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SPES Focus – Work Package #6

Assessing the vulnerability to global energy shocks and policy measures at the macro and microeconomic level:

The case of Kenya

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Abstract

This paper assesses the macro- and microeconomic impacts of the Russia-Ukraine war (RUW) induced energy price shocks on Kenya, a lower middle-income country with high dependence on energy imports. By a macro-micro-simulation, we show that commodity prices shocks caused by the RUW macroeconomic negatively affects Kenya's macroeconomy. The microsimulation, shows that poor, rural, and unskilled households are disproportionately affected while women are slightly more effected than men due to their higher vulnerability. Simulations of pro poor policies in form of cash transfers to the poor and rural households reveal that these measures can help to mitigate the negative impacts of increasing poverty and inequality. These findings highlight that the RUW impacts exacerbate poverty and inequality in vulnerable countries. The paper underscores the importance of targeted mitigation strategies. The complementary usage of Computable Equilibrium General Model (CGE) model and behavioural micro simulation model represents a fruitful application which combines the strength of both modelling approaches.

Table of Contents

1. Introduction

The Russia-Ukraine war (RUW) has triggered a series of global economic shocks, most notably through sharp increases in world prices for energy, fertilisers, and food (Arndt et al., 2023). These price surges have posed serious threats to economic growth, energy and food security, and poverty reduction efforts worldwide. The shocks have been particularly detrimental to countries in the Global South, many of which were still struggling with the negative economic consequences of the COVID-19 pandemic (Ben Hassen and El Bilali, 2024; Zhang et al., 2023). While the nature of the RUW shock is geopolitical, its economic consequences resemble those expected from ambitious sustainable transition policies—such as carbon pricing or fossil fuel subsidy removal—which can also induce energy price inflation and ripple through food systems and labour markets. As such, the RUW shock provides a real-time stress test that is highly instructive for policymakers: it highlights the importance of anticipating and mitigating the regressive impacts of global price shocks to ensure that the path toward environmental sustainability does not come at the expense of social equity. The extent and nature of the RUW impacts vary significantly across countries, depending on their economic structures and levels of resilience. Within countries, rural and urban populations are differently affected, reflecting distinct vulnerabilities to rising prices in key sectors. In the global south, rural households tend to be more exposed to agriculture and hence, to poverty risks due to increased fuel and fertiliser costs, which directly affect agricultural productivity and, consequently, agricultural incomes. In contrast, urban populations are more susceptible to rising food and energy prices, which disproportionately burden household consumption expenditures (Arndt et al., 2023). These compounded crises present significant challenges for policymakers, particularly in contexts where fiscal space is limited, and governments are navigating multiple, overlapping emergencies. In such settings, efficient allocation of public resources becomes critical. Public spending must be targeted strategically to address the needs of the most vulnerable segments of society and to mitigate further deterioration in living standards.

Kenya exemplifies the case of a lower-middle-income country highly sensitive to external shocks due to its reliance on imported oil and its structural vulnerabilities, including widespread poverty and inequality, particularly among rural populations and women (KNBS, 2022; 2023). The country's development agenda is aligned with the Sustainable Development Goals (SDGs), especially Goals 1 (No Poverty), 2 (Zero Hunger), 3 (Good Health and Well-being), 4 (Quality Education), and 10 (Reduced Inequalities). Kenya's commitment to the "Leave No One Behind" (LNOB) principle underscores its emphasis on inclusive and sustainable development (KNBS, 2023).

However, the trade disruptions caused by the RUW have set back progress toward these objectives. These disruptions affect Kenya through three main channels. First, increased energy prices elevate production costs and force households to either allocate a larger share of their income to energy or seek alternative, often less reliable, energy sources. Second, rising food prices strain household budgets and push vulnerable populations into deeper food insecurity and poverty. Third, the surge in fertiliser prices raises agricultural input costs, undermining domestic food production—an essential sector for both employment and food supply. As a result, reduced agricultural productivity and increased production costs exacerbates food price inflation and worsens food access for poor households. While the escalation in energy prices remains the most significant shock affecting both production systems and household welfare, the concurrent increases in food and fertiliser prices further compound the economic burden.

In this paper we provide empirical evidence of the impacts of the RUW on Kenya. We simulate the economy wide effects of world price changes on energy, fertiliser and food and we analyse the impact of mitigation policies to counteract the negative impacts. For the economic assessment we link a dynamic computable general equilibrium (CGE) model with a behavioural microeconomic

simulation. The microsimulation model allows to assess the distributional impacts on poverty and inequality across different population groups. It generates early evidence from secondary data and allows simulation of policy scenarios before policy implementation. Thus, it offers timely, actionable insights to inform economic assessments and policymaking amid global shocks.

1.1. Economic development in Kenya

Since 2015, Kenya has made notable progress in its economic development, as well as in reducing poverty and inequality. However, this upward trajectory has been disrupted by two successive crises: the COVID-19 pandemic in 2020 and the trade disruptions resulting from the RUW, both of which have significantly hindered the country's economic development. The growing path can be illustrated indicators of macroeconomic development and poverty index.

Figure 1a highlights a general upward trend in per capita GDP, interrupted by a sharp decline in 2020 due to the COVID-19 pandemic. This is clearly reflected in the annual growth rate, which shows a significant negative dip during that year. A second economic disruption is observed around the year of the RUW, marked by another drop in growth, followed by a recovery in the subsequent period.

Figure 1b examines the sectoral contributions to GDP. It reveals that the services sector was hit hardest during the COVID-19 crisis, while agriculture's share increased. Although agriculture saw a slight dip in 2020, it resumed an upward trend, reaching a higher share by 2023. In contrast, the industrial sector maintained relative stability until 2022 but began to decline in the aftermath of the RUW.

Figure 1c depicts the trajectories imports, which experienced a pronounced decline in 2020, coinciding with the onset of the COVID-19 pandemic. Although a partial recovery followed, import levels appear to stagnate or decline again after 2022, pointing to persistent economic headwinds. Notably, the share of fuel imports decreased sharply in 2020 due to reduced demand stemming from lockdown measures (e.g. transport), as well as falling global oil prices. By 2022, however, the fuel import share increased markedly, largely driven by the rise in oil prices following the Russia-Ukraine war.

Figure 1d highlights changes in fertiliser consumption and food production. A significant decline in fertiliser application is observed in 2022. The decrease in food production is partially explained by the impact of input price increases (fuels and fertilsers) but also significantly driven by unfavourable agronomic conditions in this period, which caused harvest losses (e.g., weather conditions, drought and outbreaks of pests).

Figure 1e illustrates the trends in consumption expenditure alongside consumer price inflation. The initial COVID-19 shock led to a stagnation of consumption between 2019 and 2020. When adjusted for inflation—which showed a slight upward trend—real consumption effectively declined. A more pronounced contraction in consumption is observed between 2022 and 2023, despite inflation remaining relatively stable, indicating a clear decrease in real consumption. During both crises, the government and its development partners implemented a range of social protection measures to cushion households from these shocks. During the COVID-19 pandemic, Kenya expanded its national cash transfer programmes (Inua Jamii), launched an emergency urban cash transfer and the Kazi Mtaani public works scheme, and partnered with donors such as the UK-FCDO, WFP, UNICEF, and the EU to deliver digital cash assistance and top-ups. These efforts helped prevent a deeper collapse in household consumption, though coverage remained uneven. During the RUW-induced cost-of-living crisis, the policy mix shifted toward universal price stabilization—fuel, maize flour, and fertiliser subsidies—alongside ongoing routine transfers and drought-responsive

payments under the Hunger Safety Net Programme. While these interventions provided temporary relief and moderated inflationary pressures, their fiscal costs limited duration and targeting. Overall, Kenya's crisis responses highlight how an evolving social protection system can buffer welfare shocks, even amid constrained fiscal space.

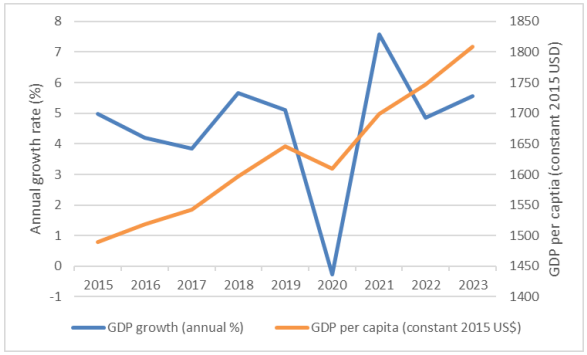


Figure 1a: *Development of GDP growth and GDP per capita*

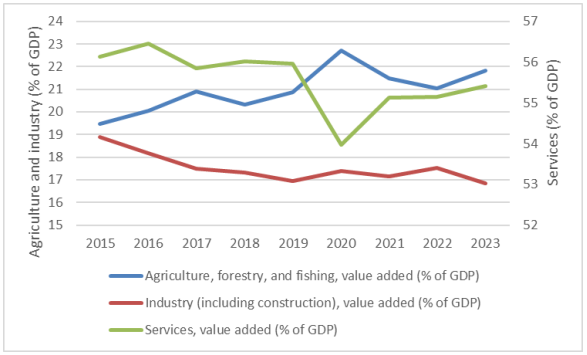


Figure 1b: *Development of sectoral contribution to the value-added*

Figure 1c: *Development of trade*

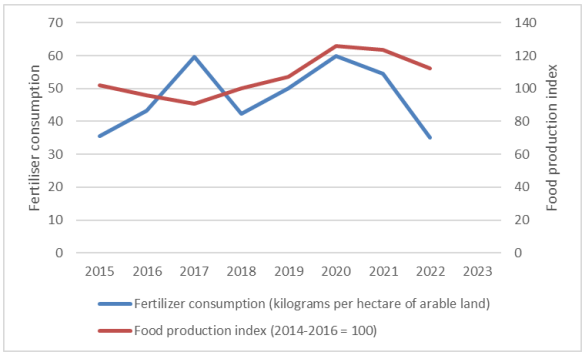


Figure 1d: *Development fertiliser consumption and food production*

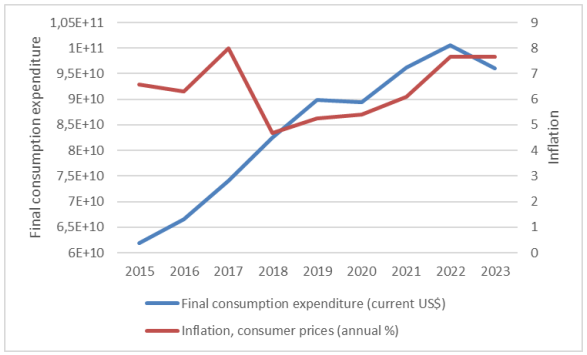


Figure 1e: *Consumption expenditures and inflation*

Source: *Authors' elaboration based on World Bank (2025)*

1.2. Poverty in Kenya

The effects of macroeconomic disruptions have significantly influenced poverty and inequality across both rural and urban regions of Kenya. Figures 2a to 2f illustrate the evolution of key poverty indicators over the period from 2015 to 2023. From 2015 to 2019, the decline in poverty indicators reflects a positive trajectory in reducing the incidence of poverty (KNBS, 2024).. As shown in Figure 2a, the outbreak of the COVID-19 pandemic led to a marked increase in overall poverty at the national level, with urban areas experiencing the most pronounced increase. The implementation of lockdown measures disproportionately affected urban populations, particularly those engaged in the industrial and service sectors. Following the pandemic, the headcount poverty level declined but reached in 2021 a slightly higher level than before the crisis. A subsequent increase occurred in 2022, coinciding with the trade disruptions triggered by the Russia-Ukraine War (RUW). In contrast to the development during the pandemic, the rural populations experienced a greater rise in poverty levels than urban populations. The rural economy, heavily dependent on agriculture, was more adversely affected by increased costs of production inputs such as fertiliser and fuel, which escalated due to global trade shocks.

