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Development of Poverty Projections based on the potential impact of conflict in Ukraine on the most vulnerable groups in Serbia, with a particular focus on children

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Executive Summary

Beyond the suffering and humanitarian crisis generated by Russia's invasion of Ukraine, the global economy feels the effects of slower growth and spiking inflation. Western Balkan countries are among the economies with the highest exposure to the conflict's consequences (IMF, 2022). Considering the increase in consumer prices and the concerns regarding the availability of electricity and gas in the winter of 2022/23, the World Bank revised its forecast for Serbia's economy. Following a significant economic recovery in 2021 with real GDP growth of 7.5%, **the consequences of Ukraine's invasion should hinder Serbia's GDP growth**. After the start of the war, the World Bank revised its projections from an expected GDP growth pre-conflict of 4.4% to 3.2% in 2022 (World Bank, 2022c).

Lower economic growth puts pressure on household income and consumption, which can substantially impact poor families with children, migrants, and other vulnerable groups, potentially worsening a situation that was already far from ideal. **In 2020, 6.9% of the Serbian population lived below the country's absolute poverty line of 12,495 RSD per month** (UNICEF, 2022). Also, Serbia is among Europe's top ten least equal countries, in terms of income. In 2021, the Gini coefficient for income was 33.3, and the wealthiest 20% of the population had six times higher income than the poorest 20% (Statistical Office of the Republic of Serbia, 2022). Moreover, **in Serbia, children are still more likely to live in poverty than any other age group**. In 2020, 10.6% of children aged 0-13 lived in absolute poverty (Social Inclusion and Poverty Reduction Unit, 2021).

In this context, UNU-MERIT was commissioned by UNICEF Serbia to conduct poverty projections accounting for the impacts of COVID-19 and the potential impact of the conflict in Ukraine on the most vulnerable groups in Serbia, with a particular focus on children. To complete this assignment, two distinct analytical strategies were employed: 1) an analysis of the effects of COVID-19 on selected living standard indicators by comparing the situation in 2019 and 2021, and 2) an estimation of the predicted impact of the Ukraine crises on selected living standard indicators in the short-term (i.e., 2022) and the medium-term (i.e., 2023-2024).

Both analytical strategies revolve around a microsimulation based on the Household Budget Survey datasets from 2019 and 2021. To estimate the impacts of the COVID-19 pandemic, the microsimulation allowed for the comparison of actual 2021 data with the simulation of the economic condition of Serbia, had COVID-19 never happened. The macroeconomic forecasts published by the IMF in late 2019, before the pandemic, are used to build our counterfactual scenario as if the COVID-19 pandemic had never happened. While for the Ukraine simulation, the short-term impacts (2022) are based on three different economic scenarios drawn from estimations of Serbia's main macroeconomic indicators published by the World Bank in October 2022. Later the simulation is extrapolated to 2023 and 2024 based on macroeconomic projections. Lastly, we applied different econometric tools to estimate how household consumption patterns may have changed in response to the covariate shocks that occurred in the aftermath of the invasion of Ukraine.

Impacts of Covid-19

The estimated absolute poverty rate for a no-COVID scenario is 8.5% in 2021 among the general population, a decrease compared to the 8.8% rate in 2019. Alternatively, the simulated scenario

considering the COVID-19 impact but without the Government of Serbia's financial measures during COVID-19 estimates a 9.6% poverty rate. However, once we consider the ad-hoc COVID-19 transfers, the poverty levels drop to 8.9%. **We can, therefore, conclude that COVID-19 would have negatively impacted poverty rates in Serbia had there not been ad hoc cash transfers to reduce its effects.**

	Pre-Covid (2019)		No Covid (2021)		Covid No SP (2021)		COVID with SP (2021)	
	Total population	*Children*	*Total population*	*Children*	*Total population*	*Child*	*Total population*	*Children*
Poverty rate	8.8%	11.6%	8.5%	12.6%	9.6%	13.7%	8.9%	10.6%
Gini Index	28.7	29	29.7	29	29.6	29	30.3	30.5

Impacts of the war in Ukraine

In 2021, the absolute poverty rate in Serbia was 8.9%, with approximately 607,572 people living in poverty. **The national absolute poverty rate is estimated to have increased in 2022 between 0.3 to 2.5 percentage points, depending on the scenario, resulting in poverty rates of 10.4% for the midpoint scenario, 9.2% for the modest scenario, and 11.4% for the worst-case scenario**. These results reflect that the average household income is expected to grow at a lower rate than inflation, reducing household purchasing power.

In Serbia, households with children are among the most vulnerable. In 2021, absolute child poverty was 1.75 percentage points higher than overall absolute poverty. According to the simulation, **in 2022, child poverty is expected to increase faster than overall poverty. Even in the most modest scenario, child poverty is expected to increase to 13.8%, representing an additional 27,987 children living below the absolute poverty line**.

	2021	Modest scenario	Mid-point scenario	Worst-case scenario
Overall absolute poverty headcount	8.9%	9.2%	10.4%	11.4%
Overall absolute poverty headcount (n. of people)	607,572	627,391	711,453	780,480
Child absolute poverty headcount	10.6%	13.8%	15.6%	16.5%
Child absolute poverty headcount (n. of children)	94,532	122,518	138,155	146,862

Furthermore, estimates of the impact of the crisis on the costs of living show that, under all three scenarios, increases in the cost of living outpace those in income. Consequently, households might engage in negative coping strategies that may affect the most vulnerable – including children – the hardest. **Price elasticity analysis conducted as part of the cost-of-living analysis shows that food consumption may be reduced by up to 0.39% for every 1% rise in the price of food**.

Lastly, using MICS data, we extended our poverty analysis and microsimulation to the Roma population in Serbia. Results point towards a dire situation for the Roma community in Serbia. **In 2019, 73.6% of the Roma population was in absolute poverty, a percentage that increased slightly to 74% in 2021. Based on our simulated scenarios, absolute poverty rates would grow between 1.2 and 3.6**

percentage points. While, based on 2019 MICS data, over 60% of Roma are already benefitting from Financial Social Assistance, the adequacy of this transfer is insufficient to prevent people from falling into absolute poverty.

To conclude, results from this study indicate that the invasion of Ukraine has hindered Serbia's recovery from the impacts of the COVID-19 pandemic. The increase in food and energy prices caused by the war has directly impacted Serbia's most vulnerable population. Hence, **the Government is urged to consider expanding its current social protection schemes horizontally to mitigate the short-term effects of the Ukrainian crisis on Serbia's most vulnerable population**. Improving the targeting of vulnerable groups or adding a categorical targeting – e.g., limiting one-off transfers to families with children, could be considered a cost-effective approach.

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List of abbreviations

COLI	Cost of Living Index
COVID-19	Coronavirus Disease 2019
CPI	Consumer Price Index
CSW	Centre for Social Work
EU	European Union
EUR	Euro
EUROSTAT	Statistical Office of the European Union
FSA	Financial Social Aid
GDP	Gross Domestic Product
HBS	Household Budget Survey
IMF	International Monetary Fund
LSG	Local Self Government
MICS	Multiple Indicator Cluster Survey
MoLEVSA	Ministry of Labour, Employment, Veteran and Social Affairs
NES	National Employment Service
PAYAG	Pay As You Go
OECD	The Organization of Economic Cooperation and Development
OHCHR	The Office of High Commissioner for Human Rights
OSCE	Organization for Security and Co-operation in Europe
RSD	Serbian Dinar
SILC	Survey on Income and Living Conditions
SORS	Statistical Office of the Republic of Serbia
UN	United Nations
UNICEF	United Nations Children's Fund
UNU-MERIT	United Nations University Merit

1. Introduction

Beyond the suffering and humanitarian crisis generated by Russia's invasion of Ukraine, the global economy is feeling the effects of slower growth and spiking inflation. Worldwide, higher prices of fuel and food items are causing a rise in consumer prices, weighing down the real value of incomes and reducing aggregate demand. Furthermore, economies neighbouring the warring parties and with stronger links to them have been put under strain by the invasion, consequential sanctions, and associated disruptions to trade. Western Balkan countries, due to their position and historical ties to Russia and, to a lesser extent, Ukraine, are among the economies with the highest exposure to the conflict's consequences, and Serbia, among them, presents a genuinely challenging situation (IMF, 2022).

Even before the invasion of Ukraine, food prices in Serbia were among the highest in Europe, with food price inflation in January 2022 at 13.5% year-on-year, which rose to 15.2% in February 2022 (Statistical Office of the Republic of Serbia, 2022a). Furthermore, in 2020, 30% of Serbia's energy had to be covered by imports (EUROSTAT, 2022), exposing consumers to international spikes in energy prices caused by soaring wholesale prices of gas, oil, and coal (World Bank, 2014). These factors have led the World Bank to forecast a slump in Serbia's economic output from a pre-conflict of 4.4% growth rate to 3.2% in 2022, undermining governmental efforts to rebuild the economy after the COVID-19 pandemic (World Bank, 2022c). According to the Statistical Office of the Republic of Serbia (SORS), real GDP growth in 2022 was even lower than that, at 2.3% according to end-of-year estimates (Statistical Office of the Republic of Serbia, 2022b).

Lower economic growth puts pressure on household income and consumption, which can substantially impact poor families with children, migrants, and other vulnerable groups, potentially worsening a situation that was already far from ideal. In 2021, the at-risk-of-poverty rate in Serbia was 21.2%[1] (Statistical Office of the Republic of Serbia, 2022). Although this represents a decrease compared to 2020 and 2019, it is still far from the rates of countries in the region like the Czech Republic (11%) and Slovakia (15%) (EUROSTAT, 2022). Similarly, while inequality has decreased in the past decade in the country, it remains one of the highest in Europe (Statistical Office of the Republic of Serbia, 2021).[2]

In this context, UNICEF is committed to advancing policy dialogues in Serbia and helping the Government of the Republic of Serbia meet its development goals, using data to inspire evidence-based policies. With this goal in mind, UNU-MERIT has been commissioned by UNICEF Serbia to conduct poverty projections accounting for the impacts of COVID-19 and the potential impact of the

[1] Note that income data underlying the reported rates refer to 2020. See https://www.stat.gov.rs/en-us/vesti/statisticalrelease/?p=8870&a=01&s=0102?s=0102

[2] While the decrease of poverty and inequality through time can mostly be attributed to better quality of life in Serbia, the methodology through which these rates have been calculated has been changing in recent years, especially the way in which income from agriculture and households declaring zero incomes have been considered when analyzing SILC data. These changes might have affected the share of poor people calculated for Serbia as well as the registered levels of inequality. More on this topic can be found here: https://socijalnoukljucivanje.gov.rs/en/income-of-the-poorest-deciles-of-serbias-population-focus-on-agricultural-activities-published/

conflict in Ukraine on the most vulnerable groups in Serbia, with a particular focus on children. This report presents the results of the study's simulations.

The remainder of this report is structured as follows: the next section provides background information on the Serbian context. Subsequently, the report introduces the study's methodology and then presents and discusses the results. Finally, a concluding section summarises the findings and provides policy recommendations.

2. Background

2.1 Serbia's economic context

In the first decade of the 2000s, the Serbian economy went through a transition phase inspired by the Washington Consensus, including implementing macroeconomic stabilization programs, privatization, and liberalization. Despite the consistent growth in GDP,[3] the new economic policies led to an industrial decline and relatively high inflation and unemployment rates (Uvalic, 2011). During the second half of the 2000s, GDP growth was sustained, mainly by domestic demand, and the unemployment rate fell to 10.7% in 2019, down from 23.9% in 2012 (European Commission, 2021).

COVID-19

In 2020, the COVID-19 pandemic and its related restrictions on movements strongly impacted the country's economy, as it did all over the world. Serbia experienced four waves of the COVID-19 pandemic. The Serbian Government responded quickly and implemented multiple containment and economic recovery measures. Following a severe recession during the first wave and lockdown in 2020, Serbia's economy survived the crisis relatively well thanks to significant government support. Nonetheless, after growing by 4.2% in 2019, GDP contracted by 0.9% in real terms in 2020, according to estimates from the Serbian Central Bank (Serbia Central Bank, 2022a).

