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Distributional impacts of global food price shocks in South Africa

Case of Russia–Ukraine conflict

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Abstract: The world has faced an increasing number of global shocks that have resulted in large and unpredictable changes in global prices, particularly of food. These increases, coupled with the negative impacts of shocks to economic growth, have had damaging effects on welfare, hunger, and diets. Future global price shocks are likely, whether spurred by geopolitical tensions, climatic extremes, or natural disasters. This paper assesses the distributional impact of food price shocks on households in South Africa using price increases during the 2022 Russia–Ukraine war as a case study. To assess the economy-wide effects on households, a computable general equilibrium model for South Africa is used. Outputs from the model are linked to an accounting-based microsimulation to assess the impacts on poverty and inequality. Government measures to alleviate price pressures are also assessed and compared to alternative possible interventions to ascertain the benefits and trade-offs of different policy responses.

Key words: computable general equilibrium, global shocks, microsimulation, policy response, poverty

JEL classification: C68, E62, F41, O5

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1 Introduction

Since 2019 food price growth in South Africa has been rising. Food inflation breached the upper inflation target band of 6 per cent in 2020, with rates rising well above those seen during the 2015/16 drought and reaching the highest levels experienced in more than a decade. In 2023 food inflation was recorded at 10.9 per cent, on average, peaking at 14.3 per cent year-on-year (y-o-y) in April. The rises in prices were primarily driven by higher global food, agriculture input, and energy prices during the period.

Over the past decade the world has faced an increasing number of global shocks, such as the US–China trade war, the COVID-19 pandemic, the Russia–Ukraine war, and country trade measures restricting exports (e.g. India in 2023), which have resulted in large and unpredictable changes in global prices, including food prices. Between 2000 and 2024 the world experienced three food and fuel crises (i.e. 2007/8, 2010/2011, and 2021/22) which led to double-digit global food price growth (Martin and Vos 2024). Increases in global food prices, coupled with the negative impacts of shocks on economic growth, have had damaging effects on both hunger and diets (World Vision International 2022). While food prices have decreased since the spikes seen in 2021 and 2022, they remain above pre-COVID levels. Glauber (2023) shows that for key crops such as wheat price volatility remains high relative to the last decade. Unexpected global shocks are likely to remain a cause for concern going forward, particularly as climate-induced extreme weather events are expected to increase in frequency and severity and countries implement mitigation policies to reduce emissions.