A similar pattern is observed in food poverty trends (Figure 2b). While both urban and rural areas followed comparable trajectories, urban food poverty experienced a slightly sharper increase. This can be attributed to urban populations' reliance on rural agricultural output, which production was hampered by price hikes in key inputs fertilisers and fuel. In contrast, rural communities—though affected stronger impacted in their income—retained some level of self-sufficiency in food production. Figure 2c presents the trends in hardcore poverty, indicating that people cannot afford the minimum required food consumption basket even if they allocate all their food and non-food expenditures to food alone (KNBS, 2024:30).. Interestingly, prior to 2020, the rate of extreme poverty in urban areas did not exhibit the same downward trend observed elsewhere, suggesting that the urban extreme poor were more severely impacted by the pandemic than rural extreme poor. During the RUW period, however, both urban and rural regions experienced comparable increases in hardcore poverty.

The spatial distribution of overall poverty (Figure 2d) reinforces these findings. The COVID-19 pandemic primarily expanded the proportion of the urban poor, while the RUW crisis resulted in a significant increase in proportion of rural poverty. Figure 2e highlights these trends in numbers of people: from 2019 to 2020, the urban poverty slope steepened sharply, reflecting the acute impact of COVID-19, whereas from 2021 to 2022, the number of rural poor increased more rapidly under the influence of RUW-related shocks.

Finally, the Gini Index (Figure 2f) reveals a divergence in inequality trends. Rural inequality intensified during the RUW period, likely due to disparate access to agricultural inputs. In contrast, urban inequality declined, potentially due to a more uniform shock across socioeconomic groups. These differentiated trends underscore the need for context-specific policy responses. The data clearly show that macroeconomic shocks have varied impacts on rural and urban populations, with the COVID-19 pandemic disproportionately affecting urban livelihoods and the RUW trade disruptions having a more severe effect on rural communities. Understanding these dynamics is critical for designing effective poverty alleviation and inequality reduction strategies in Kenya.

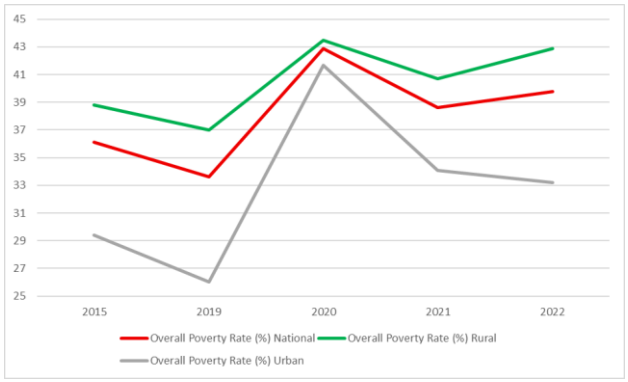


Figure 2a: *Overall poverty rate in percent of population*

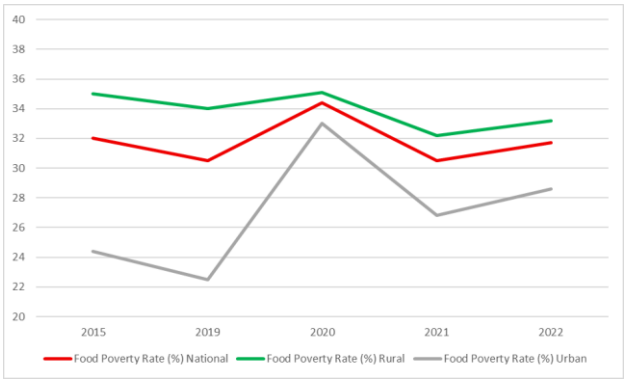


Figure 2b: *Food poverty rate in percent of population*

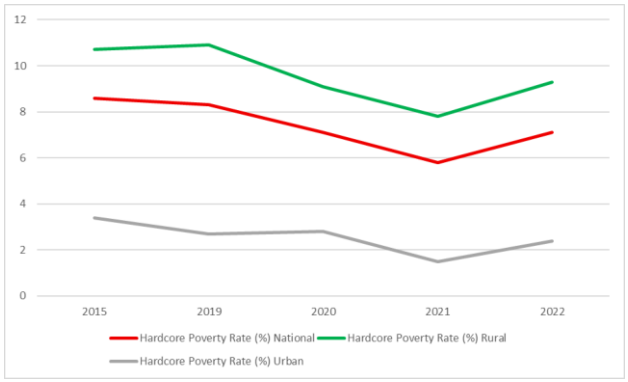


Figure 2c: *Hardcore poverty rate in percent of population*

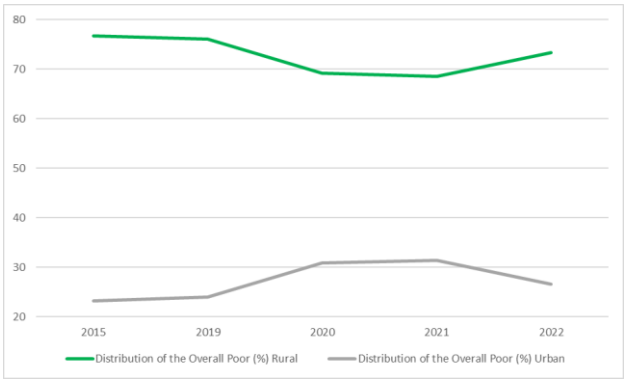


Figure 2d: *Distribution of overall poverty in percent of population*

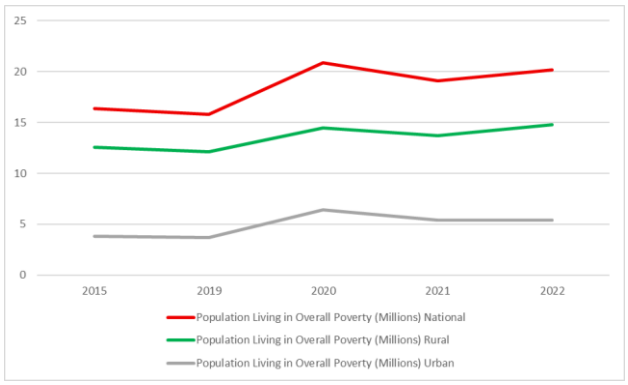


Figure 2e: *Population in overall poverty in million*

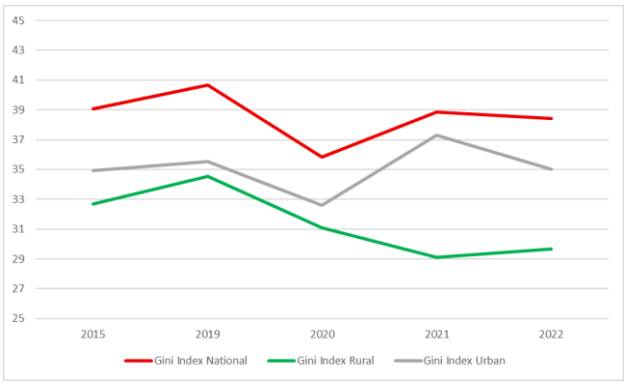


Figure 2f: *Gini index.*

Source: *Authors' elaboration based on data from KNBS (2024)*

1.3. Literature review

Recent studies have begun to shed light on the varied impacts of the Russia-Ukraine war (RUW) on Kenya, with particular attention to vulnerable groups and sectors. Onyango et al. (2024), using data from a phone survey, examine the gendered consequences of rising energy prices, focusing on household cooking fuel transitions. Their findings reveal that as kerosene prices increased, many households shifted to firewood, a change that imposes greater burdens on women due to longer collection times and inefficiencies in cooking, thereby increasing their domestic workload. In parallel, Abay et al. (2023) characterize Kenya as highly vulnerable to food insecurity, with consumption particularly sensitive to export restrictions and regional conflicts. Arndt et al. (2023) find that increases in fuel, fertiliser, and food prices contribute comparably to the poverty headcount rate, while deteriorations in dietary quality and undernourishment are primarily linked to rising fertiliser and fuel costs.

At the macroeconomic level, Ndong Ntah et al. (2023) document the adverse effects of rising import prices on Kenya's GDP and household consumption, with the largest impacts emanating from increased fertiliser and fuel costs. The agrifood and service sectors are identified as especially susceptible, and rural households face steeper increases in food prices than their urban counterparts. Although subsidies on fuel and fertiliser could alleviate many of these negative effects, they come with considerable fiscal challenges. Consequently, the authors advocate for policies that enhance intraregional trade, diversify import sources, and boost agricultural productivity and energy efficiency to strengthen resilience (Ndong Ntah et al., 2023). However, their macroeconomic approach does not delve into distributional effects at the household level.

While Onyango et al. (2024) provide a microeconomic perspective on energy price impacts with a gender focus on adaption of energy sources, Ndong Ntah et al. (2023) employ a macroeconomic computable general equilibrium (CGE) model to analyse RUW impacts on the economy. Building on these approaches, our study integrates both macroeconomic and microeconomic analyses through a sequential top-down framework. By linking a dynamic CGE model with a microsimulation, we offer a comprehensive assessment of price shock impacts and mitigation policies, including their distributional and gendered effects. This modelling approach not only generates early empirical evidence from secondary data but also enables the simulation of policy scenarios before implementation. Using gender-sensitive CGE models in conjunction with microsimulations provides timely, actionable insights to inform economic assessments and guide policymaking in the face of ongoing global shocks.

