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Are Household Consumption Responses to Social Transfers Heterogeneous? Evidence from Poland's Family 500+ Programme*

Czy reakcje konsumpcyjne gospodarstw domowych
na transfery socjalne są zróżnicowane? Dowody
uzyskane na podstawie programu Rodzina 500+

Abstract

The Family 500+ programme, introduced in Poland in 2016, significantly increased the disposable income of households with children, thereby potentially affecting household consumption. We estimate cohort-specific smooth transition models based on adjusted Household Budget Survey data to assess short- and medium-term changes in income elasticities and interest rate semi-elasticities of consumption within four household types defined by the number of adults and children. The analysis focuses on changes following major expansions in social assistance, capturing potential regime shifts in consumption. The findings underscore the importance of household heterogeneity in assessing the macroeconomic impact of large-scale social transfers. The results reveal that only the lowest-income-per-capita, single-adult households, regardless of the number of children, exhibited a significant increase in average income elasticity of consumption, rising from about 1.0 to 1.2 after the programme's implementation. The change in other groups was limited (families with three or more children), while income elasticity remained unchanged (families with one or two children). Although the effects of additional income indicate adjustments in consumption, their aggregate contribution to total consumption was limited, given the relatively small share of low-income-per-capita households in overall demand. Consequently, the programme did not generate a noticeable rise in the aggregate consumption multiplier. In addition, the analysis identifies divergent changes in interest rate semi-elasticities of consumption which may reflect changes in credit access or substitution between debt-financed and transfer-financed consumption.

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social assistance, households
heterogeneity, economic regime
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Streszczenie

Wprowadzony w 2016 r. program Rodzina 500+ istotnie zwiększył dochód rozporządzalny gospodarstw domowych z dziećmi i miał wpłynąć na ich wzorce konsumpcyjne. W artykule oszacowano kohortowe modele wygładzonego przejścia na podstawie danych z Badania Budżetów Gospodarstw Domowych, w celu zbadania krótko- i średniookresowych zmian elastyczności dochodowych i semielastyczności stóp procentowych konsumpcji w czterech typach gospodarstw domowych. Analiza koncentruje się na zmianach po rozszerzeniu świadczeń społecznych i ma uchwycić potencjalne przejścia między reżimami konsumpcji. Wyniki podkreślają znaczenie heterogeniczności gospodarstw domowych w ocenie makroekonomicznych skutków transferów społecznych. Po wprowadzeniu programu tylko gospodarstwa jednoosobowe o najniższym dochodzie per capita, niezależnie od liczby dzieci, wykazały znaczący wzrost elastyczności dochodowej konsumpcji – z ok. 1,0 do 1,2. W pozostałych grupach reakcje były ograniczone (w rodzinach z trojgiem lub większą liczbą dzieci) lub nie wystąpiły (w rodzinach z jednym dzieckiem lub dwojgiem dzieci). Choć dodatkowy dochód prowadził do dostosowań konsumpcyjnych, ich łączny wpływ był niewielki ze względu na niski udział gospodarstw o najniższym dochodzie per capita w całkowitym popycie. W konsekwencji program nie doprowadził do zauważalnego wzrostu łącznego mnożnika konsumpcji. Ponadto analiza ujawnia zróżnicowane zmiany semielastyczności konsumpcji względem stóp procentowych, co może odzwierciedlać zmiany w dostępie do kredytu lub substytucję między konsumpcją finansowaną długiem a tą opartą na transferach.

Introduction

The introduction of the Family 500+ programme (hereafter F500+) in Poland marked a transformative moment in social policymaking. Introduced in March 2016, the new benefit provided stable monthly financial assistance to families with children. Its design and size marked an unprecedented reallocation from a balanced mix of cash transfers, tax breaks and services to a strong emphasis on direct cash transfers. The programme's implementation in 2016q2 led to a significant increase in non-pension social benefits, rising by about 1.0 percentage point to 3.4% of GDP in 2017–2018. After subsequent extensions, the benefits increased to 4.5% in 2020–2023 and 5.1% of GDP in 2024, following an increase from 500 PLN to 800 PLN per child per month.

Before the expansion to each child regardless of family income in 2019, the F500+ programme covered nearly 60% of all children up to the age of 18, and almost doubled the total expenditure on families and children in Poland compared to the year prior to its introduction.¹ Advocates of the programme underlined that unlike previous social policies, F500+ provided a significant and steady monthly income, initially in the amount of 500 PLN (equivalent to 110–120 EUR, which at the time of introduction was equal to 27% of the minimum wage), for families, contributing to a substantial reduction of poverty among low-income households. In addition to the short-term effects of the programme, which included an increase in individual consumption and alleviation of poverty, especially among children from the poorest households [Bień, 2022], the mandatory regulatory impact assessment accompanying the act introducing F500+ emphasised that the consequences of the programme would also be visible in the longer term. These included a possible increase in fertility and the development of human capital through improved educational opportunities for children from low-income families [Gromada, 2018]. On the other hand, serious controversy arose concerning the possible misallocation of resources, the unnecessary expansion of the welfare state, and the poten-

¹ Expenditure on social protection benefits was 1.5% of GDP in 2015, 2.6% of GDP in 2017, and 3.0% of GDP in 2019 when the programme was extended to the first child in the middle of the year.

tial negative impact on the labour supply *via* decreasing women's labour market participation. In particular, concerns were raised in the public debate that the programme's reliance on a single criterion ignored the heterogeneity of households with different consumption patterns, leading to questions about the optimality of the allocation of social assistance funds.

The multiple concerns surrounding the introduction of the F500+ programme and questions on net effects call for an empirical analysis. Previous empirical studies primarily focused on the impacts of F500+ on labour market participation, poverty reduction, and fertility rates, but did not examine the broader macroeconomic consequences of rising household income from social assistance and the related increase in public expenditure. This aspect of the F500+ programme has so far received little attention, despite its potentially significant macroeconomic implications. The increase in disposable incomes directly increases household demand and reinforces processes caused by the consumption multiplier. However, the relationship between income, consumption demand, and output ceases to have a standard form when a sharp and substantial rise in social transfer payments (relative to the initial level of disposable income) alters the mechanisms shaping household demand in shorter time horizons. In particular, a massive inflow of transfers may temporarily increase the income elasticity of consumption, resulting in an increase of consumption demand exceeding that implied solely by changes in household income. The occurrence of such a process would amplify the consumption multiplier and, within the fiscal multiplier framework, reduce the net fiscal cost of social assistance through higher tax revenue.

The study fills a gap in empirical research on the effects of F500+ and examines how its introduction and subsequent extensions affected the income elasticity of consumption and semi-elasticity of consumption to interest rate changes. According to the most general hypothesis, the unprecedentedly large increase in household income from social assistance increased the short- and medium-term income elasticity of demand and modified how household consumption reacts to interest rate fluctuations. In particular, we hypothesise that the F500+ programme most strongly impacted income elasticities of demand in families with multiple children, while its effects were weaker when fewer children in a household were covered by the transfers. To verify the main hypothesis and its particular variants, we estimated the parameters of the private consumption functions in predefined household groups, allowing us to obtain an empirical confirmation or refutation of potential changes in the consumption demand of households with different numbers of dependent children. In the estimation and econometric inference we used time series derived from the Household Budget Survey conducted by Statistics Poland (*Główny Urząd Statystyczny*), which enabled the construction of a unique database capturing differences in income and expenditure among different types of households. We employed econometric models and techniques that allow for the identification and quantification of mild, time-distributed changes in parameter values. The empirical results provide grounds for two somewhat surprising conclusions about the effects of introducing F500+. Firstly, the medium-term income elasticity of consumption increased significantly only in the lowest per-capita-single-adult households. Secondly, income elasticity of consumption showed only a limited change in large families with three or more children, whereas in households with one or two children it remained unchanged. However, the parameters quantifying the impact of interest rates on the consumption demand of these households changed, providing a fairly strong basis for claiming that F500+ only impacted changes in the credit and savings strategies of the majority of households covered by the programme.

The article is structured as follows. The first section presents a review of the literature devoted to empirical studies on the effects of increased social assistance while changes in the social assistance system in Poland between 2005 and 2024 are discussed in the second section. The next section outlines the theoretical foundations of the empirical research and discusses working hypotheses, while the fourth part of the paper sketches the modelling strategy. Section five presents estimates of the model's parameters and their interpretation. The last section discusses the economic meaning of the empirical results and presents the most important conclusion of the article.