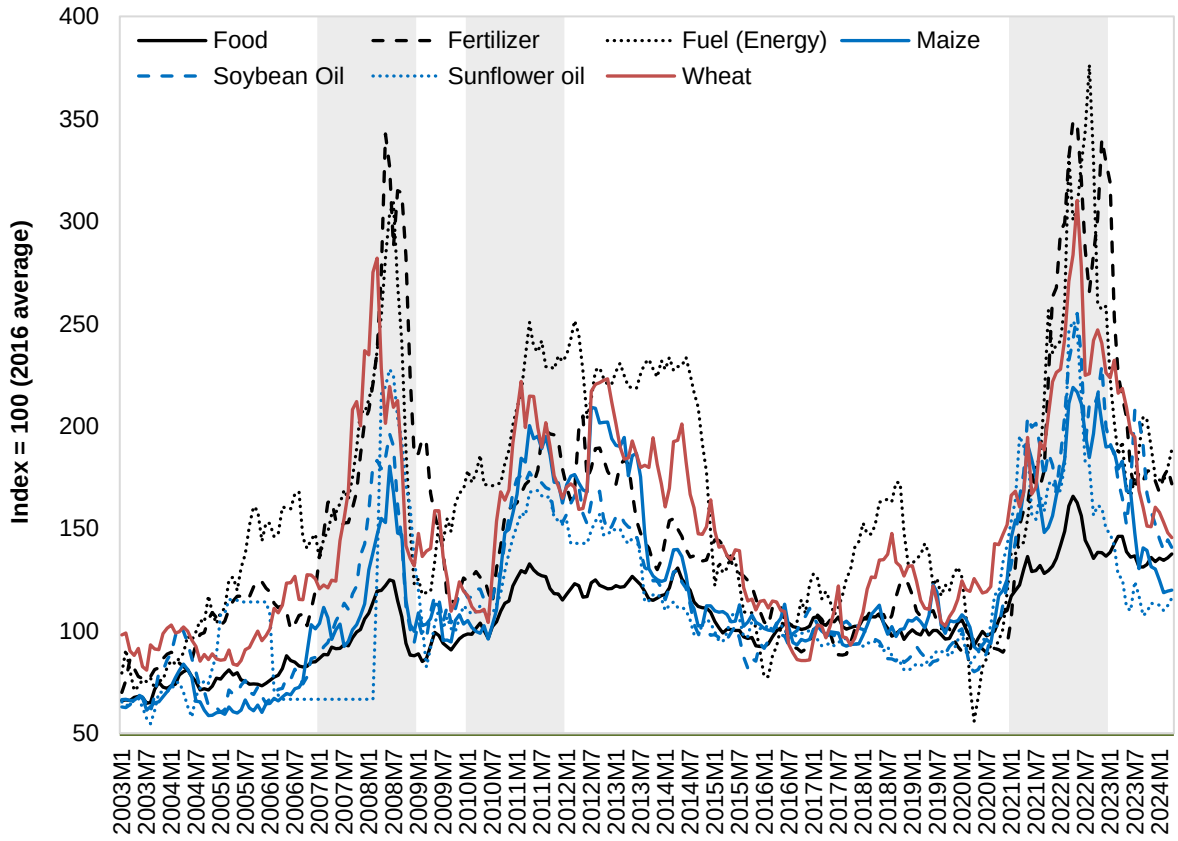
National consumer price index (CPI) statistics show that in South Africa the increases in food prices have more negatively affected lower-income households, which spend a larger share of their income on food. Between 2019 and 2024 price growth in the lowest three income deciles exceeded the national headline average. Historical trends also show that inflation in lower-income deciles exceeds headline inflation when food price growth exceeds headline price growth (StatsSA 2024). The impact of rising prices, compounded by weaker economic growth, has negatively affected food security in South Africa. Between 2019 and 2022 the number of households reported to have experienced hunger increased from 10.3 to 11.6 per cent, with the number of persons reporting that they experienced hunger increasing from 11.1 to 12.9 per cent. Vulnerability to hunger continued to increase in 2023, with the number of vulnerable persons and households increasing to 15 and 13.5 per cent respectively (StatsSA 2023). Recent research by the Human Sciences Resource Council (HSRC 2024) found that, between 2021 and 2023, nearly 18 per cent of all households experienced severe food insecurity, meaning that they reduced the number or size of meals consumed, ran out of food, went to bed hungry, or had to go a day and night without eating. A further 26.7 per cent of households were reported to be moderately food insecure, frequently having to consume low-quality or undesirable food and occasionally reduce their number or size of meals. At the sub-national level food insecurity was found to be more profound in the North West, Mpumalanga, and the Eastern Cape.

This paper assesses the distributional impact of food price shocks on households in South Africa using the 2021/2022 Russia–Ukraine war-induced price increases as a case study. To fully assess the economy-wide effects on households, a computable general equilibrium (CGE) model for South Africa is used. Outputs from the CGE model are linked to an accounting-based microsimulation model to assess the impacts of economy-wide changes on poverty and inequality. Government measures to alleviate price pressures are also assessed and compared to alternative possible interventions to ascertain the benefits and trade-offs of different potential interventions.

2 Global price changes and impacts

Global food and fuel prices reached record highs in 2022 due to the conflict which ensued between Russia and Ukraine and the resulting implications for the Black Sea trade routes. Both countries are key global suppliers of food and fuel. In 2019 Russia contributed 18 per cent to the global supply of wheat and 11 and 6 per cent to crude oil and natural gas, respectively; Ukraine made up 10 and 14 per cent of global wheat and rapeseed supply, respectively. Russia is also a key supplier of fertilizer (13 per cent of total exports in 2019) along with Belarus, which is a neighbouring country to both Russia and Ukraine and an ally to Russia (OEC 2024). Given the importance of each of these countries as suppliers to the global market, disruptions to their production or ability to export have sizeable consequences for the global economy (Glauber and Laborde 2023). Constraints to Russian and Ukrainian exports, along with export reductions and bans in countries such as India, Turkey, and China (to protect local supplies), resulted in global food, fuel, and fertilizer prices increasing by 15, 64 and 74 per cent, respectively, y-o-y in 2022 (see Figure 1). The World Bank (Espitia et al. 2022) reports that in the first half of 2022, 74 trade-restrictive policy measures on food and fertilizer were active in response to the Russia–Ukraine crisis. It estimates that this raised the prices of wheat, soya bean oil, and maize (among others) by more than 9, 14, and 6 per cent, respectively. Several trade-restrictive policies still exist at the time of writing (see World Bank 2024). The rise in prices in 2022 followed already high prices stemming from COVID-19 supply disruptions and the unevenness of the recovery, poor harvests in several countries, and increased biodiesel production (Glauber and Laborde 2023).

Figure 1: Select global commodity prices, 2001–23



Source: authors' illustration based on data from IMF (2024).