The service sector has been the most affected during the pandemic. Leisure services fell by 14.6% in real terms during 2020, and wholesale and retail trade, the second largest contributor to GDP, declined by 5.2% (OECD, 2022). While industrial sectors, excluding construction, fell by 12% between the first and second quarter, they rebounded strongly and closed the year with a 0.4% growth over 2019. On the other hand, construction closed the year with a decline of 5.1% (OECD, 2022)

War in Ukraine

Following a significant economic recovery in 2021 with real GDP growth of 7.5%, the consequences of Ukraine's invasion and sanctions on Russia slowed Serbia's GDP growth. Before the start of the war,

[3] From 2001 to 2008, average GDP growth was 5.4%. See World Bank data at https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=RS

the Serbian economy was expected to grow by 4.4% in 2022. However, considering the impact of the conflict, GDP growth was expected to stabilize at 3.2% (World Bank, 2022a)[4]. The downward revision of Serbia's GDP is mainly due to concerns regarding the energy sector and the availability of electricity and gas in the winter of 2022/23. Another relevant risk is the increased interest rates that might hinder financing the country's fiscal deficit (World Bank, 2022a). In the medium term, the Serbian economy is expected to grow consistently at 3%, boosted mainly by internal consumption and international investment. According to World Bank estimates, after 2024, economic growth should return to pre-pandemic levels (World Bank, 2022a).

Table 1 *Selected macro-economic indicators, annual percent change*

	2019	2020	2021	2022e	2023f	2024f
Real GDP Growth (at constant market prices)	**4.3**	**-0.9**	**7.4**	**3.2**	**2.7**	**2.8**
Exports, goods, and services	7.7	-4.2	19.4	8.0	5.0	5.0
Imports, goods, and services	10.7	-3.6	19.3	9.0	6.2	5.8
Real GDP Growth (at constant factor prices)	**4.4**	**-0.8**	**7.3**	**3.2**	**2.7**	**2.8**
Agriculture	-1.7	2.2	-5.4	-5.5	0.5	3.4
Industry	5.9	-0.6	7.8	1.0	4.5	4.5
Service	4.4	-1.2	8.7	5.3	1.6	1.9
Current Account Balance (% of GDP)	-6.9	-4.1	-4.4	-10.2	-9.4	-8.0
Net Foreign Direct Investment Flow (% of GDP)	7.7	6.3	6.8	6.0	5.8	5.7
Net remittance inflow (% of GDP)	5.6	4.5	4.7	4.5	4.4	4.2
Inflation rate (%)	1.9	1.6	4.0	11.4	9.2	3.7

Source: (World Bank, 2022a) e=estimate; f=forecast.

Regarding the labour market, employment rates increased significantly in the first two quarters of 2022. Employment reached a record level of 50.9%, and the unemployment rate has decreased compared to last year, reaching 8.9% in the second quarter of 2022 (World Bank, 2022b). Average monthly net wages increased by 13.5% in nominal terms compared to 2021 (World Bank, 2022b). Also, the national minimum wage had a nominal increase of 9% from 2021 to 2022 and is set to be increased by 14% in 2023 (The Government of the Republic of Serbia, 2022a).

Remittances are another vital source of income for Serbian households. Because of the intense out-migration levels in the country, remittances represent a significant share of Serbia's GDP. In 2020, personal remittances amounted to 7.3% of GDP, a decrease of about a percentage point from 2019 (World Data, 2022). The Central Bank of Serbia estimates that the flow of foreign remittances to Serbia

[4] Most recent estimates indicate that the actual rate might even be lower at 2.3% (Statistical Office of the Republic of Serbia, 2022b). However, we focus our analysis on the estimates and projections from World Bank (2022), as it provides more detailed figures.

has risen from EUR 3.121 billion in 2020 to EUR 3.635 billion in 2021 (Raiev, 2022). According to other estimates, remittance inflow increased by 18% from 2020 to 2021 (KNOMAD/World Bank, 2022).

Finally, the war in Ukraine has put pressure on food and energy prices, causing a spike in consumer prices worldwide. In Serbia, inflation has increased even with the Government's introduction of food and energy price control mechanisms, such as a price cap on six basic food items[5] (Urosevic, 2022). In November 2022, annual inflation[6] reached 15.1%. In the same month, food inflation was 22.5%, and reports indicated that the minimum wage was no longer sufficient to cover the minimum consumer basket (Serbia Central Bank, 2022a). Additionally, after multiple attempts to control energy prices, since September 1, electricity prices for households and small industrial users have risen by 6.5% on average (Dedeic, 2022).

2.2 Poverty and inequality

In 2021, Serbia's the at-risk-of-poverty rate[7] was 21.2% – 0.5 percentage points lower than in 2020. At the same time, the social exclusion rate[8] reached 28.5% –1.3 percentage points lower than in 2020 (Statistical Office of the Republic of Serbia, 2022). The decrease in poverty rates in 2021 follows the trend observed in all Balkan countries and puts Serbia's poverty rates aligned with the region's average. Before the outbreak of COVID-19, the Western Balkan region had significantly reduced poverty. However, the pandemic caused a halt in this progress. Following the region's economic recovery, poverty reduction resumed in 2021 (World Bank, 2022c). Regarding absolute poverty, in 2020, 6.9% of the population lived with less than 12,495 RSD per month (UNICEF, 2022).

Serbia is among Europe's top ten least equal countries, in terms of income. In 2021, the Gini coefficient for income was 33.3, and the wealthiest 20% of the population had six times higher income than the poorest 20% (Statistical Office of the Republic of Serbia, 2022). In 2020, about 15% of employees in Serbia received the equivalent of the local minimum wage[9], while in Slovenia and Croatia, the same is true for only 4% and 2% of the workers, respectively (A11 initiative, 2020).

Table 2 *Poverty and inequality indicators*

	2017	2018	2019	2020	2021
At-risk-of-poverty rate (%)	25.7	24.3	23.2	21.7	21.2
Absolute poverty rate (%)	7.3	7.1	7.0	6.9	
Gini index[10]	37.8	35.6	33.3	33.3	33.3

Source: (Statistical Office of the Republic of Serbia, 2022) and UNICEF (2022)

[5] The food price cap includes sugar, wheat flour types T-400 and T-500, sunflower oil, pork, and milk with 2.8% fat.

[6] Annual inflation refers to the accumulated inflation over the year.

[7] The at-risk-of-poverty rate represents the share of persons with disposable income below the relative poverty line of 24 064 RSD a month for a single person household.

[8] Social exclusion rate represents the share of individuals at risk of poverty or are severely materially deprived or live in households with very low work intensity.

[9] The minimum consumer basket cost is higher than the minimum wage.

[10] Calculated using income data from the SILC dataset.

Child poverty

Over the last few years, Serbia's share of children suffering from poverty and social exclusion slightly decreased. However, children are still more likely to live in poverty than any other age group. In 2020, 10.6% of children aged 0-13 were living in absolute poverty, while the same was true for 6.9% of all age groups (Social Inclusion and Poverty Reduction Unit, 2021). Additionally, the highest at-risk-of-poverty rate remains among households with three or more dependent children, reaching 38.8% in 2021 (Statistical Office of the Republic of Serbia, 2022).

Table 3 Absolute poverty rates

	2017	2018	2019	2020
Children (0-13) (%)	9.1	7.6	8.2	10.6
Children (14-18) (%)	10.6	8.2	8.5	7.9
Total population (%)	7.3	7.1	7.0	6.9

Source: (Social Inclusion and Poverty Reduction Unit, 2021)

Significant inequalities are observed in terms of multidimensional indicators of child well-being. Regarding educational outcomes, only 10.5% of children from the poorest quintile and 7% of children from the Roma population are enrolled in early childhood education. In 2019, the functional illiteracy rate was over 20 percentage points higher among students from the poorest quintile than the overall population (UNICEF, 2022). Moreover, there are significant differences in maternal and child health outcomes. For instance, the infant and child mortality rate in Roma settlements is almost double the average of the general population, and the incidence of stunting is three times higher (UNICEF, 2022). Additionally, only 78% of women from the poorest households had a prenatal doctor's visit during the first trimester, against 91% of women from the wealthiest households (Eurochild, 2021).

Roma population

The Roma community is Europe’s largest ethnic minority and routinely faced marginalisation and discrimination across the continent. In Serbia, the self-reported Roma population is approximately 2% of the population and faces unparalleled deprivation and vulnerability ((Robayo-Abril & Millán, 2019). Exclusion of Roma communities from nationally representative household surveys can exacerbate existing exclusion by creating awareness blind spots among policymakers. UNICEF’s nationally representative Multiple Indicator Cluster Survey (MICS) is an exception to this trend, providing information on deprivation experienced by Roma communities through time. Survey data from 2019 reveal stark differences between Roma households and national averages, including in dimensions that are likely to impact a child’s life course, contributing to the perpetuation of inter-generational poverty and inequality. Data show that 83% of households in Roma settlements reported three or more material deprivations, against just 25% of households at national level, with 14% of households in Roma settlements reporting limited or unimproved sanitation, against approximately 2% of the national population. Children living in Roma settlements were more likely than the national average to be stunted (17% vs 5%) and underweight (7% vs 1%) and were less likely to have received the full complement of immunizations recommended for children under 35 months old. Just 7% of children in Roma settlements reported attending Early Childhood Education facilities, compared to 61%

nationally, while 78% of children in Roma settlements reported participating in learning activities prior to primary school (97% nationally). While primary school attendance shows a narrower inequality (92% for children living in Roma settlements against 99% nationally), secondary school attendance for children living in Roma settlements collapses to 28%, compared to 94% nationally (UNICEF, 2019).

2.3 Social Protection

The Serbian Law on Social Welfare was adopted in 2011, supporting the country's social welfare system reform. This reform had two main objectives: (1) the improvement of the protection of the poorest, ensuring minimum subsistence level and a more efficient system of benefits, and (2) the development of a network of community services focusing on quality and functionality (OHCHR, 2011). Nonetheless, 11 years after the enactment of the Law on Social Welfare, the poor and most vulnerable are still insufficiently covered by social assistance programs. Also, investment in programs to improve labour market outcomes and labour market vulnerability is too low to make a significant impact (World Bank, 2022).

According to the Law on Social Welfare, every individual and family in need of social assistance to create the conditions for meeting basic living needs has the right to social protection. Social assistance services and material support provide the right to social welfare. Also, Serbia's social protection system includes social assistance, social insurance, social services, and employment and labour market programs (The Government of The Republic of Serbia, 2022).

Serbia's social protection expenditure represented approximately 20.3% of GDP in 2020 (EUROSTAT, 2020). Expenditure was comparable to neighbouring Montenegro but higher than Croatia, Bosnia, and the Czech Republic. However, most social protection spending is directed toward social insurance (71% of total social protection spending) (World Bank, 2022). In terms of financial mechanisms, the primary source of revenue is social contributions, followed by general government contributions (Stokić & Bajec, 2019).

Social assistance

Serbia's social assistance system is designed and implemented by the Centres for Social Work (CSW) and the social welfare departments in Local Self Governments (LSGs). Notably, most cash benefits are subject to national regulation and are financed by the national budget (World Bank, 2022). The core programs for social assistance can be categorized between means-tested and categorical, mainly targeting poor households, people with disabilities, working mothers, and households with children (**Table 4**).

Table 4 Social benefits in 2021

	Program	Delivery mechanism	Number of users (2021)
Mean tested	Financial Social Aid (FSA)	In-cash	204,666
	Accommodation in Social Welfare Institutions	In-kind	11,874

	Child Benefit	In-cash	261,059
	Energy Benefit	Subsidy	68,120 (households)
Categorical	Parental Allowance[11]	In-cash	75,457
	Allowance for Assistance and Care of Another Person	In-cash	51,336
	Wage compensation during maternity leave	In-cash	42,200 (2017)

Source: (The Government of The Republic of Serbia, 2022) (World Bank, 2022)

A reform of Serbia's social protection system refocused spending on categorical pro-natal benefits by increasing the benefit for the third and fourth child and extending the available assistance period. Hence, in 2019, the wage compensation during maternity leave, childcare, and extended childcare leave was Serbia's most extensive social assistance program[12] – representing 26% of the total social assistance expenditure, double the spending with the FSA. Accordingly, the number of maternity leave beneficiaries reached 42,200 in 2017 (World Bank, 2022).

On the other hand, social assistance to the poor is low, covering less than half of the poorest quintile and significantly lower compared to EU countries. An analysis of Serbia's social protection system indicates that the categorical programs often exclude the poor due to restrictive and complicated application procedures and primarily targeting formal workers with programs such as the maternity benefit depending on employability. Consequently, categorical programs cover over twice as many non-poor as poor children under age 5 (World Bank, 2022).

Social insurance

Serbia's labour market programs are managed by the National Employment Service (NES), a public agency under the supervision of the Ministry of Labour, Employment, Veteran and Social Affairs (MoLEVSA). The NES is responsible for passive labour market programs, such as unemployment benefits and active labour market programs. Expenditures on passive and active labour market programs are low compared to the European average and OECD countries. NES' budget reached RSD 22,600 million in 2019 and was increased by almost 20% in nominal terms in 2020 in response to COVID-19 (World Bank, 2022). Nonetheless, the unemployment benefit is claimed by only 6% of the registered unemployed, reflecting a lack of formal and longer-term employment opportunities (World Bank, 2022).