Literature review

Within the framework of endogenous growth theory, social policy is recognised as a crucial factor in fostering broad-based social development, shaping long-term economic growth, and contributing to sustained poverty reduction [Haile, Niño-Zarazúa, 2018]. In the short-term, theoretical predictions regarding the effects of the social transfers are often conflicting and highly dependent on the demographic characteristics of the beneficiaries, whether the transfers are permanent or one-off, and the amounts distributed. Empirical research presents similarly contradictory findings regarding the impact of social spending on economic growth. Studies by Khan and Bashar [2015] indicate a pro-growth effect of social spending, while research by Afonso and Alegre [2011] identifies a long-term negative impact on growth in a panel of EU countries, which they attribute to labour market distortions caused by social transfers and the limited productivity-enhancing potential of such public expenditure. Afonso and Alegre [2011] also argue that a shift of resources toward public investment or education would be more supportive of long-term growth. A meta-analysis by Awaworyi Churchill and Yew [2017] suggests that the negative effect is particularly pronounced in developed countries, mainly due to diminishing marginal returns, as transfer levels rise, especially in high-income countries. Pennings [2021], in a study of the United States, also found that states receiving higher transfers tended to experience faster short-term growth in GDP and labour income, with strong effects especially for permanent rather than temporary transfers. A panel study of OECD countries by Furceri and Zdzienicka [2012] also found that an increase in social spending raises GDP, and that this effect is comparable to that of total government spending and particularly significant during periods of severe economic downturns. Among the subcategories of social spending, the largest effects were observed for health expenditure and unemployment benefits.

Awaworyi Churchill and Yew [2017] assumed a trade-off between public spending and economic efficiency, driven primarily by labour market effects. Mathers and Slater [2014] indicate that cash transfers can provide incentives for greater labour force participation, as this type of assistance can expand employment opportunities, particularly for poorer households, and serve as a source of funding for job search costs and skill acquisition. By stimulating consumption, it can also help sustain jobs during economic downturns. Supporting this perspective, Meyer and Rosenbaum [2001] found that financial incentives, especially via an expanded earned income tax credit, increased the labour supply of low-income single mothers.

Ozlem Alper and Demiral [2016], as well as Piotrowska [2008], suggest that social spending may create a disincentive for labour force participation or efforts to seek better employment. For instance, a study on low-income individuals in the U.S. found that receiving unconditional monthly cash transfers of USD 1,000² led to a 3.9 percent decline in labour force participation and a reduction in hours worked over the 3-year duration of the programme, without significant improvements in employment quality or human capital investment [Vivalt et al., 2024]. From the perspective of universal cash transfers, Bibler et al. [2023] analysed labour market effects using Alaska's Permanent Fund Dividend as a case study. They found evidence of both an increase labour demand and a decline in labour supply, linked to increased consumer spending and reduced job-seeking. They also pointed to occurrence of a decline beneficiaries' working hours. Baird et al. [2018] found no significant change in hours worked or earnings when prime-age adults received transfers, such as in the Polish programme.

While the effects of social transfers on consumption and investment are widely recognised, evidence on the direction and strength remains mixed. In the long run, standard RBC models predict a decline in private consumption following an increase in government spending [Aiyagari et al., 1992; Baxter, King, 1993; Fatás, Mihov, 2001], while short-run IS-LM models suggest the opposite [Blanchard, 2009]. These models also differ in their predictions for investment: RBC models associate government consumption with higher investment, whereas IS-LM anticipates a crowding-out effect. Empirical research, however, predominantly indicates a positive effect on consumption. Furceri and Zdzienicka [2012] report a 0.35% increase in private consump-

² In the case of a full-time job, this is more than 80% of the gross salary of a person earning the minimum hourly wage.

tion over three years following a 1% rise in social spending. [Wilcox \[1989\]](#) and [Romer and Romer \[2016\]](#) also identify a significant increase in the elasticity of consumption over a short period. Their study, based on the U.S., demonstrates that this effect is most pronounced within the first five months following a permanent 1% increase in social security benefits, leading to an average monthly rise in real personal consumption expenditure of over 1% in the first six months [[Romer, Romer, 2016](#)]. Furthermore, a 1% increase in benefits reportedly leads to a 0.5% decline in savings [[Kopits, Gotur, 1980](#)].

The impact of increased social transfers varies significantly between household income levels. [Fiszbein et al. \[2009\]](#) find that consumption increases when transfers target poorer households, who tend to allocate most of their income to basic necessities [[Mathers, Slater, 2014](#)]. Low-income households primarily experience an increase in consumption and a reduction in precautionary savings, which in turn lowers the overall savings. Wealthier individuals may increase their investment risk [[Fessler, Schurz, 2018](#); [Evans, 1983](#)], although [Furceri and Zdzienicka \[2012\]](#) find that investment elasticity with respect to social spending shocks is not statistically different from zero, likely due to the weaker effect of social transfers on income growth in higher-income households. [Fessler and Schurz \[2018\]](#) find that households belonging to the bottom 25% of the income distribution are most likely to reduce savings in favour of consumption when a positive shock occurs, which reflects higher marginal propensity to consume of low-income households [[Jappelli, Pistaferri, 2014](#)]. In addition, credit-constrained households with a higher share of benefit income in total income are less able to smooth consumption and thus show a stronger consumption response to unexpected income shocks [[Gechert et al., 2020](#)]. Social transfers can therefore be viewed as a buffer against various risks, helping poorer households maintain an adequate level of consumption [[Mathers, Slater, 2014](#)]. [Fagereng et al. \[2019\]](#) also find that reducing savings may occur when additional income shifts a household's position in the income distribution, given that saving rates remain stable within each income group.

Empirical evidence indicates that the effects of social transfers vary depending on the household income group. Low-income households exhibit stronger changes in consumption, as transfers are primarily allocated to basic needs and reduce precautionary savings, with these households displaying a higher marginal propensity to consume and being more sensitive to unexpected income shocks, particularly under credit constraints. In contrast, higher-income households tend to channel additional income into riskier investments or savings.

In the case of the F500+ programme, previous studies primarily examined its effects on household income and poverty reduction. For instance, [Neugschwender \[2024\]](#) estimates that without transfers from the programme, the poverty rate for single parents would have reached around 70% in 2016–2020,³ and [Bień \[2022\]](#) shows that the risk of extreme poverty for children aged 0–17 dropped after the programme was introduced, with an improvement particularly among families with multiple children. [Brzeziński and Najsztub \[2017\]](#) also suggest that the programme significantly reduced expenditure poverty. For part of the households, the transfers not only allowed them to improve the security of their basic needs, but also accumulate savings, which they were previously not able to do [[Bień, 2022](#)].

The relatively short duration of the Family 500+ programme makes it too early to draw definitive conclusions regarding its impact on fertility. Nevertheless, existing research does not indicate any substantial changes in the fertility rate. In particular, [Alimowski and Bartnicki \[2022\]](#) show that increased fertility was observed only among families who already had children, and only during the initial phase of the programme (prior to its universal expansion). Similarly, regarding labour market outcomes, [Gromadzki \[2024\]](#) found no short-term effects on earnings and negative medium-term effects on household labour supply, particularly for low-income households. The study also reports that households allocated around 43% of the additional income from the programme to savings and approximately one-third to consumption. Evidence by [Magda et al. \[2020\]](#) pointed to a moderate decline in women's labour market participation shortly after the programme's introduction,

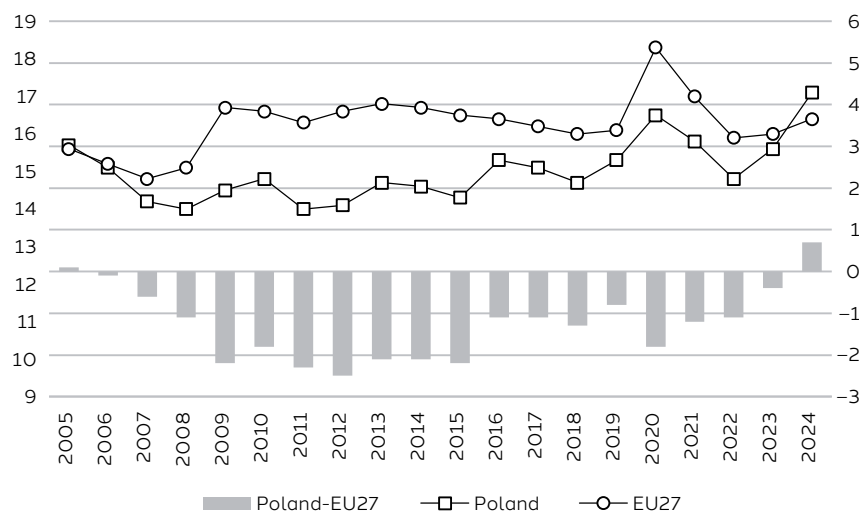
³ According to Eurostat, the share of people at risk of poverty or social exclusion in households with one adult and dependent children in Poland declined from 44.8% in 2015 to 36.7% in 2020. This downward trend continued, and by 2023 the rate had fallen to 28.1%, which was the lowest in the European Union.

particularly in the case of low-educated mothers. Premik [2022] provided evidence that the introduction of the Family 500+ programme had only minor effects on aggregate labour supply, with results differing by family type and gender. Previously employed mothers largely maintained their participation, while non-employed women became even less likely to work, whereas unemployed fathers increased their labour market activity. Contrary to the findings of Gromadzki [2024], difference-in-differences estimates using 2012–2018 data show that families obtaining this child benefit increased their saving rate by 8 percentage points after the 2016 reform, while for parents with one child not receiving the benefit (the control group) it increased by only 2.9 percentage points [Liberda et al., 2021]. Taken together, these findings suggest that the programme contributed to improving the financial position of beneficiary households, mainly through enhanced income stability and increased capacity to save, despite mixed effects on labour market participation.