Country impacts from higher global prices have differed, with some countries more negatively affected than others due to their dependency on imports from Russia, Belarus, and Ukraine as well as country resilience capacities (Glauber and Laborde 2023; Raga et al. 2024). Glauber and Laborde (2023) highlight that the Middle East and North Africa (MENA) region has been most directly affected by the conflict due to its dependence on imports from these countries. Many other countries, particularly in Africa south of the Sahara, have also been significantly impacted due to their vulnerability to higher global prices, particularly for fuel and fertilizer, and to limited government resources to absorb shocks. Tighter monetary policy in higher-income countries in response to rising inflation has also negatively impacted countries in Africa, affecting capital flows, exchange rates, and inflation (via pass-through effects) as well as domestic monetary policies (Raga et al. 2024). Raga et al. (2024) estimate that foreign direct investment (FDI) flows to Africa decreased from 3 per cent of gross domestic product (GDP) in 2021 to 1.9 per cent of GDP in 2022.

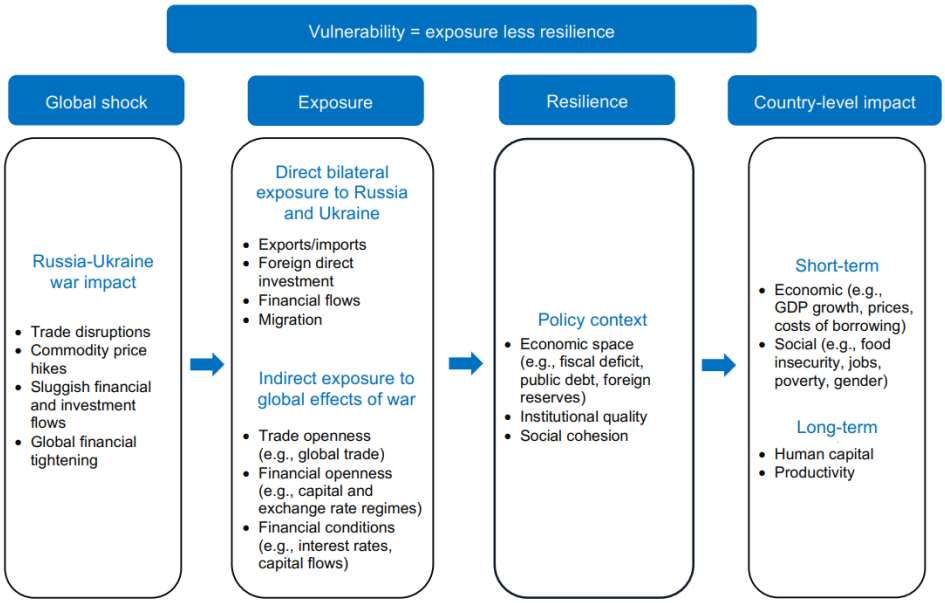
While quantifying the impact of the Russia–Ukraine war on countries is difficult given the effects of other factors such as the COVID-19 pandemic, Raga et al. (2024) report that annual GDP in Africa is more than US$7 billion lower because of the Russia–Ukraine war. Raga et al. (2024) also report a deterioration in economic forecasts and Food and Agriculture Organization (FAO) estimates of food insecurity and undernourishment because of the Russia–Ukraine war. The International Monetary Fund's (IMF) 2022 forecast for South Africa deteriorated from 2.2 per cent in October 2021 to 1.9 per cent in April 2022—a decrease of 0.3 percentage points (IMF 2021, 2022). In 2022 the United Nations Development Programme (UNDP) estimated GDP growth losses of 0.5 percentage points. The FAO (2024) estimates of moderate or severe food insecurity prevalence, measured as a three-year average, increased from 19 per cent for 2019–21 to 20.3 per cent for 2020–22, an increase of about 900,000 people. Undernourishment estimates increased by 700,000 people (prevalence rate of 6.9 per cent to 7.9 per cent). Arndt et al. (2023) estimate the impact of the Russia–Ukraine war on 19 developing countries in Africa and Asia. The results from their analysis show an increase in poverty (additional 27.2 million people) and hunger (22.3 million people) because of the war and related global food price crises. Like other studies Arndt et al. (2023) find that the impact across countries differs based on their direct and indirect exposure to the crises. Countries which export commodities experiencing large price increases see smaller negative impacts than those with large import exposures. Fuel price increases are found to have the largest negative effect, followed by higher fertilizer prices.