1.4 Research gap and road map

In our study we assess: (i) the economy-wide impacts of the RUW caused price-shocks, (ii) the spill-over effects on the labour market, on urban and rural population, and gender, (iii) the distributive impacts using linked microsimulation analysis across income, consumption, and food security, and (iv) we also simulate and analyse the macroeconomic and distributive impacts of mitigation policies to counteract poverty and inequality. The following section (Section 2) presents the macroeconomic and the microeconomic models as the research methodologies applied. Section 3 presents the simulated 2 scenarios of different carbon price assumptions. Section 4 analyses and discusses the results. Section 5 concludes for the value added of the results and for potential new research.

2. Methodology

2.1. Macroeconomic model

Since the Russian invasion into Ukraine in February 2022, several model-based studies have estimated the economic impacts of the conflict. The methods applied cover graphical models and net-work analysis (Braun et al., 2023; Estrada and Koutronas, 2022), econometric and gravity models (Liadze et al., 2023; Sedrakyan, 2022), vulnerability analysis (Abay et al., 2023), trade flow analysis (Aitken and Ersoy, 2022), input-output model analysis (Deng et al., 2022) and computable general equilibrium (CGE) model analysis (Mahlstein et al., 2022; Rose et al., 2023; Schropp and Tsigas, 2023). Most of these studies analyse the impacts of the trade sanctions and disruption for the countries and regions impacted directly or indirectly by the conflict: the allies, the non-allies and important trade partners (Evenett and Muendler, 2022; Schropp and Tsigas, 2023). Most of the CGE model based studies are multi-country studies with focus on the impacts on economic growth and trade (e.g., Evenett and Muendler, 2022; Rose et al., 2023).

Several studies analyse the economic impacts of the RUW on specific developing African countries (Chepeliev et al., 2022; WTO, 2022) which are vulnerable to changes in energy and food markets. For instance, an analysis of the impact of RUW on different African economies found particular welfare losses in Sudan, Kenya and Ethiopia (Cororaton, 2024). Also few studies focus on the socio-economic impacts the crisis will have in developing countries on vulnerable groups (Arndt et al., 2023; Chepeliev et al., 2022; Deng et al., 2022). Arndt et al., (2023) use single country CGE models[1] to estimate the near-term impacts in 19 developing countries. Ayaz et al (2023) investigate the impacts of RUW on poverty and food security for Pakistan's households and Ayaz et al. (2024) analyse the impact of the RUW on South African women. Yalew et al. (2024) analyse the impacts on households consumption and food security in Ethiopia (Yalew et al., 2024). Ndong Ntah et al. (2024) analyse the impacts of RUW on Kenyan households and the effectiveness of government subsidy measures (reducing sales tax for petroleum fuels and fertilisers) (Ndong Ntah et al. 2024).

The macroeconomic model in this study is based on the PEP-1-t standard model (Decaluwé et al., 2013). The hypotheses from the standard model and specified it consistently with the SAM of Kenya in the base year 2019. We consider the year 2019, prior to the COVID-19 crisis, to be a more representative base for the Kenyan economy than the more recent SAMs, which were compiled shortly after the crisis. The data in these newer SAMs may be significantly influenced by the effects of the pandemic shock.

[1] Using CGE models to 'estimate impacts' has limitations: Results are based on strong assumptions regarding how people will behave and markets will respond. The development observed in reality can differ from the results obtained in CGE model simulations. Therefore, empirical results based ex-post analysis are more accurate. However, often data for compiling an ex-post analyse are available sometime after the economic shock, which is subject to the analysis. Therefore, the CGE models value is to provide simulated impact assessments before data for an ex-post analysis are available.

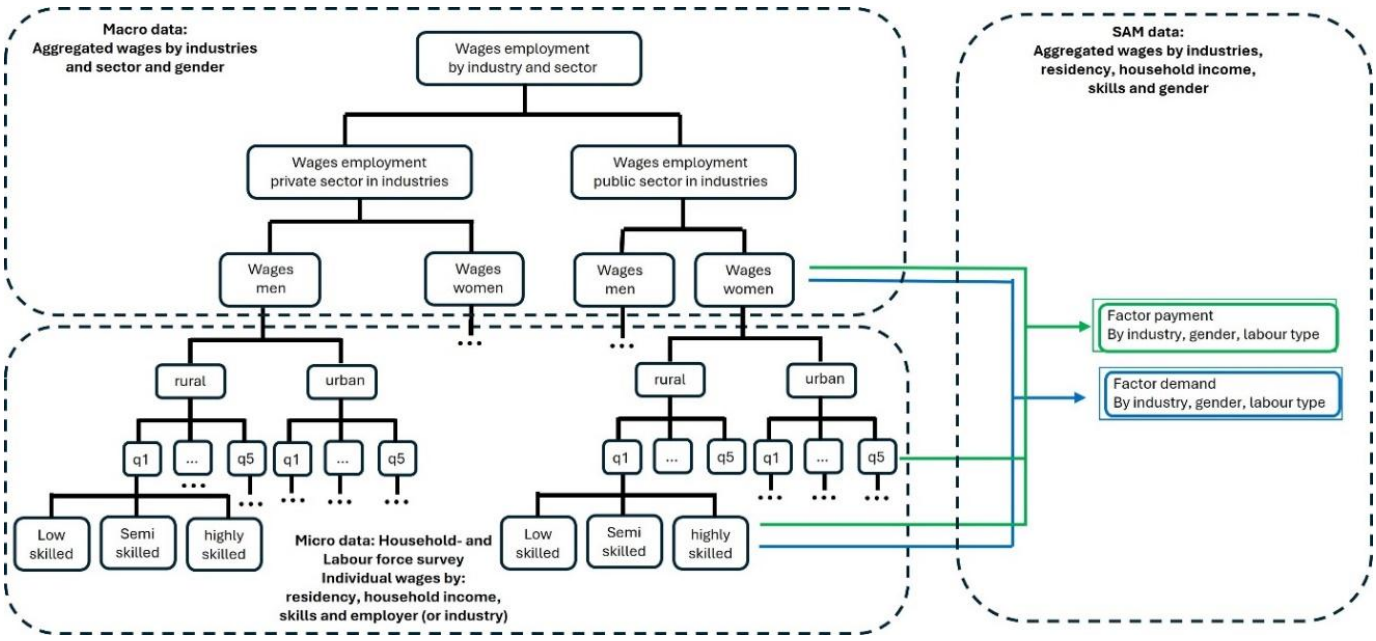
2.1.1. Macroeconomic data

2.1.1.1. Splitting the Social Accounting Matrix (SAM)

Representing gender in the CGE models for Kenya requires disaggregating the SAM without gender dimension into SAM with gender-dimensions, as "gendered" SAM. For splitting (disaggregating) the SAM we use microeconomic survey data and macroeconomic statistics. Simple: we use the microeconomic data to compute shares of wage payments which we apply to the macroeconomic (aggregated) data in the SAM. For this study we disaggregate the labour market and the factor payments to the households (i.e., household income from labour) according to following socioeconomic and economic attributes: gender (male, female), labour type (e.g., unskilled, semi-skilled, low-skilled), industry (e.g., agriculture, manufacture) residency (e.g., rural, urban) and household income level (e.g., 1st income quintile, …, 5th income quintile).

For splitting the SAM for Kenya we combine information from the Statistical report Economic Survey 2021 (KNBS, 2021) with the Kenya Integrated Household Budget Survey 2015-2016 (KNBS, 2018). From the Economic Survey 2021 we use the information on wage payments and number of male and female workers and in industries, from the Kenya Integrated Household Budget Survey 2015-2016 we use the information on labour type, residency and household income level. Figure 2, schematically presents the combination of macroeconomic data (KNBS, 2021) with microeconomic data (KNBS, 2018), to compute shares to derive in the SAM factor demands and factor payments.

Figure 2: *Combing information from macro and microeconomic data to derive shares to split the SAM data*



Source: *Authors' elaboration*

2.1.2. The Social Accounting Matrix (SAM)

The SAM serves as a data base to which the CGE model is calibrated. Thus, the SAM determines the reaction of the model in the scenario simulation. The Kenyan SAM was developed by Thurlow (2021) and is based on 2019 data (Thurlow, 2021) and IFPRI (2021). For the purposes of our studies, the SAM was gendered, and for agricultural sectors, the labour categories were modified in order to take into account own account workers.

2.1.3. The CGE model

To assess the macroeconomic consequences of global commodity price shocks—specifically those related to oil, fertilisers, wheat, and vegetable oils—on the Kenyan economy, we develop a dynamic computable general equilibrium (CGE) model based on the PEP-1-t by Decaluwé et al., (2013). We adapt and extend the standard specification to better capture the structural specificities and economic realities of Kenya.

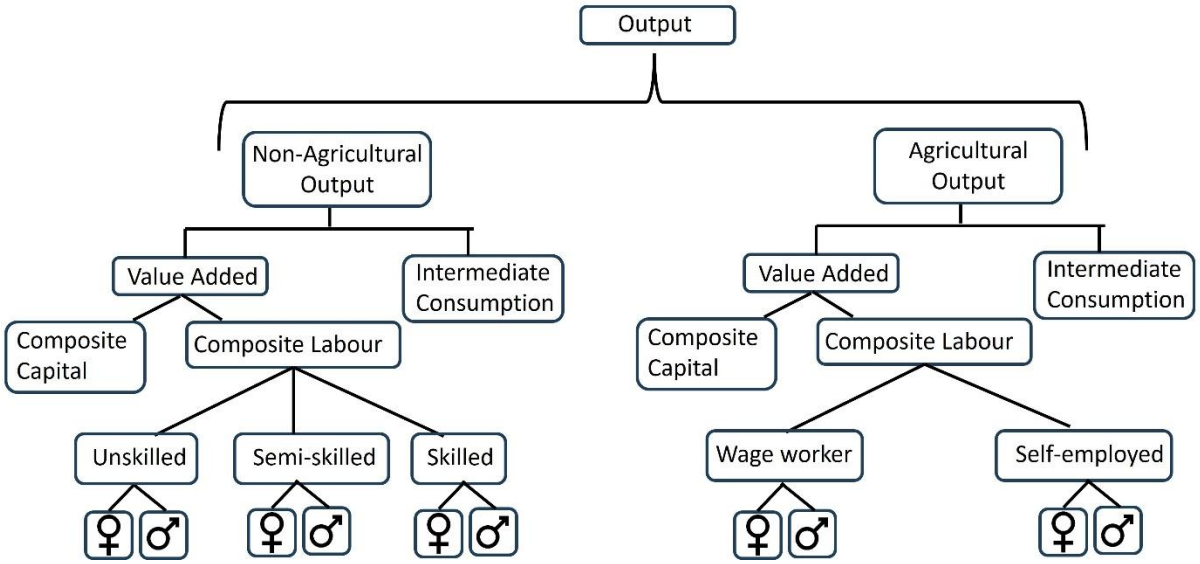
Production is defined by a multi-level nested structure as presented by Figure 3. In consistency with the SAM, there are 42 activities. At the top level, output is a Leontief type of function, which imposes fixed proportions between intermediate inputs and value added.