Social assistance in Poland in 2005–2024

After joining the EU in 2004 but before introducing the F500+ programme, social policy in Poland was passive in nature. Total general government expenditure on social benefits other than social transfers in kind dropped from around 17.0% of GDP in 2002 to the lowest level of 14.0% of GDP in 2008, before stabilising at 14.0–14.8% until 2016. From 2008 to 2015, social spending in Poland was about 2 percentage points below the EU average. After the introduction of F500+, this gap narrowed to an average of 1.1 p.p. in the years 2016–2022 (see Figure 1).

Figure 1. Share of general government total expenditure on social benefits other than social transfers in kind in GDP in Poland and the EU (% , left scale), and the difference Poland – EU (p.p., right scale)



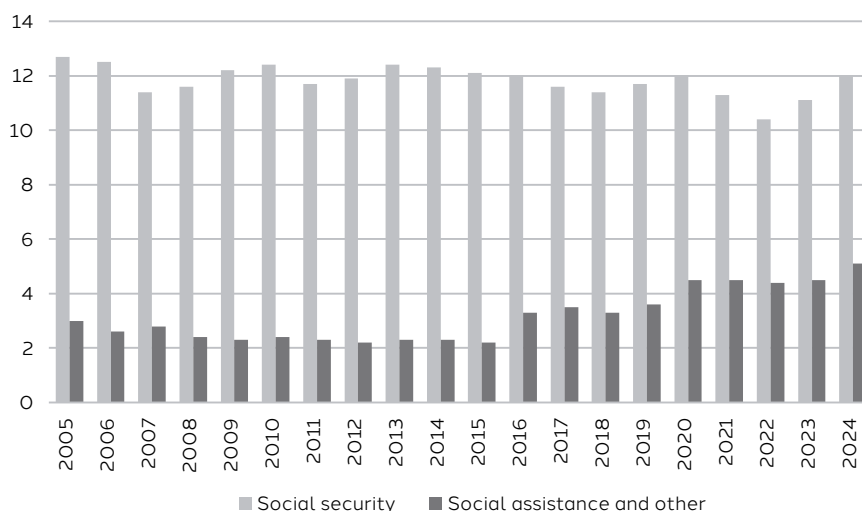
Source: EUROSTAT.

The F500+ programme not only increased total social spending but also changed its structure. Social benefits other than transfers in kind can be divided into pensions and disability benefits conditional on participation in the social security system, and other benefits not dependent on prior contributions. Benefits paid by the social security sector accounted for the majority of social protection expenditure in the general government sector (see Figure 2), with their share of GDP fluctuating around 12% until 2020, then dropping to around 11% in 2021–2023 as a result of an increase in social security benefits due to very high inflation in the previous years.

A different pattern emerges for social benefits other than social security benefits. Until 2016, these benefits averaged at 2.4% of GDP. The introduction of F500+ marked a level shift in this category up to around 3.4% of GDP in 2017–2018, while the expansion of the programme to include all children, regardless of their parents'

income, resulted in a further increase, with non-pension social benefits averaging 4.5% of GDP between 2020 and 2023. During that latter period, the ratio of nominal benefits to nominal GDP remained relatively stable due to the introduction of other benefits, such as the so-called thirteenth and fourteenth pensions. Another rise to 5.1% of GDP in 2024 was the result of changing the benefit amount from 500 to 800 PLN per child.

Figure 2. General government total expenditure on social benefits other than social transfers in kind, disaggregated, as a % of GDP



Source: Authors' own elaboration based on EUROSTAT data.

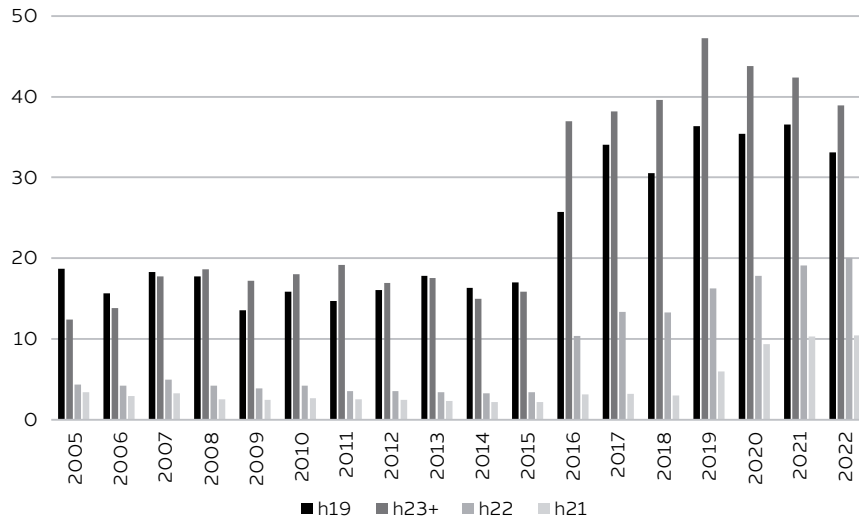
Consistent with previous studies, a direct, short-term assessment based on Statistics Poland data confirm the programme's positive impact on poverty reduction. The child poverty rate dropped from 9.0% in 2015 to 5.8% in 2016, and 4.7% in 2017, reflecting the full-year effect of the programme. However, with the benefit's nominal value remaining unchanged, its poverty-reducing effect weakened over time, particularly during the period of high inflation in 2022–2023. Consequently, child poverty once more increased, reaching 5.7% in 2022 and 7.6% in 2023. In response, the government raised the benefit from the 1 January 2024, resulting in child poverty falling to 5.4%.

The aggregate poverty rate does not capture the full range of heterogeneous distributional effects induced by the F500+ programme. Brzeziński and Najsztub [2017] addressed household heterogeneity based on data collected immediately after the programme implementation, and found that F500+ had positive distributive consequences, with the largest gains visible in the lowest income deciles. In 2016, around 42% of gains went to the poorest 20% of households, while the richest 20% received only 10% of the total support. Moreover, for the first income decile group, the programme increased household disposable income by 37.9%. Accounting for the household effects of scale on poverty measurement, the benefit reduced relative income poverty rates among children by 64–71%, and for single parents by 75–89%.

Limiting the analysis to changes in disposable income only is insufficient to capture the potential household reaction to increased income after 2016. Figure 3 demonstrates changes in social assistance in relation to household disposable income (excluding social assistance). Figure 4 presents the levels of per capita income. To reflect the heterogeneity of F500+, four household types were distinguished: single-adult households with children (h19), families with three or more children (h23+), and families with one or two children (h21 and h22, respectively). Per capita income in these cohorts between 2005 and 2022 is denoted as $ypc19$, $ypc23+$, $ypc22$, and $ypc21$ (vide Figure 4). The conclusions from the preliminary graphical analysis are clear – the strongest impact of the F500+ programme was on disposable incomes in lower-income households. In cohort h23+, the share of social assistance relative to adjusted disposable income excluding transfers in cash reached approximately 40%, while in group h19 it oscillated around 35%. In cohort h22, the effects were less pronounced but

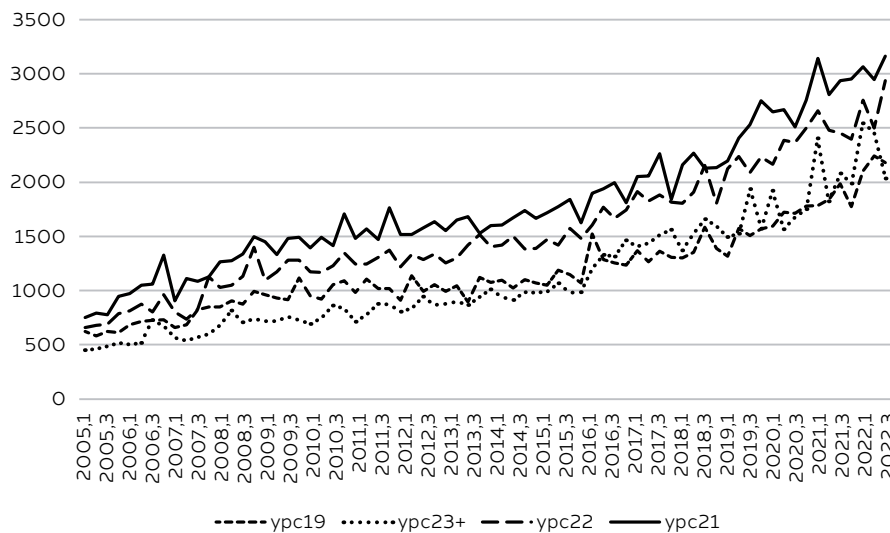
have been increasing since 2016. In the highest-income-per-capita cohort (h21), the effects were visible only in 2019, when the benefit was unconditionally extended to the first child in the household. In group h22, the share of social assistance in disposable income approached 20% in 2021–2022, while in group h21 the impact of F500+ was notably smaller. The graphical analysis does not support a substantial increase in per capita income in the higher-income groups.