3 Implications of the Russia–Ukraine war for South Africa

Raga et al. (2024) provide an analytical framework for assessing the economic and social vulnerability of countries to crises such as the Russia–Ukraine war, considering the different impact channels (see Figure 2). The key components of the framework include an assessment of exposure and vulnerability which determine the potential impact. Exposure consists of two elements, namely (i) direct exposure via trade, investment, remittances, and migrant stock; and (ii) indirect exposure via global commodity price and demand changes and dependence on foreign inflows. Resilience refers to the ability of countries to cope with the shocks experienced, including the fiscal and monetary space available to provide relief measures as well as the policy and social context within the country. Country-level impacts can be assessed from actual outcomes if available, but this is difficult in the current context given the lingering impacts of COVID-19. Country-level impacts can be estimated using counterfactual analysis. In this section we present an assessment of South Africa's exposure and resilience to the Russia–Ukraine war as per Raga et al. (2024), focusing on the short term. We also include some country-level impact data, but the

country-level impact assessment is largely handled through a counterfactual analysis presented later in the paper.

Figure 2: Vulnerability to the economic and social impacts of the Russia–Ukraine war



Source: Figure ES1 in ODI synthesis report *Impact of the Russia–Ukraine war on Africa* (Raga et al. 2024: 8); reproduced with permission. Synthesis report licensed under CC BY-NC-ND 4.0.

3.1 Exposure

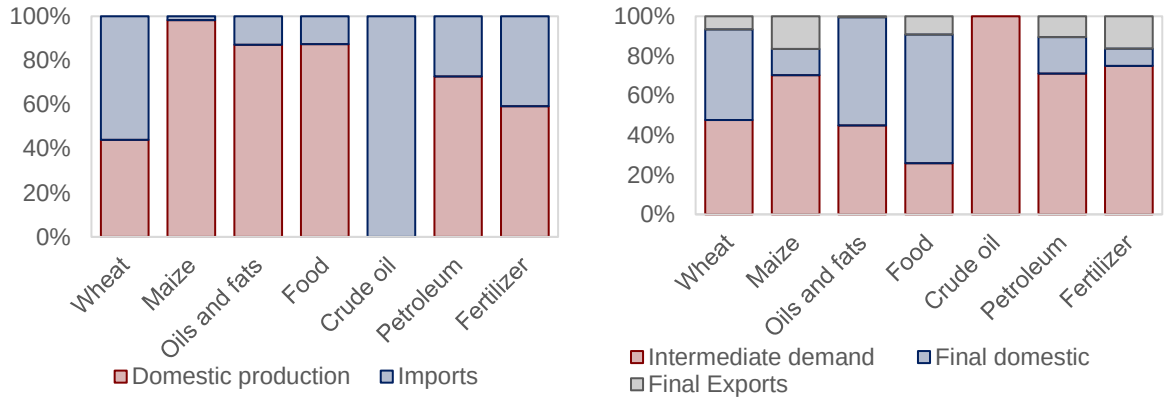
According to Raga et al. (2024), South Africa's direct exposure to the economies of Russia and Ukraine is very small across most metrics. In terms of trade, Russia and Ukraine accounted for only 0.5 per cent (average) of total imports into South Africa over the 2017–21 period. Exposure to Russian exports is larger than Ukrainian exports and comprises largely wheat, fertilizer, and lead. Russia accounts for 25 per cent of wheat imports and 11 per cent of fertilizer imports into South Africa (UNCTADStat n.d.). Although these account for only about 1 per cent of South Africa's total import bill, they represent a significant import share of one of the country's main staples and key inputs to agriculture.

South Africa is generally a net wheat importer, with domestic production meeting around half of total demand (Sihlobo 2022). While a quarter of imported wheat comes from Russia, Germany, Lithuania, and the USA are also major import sources and this provides some flexibility of supply shocks affecting the flow of trade. Wheat is the second most important crop in South Africa (following maize) and is primarily used for food consumption, accounting for 16.3 per cent of kilocalories consumed per capita per day (Raga et al. 2024). Fertilizer demand is also highly dependent on imports, which account for nearly two-thirds of total domestic supply. Other key fertilizer suppliers include Qatar, Saudi Arabia, China, and Germany (SARS 2024). South Africa has very limited exposure to direct investment and remittances from Russia or Ukraine (Raga et al. 2024). Russia and Ukraine are also small export markets for South Africa, accounting for an average of 0.6 per cent of total exports between 2017 and 2021 (UNCTADStat n.d.).