At the second level of the nesting structure, value added is disaggregated into labour and capital. The functional form for labour aggregation differs between agricultural and non-agricultural activities, reflecting the heterogeneity in labour use and employment patterns across sectors. In agricultural sectors, the demand for labour is modeled using a Constant Elasticity of Substitution (CES) function that aggregates wage-employed and self-employed workers. These two categories are further disaggregated by gender, resulting in four labour types: male wage-workers, female wage-workers, male self-employed, and female self-employed.

In contrast, non-agricultural sectors employ a broader classification of labour. Here, composite labour demand is represented as a CES function combining three skill categories: skilled, semi-skilled, and unskilled labour. Each skill category is further disaggregated by gender, capturing six distinct labour types. This approach allows for a detailed analysis of gender-specific and skill-specific labour market outcomes in response to external shocks.

The model structure reveals significant variation in labour intensity and gender composition across sectors. For instance, the rice sector is characterized by high labour intensity, while sectors such as wholesale and retail trade show a disproportionately high share of female employment.

Figure 3: *Production tree. Notes: Illiter. = unskilled, illiterate labour, Prim. = primary education, Seco. = secondary education, Terti. = tertiary education*



Source: *Authors' elaboration*

Following the SAM, in our model, there are ten types of households: households are split according to their quintile of income and location, either rural or urban. Their income is derived from three sources: male and female labour, capital and transfers from other institutions (remittances, dividends, government transfers). The composition of household income varies markedly across household types. Rural households, particularly in the lower income quintiles, derive a substantial portion of their income from capital, primarily in the form of returns to land. Conversely, urban households, especially in the lower and middle quintiles, rely predominantly on labour income. For the highest urban quintile, dividend income from firms constitutes the largest share of total income, reflecting their greater ownership of capital assets. Household expenditures are allocated across four uses: consumption of goods and services, direct taxes, transfers to other institutions, and savings. Consumption behaviour is modeled using a Linear Expenditure System (LES), which allows for the inclusion of both subsistence and discretionary spending and ensures marginal budget shares vary across commodity groups.

Firm's[2] income comes from capital income and transfers from the government and the rest of the world. All firms pay dividends to other agents, pay direct taxes and save. Government income is composed of transfers income, and direct and indirect taxes. In Kenya, most of government's income comes from direct taxes (mainly corporate taxes and taxes on the richest urban quintile) and taxes on commodities. It spends most of its income on consumption (administration, education…), transfers to other institutions and saves the rest. To represent the links between each country and the rest of the world, we follow the traditional hypothesis assuming that Kenya is a small country and consequently world prices are exogenous. However, to export more, each country producers must be more competitive on the international market. From the table below, we can see that Kenya exports mainly coffee and transportation and storage services, and its main imports are

[2] In the CGE-model we represent firms as aggregated agent. We do not represent home-based small businesses, which is are firms types typical for women in African countries. For Kenya we represent self-employment in agriculture as a labour type.

petrol, chemicals and machinery commodities. The third column sheds light on the dependency on imports and shows that a third of the wheat in Kenya is imported, and most of the petrol, chemicals, fertilisers and machinery commodities are imported. Petrol and fertilisers are mainly used as intermediate consumptions. Consequently, changes in the prices of these specific commodities will have major impacts on the Kenyan economy.

Table 1: *Trade shares and market penetration rate*

	Share of exports/total exports	Share of imports/total imports	Market penetration rate
cmaiz	0.08	0.58	1.48
crice	0.00	0.05	2.44
cwheat	0.04	1.72	33.69
cocer	0.18	0.55	7.78
cpuls	0.31	0.48	1.44
coils	0.08	0.05	1.52
croot	0.00	0.00	0.00
cvege	1.30	0.05	0.15
csugr	0.00	0.00	0.00
ctoba	0.31	0.24	38.46
ccott	0.00	0.00	0.00
cfrui	2.52	0.14	0.63
ccoff	18.61	0.10	3.51
cocrp	6.48	0.19	10.81
ccatt	0.00	0.00	0.00
cpoul	0.00	0.05	0.61
coliv	0.08	0.05	0.44
cfore	0.00	0.00	0.00
cfish	0.00	0.00	0.00
cmine	1.83	0.82	13.60
cfood	4.81	7.44	9.00
cbeve	1.14	0.48	3.31
ctext	3.89	3.04	18.16
cwood	1.53	1.50	19.02
cpetr	2.05	15.48	83.90

cfert	0.00	0.88	61.66
cchem	5.58	12.14	60.34
cnmet	0.46	1.26	17.93
cmetl	2.14	6.57	40.84
cmach	2.14	30.47	83.14
coman	0.53	1.21	6.61
celec	0.00	0.00	0.00
cwatr	0.00	0.00	0.00
ccons	0.00	2.27	3.50
ctrad	0.15	0.34	0.54
ctran	22.20	2.22	4.09
chotl	5.72	1.45	9.71
ccomm	0.00	0.00	0.00
cfsrv	4.73	1.79	8.30
creal	0.00	0.00	0.00
cbsrv	3.59	5.17	20.78
cpadm	7.48	1.26	4.64
ceduc	0.00	0.00	0.00
cheal	0.00	0.00	0.00
cosrv	0.08	0.00	0.00

Notes: cmaiz = maise, cocer = other cereals incl. rice and wheat, cpuls = pulses, coils = oilseeds, croot = root crops, cvege = vegetable, cfrui = fruit, aocrp = other crops, ccatt = cattle, colive = other livestock, cfore = forestry, cfish = fishery, cfood = food industry, cbeve = beverages, cpetr = petrol, cchem = chemicals & pesticides, coman = othermanufacturing, ccons = construction, ctrad = trade, ctran = transport, chotel = hotel & restaurants, creal = realestated, cpadm = public services, ceduc = education, cheal = health services, cosrv = other services

Source: *Authors' elaboration*

2.1.3.1. Closure rules

In terms of closure rules, we assume that the nominal exchange rate is the numeraire of the model. Kenya is considered a small open economy and therefore world prices are taken as given. The current account balance is assumed to be exogenous. This assumption is important because it prevents the model from borrowing from the rest of the world. Moreover, any reduction in imports necessarily leads to a reduction in exports. We consider these constraints to be more realistic for countries facing economic shocks or crises than assuming reactions involving increased borrowing.

Government's savings is endogenous while government spending in goods and services is fixed. In this version of the model, there is no mechanism which would force this or that agent to have a certain level of savings to maintain a constant level of investment (closure like Kaldor for example). Thus, in our model, if the government's income decreases, ceteris paribus, this will lead to a decrease in its savings, which will have an impact on the total investment budget. Capital and land are sector specific while labour is mobile across sectors. In Kenya, agricultural labour is mobile across agricultural sectors only.

Given the specificities of the country, we cannot keep the full employment capacity. There is unemployment among skilled workers, particularly women. For non-agricultural sectors, we assume that there is unemployment for skilled and middle-skilled workers. Medium-skilled workers who would not find employment as medium-skilled workers will fall back onto the market for unskilled workers. The idea behind this modelling is to represent the fact that workers are primarily looking to find a job and that they are ready to find a job less qualified than their initial qualification level. To model unemployment, we follow the Blanchflower and Oswald (1995) specification. According to these authors, there is an empirical relation between unemployment rate and wage rates. Specifically, they found that a 10% increase in the unemployment rate leads to a 1% decrease in wages. For agricultural workers, we assume that those on wages and who could not find a job would revert to the own account type of work.

Factor supplies are fixed in the first period; the labour force grows at the population rate and capital growth is modeled using an accumulation equation of Jung and Thorbecke (2003). In the absence of shocks, the economy grows naturally at the population growth rate as the Business as Usual (BAU) scenario. The effects resulting from the scenario simulations are compared to the corresponding year of the BAU.

2.2 Microeconomic model

Our model must capture Kenya's most salient labour market features. It exhibits notable gender disparities, especially regarding labour force participation and wage differences. Women are largely absent from formal employment and primarily work in the informal sector, often engaging in secondary activities with low pay and few chances for career growth. Occupational segregation remains a significant concern, as women tend to occupy lower-paying positions. Additionally, cultural norms and restricted access to education further intensify these inequalities (Kabubo-Mariara, 2006; Wanjala & Were, 2009).

2.2.1. Microeconomic data

We utilized the Kenya Integrated Household Budget Survey (KIHBS) from 2015-2016 (Kenya National Bureau of Statistics, 2018). This survey was specifically designed to gather comprehensive information on household income, expenditures, and consumption habits throughout the country. Notably, it features a labour force module that we integrate with household-level data to analyse the connection between individual labour market outcomes and household welfare. The survey provides essential insights into the socioeconomic status of households, encompassing a broad range of variables such as demographic details, housing conditions, education, health, labour force participation, and access to services.

2.2.2. The Microsimulation model

The welfare effects are obtained by transferring the macroeconomic simulations to a microeconometric model that translates aggregate price and labour market shocks into individual and household-specific outcomes. This subsection describes the assumptions behind these two transmission channels.