Furthermore, the Serbian pension system is administrated by the Pension and Disability Insurance Fund. The country's social insurance regime includes contributory and semi-contributory pension schemes. While the contributory pension sustains a defined benefit design and a Pay-As-You-Go

[11] Sometimes referred to as Birth Grant

[12] In most European countries, maternity leave is designed as social insurance and financed through contributions. However, that is not the case in Serbia.

(PAYAG) financing system, the semi-contributory scheme involves a pension for farmers based on flat contributions and benefits (World Bank, 2022).

A reform in Serbia's pension system reduced the total spending, going from 12.3% of GDP in 2014 to 10.3% of GDP in 2020 (World Bank, 2022). However, the implemented changes focusing on the scheme's financial sustainability have decreased the scheme's adequacy. For instance, the average replacement rate of old-age pensions declined from 61% in 2012 to 50% in 2020 (Ibid). The current valorisation of wages and indexation of pensions also jeopardizes the adequacy of pensions. While the adequacy of Serbia's pension scheme is higher than in other Western Balkan countries, it is lower when compared to most European countries (World Bank, 2022).

Lastly, universal health coverage is supported through social health insurance. Total health spending represented 8.8% of GDP in 2017, with compulsory health insurance contributions representing the largest share of total revenue for health from public sources. Despite its universal coverage, some vulnerable groups face financial barriers to medical care, as private spending, mainly related to out-of-pocket payments, has increased over time, reaching 42.4% of total health expenditure in 2017 (Bjegovic-Mikanovic, et al., 2019).

Responding to COVID-19

After the outbreak of COVID-19, the Serbian Government rapidly responded to minimize the impacts of the pandemic. The response focused on mitigating the health impacts, protecting the elderly by ensuring the smooth functioning of social and health institutions, promoting remote learning, and implementing two universal cash transfers (World Bank, 2022). Serbia's social protection system cannot be considered shock-responsive, as it is not designed to be expanded vertically or horizontally in response to shocks. Hence, social assistance coverage did not increase during the first year of the COVID-19 pandemic. Instead, the national Government implemented two one-off cash assistance to all adults, equivalent to EUR 100. The total cost of COVID-19 assistance was over three times the expenditure of all means-tested programs (World Bank, 2022). Moreover, analysis indicates that the COVID-19 transfer neglected poor children, as these are most likely to live in large households, in which the per capita value of the transfer was diluted (World Bank, 2022).

3. Data and Methodology

The main objective of the analysis in this study is to assess the likely impact of COVID-19 and the Ukraine crisis on poverty and living standard indicators in Serbia, with a particular focus on children. Even though both crises have their origin in the past, assessing their impact on the population is not trivial; understanding the past can remedy the harm by building better, evidence based public policy. Our analysis of both the COVID-19 impact and estimates of the potential effects of the Ukrainian crisis relies on microsimulation techniques. Microsimulations start from real-world household or individual data collected prior to an event and “simulate”, based on a set of assumptions and pre-determined values, how the situation of these households or individuals may evolve through time.

While cross-sectional, nationally representative datasets are available for 2019 and 2021 (approximately prior to and after the worst of the COVID-19 pandemic), in order to estimate the *impact* of the pandemic, we require a counterfactual – what the situation would have been if COVID-19 had not occurred. Therefore, we use microsimulation techniques to estimate this counterfactual from the available 2019 dataset to produce our impact estimates. As no publicly available, nationally representative data is available for 2022, estimating the effects of the Ukraine crisis requires a further microsimulation, this time using the 2021 dataset to produce estimates.

Based on existing literature and the assessment of the current and expected impacts of COVID-19 and the Ukraine crises on Serbia's economy, we employ two distinct analytical strategies to disentangle and predict the effects on poverty: 1) an analysis of the effects of COVID-19 on selected living standard indicators, by comparing the situation in 2019 and 2021; and 2) an estimation of the predicted impact of the Ukraine crises on selected living standard indicators in the short-term (i.e., 2022) and the medium-term (i.e., 2023-2024). In the remainder of this section, we first provide an overview of the data used and then describe the methodology for the different sub-components of the analysis.

3.1 Data

Two key components are needed to conduct this assessment: i) household-level micro-data, and ii) a set of scenarios on which to base our estimation of the impact of Ukraine crisis. The latter component relies on macro-economic indicators derived from existing analysis on the expected consequences of the war in Ukraine on the Serbian economy from the World Bank, International Monetary Fund, the Statistical Office of the Republic of Serbia and the Serbian Central Bank. Macro-economic policies adopted by the Serbian Government to address the crisis and that could have an impact on poverty levels are included to the extent possible.

Serbia's Household Budget Survey (HBS) is the core dataset used for the analysis. The HBS is regularly collected and nationally representative. It provides data on the socio-economic and demographic characteristics of respondents, as well as detailed information on household income and consumption. We have access to the data collected in 2019 and 2021. HBS data is collected on a yearly basis (except for 2020, due to COVID-19 restrictions) on a representative sample of the Serbian population. In contrast with EU SILC, data is collected each year as a cross-section so that the same households are not followed through time. In 2019, a total of 17,038 individuals from 6,354 households were sampled, while in 2021 15,754 individuals were sampled from 6,108 households. The HBS is our primary data source, given the reliability of its consumption data and detailed income information on wages, pensions, inter-household transfers, remittances, and other non-wage income.

While HBS data provides extensive information on most of the Serbian population, it is not designed to cover Roma population in the country. To extend our analysis to the Roma community, we use the latest round of Serbia's **Multiple Indicator Cluster Survey (MICS).** The MICS, UNICEF's core survey, collects internationally comparable data on a wide range of indicators about children and women, although it lacks information on household income and consumption. Samples are cross-sectional, as is the HBS, and data collection happens every 4 to 5 years. The Serbia MICS and the Serbia Roma Settlements MICS (MICS SRS) were carried out in 2019. MICS data are used to extend the analysis to

the Roma population therefore we make use solely of the Serbia Roma Settlements MICS. A representative sample of 8,329 individuals from 1,934 households were interviewed among the Roma population living in Roma Settlements in Serbia, 2019. Table 5 below reports information on both HBS and MICS samples for general demographic and socio-economic characteristics.

Table 5 Summary of datasets

	2019 HBS	2021 HBS	2019 MICS SRS
Number of individual observations	*17,038*	*15,754*	*8,329*
Female (% of population)	52	51.9	50.3
Age	46.2	47.1	25.5
Household size	3.6	3.7	7.2
Unemployment (% of above 14)	10.5	13.3	60.2
Household average monthly income (RSD)	22,533.41	26,755.96	//
Urban population (%)	61.93	//	67.7
Region (% of population)			
Belgrade	23.2	23.4	19
Vojvodina	26.1	26	19.9
Sumadija and Western Serbia	28.7	28.5	10.7
Southern and Eastern Serbia	22.1	22.1	50.4

Source: HBS data (2019 and 2021) and MICS SRS data (2019). Note: All indicators from HBS presented above are weighted with population weights and are therefore representative for the country population. Indicators from MICS SRS are weighted with population weights which are calculated to be representative of Roma population living in settlements, which is a sub-population of all Roma living in Serbia.

Finally, we rely on data from Serbia's **Survey on Income and Living Conditions (SILC)**. Collected yearly by the SORS, SILC surveys follow European Union (EU) standards in data collection on income and living conditions. SILC provides detailed data on income for the country, although it lacks information on consumption expenditure. Moreover, income data collected with SILC always refer to the previous year (contrary to the HBS). We have access to the 2019 and 2020 rounds of the SILC, which reflect the income situation in 2018 and 2019.[13]

Macro-economic information on the past, current, and expected GDP growth of Serbia and its demographic patterns, together with information on employment levels by sector complement the microdata and inform the development of the different economic scenarios.

3.2 Methodology

The analysis is organized in three different sets of simulations: 1) simulation of the impacts of COVID-19 on poverty and inequality indicators by comparing data from 2019 and 2021; 2) simulation of the impacts of the Ukraine crisis on poverty, inequality, and cost of living indicators in the short-term

[13] Note that we have no income data reflecting the situation in 2020

(2022) and mid-term (2023-2024); and 3) extrapolation of poverty estimations and simulations to the MICS dataset.

Estimating the impact of COVID-19

We start our analysis by estimating the impact of COVID-19 on poverty levels in Serbia and the relief effect of emergency social assistance measures introduced in the country. Even though we have information on household income for both before and after the pandemic, the true challenge lies in identifying a counterfactual to COVID-19 to compare to our 2021 data. In other words, to properly estimate the impact of the COVID-19 pandemic, we need to know what would have been the situation for the Serbian economy and the population's living standards if COVID-19 outbreak would not have happened. As this exercise requires to estimate a hypothetical scenario, we are adopting a simulation strategy similar to the one we will be using to analyse the impact of the Ukraine crisis. **This strategy will allow us comparing the actual 2021 data with the simulation of the economic condition of Serbia had COVID-19 never happened**. The macro-economic forecasts published by the IMF in late 2019, prior to the pandemic, are used to build our counterfactual scenario *as if* the COVID-19 pandemic had never happened. Table 6 presents information on the predictions for the Serbian economy for 2020 and 2021 as at the end of 2019.

Table 6 IMF predictions for the Serbian economy (October 2019)

	2020	**2021**
Overall real GDP	+3.9%	+4%
Agriculture	+3%	+3%
Industry	+3.5%	+3.5%
Service	+4.2%	+4.4%
Public sector	+9.5%	+6.6%
Pensions	+5.4%	+5.9%
Remittances	+6.7%	+6.5%

Source: IMF World Economic Outlook, October 2019. Note: Values indicate predicted change with respect to the previous year (i.e., 2020 as compared to 2019, and 2021 as compared to 2020).

We start our simulation with the 2019 HBS data and use the macro-economic forecasts for 2020 and 2021 presented above to inflate (or deflate) the values of the 2019 income data for the HBS sample. **After estimating the no-COVID-19 scenario, we perform an additional simulation to estimate a *pure* COVID-19 scenario**. By *pure* COVID-19 scenario we mean a scenario **that considers the impact of COVID-19 but excludes government crisis interventions that were implemented to support the population**. In 2020, Serbia implemented a one-off universal cash transfer of 100 EUR to all adult citizens as a relief measure against lockdown policies. This was complemented by a 76 EUR transfer to pensioners (ESAP, 2021). Additional one-off transfers of 60 EUR to all adult citizens and 50 EUR to pensioners were distributed in 2021. Our *pure* COVID-19 impact scenario does not take into consideration these transfers – while it considers all other social protection schemes in place – and bases the simulation exclusively on macro-economic trends from October 2020 and October 2021 (see Table 7).

Table 7 IMF economic outlook for the Serbian economy (October 2020 and October 2021)

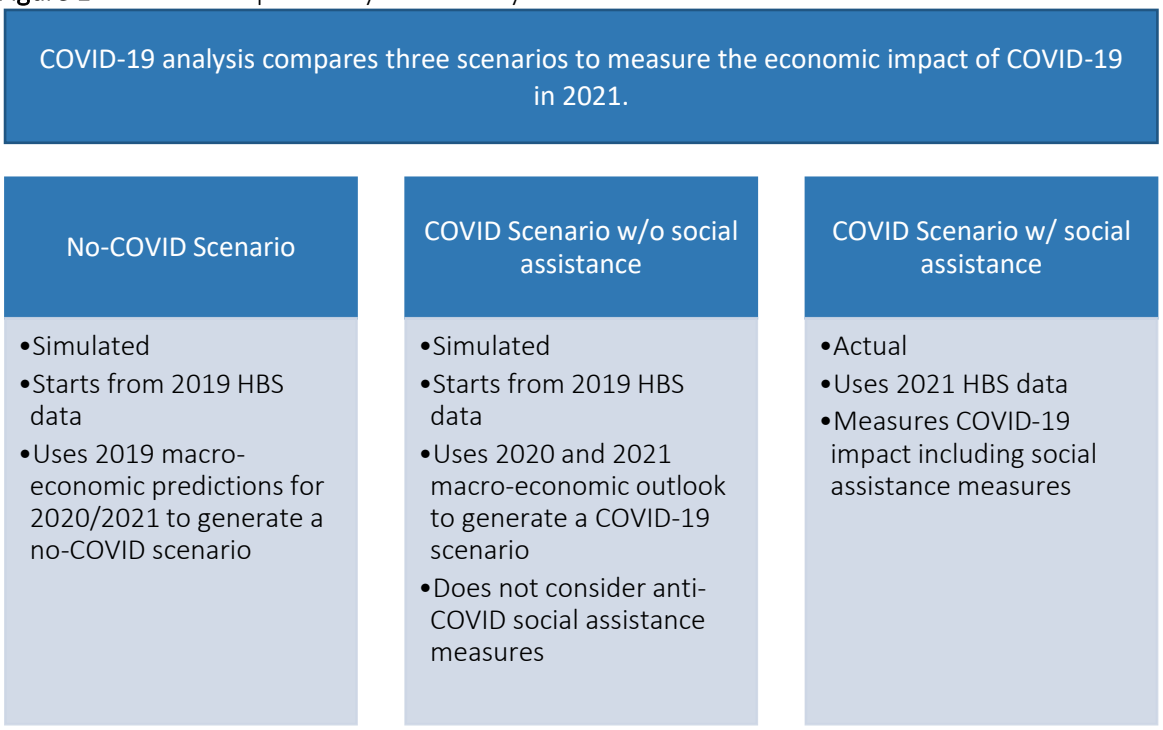
	2020	**2021**

Overall real GDP	-0.9	+7.5%
Agriculture	+2.3%	-5.7%
Industry	-0.6%	+7.8%
Service	-1.2%	+8.7%
Public sector	+8.9%	+2.9%
Pensions	+3.7%	+1.8%
Remittances	-10.6%	+8.3%

Source: IMF World Economic Outlook, October 2020 & October 2021. Note: Values presented here are not prediction but actual economic outlook values for October 2020 and October 2021. Values represent changes from the previous year.