Indirect exposure to the war through increases in global prices is more significant, particularly as many of these commodities are intermediate inputs into production processes in South Africa (see Figure 3). In terms of global price exposure, in addition to the large shares of wheat and fertilizer imports, South Africa is also a large importer of crude oil and petroleum products (UNCTADStat

n.d.). Almost all crude oil, used for fuel refinery, is imported and nearly 30 per cent of refined transport fuel is also imported. Exposure to higher maize and oil and fat prices is smaller, with the country's net maize exporter status indicating potential gains from the higher global maize price. Households are particularly exposed to the rise in global prices due to the shares of these commodities in consumption expenditure. In lower-income households expenditure on agriculture and processed foods, petroleum, and transport account for more than 40 per cent of total expenditure (Davies and van Seventer 2020). These households are also more exposed to cereals, edible oils, grains, and starches due to the composition of their food baskets. Higher-income households spend 10 per cent or less on food, although a larger share of expenditure does go to fuel use for transport. Lower-income households primarily use public transport. South African exports may also have been affected indirectly by the war's impact on the demand of key export destinations in Europe and Africa which faced significant exposure due to their dependence on Russia and Ukraine for energy and fertilizer. The country's financial system is significantly integrated into global financial markets. This, combined with the floating exchange rate and dependence on foreign investment, results in high exposure to the impacts from the Russia–Ukraine war, particularly relative to other countries in Africa.

Figure 3: Import exposure (left) and commodity use (right) of select commodities



Source: authors' calculations based on 2019 Social Accounting Matrix (Davies and van Seventer 2020).

3.2 Resilience

Like many other countries, South Africa was still recovering from the impact of the COVID-19 pandemic when Russia invaded Ukraine. COVID-19, along with resultant lockdowns, had a devastating impact on economic growth, which was already sluggish, while government support measures further reduced fiscal space. In 2020 South Africa's GDP contracted by 6.2 per cent after averaging only 1 per cent in the 2015–19 period, while the fiscal balance deteriorated to -9.5 per cent of GDP from -5.6 per cent in 2019. Foreign reserves, however, were sufficient to cover imports for nearly six months in 2021, and interest rates were at an all-time low because of COVID-19 (Raga et al. 2024). The tighter fiscal environment limited the social support interventions available to offset the impacts of the Russia–Ukraine war. In South Africa government responded to the rise in global prices by providing temporary relief to consumers through fuel price subsidies, specifically a decrease in the general fuel levy. This measure was in addition to continued social measures that were implemented under COVID-19 (Raga et al. 2024). The general fuel levy is a national excise tax imposed on petrol and diesel sold in the country, with revenues forming part of the general national revenue fund. From April to July 2022 the fuel levy was decreased by R1.50 per litre. Relief measures were extended in May to August, although the decrease in the fuel levy provided was reduced to ZAR0.75 per litre. The total value of the relief was estimated to be ZAR4.5 billion (National Treasury 2022). Mabugu et al. (2009) find that the

fuel levy is a progressive tax affecting higher-income households more as their direct spending on fuel is higher. Lower-income households are, however, also affected by the fuel levy through its impact on public transport costs as well as its indirect impact on prices in the economy.

3.3 Changes in key economic indicators in South Africa

In 2022 the South African economy expanded, with real GDP increasing by 1.9 per cent (StatsSA 2024b), following a rebound in growth of 6.2 per cent in 2021 post the COVID-19 pandemic. Although growth remained positive on an annual basis, quarterly data reveals a slowdown in activity in the first quarter and a decrease in the second quarter. While it is difficult to disentangle the impacts of the Russia–Ukraine war from the lingering effects of other shocks to the economy, the data suggests a negative impact. This is also reflected in the change in real household expenditure, which slowed to 0.1 per cent in the second quarter and contracted in the third quarter of 2022 (see Table 1).