Figure 3. Share of social assistance in household disposable income, excluding social assistance (%)



Source: Authors' own elaboration based on Statistics Poland data.

Figure 4. Nominal disposable income per capita in groups 19, 23+, 22 and 21 (PLN)



Source: Authors' own elaboration based on CSO data.

The time series presented in Figures 3 and 4 come from a unique database constructed specifically for the purpose of this study. To perform the cohort-level analysis, we constructed a dataset linking household microdata with macroeconomic aggregates, where household income Y and consumption C in the selected cohorts are defined as fractions of macroaggregates specified in accordance with the ESA2010 classification: $C^i = \omega_{iC} C$, $Y^i = \omega_{iY} Y$, $i = \{19, 23+, 22, 21\}$. The shares ω_{iC} and ω_{iY} are calculated using microdata collected in the Household Budget Survey in Poland (hereafter HBS). As the HBS consists of survey data characterised by specific prob-

lems, such as underestimation of the highest incomes and certain categories of expenditure, in order to minimise the impact of data biases on the results, a series of adjustments to the data were made to better reflect the structure of earnings in Poland. A detailed description of the measures taken can be found in the Appendix.

Theoretical framework and working hypotheses

Initial specifications of the empirical consumption equations are consistent with the predictions of standard theoretical micro-models. Under budget constraints that balance purchases of new assets and sales of previously accumulated assets with consumption expenditures and household net incomes from labour, non-interest income from physical capital, social security and government transfers, the solution to the representative household's utility maximisation problem yields an equation defining per capita consumption as the product of the marginal propensity to consume out of wealth and per capita wealth, including current incomes. Aggregating this relationship leads to the standard macroeconomic specification of private consumption function:⁴

$$c = a + \beta y + (1 - \beta)w^H, \quad (1)$$

where: y – current and future discounted income from labour, physical capital and social transfers, w^H – household financial wealth.

The above equation represents the relationship at a steady-state. The income elasticity of consumption β satisfies the model's stability condition $0 < \beta \leq 1$, which implies a constant share of consumption in total wealth. In finite time horizons, however, in which individual consumption deviates from steady state, Keynesian liquidity constraints on households may play an important role. To account for intertemporal substitution, the model is extended to include the real interest rate (R):

$$c_t = \beta_0 + \beta_1 y_t + \beta_2 w_t^H - \beta_3 R_t + u_t, \quad (2)$$

where: β_k – the long-run equilibrium parameter; $t = 1, \dots, T$; $u_t \sim n.i.d.(0, \sigma^2)$; all variables are expressed in real terms. The long-term stability condition implies homogeneity of private consumption with respect to wealth and income, $\beta_1 + \beta_2 = 1$ ($\beta_1, \beta_2 > 0$; in empirical applications: $\beta_1 \gg \beta_2$); an increase in the real interest rate is expected to decrease consumption, $\beta_3 > 0$.

In practical applications, the small size of the available time series often prevents an empirical confirmation of the convergence of β_1 and β_2 estimates to their theoretical values. In such cases, inferring the determinants of consumption on the basis of short-run models defined for growth rates or first differences, e.g. [Romer and Romer \[2016\]](#), [Furceri and Zdzienicka \[2012\]](#), and [Gechert et al. \[2020\]](#), is insufficient and inconclusive, due to: (i) neglecting the equilibrium relationship linking the *levels* of private consumption, household income and wealth, (ii) a disconnect between short-term parameter estimates and the underlying equilibrium conditions, and (iii) ignoring the short-term adjustments of private consumption toward the equilibrium path. To address these limitations, our analysis focuses on medium-term relationships between the levels of the relevant variables. It is hypothesised that, in the medium-term, the elasticities of β_1 and β_2 tend to sum up to a value below unity due to the ongoing convergence of the system toward a new equilibrium path following a substantial increase in household income, $\beta_1 + \beta_2 < 1$. Exceptions are also possible, although in the case of low-income households, the above-average growth in consumption expenditure cannot be ruled out in the medium term as a reaction to previous income poverty, $\beta_1 + \beta_2 > 1$. In both cases, the in-sample elasticities defined in this way are expected to converge toward their equilibrium values in the long term as deviations in household consumption habits from their steady-state levels disappear and the marginal propensity to consume stabilises at equilibrium.

⁴ Natural logarithms of the variables are denoted in lowercase letters throughout the article.

In the study, we aim to expand existing research on the impact of the F500+ programme by examining its specific effects on the medium-term income elasticity of consumption and the propensity to take out consumer loans or accumulate savings in four predefined cohorts of households. Therefore, in line with the general and intuitive hypothesis, increases in disposable income can lead to changes in the time-varying medium-term income elasticities β_{kt}^i :

$$c_t^i = \beta_{0t}^i + \beta_{1t}^i y_t^i + \beta_{2t}^i w_t^{H,i} - \beta_{3t}^i R_t^i + u_t^i, \quad (3)$$

where superscript i distinguishes household type, $i = \{19, 23+, 22, 21\}$.

Figures 2–3 show the variability in *per capita* disposable income $y^{PC,i}$ and the share of social assistance income in total income h^i . The conclusions are intuitive and clear-cut: on average, per capita income is higher in households with fewer dependent children, while the importance of transfers received under F500+ is greater in households with lower income and supporting more children. For these reasons, the first tests were conducted to verify whether the medium-term income elasticity of consumption increases as the share of social transfers in total household income rises. Since relative income gains were highest in the lower-per-capita-income household groups 23+ and 19, lower in group 22, and the least pronounced in the wealthiest households with one child (group 21), the expected results pointed to relatively large increases in the medium-term elasticities β_{1t}^i in the first two cohorts, with the smallest increase in cohort 21.

An analogous set of partial hypotheses can be formulated with respect to changes in the elasticity of consumption relative to household wealth β_{2t}^i . However, testing these hypotheses is challenging for two reasons. First, reliable data on household wealth levels for the specific household groups are unavailable, and only aggregate figures for the entire economy can be used. Second, the aggregate size of F500+ social transfers is negligible compared with total household wealth (0.5–0.6% in 2019–2023). It may be slightly different for the lowest-income-per-capita households in cohort 19, but even in that case it does not seem fully justified to assume that social assistance transfers are perceived as a factor permanently increasing the wealth stock.

The third group of the partial hypotheses was formulated with respect to the semi-elasticity β_{3t}^i . It was hypothesised that an abrupt increase in the share of income from social benefits in total household income could lead to bidirectional changes in the value of β_{3t}^i . An increase in this parameter may occur in households with relatively higher creditworthiness, with such a mechanism reflecting the substitution of funds from consumer loans with resources provided from social assistance. Conversely, a decline in β_{3t}^i would correspond to an improvement in debt repayment capacity, also driven by the cash inflows from F500+. As a third possibility, a scenario of zero sensitivity of consumer demand to changes in credit costs was considered, which may apply to the low-income-per-capita households in cohort 19 that lack access to credit. In all three cases, the final conclusions about the direction of shifts in the sensitivity of demand to changes in the real interest rate were formulated based on both the estimates and the statistical precision of the β_{3t}^i estimates. Estimation of the medium-term parameters of equation (3) and subsequent verification of hypotheses on β_{kt}^i require the identification of the coefficient drivers $\mathbf{x}_{(j)t}$, such that $\beta_{kt}^i = f_k(\mathbf{x}_{(j)t})$, $j = 1, \dots, J$ (details in: [Swamy et al. \[2010\]](#), [Hall et al. \[2017\]](#)). Identifying the components of vector $\mathbf{x}_{(j)t}$ is not trivial, but in many empirical applications this step is not necessary. A sufficient solution for describing the variation of β_{kt}^i parameters can be the use of a function derived from the family of generalised logistic curves with values of interval $\langle 0, 1 \rangle$, e.g. [Granger and Teräsvirta \[1993\]](#), [Teräsvirta \[1994\]](#).

A cursory analysis of the share of social transfers in disposable income (Figure 3) leads to the hypothesis of potential structural changes in household consumption demand in 2016 and 2019. For households with lower per capita income (cohorts 19 and 23+), changes in elasticities may have occurred when the shares of social welfare transfers increased from around 20 to 25–30%; analogous hypotheses can be formulated for the parameters describing the demand of the other two groups of households.

