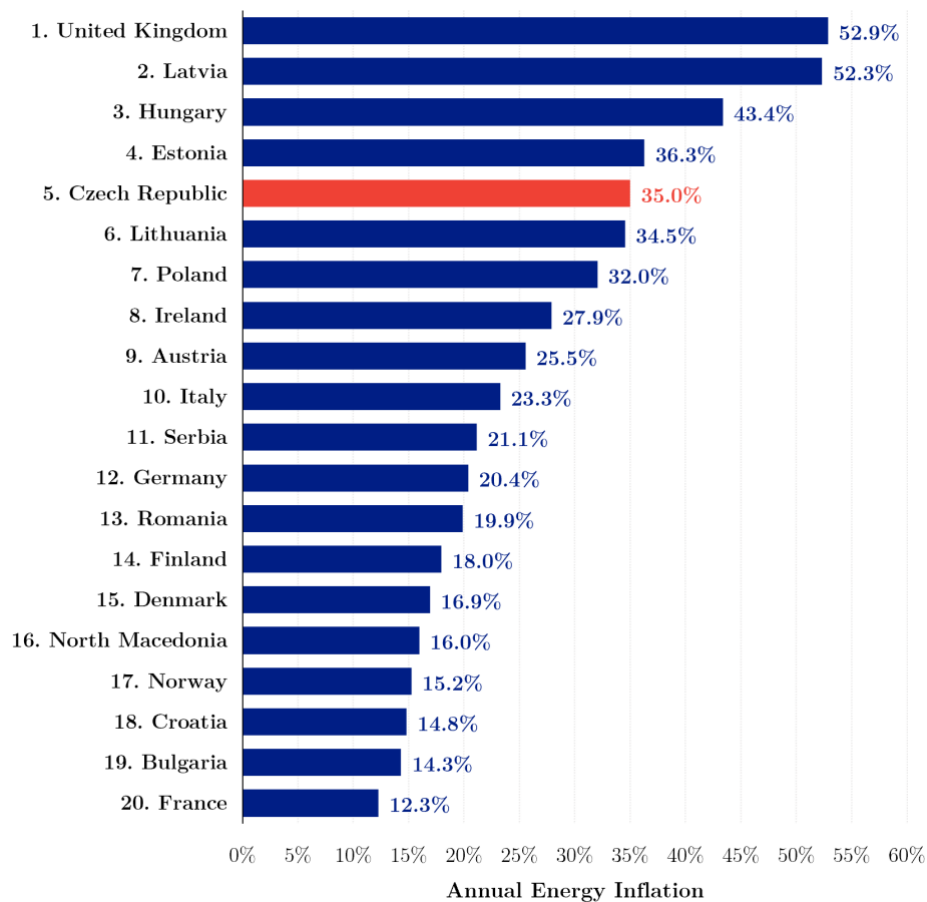

Source: Own calculation based on CZSO and Eurostat

The average household lost 3.5 % of its income solely because of rising energy prices between February 2022 and 2023. The significant differences across households show that some groups suffered substantially more from the energy crisis than others. The consumer groups most affected by the energy crisis included pensioners (lost 5.7 % of their income), the poorest households (4.6 %), single-parent households (4.6 %), and households from the smallest towns (4.1 %). Therefore, government support should focus on these socio-economic groups as the most effective and target those in the greatest need. However, families from large cities (lost 2.4 % of their income), the most affluent families (2.3 %), and two-parent families (2.6 %) were the least affected by the energy crisis. In particular, there were clear trends in municipality size and income. The larger the municipality size and income, the less the group is affected by the energy crisis and thus requires less help from the government.

7. Energy Inflation in Europe

The current energy crisis is not limited to the Czech Republic, as it has significantly affected most European countries. Different countries across Europe were affected to different extents due to the varying energy mixes and spending patterns of their households. While the Czech Republic is one of the most affected countries in terms of overall inflation, some European countries suffer from higher energy inflation levels. To compare the different energy inflation levels across Europe, Figure 14 shows the 20 European countries with the highest year-to-year energy inflation between February 2022 and 2023.