Table 1: Change in real GDP by expenditure and sector

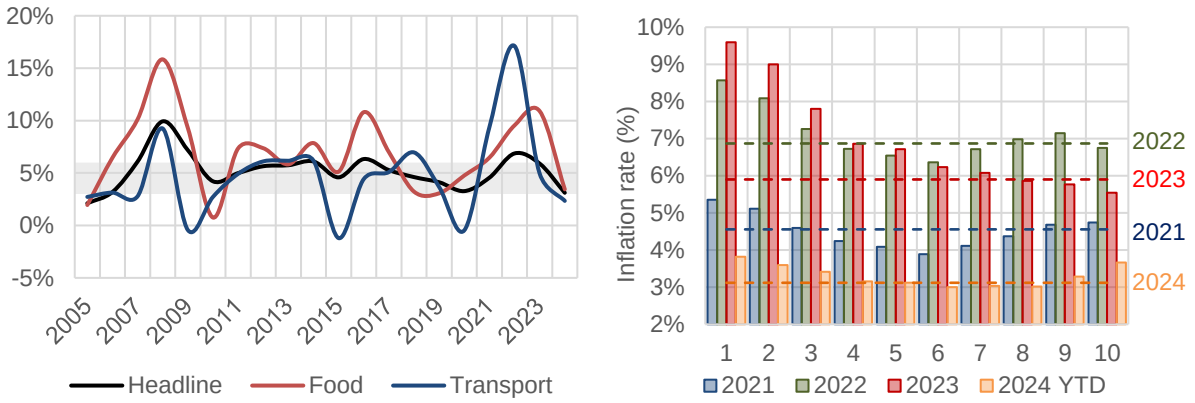
	Annual per cent change			Q-o-q per cent change			
	2020	2021	2022	Q1	Q2	Q3	Q4
Final consumption expenditure: households	-6.1	6.2	2.5	1.2	0.1	-0.4	0.6
Final consumption expenditure: gen. gov.	0.9	0.6	0.6	0.7	-1.2	0.6	-1.0
Total gross capital formation	-25.8	8.6	15.5	6.7	3.6	10.1	-4.6
Exports of goods and services	-12.0	9.7	6.8	3.8	0.2	1.7	-3.2
Imports of goods and services	-17.6	9.6	15.0	6.1	5.0	0.2	-0.8
GDP at market prices	-6.2	5.0	1.9	1.3	-0.9	1.9	-1.4
Agriculture, forestry, and fishing	17.3	5.6	2.0	-1.1	-11.4	38.4	-5.5
Mining and quarrying	-12.2	12.9	-7.3	-3.1	-3.5	1.7	-3.4
Manufacturing	-12.1	6.9	-0.4	3.8	-5.7	2.3	-2.0
Electricity, gas, and water	-5.7	2.3	-2.9	2.2	-1.6	-2.8	-2.1
Construction	-17.6	-2.2	-3.2	-0.8	-1.9	3.2	0.1
Trade, catering, and accommodation	-12.2	6.8	3.4	2.5	-1.4	1.6	-2.6
Transport, storage, and communication	-15.5	5.9	8.6	1.1	2.6	3.3	0.7
Finance, real estate, and business services	0.6	2.8	3.3	1.9	2.0	1.0	-1.6
General government services	1.0	-0.9	0.4	1.5	-1.3	0.5	-0.6
Personal services	-2.1	5.8	2.5	0.0	0.2	-1.1	-0.1
Value added at basic prices	-5.8	4.7	1.9	1.4	-0.9	2.0	-1.4

Source: authors' calculations based on data from StatsSA (2024b).

South Africa saw high domestic price increases in 2022 (see Figure 4). Headline inflation reached 6.9 per cent. The largest increases in prices were in food and transport, which recorded inflation rates of 9.5 and 17.1 per cent, respectively (StatsSA 2024a). Transport inflation would have likely increased by a larger degree had government not intervened with fuel price relief. The rise in prices in 2022 compounded the effects of already rising prices in 2020 and 2021 due to constrained supply during COVID-19, recovering demand following COVID-19, and rising global prices. Despite slowing global price increases, inflation in South Africa has remained sticky in 2023 and 2024 (year-to-date, YTD) due to higher input costs resulting from loadshedding, high inflation persistence, and a weakening exchange rate. The rand weakened from an average rate of R14.8 to the USD in 2021 to R16.4 in 2022, R18.5 in 2023, and R18.9 in 2024 (YTD). By decile, household price growth experienced by lower-income households far exceeded national headline inflation in 2022 and 2023—in the lowest two income deciles price increases rose by more than 1 and 3 percentage

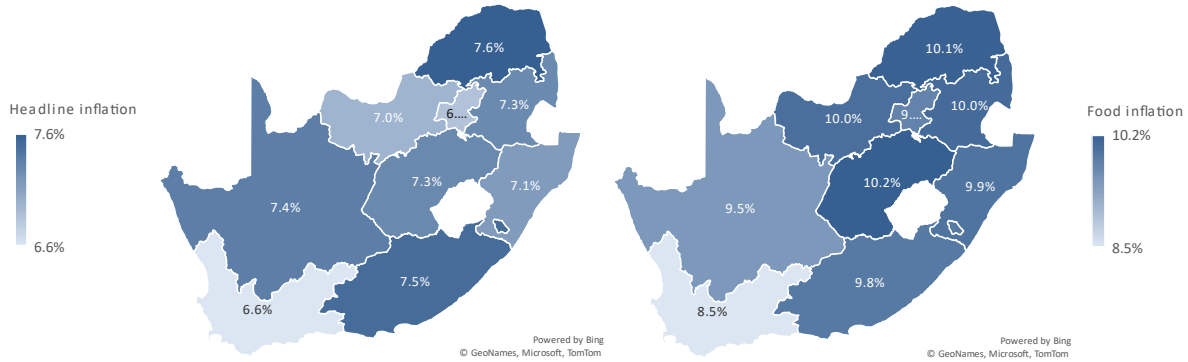
points respectively, while higher-income household inflation rose by less than the headline figure. Interestingly, inflation in middle-income households, deciles four to seven, also experienced increases smaller than the headline number. This can be explained by smaller food consumption and private transport expenditure shares. Price increases differed across the country (see Figure 5). Headline inflation was highest in Limpopo and the Eastern Cape, while food inflation was highest in the Free State and Limpopo. The Eastern Cape and Limpopo have the highest levels of multi-dimensional poverty in South Africa, with poverty intensity levels also among the highest.