Finally, to account for the one-off transfers provided by the Serbian government COVID-19, we use actual 2021 HBS data. Figure *1* below presents a summary of our COVID-19 impact analysis.

Figure 1. COVID-19 Impact analysis summary.



Source: Authors' elaboration

Estimating the impact of the Ukraine crisis

To estimate the impact of the Ukraine crisis on poverty and living standards, we apply two different methods: 1) a microsimulation of the impacts of the Ukraine crisis on monetary poverty and inequality indicators in Serbia; and 2) estimations of how household consumption patterns may have changed in response to the covariate shocks that occurred in the aftermath of the invasion of Ukraine.

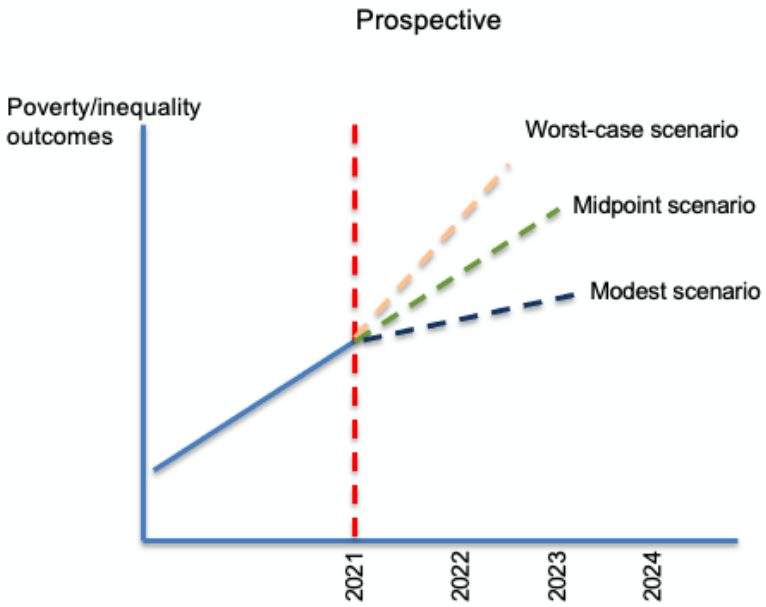
Step 1

We first examine the impact of increased inflation and income changes on aggregate monetary poverty indicators. The microsimulation is based on the Household Budget Survey data from 2021. Actual 2021 indicators serve as the baseline for our analysis and are extrapolated first to 2022, and in a second step to 2023 and 2024 based on different economic scenarios.

In the short term (2022), the simulation is based on three different economic scenarios drawn from estimations of Serbia's main macroeconomic indicators. For 2023 and 2024 the simulation is based on macroeconomic projections. The different economic scenarios and the assumptions that guide the microsimulation were based on macroeconomic data and forecasts from the World Bank, International Monetary Fund (IMF), Serbian Central Bank, and the Serbian National Statistical, including GDP growth, inflation, remittances flow, and pension indexation. It is important to emphasize that monetary poverty was calculated based on income, not consumption. Using income data facilitated the simulation of potential changes in household income based on the projected GDP growth for different economic sectors, which is at the centre of this microsimulation. Nonetheless, it

is also critical to note the potential limitation of using income instead of consumption to measure poverty. For instance, income data does not account for savings usage, ownership of durable goods, and access to credit, which can be used during a crisis to consumption smoothing mechanism.

Figure 2 Step 1 prospective



Source: Authors' elaboration

To estimate poverty rates for the different scenarios and years, we first adjust Serbia's absolute poverty line and then simulate changes in household income. The absolute poverty line[14] is inflated using three different scenarios based on Serbia's Consumer Prices Index (CPI) forecasts. The midpoint scenario uses October 2022 CPI calculated by the country's statistical office. Our modest scenario, lowers this value by 5%, while Scenario C, our worst-case scenario, increases it by 5%. Table 8 presents the values for these three scenarios. Secondly, we adjust household incomes to account for changes in wages, pensions, social allowances, and remittances. Wage changes are assumed to follow expected changes in real GDP growth per sector.[15] Public sector wages, pensions, and social allowances are increased in line with official announcements by the Serbian Government. Lastly, remittances are estimated using global and national trends (**Table 8**). For 2023 and 2024, we increase the absolute poverty line based on CPI forecasts and adjust household income components.

Table 8 below details the changes to household income and the absolute poverty line. The HBS data provides information on the source of the household income, including wages from a specific occupation, pension, social allowance, and remittances. First, we classified the occupation sector into

[14] The research team decided to use absolute poverty instead of at-risk of poverty, as the first does not fluctuate based on income changes and is more sensitive to situations in which wage growth might be lower than inflation growth.

[15] We focus our analysis on the estimates and projections from World Bank (2022), as it provides estimations per sector.

economic sectors – agriculture, industrial, public, service, and other. Then, we adjusted the income based on the projected growth per income source. Thus, we adjusted household income based on the income source and projected percentage increase/decrease for their specific sector.

Table 8 *Scenarios for 2022*

	Modest scenario	Midpoint scenario	Worst-case scenario
Poverty line adjustment			
Consumer Price Index	233.9	246.2	258.5
Adjusted absolute poverty line	RSD 14,908	RSD 15,692	RSD 16,476
Income source adjustment			
Agriculture wages		-5.5%	
Industrial wages		+1%	
Public sector wages and pensions		+7.5%	
Service sector wages		+5.3%	
Remittances		+10%	
Social allowances		+15%	
All other income		+3.2%	

Source: World Bank Macro Poverty Outlook, October 2022 for income source adjustments. Consumer Price Index (CPI) obtained from SORS, October 2022, while absolute poverty line is adjusted for inflation using the same CPI and a 2019 poverty line, still from the SORS. Income changes are the same for all three scenarios.

Table 9. Scenarios for 2023 and 2024

	2023	2024
Poverty line adjustment		
Expected inflation	9.2%	3.7%
Adjusted absolute poverty line	RSD 17,136	RSD 17,770
Income source adjustment		
Agriculture wages	+ 0.5%	+ 3.4%
Industrial wages	+ 4.5%	+ 4.5%
Public sector wages and pensions	+ 12.1%	+ 3.7%
Service sector wages	+ 1.6%	+ 1.9%
Remittances	+ 10%	+ 7.7%
Social allowances	+ 9.2%	+3.7%
All other income	+ 2.7%	+ 2.8%

Source: World Bank Macro Poverty Outlook, October 2022 for income source adjustments and inflation.

Step 2

Understanding changes to the cost of living caused by rapid price shocks is essential to have a clear picture of the impact of such shocks on households. In fact, if due to inflation the cost of living becomes unaffordable, households will be forced to make substitutions or cutbacks, negatively affecting their consumptions. These effects may not be felt by every household member equally, as the different consumption patterns between households make them differently vulnerable to price spikes – e.g., poor households usually allocate a larger share of their consumption to food purchases

as compared to richer households and would therefore be more severely affected by an increase in food prices (like the one caused by the Ukraine crisis).

We aim to understand the effects of the predicted price rises on Serbian households using several tools. The first tool is a cost-of-living index (or indices)[16], which enables us to estimate whether households would still be able to afford their costs of living under given scenarios, or not. The second, somewhat subsidiary, tool is through calculation of price elasticities of demand for aggregate groups of commodities. The third is through welfare loss analysis calculated for price changes to energy and food.

Cost-of-living indices (or COLIs) are calculated starting from a set of assumptions on the way in which prices will increase due to a crisis, and from information on household consumption levels. This allows producing a measure of how much each household is affected by inflation based on its spending patterns. We provide detailed information on how these indices are calculated in our methodological annex. Here, we present the set of assumptions on inflation that we use in our COLI calculation. The three inflation scenarios considered are presented in Table 10. After COLIs are calculated, they are compared against expected increases in wage for 2022 to understand if households would be capable of sustaining a higher cost of living.

Table 10. Scenario descriptions - inflation by core consumption groups

	Modest scenario	**Midpoint scenario**	**Worst-case scenario**
Food prices	15%	20.4%	25%
Non-food prices	11.4%	11.4%	11.4%
Electricity/fuel prices	4%	6.5%	10%

Source: Statistical Office of the Republic of Serbia (2022a); Dedeic (2022)

The scenarios in Table 10 represent an upper and lower band. The midpoint scenario represents the rates of inflation forecast during 2022, while the worst-case scenario represents an upper band situation – food and energy inflation 5% higher than the midpoint scenario, with the modest scenario representing a lower band at 5% lower than the midpoint scenario. The rapid changes and inherent complexity mean making precise forecasts a Sisyphean exercise, and the use of the band approach can provide useful upper and lower estimates.

Extrapolation to MICS data

The Roma community in Serbia is one the most vulnerable population group. Most are living a life of poverty and deprivation. It can be expected that the effects of the recent covariate shocks are particularly severe among this group. However, one of the biggest shortcomings of the HBS (and the SILC) is the insufficient coverage of Roma, which makes any disaggregated analysis unreliable. On the other hand, the MICS data, which collect robust data on the Roma, lack information on household

[16] Not to be confused with the consumer price index.

income or consumption, which represent core elements in a poverty estimation and are essential to simulate the impact of the crises we want to analyse (i.e., the COVID-19 and the Ukraine crises). By utilizing the strengths of each dataset, we designed a methodology that allows extrapolating poverty estimations and simulations conducted using HBS data to MICS data. The goal of this out-of-sample prediction method is to provide an easy-to-implement and relatively reliable methodology for the estimation of the impact of the COVID-19 and Ukraine crises on the Roma population in Serbia and, perhaps more importantly, for UNICEF Serbia to be used in the future in the estimation of poverty levels among Roma.

To extrapolate HBS poverty estimates to MICS data for Roma, we operationalize a matching strategy based on asset ownership:

1. For each household in the MICS, we need to find a similar household in the HBS. Given that both HBS and MICS collect data on household assets, we identify and select a set of assets for which we have information in both datasets and then build a household-level score for asset wealth.[17]
2. Consequently, scores are adjusted to be comparable between the two datasets so that, for example, a household with an asset score of 0.5 in the HBS data would be comparable, in terms of wealth, to a household with an asset score of 0.5 in the MICS data.[18]
3. Following the score calculation, households between the two datasets are matched based on score proximity. That means, each household in the MICS data is paired with the household with the nearest asset score in the HBS data, allowing for the same HBS household to be matched with multiple similar MICS households.
4. Finally, the estimation of the impact of the Ukraine crisis – following the same method presented in Step 1 above – is repeated for the newly created matched dataset. In this way, all Roma households in the MICS data that are matched with households in the HBS data considered to be poor, are reported as poor as well. This method, therefore, allows for the calculation of poverty among the Roma community in Serbia in the absence of income data in MICS.