Figure 14: Twenty European countries with the highest year-to-year energy inflation between February 2022 and 2023
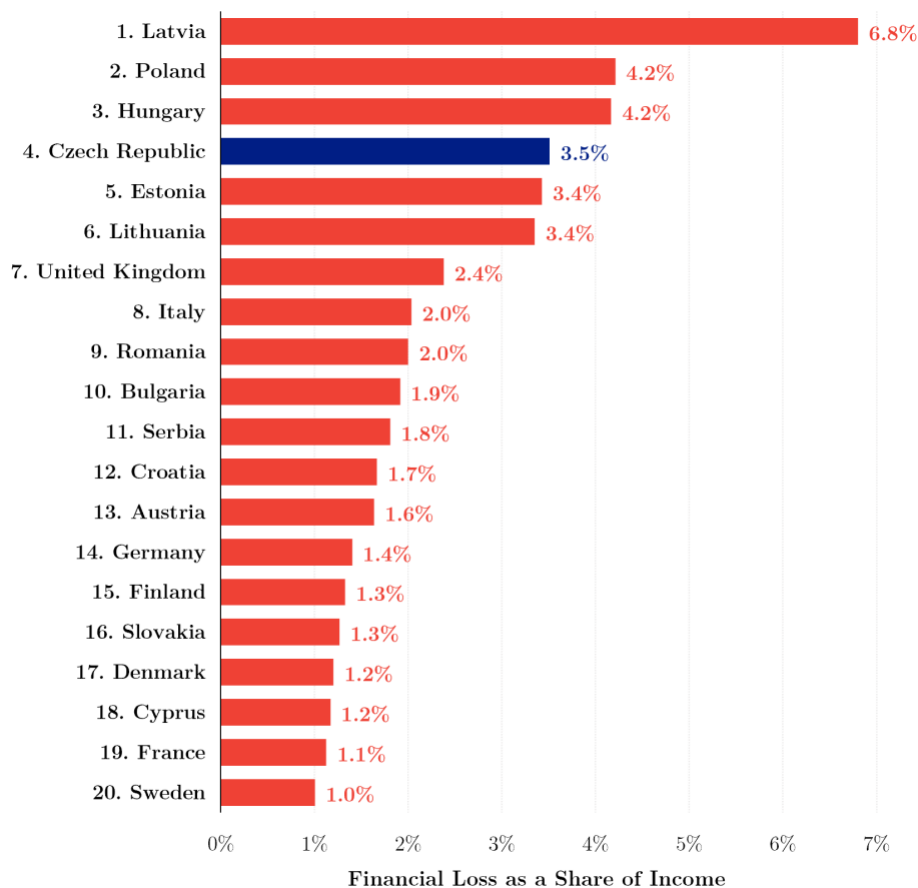

Source: Own calculation based on Eurostat

From Figure 14, we can see that the Czech Republic faces the 5th highest energy inflation in Europe at 35 %. As such, energy inflation is higher than that of most other countries that neighbour the Czech Republic or are in the region. The exception was Hungary, with an energy inflation of 43.4 %. However, many countries face considerably greater energy inflation than the Czech Republic, with levels crippling the economy. This is particularly true in the United Kingdom, where electricity prices have increased by 67 % and gas prices have more than doubled since February 2022, causing considerable problems for UK households. Very high levels of energy inflation can also be seen for Hungary (43.4 %) as well as the Baltic countries of Latvia (52.3 %), Estonia (36.3 %), and Lithuania (34.5 %). Baltic countries are particularly affected by their heavy pre-war reliance on energy supply from Russia, especially natural gas (OIES, 2022). It is essential to point out that the energy inflation of the Czech Republic is considerably higher than that of other neighbouring and regional countries. Among

the neighbouring countries, Poland has the highest energy inflation at 32 %, which is still lower than Czech inflation. Other Czech neighbours have considerably lower energy inflation across the board, including Austria (25.5 %) and Germany (20.4 %), with Slovakia being out of the top 20 countries at an annual energy inflation of 11.1 %.

Examining energy inflation levels across European countries provides a good comparison in absolute terms. However, it is difficult to determine which countries are most affected by the current energy crisis. Households in various countries across Europe spend different amounts on purchasing energy, suffer from varying energy inflation levels, and differ significantly in their available disposable income. Consequently, an annual energy inflation level of 10 % does not affect each country equally. Therefore, Figure 15 shows financial loss as a share of income across different European countries.