The above premises provide justification for considering the first-order logistic function to describe changes in the equilibrium parameters:

$$c_t^i = \beta_0^i + \beta_1^i y_t^i + \beta_2^i w_t^{H,i} - \beta_3^i R_t^i + G^i(s_t^i; \gamma^i, \mu^i) \cdot (\beta_0^{i'} + \beta_1^{i'} y_t^i + \beta_2^{i'} w_t^{H,i} - \beta_3^{i'} R_t^i) + u_t^i \quad (4)$$

where: $G(s_t^i; \gamma, \mu) = (1 + \exp(-\gamma(s_t^i - \mu)))^{-1}$. The values of the transition variable s_t^i determine the positioning of the economic system in one of two regimes; for $s_t^i = \mu^i$ there is a transition between regimes, which is smoother the smaller the value of the parameter γ^i ; parameters μ^i and γ^i are estimated. In the first regime, where $G^i(s_t^i; \gamma^i, \mu^i) = 0$, the medium-term equilibrium is defined by the relation:

$$c_t^i = \beta_0^i + \beta_1^i y_t^i + \beta_2^i w_t^{H,i} - \beta_3^i R_t^i \quad (5a)$$

in regime two, defined for $G^i(s_t^i; \gamma^i, \mu^i) = 1$, the relationship is as follows:

$$c_t^i = (\beta_0^i + \beta_0^{i'}) + (\beta_1^i + \beta_1^{i'}) y_t^i + (\beta_2^i + \beta_2^{i'}) w_t^{H,i} - (\beta_3^i + \beta_3^{i'}) R_t^i \quad (5b)$$

Inferring the magnitude and direction of changes in the income elasticity of consumption, the elasticity of private consumption with respect to wealth, and the semi-elasticity of consumption with respect to interest rates requires estimating the parameters $\beta_k^{i'}$.

The partial research hypotheses are summarised in Table 1.

Table 1. Partial hypotheses

Household group i	Parameter		
	$\beta_1^{i'}$	$\beta_2^{i'}$	$\beta_3^{i'}$
21	0	0	≥ 0
22	≥ 0	0	≥ 0
23+	> 0	0	≤ 0
19	≥ 0	0	0

Notes: $\beta_k^{i'}$ represents the regime-specific deviation in parameter β_k associated with the implementation of F500+.

Source: Authors' own elaboration.

Modelling strategy

The estimation of medium-term equilibrium parameters in the consumption functions (5) can be carried out using the standard smooth transition autoregressive modelling procedure (hereafter STR; e.g. [Teräsvirta \[1994\]](#)). The estimation procedure involves five steps. First, the optimal lags of the variables in a linear autoregressive distributed lag model are determined. Next, hypotheses regarding the linearity of the relationship between the variables are verified. If nonlinearity is found, a sequence of hypotheses is tested, which in the most commonly considered cases leads to a choice between logistic functions of 1 and 2 degrees as alternative approximations of the changes in economic regimes. The final steps include parameter estimation and an evaluation of the model's stochastic properties.

In this study, a modified approach was applied to analyse potential changes in income elasticities of individual consumption of the defined household groups. In the first stage, four distinct vector error correction models VEC were estimated separately for each household group, e.g. [Johansen \[1995\]](#) and [Juselius \[2006\]](#):

$$\Delta y_{(m)t}^i = \alpha^i (\beta^{iT} y_{(m)t-1}^i) + \sum_{s=1}^{S-1} \Gamma_s^i \Delta y_{(m)t-s}^i + u_{(m)t}^i \quad (6)$$

where: $y_{(m)}^i$ – vector of M endogenous variables, β^i – cointegrating matrix, α^i – adjustment matrix, Γ_s^i – matrices comprising short-term parameters, $u_{(m)}^i$ – error term, $u_{(m)}^i \sim n.i.d.$, $m = 1, \dots, M$, $s = 1, \dots, S-1$; β^{iT} denotes transposition of β^i . The endogenous variable vectors $y_{(m)t}^i$ consisted of the variables present in equations (4)–(5), $y_{(m)t}^i = [1, c_t^i, y_t^i, w_t^{H,i}, R_t^i]^T$. The equilibrium conditions in each household cohort are met when $\beta^{iT} y_{(m)t}^i = 0$.

In the second stage of the analysis, an attempt was made to construct STR models describing the mechanisms shaping the demand of the predefined four households types:⁵

$$c_t^i = \sum_{s=1}^S \theta_s^i c_{t-s}^i + \sum_{s=0}^S \psi_{1s}^i y_{t-s}^i + \sum_{s=0}^S \psi_{2s}^i w_{t-s}^{H,i} - \sum_{s=0}^S \psi_{3s}^i R_{t-s}^i + \\ + G^i(s_t^i, \gamma^i, \mu^i) \cdot \left(\sum_{s=1}^S \theta_s^i c_{t-s}^i + \sum_{s=0}^S \psi_{1s}^i y_{t-s}^i + \sum_{s=0}^S \psi_{2s}^i w_{t-s}^{H,i} - \sum_{s=0}^S \psi_{3s}^i R_{t-s}^i \right) \quad (7)$$

in which the equilibrium time-varying parameters β_{kt}^i are defined according to standard identities:

$$\beta_{kt}^i = \sum_{s=0}^S \psi_{ks}^i (1 - \sum_{s=1}^S \theta_s^i)^{-1} + G^i(s_t^i, \gamma^i, \mu^i) \cdot \sum_{s=0}^S \psi_{ks}^i (1 - \sum_{s=1}^S \theta_s^i)^{-1}. \quad (8)$$

The reason for modifying the estimation procedure of the model (4) is the limited applicability of the STR approach. *First and foremost*, the use of single-equation STR models or their multidimensional generalisations, i.e. smooth transition STVEC models [Hubrich, Teräsvirta, 2013], leads to reliable results only when sufficiently long time series are used. Such a condition is not met by the data available for Poland. *Second*, according to the authors' best knowledge, the problem of structuring nonlinear vectors and testing structuring constraints in STVEC models has yet to be solved. Consequently, multidimensional STVEC analogues of μ^i and γ^i are the only parameters that can be given an economic interpretation [cf. Hubrich, Teräsvirta, 2013], and drawing conclusions regarding the properties of the modelled system is possible only by analysing generalised impulse response functions. Thus, if the main purpose of the study is to verify hypotheses allowing for changes in income elasticities of consumption and semi-elasticities of individual consumption with respect to interest rates, the usefulness of STVEC models is limited. *Third*, focusing research on single-equation STR models allows for the structuring of potential single nonlinear cointegrating relationships, although it still does not free the analysis from the risks associated with the use of linearity tests and optimal transition function selection tests, for which only asymptotic distributions are known. Moreover, adopting the one-dimensional STR approach means adopting arbitrary weak exogeneity restrictions, which can lead to inappropriate estimates of equilibrium parameters whenever adjustments occur in even one regressor of the cointegration trajectory.

Therefore, the advantages of the estimation procedure adopted in the analysis of private consumption in Poland are fourfold. *First*, evidence of cointegration eliminates the risk of drawing conclusions on spurious regressions and makes it possible to identify the (medium-term) equilibrium relationships toward which the model variables adjust. Along with the verification of the hypotheses of variables cointegration, it is possible to determine the optimal lag length S and perform an equilibrium parameter stability analysis. *Second*, the methods used to structure and test economically interpretable cointegrating vectors in VEC models are well established. *Third*, the Johansen procedure allows for simultaneous analysis of cointegrating relationships and analysis of the stability of equilibrium parameter estimates β^i by using recursive estimation. Potential structural changes in equilibrium relationships can be identified and approximately mapped by extending cointegrating vectors with deterministic trends and dummy variables. *Fourth*, the equilibrium parameters in the VEC model without structural breaks are the weighted averages of the elasticities of two potential economic regimes. As such, VEC model estimates are an important initial benchmark in assessing elasticities in STR models.

Empirical results

The estimation of the parameters of the medium-term equilibrium equation (5) was carried out using quarterly data covering the period 2005–2022. The division of households into four predefined groups made it impossible to include the time series data of the wealth held $w_t^{H,i}$ and the real interest rate R_t^i for each analysed cohort in the estimation procedure. Therefore, the following equilibrium equations were considered for both regimes under consideration:

⁵ In order to simplify the notation, the deterministic variables and errors terms have been omitted.

$$c_t^i = \beta_0^i + \beta_1^i y_t^i + \beta_2^i w_t^H - \beta_3^i R_t, \quad (9a)$$

$$c_t^i = (\beta_0^i + \beta_0^{i'}) + (\beta_1^i + \beta_1^{i'}) y_t^i + (\beta_2^i + \beta_2^{i'}) w_t^H - (\beta_3^i + \beta_3^{i'}) R_t. \quad (9b)$$

To empirically test the theoretical relationships specified in equations (9), a set of VEC models was estimated for each household cohort. Household wealth was defined as the sum of the capital stock, net foreign assets and government debt; the variable exhibited a smooth, near-linear upward trend. The inability to determine real interest rates for each group of households is due to the unavailability of information on both consumption baskets prices and inflation expectations for each cohort. Therefore, the real interest rate was determined as the difference between the nominal interest rate on the 10-year bond and the observed consumer price inflation: $R_t = I_t - \Delta p_t^{CPI}$; p_t^{CPI} – consumer price index. This approach corresponds to assuming a static expectations formation, which can be considered a reasonable assumption for households with limited access to information on inflationary processes in the medium term. At first glance, the choice of the long-term interest rate as the variable determining intertemporal substitution by households may appear questionable, but there are at least two reasons for including this variable in private consumption equations. First, the stream of additional household income does not have to be spent exclusively on increasing consumption expenditure, but may – and in most cases does – increase savings in the form of financial assets with longer maturities. Second, it is difficult to assume that an increase in disposable income will cause changes in the propensity to borrow only short-term loans to finance current consumption. A fully valid alternative is the assumption of increased financing of expenditure on durable goods.