Figure 4: Inflation by group (left) and headline inflation by household decile (right)



Source: authors' illustration based on data from StatsSA (2024a).

Figure 5: Headline (left) and food (right) inflation by province, 2022



Source: authors' illustration based on data from StatsSA (2024a).

4 Methodology

4.1 Economic model

We assess the distributional impacts of food price shocks using a CGE model for South Africa, calibrated to an enriched version of the draft 2019 Social Accounting Matrix (SAM) by Davies and van Seventer (2020). The SAM is enriched by allowing for more detail in the agriculture, mining, and energy sectors. The agriculture sector is disaggregated to reflect different crop and food processing activities using data from Phoofolo (2018). Mining and energy activities are disaggregated to align with the 2019 energy balance for South Africa. This level of detail in the model allows us to better trace the channels by which the effects of global prices affected by the

Russia–Ukraine war have influenced the food system and broader economy. The disaggregation of the SAM is described in the Appendix.

The South African General Equilibrium (SAGE) model is a dynamic recursive, economy-wide CGE model built on the framework from Diao and Thurlow (2012) and Lofgren et al. (2002). The model is a simulation tool that is useful for analysing the distributional effects of shocks because it mimics the functioning of the market economy by modelling the interactions of economic agents, mediated via prices and markets. As described above the data used in the model includes important agriculture and food processing sector detail. Thus, along with other sectors, we can analyse the direct and indirect effects of food price shocks. Disaggregated information on household income and expenditure is included for ten representative household groups. Incomes are linked to the production sector via returns to households for factors of production provided to the market (mostly capital and labour, depending on the factor endowment of the household) as well as transfers from other institutions (which include government transfers and remittances). Household expenditures are linked to the productive sector through the purchase of goods and services, although the split between what is domestically produced and imported depends on relative prices. Similar models have been used to assess the impacts of the Russia–Ukraine war in developing countries (see Arndt et al. 2023).

While SAGE is capable of household distributional analysis, this is limited as the household groups included are representative agents. In effect households are an aggregate group for each decile and do not reflect intra-household group differences. Traditional distribution analysis in CGE models like SAGE therefore considers changes in incomes and expenditures across different groups, with positive changes reflecting improvements in welfare. Differences in changes across groups can be used to identify which groups are affected more by changes in the economy relative to others. Detailed information on expenditure by commodity can also be used to look at specific categories of welfare; for example, changes in expenditure on food can be used as an indicator for change in food security. It is not possible to estimate poverty indicators from SAGE alone (Decaluwé et al. 1999). To improve on this, we extend the distributional analysis of this paper by using a top-down micro-accounting approach, following Pauw and Thurlow (2011), for a refined interpretation of the effects on inequality and for the estimation of poverty indicators. The microsimulation model includes a larger number of households than SAGE. This not only allows us to calculate poverty metrics but also improves the estimation of inequality metrics. Microsimulation models also allow for the potential analysis of distributional changes by household characteristics such as gender or race (although this is not explored here).

Under the top-down micro-accounting approach, SAGE outputs, specifically annual changes in household consumption and population by scenario, are linked post solution to a microsimulation module to calculate expenditure-based inequality and poverty estimates. The microsimulation module is calibrated using the 2015/16 Living Conditions Survey (LCS) (StatsSA 2017), and each household is linked to one of the representative household groups contained in SAGE. For each scenario annual changes in SAGE household expenditures by commodity group are used to inform changes in household expenditures in the microsimulation model.[1] Poverty and inequality indicators are calculated for each year and scenario. The difference between indicators in the scenarios gives the change in poverty and inequality resulting from the model shock(s). While no

[1] Commodity groups are used to match commodities in SAGE and the microsimulation. This is done for ease of modelling but also to avoid any mismatches in data between the two models. Commodity groups include food, energy, manufacturing, transport, and other industry, and services and cover total consumption expenditure. Due to data limitations population growth is assumed to be uniform across household representative groups. Population growth is used to adjust the weights of households in the microsimulation module.

behavioural changes are directly modelled in the microsimulation module, the SAGE output will have incorporated behavioural changes through the determinants of demand included in that model. Within-group income distributions remain constant, and the dynamics related to persistent poverty and poverty traps are not included (Pauw and Thurlow 2011). Poverty lines associated with the 2014/15 LCS are used, although they are updated to reflect 2019 annualized values.