The Price Channel

The macro model offers highly disaggregated price shocks on more than 45 goods and services that were mapped into the available household expenditure data. Each household has a unique expenditure share across these four categories, meaning that price shocks will impact households differently, depending on their individual consumption basket diversification. The i-th household specific consumer price index is defined from the price shocks over the *j*-items noted P_j^0 (before) and P_j^1 (after the shock). The i-th household expenditure share on the j-th item is noted s_{ji}:

$$CPI_i^1 = \prod_j^J \left(\frac{P_j^1}{P_j^0}\right)^{s_{ji}}$$

The Labour Market Channel

As discussed earlier, women are underrepresented in the formal labour market, with many employed in informal sectors like agriculture and low-skilled services. Agriculture plays a crucial role in this dynamic, as many women in rural areas rely on agricultural work as their primary job while taking on secondary jobs, also in agriculture, to supplement their income (Wanjala & Were, 2009). Hence, our microsimulation model's main challenge represents its most salient feature: the prevalence of secondary jobs in agriculture, where the most vulnerable women lie. While the specification of an ideal econometric model of the labour market would be straightforward, its probabilistic simulation would require a sophisticated procedure beyond the scope of our exercise. The ideal econometric model is a two-levels nested one. In the first level the individual decides to engage in a main activity, which will lead to labour income w1 with probability p1. In the second level, the individual may consider engaging in a secondary activity with income w2 and probability p2, given it is already engaged in a primary job. This may be implemented through a nested logit or an equivalent multinomial probit that does not impose the independence of irrelevant alternatives assumption (IIA) (Wen, 2009). However, as argued by the literature, the estimation of these models rapidly becomes challenging as the number of alternatives increase (Liesenfeld and Richard, 2010; Natarajan et al. 2000). In our case, this would imply a choice model with too many alternative segments even under a simple specification that considers 5 occupational choices:

Non-agriculture:

1. Non-agriculture employment
2. Agriculture:
3. Employed in small-scale agriculture
4. Self-employed in small-scale agriculture
5. Employed in pastoralist activities
6. Self-employed in pastoralist activities

Considering the five alternatives mentioned, whether for a primary or possible secondary job[3], the equivalent multinomial probit model should account for all mutually exclusive combinations, leading to 25 theoretical alternatives. Hence, we adopt a more parsimonious approach. We implement a Heckman model to analyse labour earnings across different occupational choices (j=1,…,5) described above. This model is utilized to estimate the earnings for main and secondary jobs, represented as per the following expressions:

Main job: $\ln w_{ij} = x_i'\beta_j + e_{ij}$ with probability P_{ij} (1)

Secondary job: $\ln \tilde{w}_{ij} = x_i'\tilde{\beta}_j + \tilde{e}_{ij}$ with probability $\widetilde{P_{ij}}$ (2)

For workers with a main job only, we estimate equation (1) at every occupational choice, thus resulting in 5 models. For those with a primary and secondary job, we estimate equations (1) and (2), resulting in 10 models.

The probabilities P_{ij} and $\widetilde{P_{ij}}$ are selection probabilities based on a Heckman specification that is computationally and analytically tractable vis-à-vis a multinomial specification. Each model

[3] Engaging in a secondary activity suggests that a woman receives a very low salary in her primary job and therefore seeks additional paid employment. Following a primary and secondary activity can have negative implications for a woman's time poverty and health.

incorporate their respective exclusion restrictions. In our analysis, we selected civil status as a an exclusion variable because, unlike the number of children in the household, it rarely had missing values. This consistency helps prevent a loss of observations among the vulnerable subpopulations we aim to model, such as those in rural areas, low-skilled individuals, and women. The control variables include gender, skill level, age, age squared, a dummy variable for rural location, and the skill level of the household head or their partner if that information is missing.

The microsimulation algorithm is executed in two phases:

1. Labour demand shocks from the macro model are first applied to the primary jobs. Workers are simulated to be either dismissed or hired based on their ranking probabilities within the specific labour market segment. Their counterfactual simulated wages are derived assuming a normal distribution of the residual terms.

2. After the microsimulation meets the macro model specifications for the primary jobs, a similar approach is used for secondary jobs. This step applies only to workers who have a primary job, as outlined in the previous phase.

Household transfers from the macro model are distributed as a flat rate that is specific to each of the ten segments categorized by wealth quintiles for both urban and rural households. After simulating individual labour earnings and transfers, a real income at the household level noted $\hat{y}_h$, is calculated, by indexing the nominal income by the household specific price index CPI_i^1.

Scenarios

This paper evaluates three scenarios.

The first scenario (Sim 1) evaluates the changes in prices of four commodities (wheat, vegetable oil, petrol and fertilisers) from 2022 to 2030. In 2022, we simulate the increase in world prices for crude oil (+ 50%), fertiliser (+ 54.7%), wheat (+21,4%), and vegetable oil (+14.2%). After a large increase of the world prices in 2022 for these four commodities, the increase is lower in 2023 and 2024, and for 2025 and 2026, prices are expected to be lower than their 2021 levels. After 2027, we assume that prices are equal to their business as usual (BAU) level.

In the second and third (scenarios, on top of the world prices changes scenarios, we evaluate mitigation policies:

The first one (Sim 2) evaluates the impacts of a transfer from the government to the first two deciles of households (both rural and urban) during the 3 first years of the shock.

The second mitigation policy (Sim 3) evaluates the impact of a price subsidy on food commodities, as well for the first three years of the shock.

For each scenario, we present the results in the short run (the year of the shock) and in the long run (2030).

3. Results and discussion

3.1. CGE model results

3.1.1. Macroeconomic impacts

The transmission of global commodity price shocks to the Kenyan economy occurs primarily through two interrelated channels. First, an increase in world prices for key imported goods—particularly petroleum products and fertilisers—raises the domestic cost of these inputs. Given Kenya's high import dependency on these commodities, the resulting cost-push increase significantly affects both consumers and producers.

Second, for commodities where Kenya is an exporter, such as tea and coffee, an increase in global prices can generate incentives for domestic producers to reallocate supply from the domestic to the international market, thereby increasing export volumes and foreign exchange earnings. However, this second mechanism is of limited relevance in the case of petroleum and fertilisers, as Kenya is overwhelmingly a net importer of these commodities and has minimal export capacity in these markets.

The large increase in the world price of the four commodities in 2022 has dramatic impact on the Kenyan economy (Table 2). First, given the high dependency of Kenya on the imported oil, there is an increase in production cost for all the different activities, as well as for households. Firms and businesses reduce their production and lay off workers. Model simulations indicate that total labour demand declined by approximately 0.06% in response to the price shocks. Notably, the decline in labour demand disproportionately affected male workers, a reflection of gender-based occupational segregation and sectoral labour intensity. The contraction in employment, coupled with rising consumer prices, contributed to a decline in real GDP over the simulation period, underscoring the macroeconomic vulnerability of the Kenyan economy to external price shocks.

To address the adverse impacts, two mitigation policies were implemented in the simulation framework. At the macroeconomic level, both policies contributed to a partial recovery in employment levels, demonstrating their effectiveness in stabilizing labour markets in the short term. However, these interventions came at a fiscal cost. Both policy packages worsened the government budget deficit, primarily through increased public spending and reduced tax revenues. As a result, government savings declined, with negative spillovers for the total investment budget. This reduction in investment capacity poses risks to long-term growth and capital accumulation, highlighting the trade-offs involved in counter-cyclical fiscal interventions in resource-constrained environments.

Table 2: *Impact on macroeconomic variables (in % to the BAU)*

	Sim 1		Sim 2		Sim 3	
	2022	2030	2022	2030	2022	2030
Real GDP	-0.02	-0.15	-0.09	-0.20	-0.05	-0.19
Total investment	-15.70	0.14	-16.09	0.20	-16.15	0.19
Total labour demand	-0.06	-0.04	-0.24	-0.05		
Total female labour demand	0.43	-0.05	0.28	-0.06	0.35	-0.06
Total male labour demand	-0.19	-0.04	-0.35	-0.04	-0.27	-0.04
Total exports	4.65	-0.22	4.29	-0.31		
Consumer Price Index (CPI)	-9.48	0.25	-8.80	0.32	-9.06	0.32

Note: Sim1 is the RUW scenario. Sim 2 evaluates the impacts of a transfer from the government to the first two deciles of households (both rural and urban) during the 3 first years of the shock. Sim 3, evaluates the impact of a price subsidy on food commodities, as well for the first three years of the shock.

Source: *Authors' elaboration*

The sectoral impacts of global commodity price shocks are heterogeneous, driven primarily by the intensity with which different sectors utilise the affected inputs—namely petroleum products, fertilisers, wheat, and vegetable oils (see Table 3). Sectors with a high dependency on these inputs face sharper increases in production costs and consequently experience more pronounced contractions in output. For example, the transport sector, which uses a lot of oil, is seeing its production decline, as are parts of the agricultural sectors, for which the increase in fertiliser prices is increasing production costs. These direct effects are increased through input-output linkages in the economy. As production contracts in these key sectors, their demand for intermediate goods and services also declines, transmitting the shock to upstream and downstream sectors that are not directly reliant on the affected imports. This propagation mechanism leads to a broader economic slowdown, even in sectors with limited direct exposure to the global price increases.

The transfer policy will benefit certain sectors, notably those consumed by poor households (mainly food products). Poor rural households spend mainly their income on food commodities, pulses and maize while poor urban households spend the highest share of their income on food commodities, pulses and vegetables. The subsidies policy on food commodities help the consumption of all households as well as the prices of intermediate commodities for the different activities. We can expect an increase in the production of these commodities.

As in the previous table, an improvement in the situation means that sector production decreases less than in the crisis scenario.

The construction sector, as well as sectors producing investment goods, are seeing their production decline given the worsening budget deficit following the implementation of support policies. These sectors are particularly intensive in medium-skilled labour.

Table 3: *Impacts on production (in % to the BAU)*

	Sim 1		Sim 2		Sim 3	
	2022	2030	2022	2030	2022	2030
amaiz	-0.69	-0.12	-0.54	-0.14	-0.55	-0.14
arice	-0.10	-0.12	-0.02	-0.17	0.02	-0.16
aocer	1.40	-0.22	1.44	-0.26	1.49	-0.25
apuls	-1.18	-0.14	-1.01	-0.15	-1.16	-0.16
aoils	-0.04	-0.15	-0.09	-0.19	0.31	-0.17
aroot	-1.13	-0.14	-1.09	-0.16	-1.03	-0.15
avege	-1.59	-0.13	-1.44	-0.15	-1.52	-0.15
asugr	-1.19	-0.12	-1.08	-0.14	-0.88	-0.13
atoba	2.24	-0.21	1.87	-0.28	3.07	-0.19
acott	-2.77	-0.16	-2.69	-0.22	-2.48	-0.21
afrui	-0.77	-0.14	-0.91	-0.15	-0.88	-0.15
acoff	7.88	-0.22	7.11	-0.31	7.17	-0.30
aocrp	7.66	-0.20	6.94	-0.31	7.09	-0.28
acatt	0.30	-0.10	0.33	-0.13	0.31	-0.12
apoul	0.20	-0.11	0.22	-0.14	0.34	-0.13
aoliv	0.17	-0.11	0.21	-0.14	0.30	-0.13
afore	-0.79	-0.15	-0.92	-0.25	-0.94	-0.23
afish	-0.49	0.01	-0.42	-0.04	-0.46	-0.04
amine	-0.50	-0.19	-0.66	-0.29	-0.61	-0.28
afood	-1.19	-0.09	-1.01	-0.13	-1.01	-0.12
abeve	-4.44	-0.11	-4.31	-0.15	-4.09	-0.14
atext	-2.77	-0.16	-2.69	-0.22	-2.48	-0.21
awood	2.05	-0.20	1.85	-0.30	1.89	-0.29
achem	5.12	-0.29	5.02	-0.43	5.12	-0.39
anmet	-0.77	-0.21	-1.03	-0.33	-0.97	-0.31
ametl	-1.58	-0.19	-1.91	-0.30	-1.87	-0.29
amach	-3.10	-0.08	-3.30	-0.14	-3.28	-0.13
aoman	-1.81	-0.12	-1.73	-0.18	-1.72	-0.17
aelec	-0.53	-0.15	-0.67	-0.22	-0.62	-0.21