Figure 15: Twenty European countries with the highest household financial loss as a share of income between February 2022 and 2023

Source: Own calculation based on Eurostat

From Figure 15, it is clear that Latvia is by far the country most affected by the ongoing energy crisis. Latvian households have lost almost 7 % of their disposable income solely because of rising energy prices before considering the inflation of other items, such as food and water. This portrays the fact that the Baltic countries are among the most heavily affected. Estonia is the fifth most affected country (families lost 3.4 % of their income), followed by Lithuania (3.4 %). Central European countries (particularly V4) are among the most heavily affected. Poland is second, with a loss of household income of 4.2 %, Hungary third at 4.2 %, and the Czech Republic fourth at 3.5 %. Out of V4 countries, only Slovakian households lost a relatively small share of their income due to energy inflation at 1.3 %. The other two neighbours of the Czech Republic (Germany and Austria) lost significantly less income (1.4 % and 1.6 %, respectively). If the more vulnerable Baltic countries and V4 are omitted, no European country has experienced a greater household loss of income. Outside these two groups, the United Kingdom experienced the greatest loss in household income (2.4 %). The considerable financial loss of Czech families was attributed to the heavier reliance of the Czech energy sector on supplies of energy, such as natural gas, from Russia. Therefore, due to the greater sensitivity and large financial loss of Czech households in terms of disposable income, the Czech government should provide more extensive support in order to minimize the impact of the energy crisis. In particular, government support should be selective rather than blanket, as several socio-economic groups have been considerably more affected than others and are, therefore, in the greatest need of help.

8. Discussion and Policy Implications

Throughout the years 2022 and 2023, Europe faced rampant inflation across all sectors of the economy, with energy inflation forming a considerable part of the total inflation. The Russian invasion of Ukraine has seriously contributed to this high-energy inflation, disrupting supply chains and energy imports across Europe. In particular, the Czech Republic faced an above-average inflation of 16.7 % compared to 9.9 % of the EU in February 2023 (Trading Economics, 2023).

By employing the Czech Household Budget Survey and Consumer Price Index data, we calculated contemporary consumer price indices for different (in terms of income and household characteristics) population subgroups in the Czech Republic. We determined that the subgroup-specific inflation rates were similar to those of the total non-elderly population. The only exception concerned single-parent households, which experienced higher inflation in

2022 than other subgroups. However, the difference was modest. Importantly, we found that inflation from housing, water, electricity, gas, and other fuels is significantly higher for low-income and single-parent households than for high-income and two-parent households. The difference is particularly significant for single-parent households, for which inflation due to increases in housing, water, electricity, gas, and other fuel costs represents approximately 29.2 % of the overall inflation burden, compared to approximately 18.9 % for two-parent households. In addition, we calculated the total loss of purchasing power due to inflation, which revealed that low-income and single-parent households suffered losses of 18,328 CZK, and 24,849 CZK, respectively.

The results of the analysis revealed that socio-economic groups in the Czech Republic face the highest energy inflation rates. The average Czech household faced a year-to-year energy inflation of 35 %; however, significant differences were present across socio-economic groups. Several groups, particularly pensioners, families from the smallest towns, and single-parent families, faced higher-than-average energy inflation. The average household lost 18 010 CZK of disposable income between February 2022 and 2023. In absolute terms, employees, families from the smallest towns, the most affluent families, and two-parent families experienced the greatest annual financial losses due to the energy crisis. Considering household income and calculating the relative financial loss as a share of income, the average Czech household lost 3.5 % of its income due to rising energy prices. The findings suggest that the most affected (and therefore vulnerable) socio-economic groups are pensioners (loss of 5.7 % of income), poorest households (4.6 %), single-parent households (4.6 %), and households from the smallest towns (4.1 %).

Comparing the Czech Republic to the rest of Europe, the average energy inflation of 35 % is the 5th highest in Europe, comparable to V4 countries such as Hungary (43.4 %) and Poland (32.0 %). The countries with the highest energy inflation are the United Kingdom, Hungary, and the Baltic countries. Considering the varying income levels across European countries, Czech families are the 4th most affected in Europe, losing 3.5 % of their incomes. The countries most affected by the energy crisis are the V4 countries and the Baltic countries, all of which (except for Slovakia) lost over 3 % of their annual household income, with Latvia losing almost 7 %. As such, the Czech Republic ranks as one of the most heavily affected countries, and Czech households thus require government support to overcome the energy crisis.

The findings presented in this study can provide helpful information for Czech policymakers in forming group-specific support policies. In this sense, the government should

design and implement policies promoting energy-saving behaviour in those socio-economic groups with the greatest energy-saving potential (Brounen et al., 2012; Ofetotse et al., 2021). The Czech government has implemented several policies to diminish the damaging effects of the energy crisis, many of which are comparable to those of other European countries. The list of various energy policies currently implemented in different European countries is shown in Table 2, similar to Adunts et al. (2022).