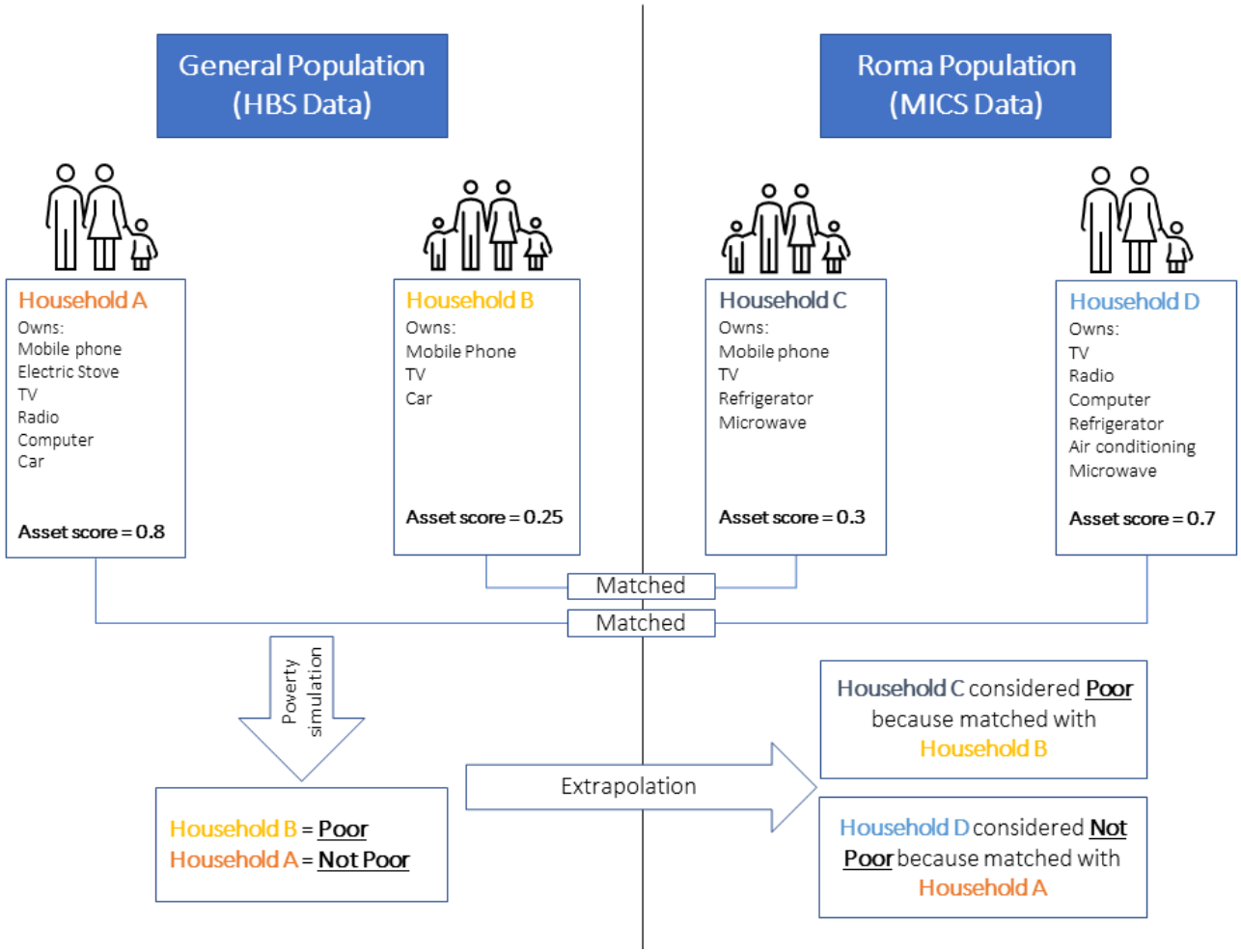
The four steps presented above are illustrated in Figure 3 to clarify the flow between the different stages of the analysis. Our method is not exempt from limitations which are manly represented by its strong assumptions. A first assumption is that comparability in terms of asset wealth could also be considered as comparability in terms of income or of consumption. This assumption is based on evidence – calculated using MICS and other household survey data – that a correlation exists between income and asset wealth (June Y. T. Po 2012). Additionally, we strengthened our asset score by selecting assets that could be considered valuable for both the Roma and the general population. An additional assumption is that our matching process between MICS and HBS data leads to strong pairing. In order to test that, we run the same matching process between HBS and the MICS data for

[17] The selected assets are mobile phone, electric stove, microwave, refrigerator, freezer, washing machine, dishwasher, TV, radio, personal computer, car or van, and air conditioner. The asset wealth score considers also whether the household has access to the internet and to a fixed line or not.

[18] Asset scores are created as principal component factors – a method that puts together different elements (in this case, assets) with the assumption that they all contribute to a common indicator (i.e., asset wealth). Scores can range between any given decimal number and are therefore standardized to range between 0 and 1 in our analysis so that they are comparable between HBS and MICS data.

the general population of Serbia. We find that the poverty estimates calculated in HBS and then extrapolated to MICS are comparable, showing that indeed the matching process appears to be paring households that are similar. Our methodological annex provides more details on this robustness check and the quality of the matching between MICS data for Roma population and HBS data.

Figure 3 Summary of the matching strategy



Source: Authors' own elaboration. Note: "Poverty simulation" mentioned in the arrow to the left side of the illustration refers to our Ukraine crisis impact simulation presented above.

4. Results

4.1 Impacts of COVID-19

The impacts of COVID-19 on the poorest have been widely analysed, as the global pandemic worsened vulnerabilities worldwide. According to a World Bank study, the impact on the income of the bottom 40% of the global income distribution has been more than twice as large as the impact on the top 40%. Consequently, in Europe, an additional one million people fall below the extreme poverty line by the end of 2021 (World Bank, 2021). The impacts of pandemic hindered Europe's progress on reducing inequality in the region – inequality indexes increased near to 2008 financial crisis levels (World Bank, 2021).

Table 11 below summarizes the results of our COVID impact simulation for Serbia. The estimated absolute poverty rate for a no-COVID scenario is 8.5% in 2021 among the general population, a decrease compared to the 8.8% of 2019. Alternatively, our simulated scenario considering the COVID-19 impact but without Government of Serbia's social assistance measures, estimates a 9.6% poverty rate. However, once the COVID-one off transfer is added to the equation in our last scenario using actual 2021 data, poverty levels drop again to 8.9%. **We can, therefore, conclude that COVID-19 would have negatively impacted poverty rates in Serbia had there not been *ad hoc* cash transfers to reduce its effects**. Thanks to its emergency one-off transfers for adults and pensioners, the Government of Serbia was able to reduce the impact of COVID-19 and keep absolute poverty in 2021 to the same levels of 2019. Similar findings apply to child poverty, although to a different extent. The government interventions also reduced child poverty levels compared to the COVID-without social protection scenario, yet child poverty rates in 2021 are higher than what they were in 2019. Similar patterns have been determined for other poverty indicators, such as poverty gap and poverty severity, and distributional outcomes (Gini Index, S80/S20, and P90/P10).

While these findings are comforting and relevant, it should also be considered at what costs these results were achieved. An analysis by the Fiscal Council of the Republic of Serbia on the budgetary implications of these anti-crisis schemes has highlighted how **the costs of the one-off transfers corresponded to 2.9% of GDP in 2021** (Fiscal Council 2022). This corresponds to almost four times the average budget allocation of CEE countries for similar crisis measures, and for a transfer that contributed marginally to poverty reduction and had no permanent effects on economic growth (Fiscal Council 2022).

In response to the impacts of COVID-19 and its containment measures, social protection programmes were expanded, and new transfers were designed by governments worldwide, including in Serbia. Our study is not the only one to highlight the positive effects of Serbia's universal one-off payment to adults, especially when it comes to better coverage. A recent World Bank review ranks it among the top 10 such transfers for coverage, reaching approximately 90% of the population. This was in addition to bonus for pensioners and special "cash-for-jabs" incentives to youth to stimulate the uptake of COVID-19 vaccines. Other countries that implemented such large-scale transfers, such as Czech Republic but also India, Israel, Peru, and the United States, have all succeeded in increasing households' resilience (World Bank, 2022b). However, it is important to consider that, on average,

these emergency transfers have lasted 4.5 months between 2020 and 2022 – in the case of Serbia, they were only disbursed twice over the entire period. With COVID-19 long-lasting effects still affecting our societies, compounded by the Ukraine crisis, countries should consider ways to sustainably expand coverage of social assistance schemes instead of focusing on emergency one-off transfers. The cost of the one-off transfer in 2020 was RSD 72 billion, according to the Ministry of Finance (ESAP, 2021). In total, one-off transfers disbursed in 2020 and 2021 had a cost higher than all of Serbia's means-tested safety nets programmes together. Therefore, while a relatively efficient measure, one-off transfers of this magnitude represent a burden for the country's fiscal capacity and should be carefully evaluated in the future.

Table 11 Poverty and inequality outcomes for the Covid scenarios

	Pre-Covid (2019)		**No Covid (2021)**		**Covid No SP (2021)**		**COVID with SP (2021)**	
	Total population	*Children*	*Total population*	*Children*	*Total population*	*Child*	*Total population*	*Children*
Poverty outcomes								
Poverty rate	**8.8%**	11.6%	**8.5%**	12.6%	**9.6%**	13.7%	**8.9%**	10.6%
Poverty gap	3%	3.9%	2.9%	4.2%	3.2%	4.5%	2.9%	3.8%
Poverty Severity	1.6	2	1.6	2.2	1.8	2.3	1.5	1.9
Inequality outcomes								
Gini Index	28.7	29	29.7	29	29.6	29	30.3	30.5
S80/S20	4.650	4.775	4.861	4.775	4.825	4.775	5.201	5.129
P90/P10	3.891	3.938	4.013	3.928	4.003	3.928	4.379	4.246

Source: own calculations based on HBS 2019 and 2021. Note: results estimated based on income instead of consumption. Therefore, results differ from published data as official reports calculate poverty based on consumption.

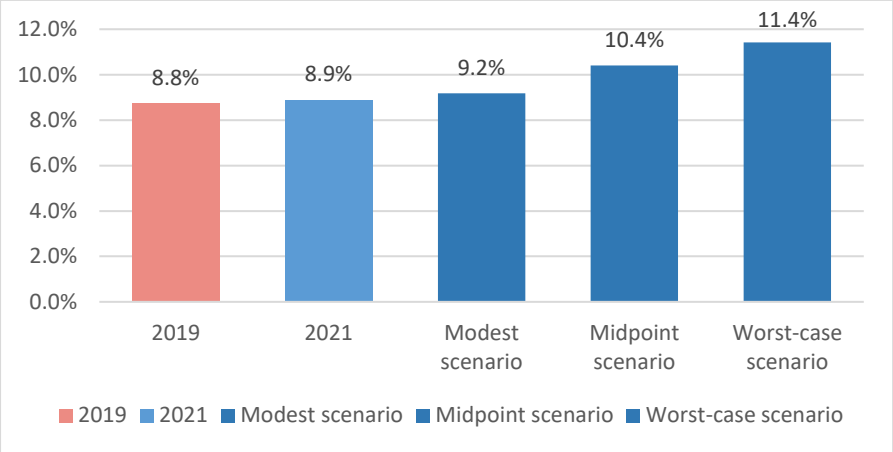
4.2 Impacts of the Ukraine crisis

In 2021, the absolute poverty rate in Serbia was 8.9%, with approximately 607,572 people living in poverty (Table 11). Considering the potential impacts of the Ukrainian war, the national absolute poverty rate is estimated to increase in 2022 with 0.3 to 2.5 percentage points, depending on the scenario, resulting in poverty rates of 10.4% for the midpoint scenario, 9.2% for the modest scenario, and 11.4% for the worst-case scenario (

Figure *4*). These results reflect that the average household income is expected to grow at a lower rate than inflation, reducing household purchasing power. This phenomenon is observed not only in Serbia but also worldwide. For instance, a study from the IMF indicates that, by 2023, high food price inflation

would increase poverty rates by an average of 0.7 percentage points across the Caucasus and Central Asia region (Hlayhel, Matheson, & Sakha, 2022).

Figure *4* Absolute poverty headcount for different scenarios



Source: own calculations based on HBS 2021 and proposed economic scenarios. Note: results estimated based on income instead of consumption. Therefore, results differ from published data as official reports calculate poverty based on consumption.

The poverty gap and poverty severity indicators are also expected to increase because of the Ukraine crisis. The poverty gap indicates that the average depth of poverty would increase, growing from a 2.9% shortfall in income from the poverty line to 3.6% in the worst-case scenario. Also, the poverty severity is projected to increase by 0.3 percentage points in the worst-case scenario (Table 12).