awatr	-1.27	-0.12	-1.24	-0.17	-1.18	-0.16
acons	-4.96	-0.12	-5.38	-0.21	-5.37	-0.20
atrad	-1.84	-0.11	-1.77	-0.15	-1.76	-0.14
atran	0.08	-0.17	-0.01	-0.23	0.03	-0.22
ahotl	1.12	-0.16	1.04	-0.22	1.19	-0.21
acomm	-1.85	-0.13	-1.82	-0.19	-1.77	-0.18
afsrv	-0.83	-0.16	-0.90	-0.23	-0.82	-0.23
areal	-0.50	-0.17	-0.44	-0.22	-0.45	-0.23
absrv	0.86	-0.19	0.64	-0.28	0.73	-0.27
apadm	6.11	-0.18	5.73	-0.25	5.87	-0.24
aeduc	6.27	-0.16	5.91	-0.22	6.05	-0.22
aheal	3.59	-0.15	3.25	-0.20	3.38	-0.19
aosrv	-2.85	-0.13	-2.74	-0.18	-2.70	-0.17

Notes: amaiz = maise production, aocer = other cereals incl. rice and wheat, apuls = pulses, aoils = oilseeds, avero = vegetable & root crops, afrui = fruit, aocrp = other crops, acatt = cattle, aolive = other livestock, afore = forestry, fish = fishery, afood = food industry, amanuf = manufacturing, otherindu = other industries, acons = construction, atrad = trade, atran = transport, apadm = public services, aeduc = education, aheal = health services, aserv = other services.
Sim1 is the RUW scenario. Sim 2 evaluates the impacts of a transfer from the government to the first two deciles of households (both rural and urban) during the 3 first years of the shock. Sim 3, evaluates the impact of a price subsidy on food commodities, as well for the first three years of the shock.

Source: *Authors' elaboration*

The simulation results reveal that global commodity price shocks have pronounced effects on labour market dynamics in Kenya, particularly for skilled and semi-skilled workers. Both categories experience a decline in labour demand as economic activity contracts across key sectors. In response to reduced employment opportunities, many semi-skilled workers attempt to re-enter the labour market by accepting unskilled jobs, leading to excess supply in the unskilled labour segment. This labour market downgrading creates significant downward pressure on unskilled wage rates, contributing to a deterioration in job quality and an increase in vulnerable forms of employment.

The drop in the labour demand combined with a drop in the different wage rates, especially for unskilled workers, and the rental rate of capital lead to a drop in household income. With a drop in their income, households' payments for direct taxes are decreasing and so are their savings. Household real consumption is decreasing also for all households and a bit greater for rural households at the bottom of the distribution, because their income is mainly based on agricultural production for which production costs for fertiliser and energy have increased drastically.

The introduction of mitigation policies partially offsets the negative consumption effects. Both the targeted transfer policy and the food subsidy policy support household real consumption by either directly augmenting disposable income or reducing the cost of essential goods. The second policy scenario (Sim3), which includes food subsidies, is especially effective in the short run, as it benefits all households by lowering the prices of widely consumed food items and intermediate goods used in food production. This results in an across-the-board improvement in real consumption, particularly for poorer households.

However, in the long run, the benefits of these policies diminish slightly. The deterioration in the government's fiscal position, stemming from higher public spending and lower revenues, leads to reduced public savings and investment. This, in turn, constrains future economic growth and capital accumulation, potentially reversing the short-term gains in household welfare. Thus, while the mitigation policies provide important relief during the crisis, they may exacerbate fiscal vulnerabilities and have adverse intertemporal effects, highlighting the importance of balancing short-term support with long-term fiscal sustainability.

Table 4: *Impacts on household real consumption*

	Sim 1		Sim 2		Sim 3	
	2022	2030	2022	2030	2022	2030
hhd-r1	-3.59	-0.09	-2.35	-0.13	-3.19	-0.12
hhd-r2	-3.48	-0.09	-2.55	-0.13	-3.07	-0.13
hhd-r3	-3.36	-0.10	-3.24	-0.13	-2.99	-0.13
hhd-r4	-3.10	-0.10	-3.03	-0.13	-2.79	-0.13
hhd-r5	-2.96	-0.10	-2.94	-0.13	-2.70	-0.13
hhd-u1	-2.65	-0.08	6.74	-0.11	-2.50	-0.11
hhd-u2	-2.80	-0.10	1.05	-0.12	-2.69	-0.12
hhd-u3	-2.62	-0.10	-2.79	-0.12	-2.54	-0.12
hhd-u4	-2.30	-0.11	-2.54	-0.13	-2.30	-0.13
hhd-u5	-2.53	-0.12	-2.77	-0.14	-2.53	-0.13

Notes: hhd- = household income decile, -n1= (non-rural = urban) first decile, …, n5 = (non-rural = urban) fifth decile, -r1= rural first decile, …, r5 = rural fifth decile, -u1= urban first decile, …, u5 = urban fifth decile. Sim1 is the RUW scenario. Sim 2 evaluates the impacts of a transfer from the government to the first two deciles of households (both rural and urban) during the 3 first years of the shock. Sim 3, evaluates the impact of a price subsidy on food commodities, as well for the first three years of the shock.

Source: *Authors' elaboration*

Firms' income, which is mainly based on capital income, is decreasing. This drop in firms' income leads to a decrease in their savings and direct taxes paid. The decrease in payments of direct taxes from households and firms to the government causes government's income is dropping (Table 5). The drop in government's income and fixed spending leads to an increase of the government's current deficit, and the deficit becomes wider with the mitigation policies. Since the saving of each agent is decreasing, total investment budget is decreasing, which will particularly negatively affect the construction sector.

Table 5: *Impacts on government (in % change to the BAU)*

	Sim 1		Sim 2		Sim 3	
	2022	2030	2022	2030	2022	2030
Government's income	-9.76	0.11	-9.30	0.15	-10.38	0.15
Taxes on products	-6.38	0.08	-5.95	0.11	-8.27	0.11
Direct taxes on households	-11.86	0.14	-11.32	0.19	-11.40	0.18
Direct taxes on firms	-13.50	0.12	-13.06	0.17	-13.07	0.17

Notes: Sim1 is the RUW scenario. Sim 2 evaluates the impacts of a transfer from the government to the first two deciles of households (both rural and urban) during the 3 first years of the shock. Sim 3, evaluates the impact of a price subsidy on food commodities, as well for the first three years of the shock.

Source: *Authors' elaboration*

3.2. Microsimulation model results

The microsimulation results reveal that the Russia–Ukraine War (RUW) price shock has pronounced regressive effects on household welfare in Kenya. Across all households, real consumption falls under the shock, and poverty and inequality indicators deteriorate markedly without any mitigation (Table 6). In the immediate aftermath (2022), the national poverty headcount jumps from 35.3 percent to about 39.0 percent, while the poverty gap and severity also worsen (FGT_1 rising from 0.10 to 0.134; FGT_2 from 0.043 to 0.067). These initial spikes moderate slightly over time as the economy adjusts—by 2030 the headcount settles around 37.7 percent, with the poverty gap ≈ 0.121 and severity ≈ 0.060, still higher than baseline. The shock also briefly widens inequality (Gini coefficient up from 0.39 to 0.427 in 2022) before it nearly returns to pre-shock levels by 2030, suggesting that the most acute distributional damage occurs in the short run. Nonetheless, all these metrics remain worse than their no-shock baseline values, confirming a significant overall welfare contraction due to the RUW shock.

Table 6: *Poverty headcount, gap and severity at baseline and RUW simulation*

	FGT (0)	FGT (1)	FGT (2)	Gini
Baseline	0.353	0.10	0.043	0.39
RUW/Sim 1:				
2022	0.39	0.134	0.067	0.427
2030	0.377	0.121	0.060	0.390
Transfer/Sim 2				

2022	0.399	0.132	0.0434	0.389
2030	0.378	0.121	0.060	0.390
Food subsidy/Sim 3				
2022	0.398	0.133	0.067	0.423
2030	0.377	0.121	0.060	0.390

Note: FGT (0) Headcount ratio. FGT (1) Average normalised poverty gap. FGT (2) Average squared normalised poverty gap. The poverty line is 3.8$us per day (average official). Sim1 is the RUW scenario. Sim 2 evaluates the impacts of a transfer from the government to the first two deciles of households (both rural and urban) during the 3 first years of the shock. Sim 3, evaluates the impact of a price subsidy on food commodities, as well for the first three years of the shock.

Source: *Authors' elaboration*

Table 6 also traces the short- and long-term welfare dynamics under two mitigation policies. The cash-transfer scenario (Sim 2) cushions the poorest in the short term. In 2022, the headcount ratio (≈ 39.9 percent) stays similar to Sim 1, yet poverty intensity declines: FGT_2 drops to ≈ 0.043 and the Gini almost reverts to baseline (0.389). By 2030, poverty (37.8 percent) and inequality (0.390) converge with Sim 1, showing that transfers provide short term relief but limited persistence once financing pressures end.

Under the food-subsidy scenario (Sim 3), poverty and inequality in 2022 mirror the RUW outcomes, indicating broader but weaker targeting in aggregated terms.By 2030, results again converge (poverty ≈ 37.7 percent; Gini ≈ 0.390). Overall this suggests that transfers may offer deeper short-term protection, while subsidies provide wider, though shallower, stabilization. A better picture is provided by closer look to vulnerable group effects.