Table 2: Types of energy policies aimed to reduce the effect of energy crisis

Energy Policy	Countries Implementing at the Moment
Reduced energy tax or VAT	**All EU countries** (except for Malta and Slovakia), Norway, and UK.
Transfers to vulnerable groups	**All EU countries** (except for Hungary and Malta), Norway, and UK.
Business support	**All EU countries**, Norway, and UK.
Retail price regulation	**All EU countries** (except for Finland, Ireland, and Lithuania), Norway, and UK.
Mandate to state-owned firms	Cyprus, France, Greece, Malta, Portugal, and Slovakia. **Proposed in the Czech Republic**.
Windfall profits tax	**All EU countries**, Norway, and UK.
Wholesale price regulation	France, Malta, Portugal, Slovenia, and Spain.

Note: The information used to construct the table is taken from Sgaravatti et al. (2023).

Similar to many other European countries, the Czech Republic has reduced energy taxes, supported businesses, made household transfers, established a windfall profit tax, and implemented retail price regulation. On the other hand, a mandate for state-owned firms has been proposed, but has not yet been implemented. The potential future implementation of wholesale price regulation in the Czech Republic has not yet been discussed (Sgaravatti et al., 2022).

In addition to the discussed policies, the government should strive to specifically target its support for the most vulnerable groups in need, rather than providing blanket support for all. This is because each socio-economic group faces a different energy inflation level and disposable income loss. As the most vulnerable groups are pensioners, the poorest households, single parents, and small-town households, government support should be primarily targeted at these groups.

As the Czech Republic faces constantly increasing energy prices and an uncertain geopolitical future, the government should also attempt to implement long-term structural changes and promote policies that lead to greater energy efficiency and conservation. The target should be to permanently reduce household energy use and reduce household sensitivity to future major energy inflation shocks (Longhi, 2015). This is especially the case for electricity, as the expenditure of Czech households on this energy source has been continuously increasing (Figure 9). The government can attempt to inspire behavioural change using awareness-inducing campaigns through TV, radio, and social media advertisements, to provide information and tips to households, educating them on daily energy conservation (Cayla et al., 2011; Belaïd and Rault, 2021). These may include implementing government-backed energy labels and certificates that provide information on household-specific energy efficiency compared to the rest of the market or encouraging households to alter heating and air conditioning temperatures by 1-2 degrees (Brounen et al., 2012). In the medium and long run, the government should focus on more structural changes, providing incentives to improve energy efficiency of accommodation. This may include tax reductions or deductibles to install energy-saving equipment, such as double or triple glazing, smart appliances and lighting, or installation of renewable technologies, such as solar photovoltaic panels (Belaïd, 2016; Taneja and Mandys, 2022). This government support may be stronger for the most vulnerable groups, that is, pensioners, single parents, and the poorest families. Implementation of at least some of the aforementioned policies by the Czech government could not only have a significant positive environmental impact, but also reduce household sensitivity to the energy inflation shocks of the future.

From the policy perspective targeting the overall inflation level, our findings and evidence from previous papers suggest that

(i) recent increases in electricity and gas prices may exert detrimental effects on single-parent households unless the government provides the support necessary to mitigate the adverse effects of rising prices;

(ii) The total losses in purchasing power for low-income and single-parent households are 18,328 CZK and 24,849 CZK, respectively. The one-off subsidies provided by the Czech government are not sufficient to compensate for the loss of purchasing power experienced by low-income and single-parent households. Compensation for declines in purchasing power should, instead, be addressed with long-term rather than one-off solutions;

(iii) Compensation measures for the loss of purchasing power should combine a range of responses to inflation. For instance, subsidies for low-income households with children could be combined with energy vouchers or cash transfers to help with electricity costs;

(iv) EU governments have introduced new measures or reinforced previously introduced inflation mitigation policies that can be broadly divided into price and income policies. While price policies are effective in decreasing prices, they may act to disincentivize consumers and firms from improving their energy efficiency and/or shifting to alternative energy sources, thus leading to an increase in greenhouse gas emissions and increased reliance on imported fossil fuels. Therefore, targeted income policies, such as cash transfers and energy vouchers targeted at vulnerable population subgroups, should be the preferred option (Bethuyne et al., 2022);

(v) The nonuniform impacts of inflation on the purchasing power of various population subgroups suggest that compensation for the loss of purchasing power should also be nonuniform. Moreover, compensation for the loss of purchasing power should target the most vulnerable groups in society, e.g., low-income and single-parent households.

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