The model analysis successively included (i) determining the lag length S that yielded desirable error-terms properties, (ii) exclusion and weak exogeneity tests, (iii) cointegration tests, (iv) assessment of the error-term properties, and (v) evaluation of recursive parameter estimates. In all VEC model variants, household wealth was assumed to be weakly exogenous. The results indicate that in nearly all variants of the VAR models, the optimal lag is two quarters.

Table 2. Estimates of the cointegrating vectors

Household group:	c^i	y^i	w^H	R	$const$	ECT	$r=1$ (p-value)
19	1	-1.18 (23.9)	0	-	1.44 (3.4)	-0.44 (2.8)	0.335
23+	1	-0.80 (33.8)	0	3.31 (3.4)	-1.81 (8.2)	-0.72 (4.7)	0.175
22	1	-0.70 (20.4)	0	3.82 (5.2)	-3.05 (8.4)	-0.70 (3.7)	0.119
21	1	-0.86 (19.8)	0	-0.91 (0.9)	-1.49 (3.2)	-0.36 (2.7)	0.337

Notes: ECTs stand for error correction terms in Δc_t^i equations; the last column reports p -values in the cointegration tests for $r=1$; t -ratios are reported in parentheses.

Source: Authors' own elaboration.

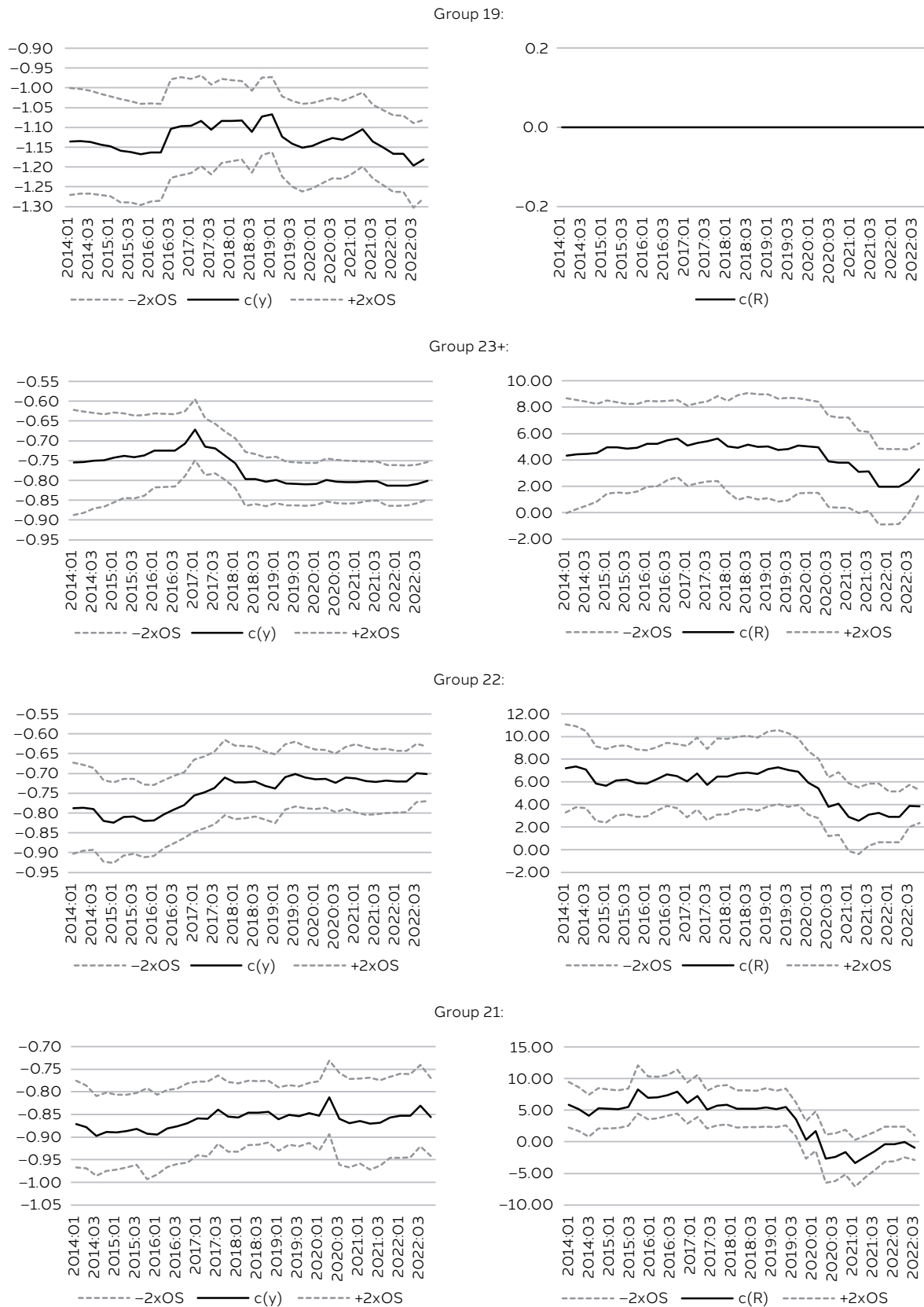
Table 2 summarises the results of the estimation of equilibrium parameters and parameters characterising the speed of the return to equilibrium.⁶ Their interpretation is straightforward. The transformation of the first cointegrating vector:

$$c_t^{19} = 1.44 + 1.18y_t^{19} \quad (10^*)$$

leads to the conclusion that medium-term overshooting effects occur in the processes shaping private consumption in cohort 19: a one-percentage increase of the disposable income induces an increase in consumer demand of around 1.2 percent, *ceteris paribus*. In the other three cases, the estimated income elasticities of consumption rank below unity, indicating also the medium-term nature of the identified relationships.

⁶ The detailed estimation results are available on request.

Figure 5. Recursive estimates of income elasticities of private consumption $c(y)$ and semi-elasticities on real interest rates $c(R)$ in VEC models



Notes: The dashed lines represent the interval of two standard deviations.

Source: Authors' own elaboration.

Although the results of the cointegration analysis confirm the existence of equilibrium relationships between private consumption and income in the considered household groups, and the short-term adjustments attract all c_t^i s towards their medium-term equilibrium paths, an analysis of the recursive estimates of the cointegrating vectors points to drawbacks of the VEC models' parameter estimates. Figure 5 illustrates changes in the recursive estimates of the cointegrating vectors as the estimation sample is gradually extended by one quarter, from 2005q1–2014q1 to 2005q1–2022q4. Notably, shifts in selected parameter estimates occur around the turn of 2016–2017 and 2019–2020, i.e. the periods corresponding to the introduction and expansion of the F500+ programme. Only minor changes in the income elasticities of consumption are observed for the lower-income-per-capita household groups 19 and 23+, while more pronounced changes appear in the semi-elasticities of consumption with respect to interest rates in the higher-per-capita-income groups 22 and 21.

As indicated in the previous section, the main limitations of single-equation smooth transition models stem from their sensitivity to limited sample sizes, which is why estimates from the VEC models were used as reference values when constructing the single-equation STR models. *First*, it was assumed that wealth does not affect households expenditure in the medium term. *Secondly*, due to the presence of only one structural change, a deterministic trend was assumed for the transition variable, $s_t = t$. Identifying the periods when the transition between systems occurs makes it possible to assess the share of social assistance income in other disposable income at which changes in parameter values become evident (see Figure 3). *Third*, due to forcing the assumption of weak exogeneity of income y_t^i , which is only satisfied in the VEC model for cohort 19, a four-quarter lag horizon was adopted to make the initial STR models more flexible, as indicated by Schwarz and Hannan-Quinn's criteria and autocorrelation tests. A general-to-specific modelling strategy was applied; zero restrictions were consistently and sequentially imposed on parameters with either the greatest or the smallest lags. *Fourth*, due to the small sample size, liberal significance levels were applied with no zero restrictions imposed on parameters whose estimates were relatively high, despite the fact that the t -ratios associated with these estimates only fluctuated around 1.

The detailed results of the estimation of the final STR models are reported in table 3, whereas the estimates of the medium-term equilibrium parameters are summarised in table 4.

Particularly noteworthy are the heterogeneous estimates of short-term income elasticities observed in the period preceding the introduction of the F500+ programme. The strongest demand response was found for households in group 19 (0.874), while significantly weaker responses were identified in groups 22 and 21 (0.458 and 0.525, respectively).⁷ In cohort 23+, the short-term elasticity is considerably lower (0.251), although the estimate of the parameter on lagged income y_{t-1}^{23+} equal to 0.369 places the overall short-term response of this group between those of the remaining cohorts. The estimates of the short-term elasticities remain virtually unchanged following the implementation of the programme.