Crucially, the RUW impacts are highly uneven across different population groups. The shock is clearly regressive, hitting the poorest households the hardest (Table 7). By 2030, per-capita consumption in the bottom deciles is dramatically lower relative to baseline growth trends (without any mitigation policy), whereas higher-percentile households see smaller declines. For instance, the 10th percentile of the overall expenditure distribution suffers a ≈ 22 percent loss by 2030, compared to ≈ 3–4 percent at the median. Poor urban households are especially vulnerable: the poorest urban decile experiences about a 23.7 percent drop in real spending, versus 20.1 percent for the poorest rural decile. This reflects the intense burden of food and fuel inflation on urban consumers, even as rural farming households struggle with higher input costs. The female population tend to fare slightly worse than the male one at the 10th percentile women lose about 23.4 percent of consumption, compared to 20.6 percent for men. Likewise, disparities by skill level are pronounced: skilled workers in the poorest decile face an extreme ≈ 28 percent reduction in expenditure, significantly more than the ≈ 19 percent decline for their unskilled counterparts. This outcome reflects labour-market downgrading: as the shock suppresses demand, skilled and semi-skilled workers accept lower-skill jobs, pushing down unskilled wages. Overall, the RUW-induced price surge imposes the largest welfare losses on the poor, urban households, women, and lower-skilled workers—underscoring the shock's regressive nature.

Table 7: *Relative change in total household expenditure (per capita) by 2030*

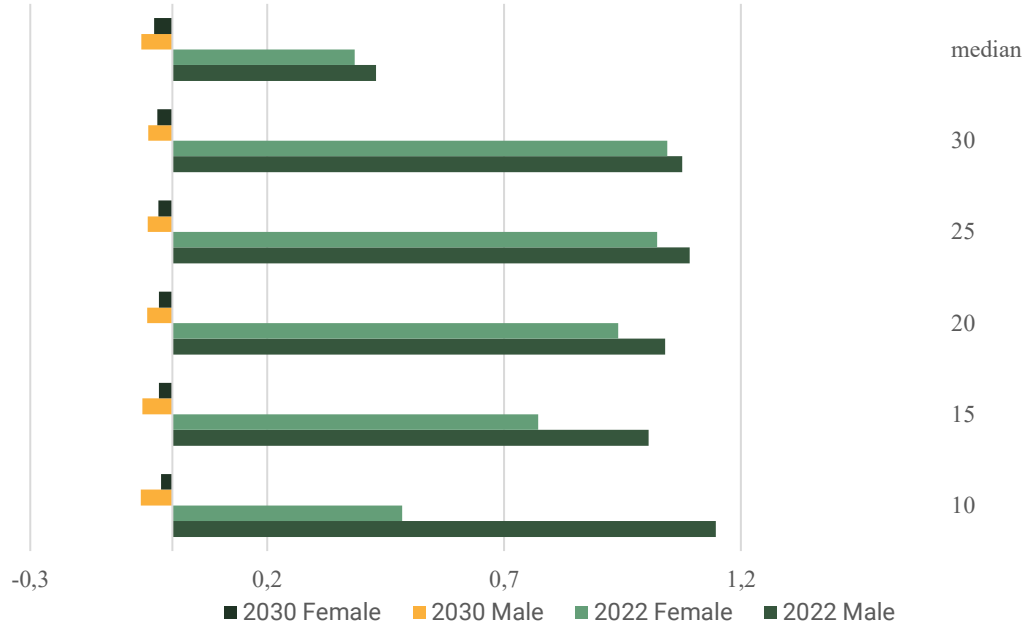
		10th	15th	20th	25th	30th	Mean	Median
Overall		-22.2	-17.3	-14.3	-12.3	-10.9	-4.5	-3.4
Gender	Male	-20.6	-16.1	-13.4	-11.6	-10.3	-4.3	-3.2
	Female	-23.4	-18.1	-14.9	-12.8	-11.4	-4.6	-3.5
Location	Rural	-20.1	-16.3	-13.7	-11.9	-10.6	-3.5	-3.2
	Urban	-23.7	-17.9	-15.0	-13.0	-11.7	-5.3	-3.8
Skill	Skilled	-28.2	-21.4	-17.9	-15.6	-13.9	-6.5	-5.2
	Unskilled	-19.3	-15.2	-12.7	-11.0	-9.8	-3.2	-3.1

Source: *Authors' elaboration*

Mitigation policies

Looking at the lower end of the welfare distribution unveils some group-specific mitigation effects behind the aggregate figures in Table 6. The gender-disaggregated results in Figure 4 show that in the short term, transfers (Sim 2) cause both men and women in the 10th–30th percentiles to shift from strongly negative consumption growth under RUW to small positive gains (+0.1 to +1.3 percent). Although the transfer targeted the first two deciles, its spillover effects through economic activity had an prevailing effect across the whole distribution, with an stronger incidence on the male labour force. Over the long term, these effects taper off confirming that targeted transfers neutralize the effects of the RUW shock, with negligible effects in the gender gap at the lower end of the distribution. Food subsidies (Sim 3) display a similar equalizing trend (Figure 4, bottom), especially by 2030 when male- and female-headed households' median losses are nearly identical. In the short term, however, price subsidies have a more modest effect on household welfare than transfers, which is explained by the targeting of transfers to the vulnerable populations.

Figure 4: *Relative changes in household expenditures by gender Transfers-Sim 2 (top) and Price subsidies-Sim3 (bottom)*



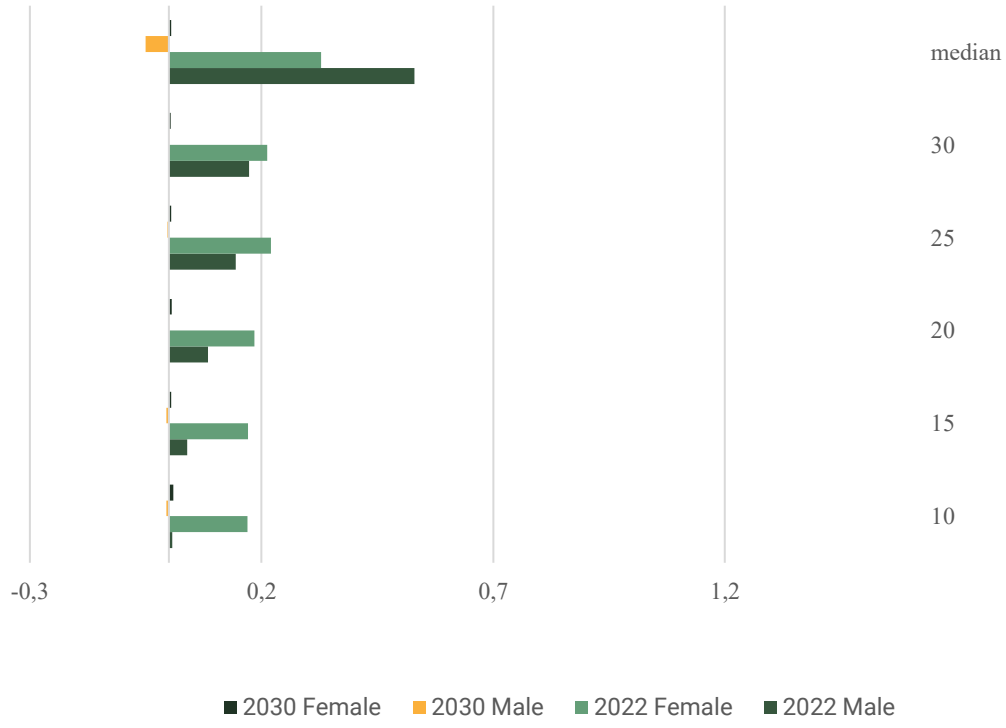


Figure 5 illustrates how rural/urban location mediates the welfare response to the shock once the mitigation policies are introduced (with values expressed relative to the no-shock, BAU). In the transfer scenario (Sim 2, top panel), urban individuals in the lowest percentiles experience the largest short-term gains in 2022, with real expenditure rising up to about +4 % above the baseline, while rural individuals gain much less. This pattern follows directly from the CGE's assumptions: transfers are implemented as a flat rate which in turn triggers more economic activity depending on economic sectors' labour market concentration. This pushes urban economic activity higher. By 2030 the bars for both groups approach zero, showing that once the temporary transfers end and macro balances re-stabilise, welfare converges back to the baseline trajectory. In contrast, the food-price subsidy (Sim 3, bottom panel) produces modest but spatially neutral improvements in 2022: both urban and rural individuals record welfare levels about 0.2–0.4 % above the baseline. The subsidy operates through the price channel, reducing the cost of food economy-wide; urban consumers benefit from cheaper purchases, while rural households gain both as consumers and producers facing lower intermediate input costs. Because the policy affects everyone through prices rather than income, the results are nearly identical across space, and by 2030 the advantage fully dissipates. Overall, these figure shows that transfers create a short-lived, urban-biased overshoot above the no-shock path, whereas food subsidies deliver smaller but geographically balanced relief— that partially counteracts the very price shocks triggered by the RUW.

Figure 5: *Relative changes in household expenditures by location (urban/rural)*
Transfers-Sim 2 (top) and Price subsidies-Sim3 (bottom)