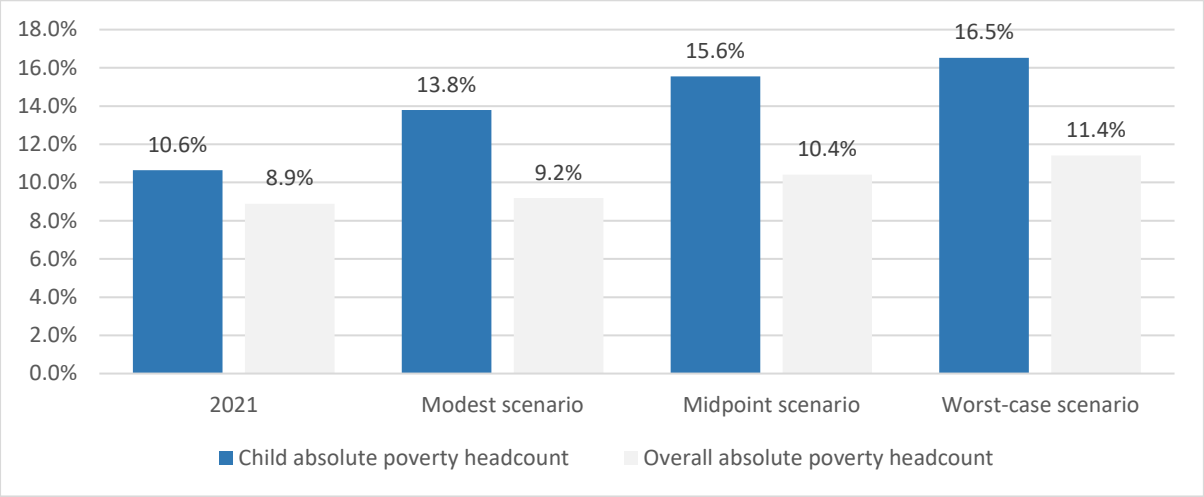
Table 12 Absolute poverty headcount for different scenarios, 2022.

	2021	Modest scenario	Mid-point scenario	Worst-case scenario
Absolute poverty headcount (n. of people)	607,572	627,391	711,453	780,480
Absolute poverty gap index	2.9%	2.9%	3.2%	3.6%
Absolute poverty gap	RSD 395.92	RSD 433	RSD 509.80	RSD 595.20
Absolute poverty severity	1.5	1.5	1.7	1.8

Source: own calculations based on HBS 2021 and proposed economic scenarios. Note: results estimated based on income instead of consumption. Therefore, results differ from published data as official reports calculate poverty based on consumption.

Poverty does not affect all households in the same way. In fact, households with children are among the most vulnerable in Serbia. In 2021, absolute child poverty was 1.75 percentage points higher than overall absolute poverty (Figure 5). According to the simulation, child poverty is expected to increase faster than overall poverty. Even in the modest scenario, child poverty is expected to increase to 13.8%, representing an additional 27,987 children living below the absolute poverty line. In the worst-case scenario, child poverty is estimated to rise to 16.5%. Similarly, the poverty gap rate will remain highest for children in every scenario, ranging from a 4.4% to a 5.5% shortfall in income from the absolute poverty line depending on the scenario (Table 13). Similar results were also observed in other countries in the Easter Europe and Central Asia region. According to a UNICEF study, children will bear the largest share of the shock caused by the Ukraine crisis. An additional 4 million children are projected to live in poverty in the region, meaning that children will account for 40% of the increase in poverty (UNICEF, 2022a).

Figure 5 Comparison between child absolute poverty and overall absolute poverty



Source: own calculations based on HBS 2021 and proposed economic scenarios. Note: results estimated based on income instead of consumption. Therefore, results differ from published data as official reports calculate poverty based on consumption.

Table 13. Child absolute poverty indicators

	2021	Modest scenario	Midpoint scenario	Worst-case scenario
Child absolute poverty gap	3.8%	4.4%	4.9%	5.5%
Child absolute poverty headcount	94,532	122,518	138,155	146,862

Source: own calculations based on HBS 2021 and proposed economic scenarios. Note: results estimated based on income instead of consumption. Therefore, results differ from published data as official reports calculate poverty based on consumption.

This study also projected the potential mid-term impacts of the crisis based on macroeconomic projections. By the end of 2023, the absolute poverty headcount in Serbia is projected to reach 12.1%, representing over 824,000 people. However, our projections indicate that in 2024, absolute poverty may decrease to 11.8% (Table 14). These results show that even though projections indicate an economic recovery in the mid-term, it is not enough to entirely compensate for the impacts of the Ukraine crisis, as poverty rates remain higher than pre-Ukraine levels. In addition to poverty analysis,

we also include estimates for income inequality in Serbia. Results from the microsimulation indicate that Serbia's Gini index would have a slight increase in 2022, reaching 29. Furthermore, income inequality is projected to worsen in the mid-term, getting to 34 in 2024.

Table 14. Absolute poverty 2023 and 2024

	2021	2023	2024
Absolute poverty rate	8.9%	12.1%	11.8%
Absolute poverty headcount	607,572	824,220	803,717
Gini coefficient	28	30	34

Source: own calculations based on HBS 2021 and proposed economic scenarios. Note: results estimated based on income instead of consumption. Therefore, results differ from published data as official reports calculate poverty based on consumption.

Lastly, our analysis points at the most vulnerable among the Serbian children. Table 15, below, presents results for some of the most vulnerable groups. Notably, children under five are among the most affected, with absolute poverty among the group reaching 17.1% in 2022. Also, children living in bigger households (more than four members) are among the most vulnerable, with 21.6% of children from these households living in absolute poverty in 2023. Furthermore, among the sectors considered in this study, households from agriculture and industry are among the most vulnerable – in 2023, child absolute poverty would reach 43.8% and 25%, respectively.

Table 15. Analysis of vulnerable groups

	2021	2022 (midpoint scenario)	2023	2024
Child absolute poverty	10.6%	15.6%	17.6%	18.2%
Female child	10.6%	15.5%	17.4%	17.9%
Male child	10.7%	15.6%	17.7%	18.4%
Child <5 years	11.7%	17.1%	18.8%	19.5%
Child 5 – 14 years	8.7%	9.7%	11.5%	11.2%
Household characteristics				
Household >4	14.9%	19.5%	21.6%	22.3%
Main source of income: agriculture	25%	39.8%	43.8%	45%
Main source of income: industry	10.4%	17.7%	20.5%	20.5%

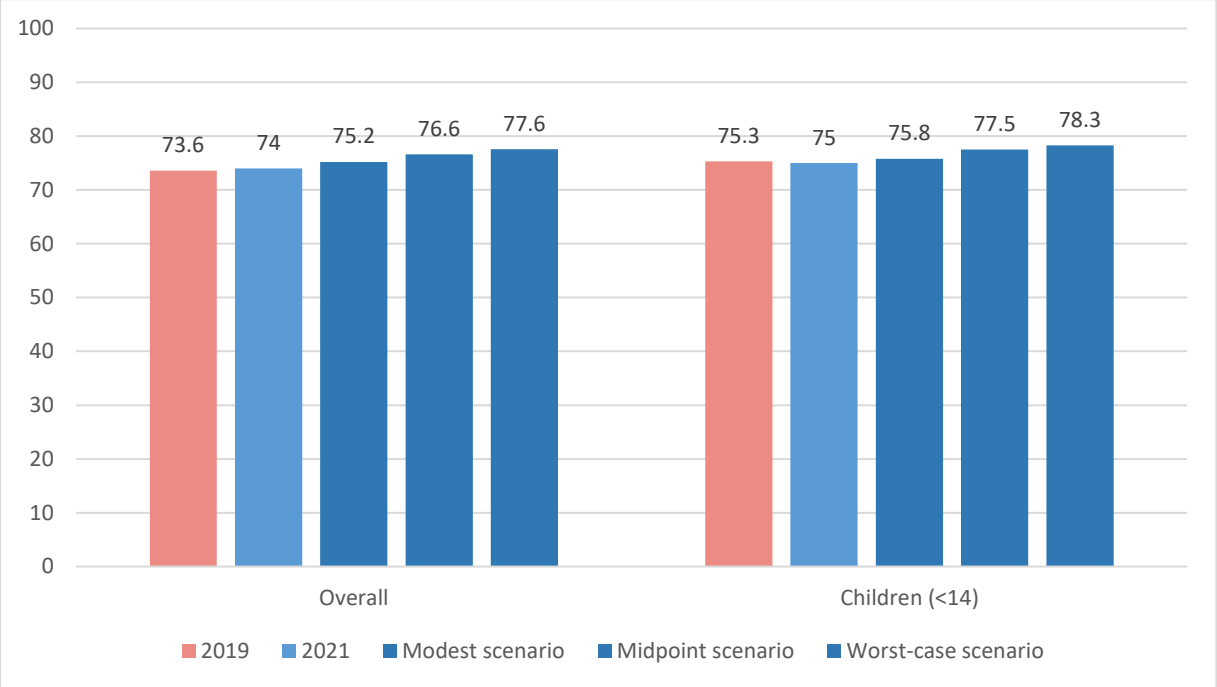
Source: own calculations based on HBS 2021 and proposed economic scenarios. Note: results estimated based on income instead of consumption. Therefore, results differ from published data as official reports calculate poverty based on consumption.

4.3 Poverty predictions for the Roma population

Using the methodology outlined in Section 3.2, we were able to extend our poverty analysis and microsimulation to the Roma population in Serbia using MICS data. Results point towards a dire situation for the Roma community in Serbia, with our results consistent with those of other studies. In 2019, 73.6% of the Roma population was in absolute poverty, a percentage that increased slightly to 74% in 2021. Based on our simulated scenarios, absolute poverty rates would grow between 1.2 and 3.6 percentage points. These figures, although high, are consistent with estimations from OCSE (OSCE, 2016). Similarly, the fact that, within MICS data, over 60% of respondents declare benefitting from the Financial Social Aid (FSA) – a transfer aimed at the poorest – also points towards the fact that

the majority of the Roma population meets country-level criteria to be considered as living in poverty. Relative to overall poverty, child poverty is only marginally higher at 75% in 2021 and increasing to a maximum of 78.3% due to the Ukraine crisis, according to our scenarios.

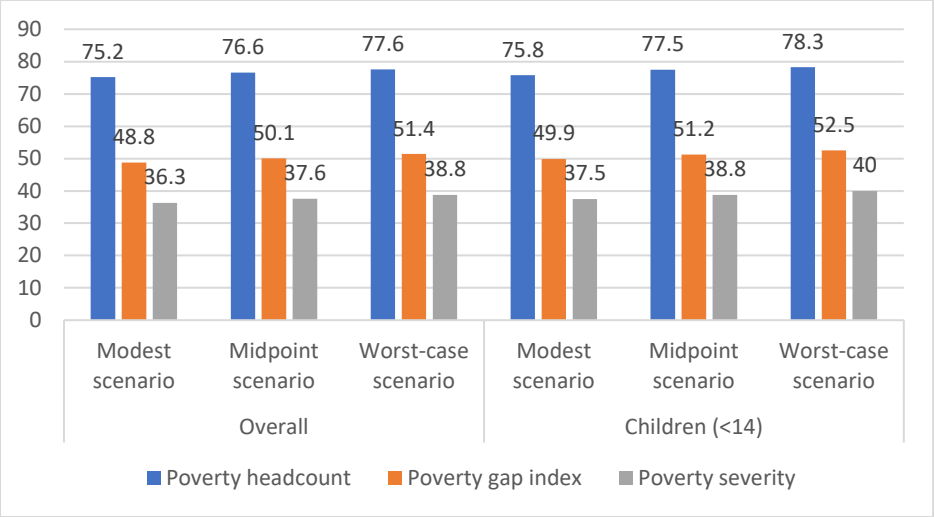
Figure 6 Absolute poverty among the Roma population



Source: own calculations based on MICS 2020 and proposed economic scenarios.

Additional poverty measures calculated in the 2022 simulation show how the poverty gap rate and poverty severity will also be affected differently based on our scenarios. In our most modest scenario, the poverty gap rate will reach 48.8% (49.9% for children). In comparison, our worst-case scenario shows a poverty gap rate of 51.4% overall and 52.5% for children. Complete figures, including poverty severity, are presented in Figure 7.

Figure 7 Poverty indicators among the Roma population.



Source: own calculations based on MICS 2020 and proposed economic scenarios.

Finally, as per our main analysis, we present by-group poverty estimates to identify more at-risk groups. As shown in Table 16, male children appear to be worse off than female ones, showing a poverty rate about 3 percentage points higher in 2021. Similarly, younger children (i.e., below the age of five) are worse off than older ones. With regards to household characteristics, household size and whether the households live in an urban setting don't seem to influence poverty rate too much, while gender of the household head is a relevant determinant. Female-headed households are significantly worse off, with a poverty rate of 79.2% in 2021 and of 81.3% in the worst-case scenario for 2022. However, the most vulnerable households in our simulation are represented by those with only one parent alive. These households show an alarming 86% poverty rate in the worst-case scenario of our Ukraine crisis simulation.