Table 3. Estimates of the STR model parameters

:	c^{19}	c^{23+}	c^{22}	c^{21}
Regime 1				
<i>const</i>	−0.090 (0.1)	2.788 (1.8)	1.998 (4.3)	1.003 (2.9)
c_{t-1}^i	−0.085 (0.9)	−0.206 (2.0)	0.164 (1.6)	0.380 (6.7)
c_{t-2}^i	0.198 (2.1)	−0.262 (2.5)	−	−
c_{t-3}^i	−	0.141 (0.9)	−	−
c_{t-4}^i	−	0.171 (1.3)	−	−
y_t^i	0.874 (9.1)	0.251 (3.7)	0.458 (7.2)	0.525 (10.5)
y_{t-1}^i	0.172 (1.8)	0.369 (4.7)	−0.028 (0.3)	−
y_{t-2}^i	−0.134 (1.3)	0.131 (1.5)	0.208 (3.0)	−

⁷ In the upper panel of Table 3 the short-term parameters are highlighted in italics.

cont. Table 3

:	c^{19}	c^{23+}	c^{22}	c^{21}
y'_{t-3}	-	0.100 (0.9)	-	-
R_t	-	-6.868 (2.9)	-2.120 (1.8)	-
R_{t-1}	-	-	-	-1.663 (1.5)
Parameter change in regime 2				
const	-1.268 (0.6)	-0.301 (0.2)	-1.055 (0.6)	-0.062 (4.4)
c'_{t-1}	-	-	-	-
c'_{t-2}	-	-	-	-
c'_{t-3}	-	-0.516 (2.6)	-	-
c'_{t-4}	-	0.130 (0.8)	-	-
y'_t	-	-	-	-
y'_{t-1}	-0.501 (2.6)	-	-	-
y'_{t-2}	0.284 (1.6)	-	-	-
y'_{t-3}	0.363 (2.0)	0.356 (2.3)	-	-
R_t	-	2.446 (0.9)	-3.461 (2.2)	-
R_{t-1}	-	-	-	-1.332 (0.9)
Transition parameters				
μ^i	52.0 (27.4)	41.5 (0.0)	59.5 (0.0)	58.9 (2.7)
γ^i	60.1 (0.3)	1080.5 (0.0)	2043.5 (0.0)	394.5 (0.0)
Diagnostics				
AR (1)	0.55	0.43	0.95	0.12
AR (2)	0.79	0.36	0.21	0.12
AR (3)	0.47	0.54	0.54	0.16
AR (4)	0.68	0.64	0.69	0.32
ARCH (4)	0.95	0.05	0.13	0.95
JB joint	0.042	0.817	0.265	0.999
JB skewness	-0.28	-0.159	-0.126	0.002
JB kurtosis	4.36	3.205	2.079	2.989

Notes: The table provides parameter estimates on the regressors (first column) in the equations of the dependent variables listed in the first row of the table. t -ratios are given in parentheses. AR(s) denotes the LM test for no autocorrelation of order s ; ARCH(4) refers to the homoscedasticity test; JB is the Jarque–Bera normality test. p -values are reported for all tests.

Source: Authors' own elaboration.

Short-term semi-elasticities on real interest rates indicate that the consumption expenditures of households in group 19 are insensitive to changes in the cost of borrowing in both regimes. In group 23+, the response of private consumption to interest rates is immediate and strongest, while in group 21 it is weaker and delayed. For the final assessment of the magnitude of the impact of interest rates on private consumption, the shifts in semi-elasticities occurring in the second economic regime are crucial: demand sensitivity declines (in absolute terms) in group 23+, rises in group 22, and – again with a delay – increases in the highest-income group 21.

The estimates of μ^i s indicate a transition between regimes in cohorts 21 and 22, shortly after the period of the extension of the F500+ programme to include the first child in the family, that is between quarters 2019q3/2019q4 and 2020q1/2020q2, respectively. In contrast, the change in consumption demand mechanisms in cohort 23+ occurred immediately after the programme's introduction, between the first and second quarters of 2016. Large estimates of the smoothness parameters γ^i point to abrupt changes in the demand elasticities with respect to income, and in the semi-elasticities with respect to interest rates in these household groups. The timing and speed of response of the lowest-income-per-capita households (group 19) differ significantly. A clear correction in consumer demand is delayed, as the change in regime occurred between 2018q2 and 2018q3, indicating a cautious spending decision process in this group of households.

The analysis of the estimates of medium-term parameters allows for drawing general conclusions (see Table 4). As expected, the overall effect of the increase in disposable income was strongest in group 19 characterised by the lowest per capita disposable income, with the estimate of the medium-term elasticity suggesting an overreaction of consumption demand in this household group. In the remaining groups, the effects of higher disposable income proved to be moderate at best (group 23+) or empirically indistinguishable from zero (cohorts 22 and 21).

Table 4. Medium-term equilibrium elasticities in model (9)

Parameters:	Household group:			
	c^{19}	c^{23+}	c^{22}	c^{21}
β_1	1.03	0.74	0.76	0.85
$\beta_1 + \beta'_1$	1.19	0.78	0.76	0.85
β_3	0	5.9	2.5	2.7
$\beta_3 + \beta'_3$	0	2.9	6.7	4.8

Source: Authors' own elaboration.

The conclusions regarding the effect of interest rates on private consumption in the considered household groups are mixed. In the period preceding the introduction of the F500+ programme, the impact of interest rates appears stronger in group 23+, while weaker and of similar magnitude in groups 22 and 21, which represent higher income per capita. The increase in disposable income under the second regime leads to divergent reactions: a decline in the sensitivity of demand to changes in real interest rates in group 23+, and an increase in groups 22 and 21. These results can be interpreted in three ways. *First*, the income growth in group 23+ may have increased its tolerance for higher consumer credit costs, as these can be repaid using the additional funds received. *Second*, the reduced sensitivity of group 23+ households to changes in R may result from improved creditworthiness, e.g. Mathers and Slater [2014], Fessler and Schurz [2018]. *Third*, the increase in medium-term equilibrium elasticities with respect to real interest rates in the demand equations for cohorts 22 and 21 may be interpreted as a consequence of declining interest in consumer borrowing, which is replaced by funds received through social transfers.

Discussion and conclusions

The conclusions that can be drawn from the presented research are conditional to the information contained in the available time series. It should therefore be emphasised that despite the use of all accessible and reliable data on the evolution of disposable income and private consumption in household covered by the Family 500+ programme, the obtained empirical results should be viewed as a first approximation. The preliminary nature of these conclusions stems from three main factors.

First, the currently available time series are too short to contain sufficient information on shifts in the equilibrium trajectories of private consumption following the introduction of the Family 500+ programme. The main consequence of the limited informativeness of the data is the relatively low precision of the estimates, while the second is the need to consider, in the selection of the final models, not only the results of statistical significance tests (via t -ratios) but also the economic interpretability of the estimated coefficients. The rationale for such an approach is straightforward: a low t -ratio does not necessarily imply the absence of a causal relationship between the dependent and explanatory variables, but rather a lack of estimation precision resulting from data constraints.

Second, it should be emphasised that the empirical results were obtained from a time series covering only one episode of significant increase in social transfers income. Therefore, adopting a deterministic trend as the transition variable s_t is a sufficient solution, since identifying the point of transition between regimes allows

one to determine, with adequate precision, the share of Family 500+ transfers in total disposable income at which changes in income elasticities of demand or in consumption semi-elasticities with respect to interest rates occur. In future studies based on longer samples that include multiple episodes of fiscal expansion (social benefits) or fiscal tightening resulting from the absence of an indexation mechanism in social assistance programmes, parameter changes should emerge from the fluctuations of precisely selected endogenous variables. The ratio of the F500+ programme transfers to disposable income is one possible choice. Undoubtedly, further research will be needed once longer time series become available.

Third, the study analysed private consumption patterns in household cohorts that differed solely in the number of dependent children. This implies that the defined cohorts may comprise households that vary in per capita income levels and, consequently, in the changes in their propensity to consume resulting from increased income due to government transfers. The implications of this limitation may be quite significant. A natural next step in advancing the analysis of household expenditure determinants would be to construct household cohorts with greater internal homogeneity, which could be achieved by classifying households simultaneously by the number of dependent children and by disposable income per capita. Accounting for these differences would likely improve the precision of income elasticity estimates within narrower household subgroups. Unfortunately, the data adjustments applied to the predefined household cohorts cannot currently be replicated for more disaggregated time series, which limits the possibility of conducting a more detailed assessment of the processes triggered by the F500+ programme.

Despite the data limitations, the empirical results allow for formulating several conclusions that may become reference points for future research.

The empirically confirmed increases in the medium-term income elasticity of demand in households in cohorts 19 and 23+, and the premises supporting the thesis of an increase in the sensitivity of consumer demand to interest rates in cohorts 22 and 21, suggests asymmetric reactions of households differing in per capita income to a steady stream of additional income after the introduction of the F500+ programme. The estimates indicate that social transfers received are immediately used to increase consumer spending in households with children supported by a single adult. The increase in medium-term income elasticity of demand from 1.03 to 1.19 fosters the thesis that funds from the F500+ programme are used to satisfy deferred consumption demand, thus reducing poverty. The scale of this process is incomparably smaller in families with two parents and at least three children (an increase in income elasticity from 0.74 to 0.78), but when assessing the impact of the F500+ programme on the consumption demand of this household group, one should also take into account the decrease in its sensitivity to the price of consumer credit or, equivalently, a decrease in the propensity to accumulate precautionary savings. Therefore, if one assumes that transfers from F500+ increase the creditworthiness of households in the 23+ group, and facilitate the financing of demand through consumer credit, then in their case too one can find links between welfare transfers and poverty reduction.