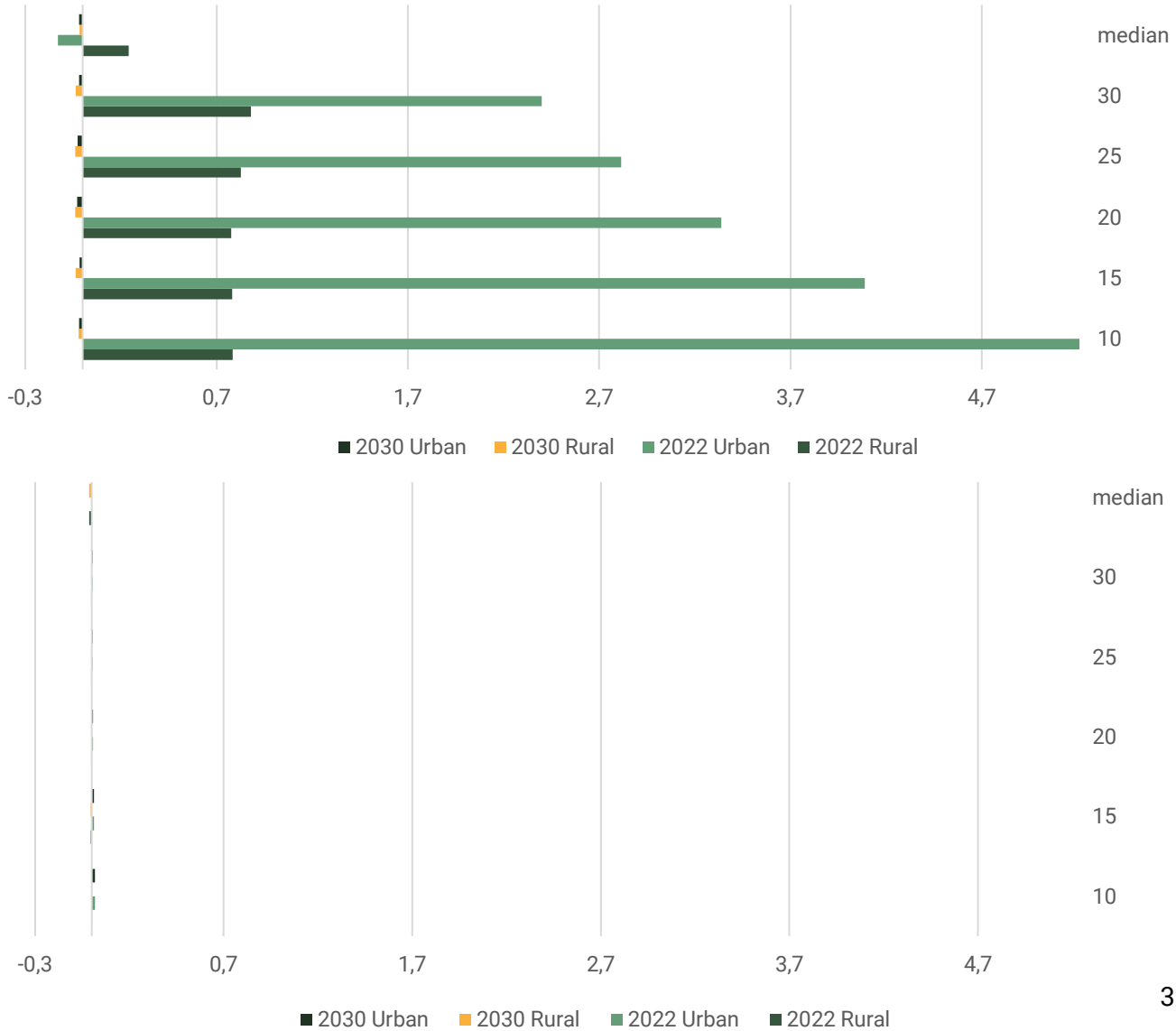
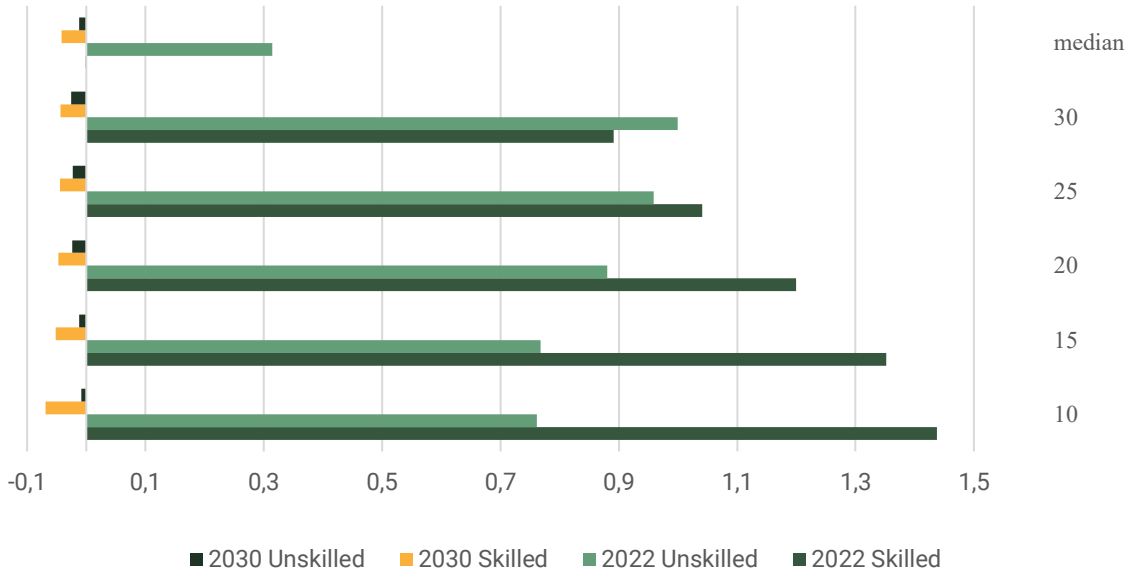
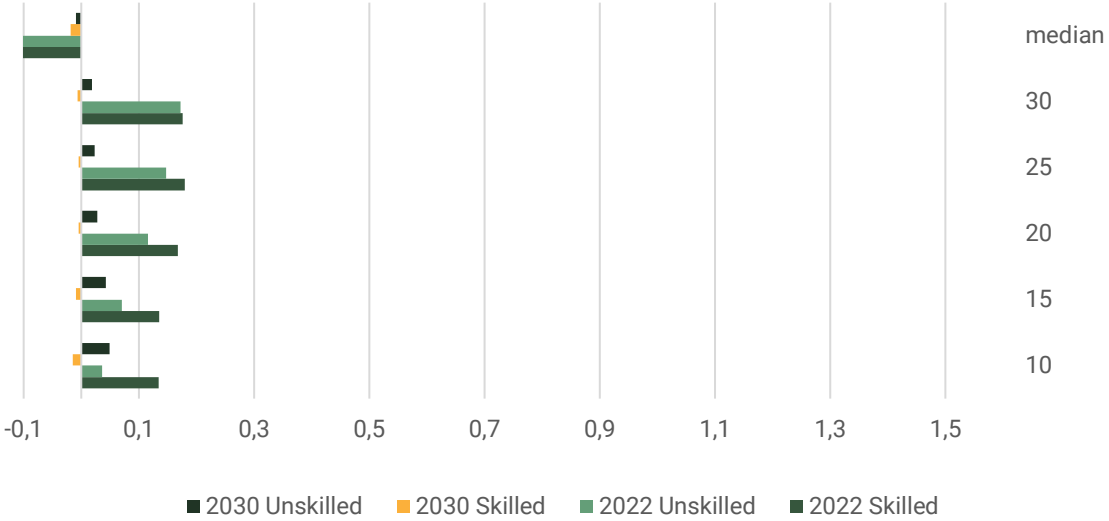


Figure 6 shows how welfare responses differ across skill groups. In Sim 2 (top panel), both skilled and unskilled individuals gain relative to the no-shock baseline in 2022, but the effect is stronger for the skilled (up to +1.4%). Because of transfers, the liquidity injection amplifies demand in urban, skill-intensive sectors such as trade and services. These sectors expand through input–output linkages, indirectly raising skilled labour incomes even though the policy targets low-income households. Unskilled workers also benefit, but their gains are partly offset by high input costs in agriculture and by labour downgrading from semi-skilled workers crowding into low-skill jobs. By 2030, both groups return to baseline as the temporary transfers expire and the fiscal constraint curbs investment-led recovery. Under the food-price subsidy (Sim 3, bottom panel), the gains are smaller (about +0.2–0.4%) but more evenly distributed as they are applied across the economy. The subsidy reduces living costs for all consumers and lowers intermediate costs in food and service sectors, creating diffuse positive spillovers across occupations. Unskilled households benefit slightly more because food accounts for a larger share of their budget, yet overall differences across skill groups are minimal. By 2030, the effects vanish as food prices normalize.

Figure 6: *Relative changes in household expenditures by skill level*
Transfers-Sim 2 (top) and Price subsidies-Sim3 (bottom)





4. Conclusions

The RUW shock offers valuable lessons for sustainable transition policies. Despite their different origins, both can generate similar distributional pressures, disproportionately affecting the poorest and most vulnerable populations. This study emphasizes the importance of incorporating equity considerations into policy design from macro and micro perspectives. We show that effective mitigation must balance economic efficiency with social protection to ensure inclusive and politically viable transitions

We provide an economic assessment of the impacts of price shocks induced by the Russia-Ukraine war (RUW) on the Kenyan economy. To capture both macroeconomic and distributional effects, a macro-micro modelling framework is employed. Three simulation scenarios are analysed. The first considers a baseline shock scenario involving simultaneous increases in the prices of energy, fertiliser, and food. The second scenario introduces a mitigation policy in the form of direct government transfers to households in the first two income deciles (both rural and urban) during the initial three years of the shock. A third scenario evaluates the effectiveness of a time-bound food price subsidy as an alternative mitigation measure.

The microsimulation results offer nuanced insights into the distributional consequences of these shocks. Under the RUW scenario, both poverty and inequality deteriorate markedly, with the largest welfare losses concentrated among the poorest deciles—especially urban households and female and unskilled individuals. These outcomes mirror the macro model's transmission channels: higher import prices for energy and fertiliser raise production costs and living expenses, hitting agricultural and low-income urban sectors hardest.

Although the mitigation policies do not outperform the RUW baseline in aggregate terms, they succeed in neutralizing the short-term welfare losses and preventing further deterioration at the lower end of the distribution. The targeted transfers (Sim 2) produce stronger but temporary gains, particularly in urban and skill-intensive sectors where higher market integration amplifies spillover effects. In contrast, food-price subsidies (Sim 3) yield smaller yet more spatially and socially balanced improvements by lowering living costs across all households. By 2030, both interventions converge toward the baseline trajectory, consistent with the macro model's fiscal closure—temporary spending boosts welfare while active, but the effects dissipate once transfers and subsidies are withdrawn and investment constraints reassert equilibrium. Overall, the integrated macro–micro framework demonstrates that well-designed short-term measures can stabilize welfare outcomes without altering the long-run growth path, highlighting the importance of complementing fiscal relief with structural policies that enhance resilience.

These findings highlight the critical need for targeted government interventions to shield vulnerable households from the adverse effects of price shocks. While such measures demand greater administrative capacity, they promote a more efficient allocation of scarce public resources. For countries facing fiscal constraints amid overlapping crises, or "polycrises," cost-effective and well-targeted mitigation strategies become especially vital.

To answer the research question regarding the distributional effects of RUW-induced shocks in Kenya, the simulations are based on the most recent Social Accounting Matrix (SAM) from 2019. However, the scope of this study does not extend to overlapping or compounding crises—such as global inflation, food supply disruptions, regional conflicts, or climate-related shocks—which would likely amplify the observed negative impacts. Addressing these interconnected shocks represents a promising direction for future research. Such work should focus on constructing empirically grounded scenarios reflecting the economic repercussions of individual shocks within the broader context of polycrises. Ongoing refinement of the modelling framework, informed by empirical validation, stakeholder input, and policy feedback, is essential to ensure its relevance and applicability for both researchers and decision-makers.

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