Table 16. Analysis of vulnerable groups – population of Serbia Roma Settlements

	2021	Modest scenario	Mid-point scenario	Worst-case scenario
Overall population	*74*	*75.2*	*76.6*	*77.6*
Female child	75.16	74.45	76.29	76.80
Male child	78.10	78.46	79.61	80.58
Child <5	77.39	76.85	78.14	79.27
Child 5-14	76.08	76.17	77.82	78.27
Head of household characteristics				
Female	79.23	77.70	79.62	81.29
Aged 18-64	75.46	76.40	77.78	78.58
Aged 65 and older	71.54	69.35	70.94	71.68
Only one parent alive	85.07	81.43	83.73	85.98
Ever attended school	74.48	75.38	76.71	77.58
Employed	73.97	75.24	76.18	76.60
Household characteristics				
Household size > 4	75.27	75.59	76.97	77.81

Urban household	75.44	75.53	76.78	77.92

Note: As compared to HBS disaggregation, poverty estimates by main income source is missing as this information is not recorded in MICS surveys. Source: own calculations based on MICS 2019 and proposed economic scenarios.

4.4 Cost of living – inflation effects on consumption

This section presents the results of our analysis of the effects of the Ukraine crisis effects on the ability of households to maintain their living standards. Changes in the cost of living (particularly rapid and unexpected changes) may have significant effects on household welfare and wellbeing. If the cost of living becomes unaffordable, households will be forced to make substitutions or cutbacks. For some households these might be relatively benign, but in other households, rises in the cost of living may require households to reduce food consumption, reduce education expenditure or alter health-seeking behaviors. In addition, these effects may not be felt by every household member equally. Children are often the most vulnerable within a household. Their economic and socio-cultural dependence on adults renders them vulnerable, while their lack of agency and voicelessness reduces their ability to remove themselves from difficult or dangerous situations.

As indicated in our methodology section, we rely for these calculations on the use of cost-of-living-indices and, in particular, on the Fisher index. The principle behind this index, and all other COLI indices, is to calculate a consumer price index (CPI) based on actual household consumption instead of a fixed basket of goods as for country-level CPIs. We explain more in detail the mathematical reasoning behind the COLIs in our methodological annex, while here we limit ourselves to presenting the results of our calculations.

Table 17 reports average Fisher index values for our sample, with disaggregated figures based on different household characteristics. Values greater than one indicate an increase in the cost of living. Due to the fact that the Fisher index in a base year would be 0, they can also be read as percentage increases. Hence, under the midpoint scenario, the costs of living have increased on average by 12.5%. The expected cost of living increases is largest under the worst-case scenario, which assumes a higher increase in food and energy prices. Overall, differences across different groups of households are small. Households which spend more than 50% of the total budget on food are exposed to a fractionally higher rise in the cost of living.

Table 17. Average predicted Fisher index scores by sub-group

	Average income growth	Modest scenario	Midpoint scenario	Worst-case scenario
All	1.03	1.11	1.125	1.14
Residing in a large household	1.02	1.11	1.12	1.13
Residing in a small household	1.04	1.11	1.125	1.14
Food expenditure share <50%	1.03	1.11	1.12	1.13
Food expenditure share >=50%	1.04	1.11	1.13	1.14

Source: authors' own calculations based on Serbia Household Budget Survey 2021.

Irrespective of scenario and of the sub-group considered, growth in income is not forecast to keep pace with the rising cost of living. This translates into a real welfare loss. Overall, incomes are expected to grow 3% on average, though this is smaller for those residing in larger households. Households which have limited access to credit or savings may be required to make significant alterations to household consumption patterns in order to meet the cost of living. Commonly used coping strategies range from spending savings, obtaining credit or asset shedding through to begging and selling property.[19] The data does not permit analysis of coping strategy. However, households on fixed income, with limited access to credit or savings, are most likely to be required to engage in negative coping strategies or face substantial reductions in household welfare or wellbeing.

Price Elasticity of Demand

The analysis in the section above relies on the price elasticity of demand for different commodities. These are interesting in their own right. For example, a price elasticity of demand of -0.2 for bread would indicate that, for a 1% increase in the price of bread, the quantity of bread would decrease by 0.2%. A price elasticity close to |1| means that demand is very sensitive to a change in price, while a value close to zero represents a relatively inelastic demand. The calculation of the price elasticity of demand for energy (heat, electricity, gas) was not possible due to very low response rates in the survey for these items.

Negative elasticities indicate that, for an increase in price, demand decreases (normal good), with a positive sign on the coefficient indicating an increase in demand for a price increase (superior good). The relatively inelastic demand for food is consistent with expectations. Food, clothing and footwear, and health and education all exhibit relatively low demand elasticity. While the price elasticity of demand for food is relatively low, it does indicate that there would be a reduction in demand for an increase in prices.

The very low and statistically insignificant price elasticity of demand for health and education spending may be due to limited representation in the survey as well as limitations of survey design. The survey asks respondents to report their expenditure on all items in a 15/16 day period; if a household has not spent on education or health in the previous 15/16 days, this spending would be absent from the data. However, it may also indicate that essential spending on health and education is relatively well protected from any price increases. This hypothesis is somewhat confirmed by the results of a recent UNICEF-commissioned survey on the impact of the Ukraine conflict on families with children in Serbia (IPSOS 2022). This report highlights how, among most materially deprived households, the share of total consumption spent on health and education increased in 2022 as compared to 2021, while spending on durables and recreational activities decreased, indicating a potential trade-off to keep health and education consumption constant with higher prices. To confirm this, it should be

[19] Based on the World Food Programme's Indicator Compendium 2019

considered that median yearly health expenditure in 2021 (from HBS data) was approximately RSD 25,000 in Serbia. If corrected for a 2022 year-on-year inflation rate of 15.1% (from November 2022), this value reaches approximately RSD 29,000, which is an expenditure comparable to that reported in the IPSOS survey (i.e. RSD 30,000) (IPSOS 2022). Serbian households appear, therefore, to keep their demand for health and education constant even with higher inflation.

Table 18. Price elasticity of demand for different commodities, 2021

	Price Elasticity
Food	-0.388***
Alcohol & tobacco	-0.521***
Clothing & footwear	-0.214***
Health & education	-0.145

Source: authors' own calculation based on HBS 2021

5. Conclusion and policy recommendations

Based on the results of our COVID-19 impact assessment and the simulation of the impact of Ukraine crisis, several conclusions can be drawn. This section summarises our findings and provides some recommendations for future action.

The main takeaway from our COVID-19 Impact Assessment is that the COVID-19 mitigation strategies implemented by the government, especially the one-off transfer to all adult citizens and the one to pensioners in 2020 and 2021, helped limit the adverse economic effects of COVID-19-related restrictions and of the global economic downturn. The analysis conducted here focuses on isolating the effect of COVID-19 specific measures, and at present does not represent a full social protection system analysis – though this would represent an important future research agenda. Thanks to these measures, poverty headcount rates and poverty gap levels remained comparable to those of 2019. Had they not been enacted, poverty rates would have been 0.7 percentage points higher (3.1 percentage points for children), and the poverty gap would have been 0.3 percentage points higher. The effectiveness of these transfers has been highlighted in other studies besides our own (ESAP, 2021; World Bank, 2022b), but so have its costs (Financial Council 2022). The emergency safety net scheme earned its place among the top 10 COVID-related interventions based on its coverage, and had clear benefits for families, especially those with children (World Bank, 2022b). Broad coverage of non-contributory social transfers can play an important role in protecting consumption in the case of a covariate shock that might affect households not typically in receipt of non-contributory social transfers – for example, households in higher wealth quintiles. In addition, in the absence of coordinated and harmonized social registries or databases, broad coverage implicitly reduces exclusion errors. Programmes with broad coverage are required to balance the risk of exclusion errors against cost efficiency; transfers provided to the poorest of the poor are, strictly, the most efficient form of social transfer. The (partial) poverty protective effect of one-off non-contributory social transfers has not translated into economic growth, with the programme costing up to 2.9% of GDP (Financial Council, 2022). To reduce the financial burden of future non-contributory programmes, and to improve the efficiency and poverty-reducing potential of transfers, programmes can be targeted to

facilitate greater benefit incidence to poorest income quintiles. However, provision of effectively targeted transfers requires high-quality, regularly updated, and granular data, harmonised and coordinated between the different ministries and departments responsible for social welfare.

Unfortunately, Serbia's recovery from the impacts of the COVID-19 pandemic has been hindered by the invasion of Ukraine in early 2022. The increase in food and energy prices caused by the war has directly impacted Serbia's most vulnerable population. Overall poverty is expected to increase by 2.5 percentage points in the worst-case scenario. As expected, children are among the most affected, with an additional 27,987 children living below the absolute poverty line, even in the most modest scenario. The partial evidence for the poverty-reducing and protective effects of cash transfers in response to COVID-19 in Serbia contributes to a large body of evidence on the widespread benefits of non-contributory cash transfers, with benefits that extend beyond pure consumption protection. Improving visibility through social registries can enable the government of Serbia to create targeted packages of assistance to protect households in poverty or at risk of poverty in this crisis and in the face of future crises at a lower initial price (World Bank, 2022). The Government is urged to consider expanding horizontally its current social protection schemes to mitigate the short-term effects of the Ukrainian crisis on Serbia's most vulnerable population, without implementing a full scale one-off transfer to all adult population. Improving targeting of vulnerable groups or adding a categorical targeting – e.g. by limiting one-off transfers to families with children, could be considered as a cost-effective compromise.

Estimates of the impact of the crisis on the costs of living show that, under all three scenarios, increases in the cost of living outpace increases in income, over each of the sub-groups considered. This may result in households engaging in negative coping strategies that may affect the most vulnerable – including children – the hardest. Price elasticity analysis conducted as part of the cost-of-living analysis shows that food consumption may be reduced by up to 0.39% for every 1% rise in the price of food. Essential health and education expenditure, however, seem to be protected in the event of inflationary pressure in these sectors, but further analysis is needed in this regard.

The poverty analysis of the Roma community presents two main contributions. The first, policy-related, supports prior evidence on the very high levels of poverty among the community (OSCE 2016), and gives an estimate of the impact of the Ukraine crisis on the Roma population. The second, methodological, provides an intuitive way to extrapolate poverty estimations and simulations conducted with HBS data to MICS data collected by UNICEF. The very high levels of poverty estimated for the Roma population, which reach 80.6% for male children and 86% for children with only one parent alive, call for rapid interventions from relevant stakeholders. While it is true that, based on 2019 MICS data, over 60% of Roma are already benefitting from FSA, the adequacy of this transfer is insufficient to prevent people from falling in absolute poverty. The divergence between the general population and the Roma community is stark, and although in the past international agencies mobilised to provide support, especially during COVID-19, interventions were mostly aimed at

increasing access to healthcare and vaccination.[20] Strategies to increase social inclusion of Roma youth, fight discrimination and facilitate access to the job market have been implemented in Serbia in the past decade (UNDP 2021). We believe strategies like these should be strengthened and expanded the entire Roma population, to reduce the high levels of informality and build resilience among the community and provide durable solutions to poverty.

[20] See https://www.undp.org/serbia/news/vaccines-equally-available-everyone-campaign-inform-roma-population-about-immunization-against-covid-19-has-started

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Annex

Extrapolation to MICS data – additional information

This section reports a robustness check on the extrapolation to MICS data conducted in the main report. Specifically, we conduct the same matching strategy used in the main reporte between HBS data and MICS data for Roma population, but using MICS General population data and report poverty rates obtained from that matching, to show similarities with poverty rates obtained with HBS General population data.

Table A1 below shows a series of poverty and inequality outcomes for both HBS and MICS datasets in 2019. We use 2019 as this is the year for which both HBS and MICS data are available and the year on which our matching is based. As it can be noticed, differences in poverty estimates exists between the two matched samples, although minimal. More importantly, the absolute poverty levels for the general population from the MICS data almost perfectly match the rate of 7% calculated by the Statistical Office of the Republic of Serbia. On the other hand, inequality estimates are almost perfectly matching between the two samples.

Table A1 Poverty and inequality outcomes for HBS and MICS – General Population

	HBS (2019)	MICS (2019)
	Total population	*Total population*
Poverty outcomes		
Poverty headcount	**8.8%**	**7.1%**
Poverty Gap Index	3%	2.3%
Poverty Severity	1.6	1.2
Inequality outcomes		
Gini Index	28.7	28.7
S80/S20 Ratio	4.650	4.821
P90/P10	3.891	3.754

Source: own calculations based on HBS 2019 and MICS 2019.

Results presented above highlight the quality of our matching method between HBS and MICS data. It appears that matching based on asset wealth does allow for the extrapolation of poverty figures between the two datasets. As said, conducting this test for the general population and validatings its strength makes us more confident that the same type of matching between HBS data and MICS for Roma population data would have produced valid poverty estimates for the Roma community.

Understanding the cost of living, and particularly changes in the cost of living (particularly rapid and unexpected changes) may have significant effects on household welfare and wellbeing. If the cost of living becomes unaffordable, households will be forced to make substitutions or cut-backs. For some households these might be relatively benign, but in other households, rises in the cost of living may require households to reduce food consumption, reduce education expenditure or alter health-seeking behaviours. In addition, these effects may not be felt by every household member equally. Children are often the most vulnerable within a household. Their economic and socio-cultural dependence on adults

renders them vulnerable, while their lack of agency and voicelessness reduces their ability to remove themselves from difficult or dangerous situations.