The inability to formulate an explicitly positive assessment of the F500+ programme as a significant medium-term stimulus boosting demand and economic activity via the Keynesian multiplier stems from the difference between the shares of consumption of the combined cohorts 19 and 23+, as well as cohorts 22 and 21, in total private consumption and the absence of changes in income elasticities among both groups of households with higher per capita income. The share of total private consumption in cohorts 19 and 23+ in total private consumption only slightly exceeded 6% in 2015, rising to 7.5% in 2020, whereas the share of the other two cohorts was incomparably higher and amounted to over 30% and 35% in the same years, respectively. Thus, the increase in consumer demand momentum was almost exclusively due to an increase in the medium-term propensity to consume in the lowest per capita income households group, and the scale of the demand-boosting effect was marginal. Furthermore, the increase in estimates of semi-elasticity with respect to interest rates in consumption functions in cohorts 22 and 21 can be interpreted as a symptom of consumer credit being replaced by funds obtained from social assistance transfers or – more intuitively – as a result of funds received under the F500+ programme being used to increase savings. The occurrence of such a mechanism immediately raises the question of its compatibility with the programme's objectives.

The programme's assessment becomes even more confusing when the amounts of transfers directed to household groups are taken into account. The introduction of F500+ in 2016 resulted in an increase in disposable household income in groups 19 and 23+ combined and in group 22 by similar amounts. The empirical results therefore provide a basis for claiming that only half of the expenditure incurred in the programme in 2016–2019 triggered processes that resulted in a very slight increase in medium-term income elasticity in the economy and in strengthening the demand impulse in groups 19 and 23+. The remaining part of transfers did not change the medium-term propensity to consume in households from cohort 22, but increased the latter's interest in building savings, for which part of the funds obtained from F500+ were allocated. This mechanism was radically strengthened in 2019 when the F500+ programme was extended to include the first child in each family, and when the income criterion was abandoned. The amount of funds transferred to households in groups 22 and 21 nearly doubled, which naturally strengthened consumer demand, but did not increase medium-term propensity to consume in cohorts 22 and 21. A side effect of the social assistance transfers was an increase in net savings accumulation. In summary, the empirical results obtained provide a solid basis for claiming that only one-third of social assistance transfers strengthened the consumption multiplier, while the remainder did not cause any changes in the medium-term relationship between disposable income and private consumption.

The above evaluation of the F500+ programme, which is neutral at best, is preliminary. Due to the relatively short duration of the programme, it is not currently possible to present fully convincing empirical evidence confirming or refuting the advisability of its introduction and extension, as well as the benefits associated with its redistributive nature. Unequivocally, further research is needed to evaluate the adequacy of the criteria adopted at inception of F500+ in 2016 and the rationale behind the decision to extend the programme in 2019. Although criticism of the solutions introduced under the 500+ programme may be perceived to some extent as routine, the weight of the arguments raised within its framework cannot be ignored. In particular, it can be argued that the Family 500+ programme led to a substantial increase in government expenditure on social transfers. The launch of the programme coincided with reducing the VAT gap mitigating the effects of increased social spending and prevented excessive fiscal tensions. The latter coincidence does not diminish however the relevance of the question concerning the economic policy mix. It remains unclear whether scaling down the Family 500+ programme, narrowly targeting social assistance at the poorest households, and simultaneously easing fiscal policy by reducing tax rates or lowering social security contributions might have been a solution closer to the optimal economic policy mix.

Within the currently available time horizons, it is possible to conduct a preliminary analysis of the medium-term consequences of a massive, unexpected, and presumably permanent increase in social assistance transfers. It is obvious that the expansion of social assistance stimulates private consumption, whose changes in the long term must be proportional to the changes in total disposable income; a similar mechanism must also occur in arbitrarily defined household groups. The final result of consumption adjustments in the long term will be its convergence to the steady state level. The effects of the consumption multiplier will then disappear.

The perspective changes when one considers an unexpected but sustained growth in income from social assistance transfers, which may considerably alter households' consumption habits and their propensity to consume. The empirical results presented in the article indicate that this effect does indeed occur. And again, it can be argued that in the long term, the relationship between income and consumption in each of the household cohorts identified will converge towards equilibrium, but it should also be noted that this convergence may be much slower for households with changed consumption habits. This last feature of the new rebalancing mechanism may create additional opportunities for economic authorities to influence demand by directing further cash flows to households that increase their spending mostly in response to an increase in disposable income. Empirical results indicate that households in cohorts 19 and 23+ may have been the appropriate target group for increased social assistance. The opposite reasoning can be applied to the other two groups of households, whose response to the inflow of social transfers was to increase their savings.

In summary, assessments of the effects of the Family 500+ programme are, for obvious reasons, conditional on the currently available data. There is no doubt that future analyses will require the use of longer time series and more detailed decompositions of the sub-aggregates of private consumption and disposable income. It is also clear that the conclusions formulated in the article are partial. Their generalisations call for constructing and simulating a macroeconomic models describing the full spectrum of processes triggered by the programme. From this perspective, the findings of the discussed are significant in that sense that they highlight the necessity of incorporating household heterogeneity into both the design of social assistance programmes and the evaluation of the effects of social, fiscal and monetary policies.

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Appendix

The Household Budget Survey in Poland (hereafter HBS) is the only available dataset containing detailed information on both household income and consumption. The survey is conducted by Statistics Poland, with randomly selected households providing data on demographic composition, living conditions, material assets and economic activity. Households are required to keep a diary reporting detailed income and expenditure information, which is subsequently classified by income source and COICOP expenditure category. Due to its self-reported nature, the dataset is known to suffer from several significant drawbacks. The main issue is non-random non-response bias, whereby, in the event of non-response by a randomly selected household, another household from the primary sampling unit is selected. Households are drawn according to a two-stage random sampling scheme with clustering and rotation. Sampling weights are calculated as inverse probabilities of selection within each stratum, and then calibrated by household size and urban/rural location using values derived from the most recent Census. Inaccuracies in the data were corrected in four steps.

Firstly, historical data do not include calibration of sampling weights to population totals. The absence of such weight corrections yields a biased distribution of social transfers, especially those targeting households with children. Therefore, the first step in the construction of the database consisted of calibrating HBS weights to five-year age group totals. This is done by minimising the distance between new and original weights according to the methods employed by [Gomulka \[1992\]](#), [Deville and Sarndal \[1992\]](#) and [Creedy and Tuckwell \[2004\]](#); see also [Myck and Najsztab \[2015\]](#). Since 2023, GUS has applied similar weight calibration to population totals [\[GUS, 2024\]](#).

Secondly, weight calibration is not enough to correct for the under-representation of high- and low-income earners from the survey, which can bias the income structure present in the data [\[Bukowski, Novokmet, 2021; Bukowski et al., 2023; Brzeziński et al., 2022\]](#). To overcome this issue we use average tax rates calculated from tax administration data for the analysed period and convert net incomes into gross incomes, thereby obtaining estimates of social security contributions, health insurance contributions and personal income tax (PIT) liabilities. We divide the net income distribution in the administrative data for main income categories available both in the HBS and administrative data (employment, pensions, self-employment) into 500 groups and separately for individual and joint taxation. Each group is matched with the corresponding HBS quan-

tile, and incomes are scaled proportionally. Tax components are then imputed based on group-level average tax rates. This aligns the HBS income distribution with that observed in administrative data. Adjustments are minor for pensions, small for employment (mainly adding high earners), and substantial for self-employment. Self-employed respondents with declared activity but zero income were assumed to have losses drawn randomly from a calibrated distribution based on tax return data.

Thirdly, to align the HBS data with the national accounts ESA2010 data for consumption, we included imputed rents for both income and consumption, which were missing from the HBS. We introduced an imputation method based on a log-linear model estimated for households reporting rental expenditures (about 5% of the total) with the resulting totals subsequently scaled to match national accounts values (EUROSTAT). Due to the absence of financial assets data, the Financial Intermediation Services Indirectly Measured (FISIM) component could not be included. We also added local taxes paid by farmers using Local Data Bank data (BDL, GUS), scaling totals by farm size in equivalent hectares. Local taxes paid by businesses were excluded due to the lack of separation between household and non-household sectors in aggregate data.

Fourthly, a substantial share of households' final consumption expenditure reported in the national accounts is unaccounted for in the HBS. Not only do the totals differ, but so does the consumption structure. For consumption we used calculated HBS totals by COICOP and scaled them at the household level to the corresponding national accounts values obtained from EUROSTAT. This improved product-level distribution slightly, but did not enhance income-based consumption structure.

The outlined corrections improve the quality of the resulting time series, although some limitations remain. In particular, the HBS does not capture the seasonality of household income, so the computations rely on annual averages, which is most noticeable for farming income. Similarly, due to limited demographic information (lack of information on education) in the administrative data average effective tax rates were used.