The illegal invasion of Ukraine in February 2022 has – in addition to unimaginable human suffering - resulted in tumultuous commodity markets and disruptions to trade routes, resulting in price rises in staple food commodities, fuels and fertilizers. Exposure to inflationary pressure and trade disruption varies by country, though very few countries are immune to the challenges posed by substantial and rapid changes in prices. As a result, the cost of living dominates the political discourse in many countries, including Serbia. At a presentation of preliminary findings of different research threads in Belgrade in late 2022, perceptions and the effects of the cost of living crisis in Serbia was presented through different lenses. Affording the cost of living, and the trade-offs that might be necessary as a result, were at the forefront of the findings presented using both qualitative and quantitative research. We look to understand the effects of the predicted price rises as a result of the Ukraine crisis using several key tools. The first is key tool is a cost of living index (or indices), which enables us to estimate whether households may not be able to afford the cost of living under given scenarios. The second, somewhat subsidiary, tool is through calculation of price elasticities of demand for aggregate groups of commodities. The third is through welfare loss analysis calculated for price changes in heat energy and food prices.

Calculating cost of living indices

There is no universally recognised measure of the cost of living, with a number of competing methodologies that each have polemic or technical limitations. Commonly used consumer price indices use a fixed basket of goods, including what is commonly referred to as the Consumer Price Index in addition to the Laspeyres index and Paasche index. The commonly reported CPI uses a fictional fixed basket – commodities pertaining to be representative of consumer habits chosen by the national statistical office. The Laspeyres and Paasche use as their base actual consumer quantity vectors in either a base period (time *0*) or in the current time (time *t*). The precision advantages of the Laspeyres and Paasche index led to their dominance in the field. Fundamentally they differ by the choice of commodity vector. The Laspeyres index (equation i) is, for a vector of *n* commodities for a given household, the arithmetic mean of the ratio of prices in time *t* to prices in time *0* weighted by the base period expenditure share. On the other hand, the Paasche index (equation ii) is the current period (time *t*) expenditure weighted by the harmonic average of the same ratio of prices in time *t* and time *0* as in the Laspeyres.

$$P_{Laspeyres} = \frac{\sum_{i=1}^{n} p_i^t q_i^0}{\sum_{i=1}^{n} p_i^0 q_i^0} \equiv \sum_{i=1}^{n} \left(\frac{p_i^t}{p_i^0}\right) s_i^0 \quad \text{(i)}$$

$$P_{Paasche} = \frac{\sum_{i=1}^{n} p_i^t q_i^t}{\sum_{i=1}^{n} p_i^0 q_i^t} \equiv \left\{\sum_{i=1}^{n} (p_i^t / p_i^0)^{-1} s_i^t\right\}^{-1} \quad \text{(ii)}$$

The two indices are a valid measure of the cost of living, and equally so – any choice between them would be arbitrary. However, they may yield slightly different results and it is unappealing to have two valid indices giving slightly different results. Moreover, neither of the indices on their own pass the time reversal test – that is to say, it ought not matter which time period is chosen as the base for the

equations above. The Fisher ideal price index meets a number of important criteria, including homogeneity, symmetry and the time reversal test. The Fisher index (equation iii) is the geometric average of the Laspeyres and Paasche, and is a superlative index.

$$P_{Fisher} = \sqrt{P_{Laspeyres} P_{Paasche}} \quad \text{(iii)}$$

Typically, Laspeyres and Paasche indices are calculated retrospectively, in the presence of several rounds of data – i.e. both time *0* and time *t*. However, this work is intended to be *prospective*. As a result, there were several additional steps required in the estimation of results.

Time *0* - *2021*	Time *t* - *2022*
Observed:	Unobserved – simulated:
Household Budget Survey 2021	p^t inflated using the scenarios described in Table 1
$\boldsymbol{p^0}$	q^t estimated using the price elasticity of demand

Figure A1. Data construction approach, COLI analysis.

In line with the benefits of the Fisher index outlined in the introduction to this section, we select the Fisher index as our index of choice. However, the authors note that the Paasche and Laspeyres are very close (often similar to the third decimal), which is in line with our expectations.

Price Elasticity of Demand

In order to simulate the future quantities of commodities consumed under the different inflation scenarios, it was necessary to estimate the price elasticity of demand. A price elasticity of demand estimate of -0.2 for bread would indicate that, for a 1% increase in the price of bread, the quantity of bread would decrease by 0.2%. A price elasticity >1 represents a relatively elastic demand, while a value close to zero represents a relatively inelastic demand. In order to estimate the quantity consumed under each of the three scenarios, the quantity reported as consumed in 2021 was reduced by the product of the elasticity and the percent inflation under each scenario. The calculation of the price elasticity of demand for energy (heat, electricity, gas) was undermined by very low response rates in the survey for these items. The estimate was statistically insignificant at all common significance levels, and slightly positive which is illogical. We have assumed that this unusual result is associated with the very low reported consumption. Therefore we have replaced this value with 0, since we would assume heat and electricity to be quite inelastic. The small sample size for heat energy may be an artefact of survey timing or recall, or may be as a result of reliance on combined neighbourhood heating systems, or firewood in rural areas.

In order to estimate price elasticities, Deaton and Muellbauer's almost-ideal demand system was estimated using the *aidsills* package developed for *Stata* by Lecocq and Robin (2015). The vector of commodities for which an elasticity is required is quite large and computational limitations rendered the operation impossible for a disaggregated vector of commodities. In order to reduce the computational burden of the process, commodities were aggregated into groups: food, alcohol & tobacco, clothing & footwear, housing, energy, health & education, along with a final catch-all category. Group prices were weighted by the budget share of the given commodity.

Price elasticities are estimated using the quadratic (Banks, Blundell & Lewbel, 1997) extension of Deaton & Muellbauer's (1980) work almost-ideal demand system, implemented in *Stata* using the *aidsill* package developed by Lecocq & Robin (2015).

$$w_i^h = \alpha_i + \gamma_i' \mathbf{P}^h + \beta_i \left\{ x^h - \alpha(\mathbf{P}^h, \boldsymbol{\theta}) \right\} + \lambda_i \frac{\{x^h - a(\mathbf{P}^h, \boldsymbol{\theta})\}^2}{b(\mathbf{P}^h, \boldsymbol{\theta})} \Bigg) + \mu_i^h$$

w_i^h represents the budget share for commodity $i = 1, \dots, N$; x^h represents log total expenditure and N-vector of log prices is $\mathbf{P^h}$. $\boldsymbol{\alpha, \beta, \lambda, \gamma}$ are to be estimated.

Price indices are given by (Lecocq & Robin, 2015):

$$\alpha\left(\mathbf{P}^h, \boldsymbol{\theta}\right) = \alpha_0 + \boldsymbol{\alpha}' \mathrm{P}^h + \frac{1}{2} \mathbf{P^{h'}} \boldsymbol{\Gamma p^h}$$

$$b\left(\mathbf{P}^h, \boldsymbol{\theta}\right) = \exp(\boldsymbol{\beta}' \mathbf{P^h})$$

$\alpha = (\alpha_1, \dots, \alpha_N)', \beta = (\beta_1, \dots, \beta_N)', \Gamma = (\gamma_1, \dots, \gamma_N)', \theta$ is the set of all parameters, with μ_i^h is an error term. The parameters must sum to zero over all equations, log price parameter must sum to one within an equation and symmetry $\gamma_{ij} = \gamma_{ji}$ is required.

The compensated price elasticity is given by Lecocq and Robin (2015) as:

$$e_{ij}^c = e_{ij}^u + e_i w_j$$

Where

$$e_{ij}^u = \frac{\mu_{ij}}{w_i} - \delta_{ij} \; where \; \delta_{ij} is \; Kronecker's \; delta$$

Where

$$\boldsymbol{\mu_{ij}} = \boldsymbol{\gamma_{ij}} - \boldsymbol{\mu_i}\left(\boldsymbol{\alpha_j} + \boldsymbol{\gamma_j} \mathbf{P}\right) - \lambda_i \beta_j \frac{\{x - a(\boldsymbol{p}, \boldsymbol{\theta})\}^2}{b(\boldsymbol{p}, \boldsymbol{\theta})}$$

When

$$\boldsymbol{\mu_i} = \boldsymbol{\beta_i} + \mathbf{2} \boldsymbol{\tau_i} \frac{\{x - a(\boldsymbol{p}, \boldsymbol{\theta})\}}{b(\boldsymbol{p}, \boldsymbol{\theta})}$$

Table A2. Compensated own price elasticities

	(Compensated) Own Price Elasticity
Food	-0.388***
Alcohol & tobacco	-0.521***
Clothing & footwear	-0.214***
Housing	0.521***
Energy	0†
Health & education	-0.145
All others	0.156*

Source: authors' own calculation based on Serbia Household Budget Survey 2021. Note: * indicates statistical significance: * 10%, ** 5%, *** 1%. † Not estimated due to low response levels in the diary.

Negative elasticities indicate that, for an increase in price, demand decreases (normal good), with a positive sign on the coefficient indicating an increase in demand for a price increase (superior good). The relatively inelastic demand for food is consistent with expectations. Food, clothing and footwear, and health and education all exhibit relatively inelastic demand. The low and statistically insignificant price elasticity of demand for health and education spending may, similar with energy, be due to limited representation in the survey. While the negative sign on the coefficient is polemically negative, the value is small. This may indicate that essential spending on health and education will be relatively well protected from any price increases. While the price elasticity of demand for food is relatively low, it does indicate that there would be a reduction in demand for an increase in prices. While this value is higher than anticipated, this may be an artefact of the aggregation. While most food groups are expected to have inelastic demand, some items would be expected to have a higher elasticity than others. The positive and significant elasticity of demand for housing may indicate that there is a luxury effect to some housing.

There are a number of limitations to these approaches. The most significant of the problems is the lack of price data. Analysis in this section employs the diary component of the HBS 2021, in which respondents report quantities and amount paid for all commodities purchased in a 15/16 day period. For the purposes of this analysis, we have used the division of price by quantity to be price. While diary modules for eliciting consumption is viewed as the gold standard (Gibson et al., 2015), there is still room for random and systematic error in reporting consumption expenditure. Moreover, the timing of the survey and the recall period will also influence reporting of specific commodities. The aggregation of commodities into groups results in a natural loss of fidelity, however the computational power required to gain additional fidelity was unavailable to the authors.

Microsimulation of the impacts of the Ukraine war

To simulate the potential impacts of the Ukraine war of poverty, household income was adjusted based on projected GDP growth for different economic sectors. As the HBS dataset has data on the source of the income divided by professional occupation, we classified each of the occupations into an economic sector, as per the table below.

Table A3. Occupation to sector classification

code	Occupation	Sector
1	Commissioned armed forces officers	Public
2	Non-commissioned armed forces officers	Public
3	Armed forces occupations, other ranks	Public
11	Chief executives, senior officials and legislators	Service
12	Administrative and commercial managers	Service
13	Production and specialised services managers	Service
14	Hospitality, retail and other services managers	Service
21	Science and engineering professionals	Service
22	Health professionals	Service
23	Teaching professionals	Service
24	Business and administration professionals	Service
25	Information and communications technology professionals	Service
26	Legal, social and cultural professionals	Service
31	Science and engineering associate professionals	Service
32	Health associate professionals	Service
33	Business and administration associate professionals	Service

34	Legal, social, cultural and related associate professionals	Service
41	General and keyboard clerks	Service
42	Customer services clerks	Service
43	Numerical and material recording clerks	Service
44	Other clerical support workers	Service
51	Personal service workers	Service
52	Sales workers	Service
53	Personal care workers	Service
54	Protective services workers	Service
61	Market-oriented skilled agricultural workers	Agriculture
62	Market-oriented skilled forestry, fishery, and hunting workers	Agriculture
63	Subsistence farmers, fishers, hunters, and gatherers	Agriculture
71	Building and related trades workers, excluding electricians	Industry
72	Metal, machinery, and related trades workers	Industry
73	Handicraft and printing workers	Industry
74	Electrical and electronic trades workers	Industry
75	Food processing, wood working, garment and other craft and related trades workers	Industry
81	Stationary plant and machine operators	Industry
82	Assemblers	Industry

83	Drivers and mobile plant operators	Industry
91	Cleaners and helpers	Service
92	Agricultural, forestry and fishery labourers	Agriculture
93	Labourers in mining, construction, manufacturing, and transport	Industry
94	Food preparation assistants	Service
96	Refuse workers and other elementary workers	Service