4.2 Scenarios and assumptions

The three sets of scenarios considered in this analysis are summarized in Table 2. In the first scenario we develop a reference case growth path for South Africa, in which no change in global prices occurs. This path provides a counterfactual for the remaining scenarios, which estimate the impact of global price changes associated with the Russia–Ukraine war, with and without state relief measures.

The second set of scenarios considers the impact of global price changes individually and cumulatively (Combo) on the South African economy. Actual global price increases of the first three-quarters of 2022 are used to inform the model shocks.[2] Although Raga et al. (2024) identify FDI, financial flows, and migration to be vulnerable to the war, we do not explicitly consider this in our analysis. This is because we assess that the expected exposure and extent of this direct vulnerability to South Africa is low in the case of migration, slow in the case of foreign investment, or temporary in the case of risk aversion towards the country.

In the third set of scenarios, we assess the impact of relief measures to alleviate the impact of global price increases. Specifically, we look at the impact of the actual relief provided via the fuel levy, valued at ZAR3.9 billion in 2019 prices. Cash transfers and agricultural production subsidies were implemented in other countries and are also suspected to have larger welfare benefits for more vulnerable households (Amaglobeli et al. 2023; Glauber and Laborde 2023; Raga et al. 2024). Hence, we compare the effects of South Africa's policy measure against two alternative proposals with the same direct fiscal cost. As per the fuel levy subsidy provided, we assume that all policy measures modelled affect the fiscal balance, which in turn has implications for investment. The first alternative policy measure considered is a cash transfer which benefits households up to the seventh decile. The cash transfer is uniform across household groups. The second alternative policy measure is an agricultural production subsidy provided via tax relief.

Table 2: Summary of scenarios modelled

Scenario		Description
Counterfactual	Reference	Business as usual scenario—no increase in global prices
Global price impacts	Maize	13 per cent increase in global maize prices (agriculture)
	Wheat	27 per cent increase in global wheat prices (agriculture)
	Oils	12 per cent increase in global oils and fats prices (agriculture + processed)
	Fertilizer	68 per cent increase in global fertilizer prices
	Fuel	33 per cent increase in global crude oil and petroleum prices
	Combo	Combined impact of maize, wheat, oils, fertilizer and fuel. Food price index increase of 4.
Relief measures	Policy	Combo + R3.9bn (2019 prices) policy relief measure via fuel levy
	Cash	Combo + possible alternative policy relief measure—cash transfer to low-income households (<=decile 7)
	Agriculture	Combo + possible alternative policy relief measure—agriculture subsidy

Source: authors' compilation.

[2] Prices are adjusted for currency changes and inflation. Shocks are therefore measured based on real 2019 USD prices.

Exogenous assumptions that inform growth are kept in line with historical trends, and sector total factor productivity is adjusted to reach the targeted growth path. As the analysis takes place over the short term, we assume macroeconomic closures aligned with this as well as the stylized facts for the country. Specifically, we assume that capital and land supply are fixed and cannot shift between sectors; that government savings adjust to changes in income and revenue with no fiscal rule imposed; that the exchange rate is flexible and no central bank intervention takes place to maintain the currency; and that investment is savings driven. To capture the impacts on employment we assume that labour is mobile and underemployed, meaning that workers can enter and exit job opportunities depending on labour demand. The exception to this assumption is highly skilled labour, which is assumed to be fully employed.

5 Impacts of global price increases

The increase in global prices has a moderately negative impact on the South African economy, eroding the level and growth of real GDP by 0.32 per cent (see Table 3). The strongest driver of this decline in GDP is higher fuel prices, which have a broader impact on the economy than food and fertilizer price increases. As well as affecting the production of agriculture (diesel is used intensively in commercial, mechanized farming), higher fuel prices also affect segments of manufacturing and transport services. The higher cost of transport services in particular increases cost pressures in industries such as chemicals and metals manufacturing. Moreover, passenger transport services are a significant part of the budget of poorer households.

Fertilizer price increases primarily affect the agriculture sector, as fertilizer is a key input in the cultivation of crops. When considered in isolation, the increase in fertilizer prices lowers real agriculture gross value added (GVA) by nearly -0.8 per cent.

Higher global maize, wheat, and oilseed prices have a negligible impact on real GDP. This masks important effects at the sectoral level. The higher global prices stimulate domestic production, which offsets increased costs for manufactured food. Maize production and exports increase as the sector responds to favourable margins offered by higher world prices. In a similar way higher wheat prices encourage domestic production, which reduces the import bill.

On the other hand the increase in cereal prices negatively affects the production of manufactured food, particularly processed grains, starches, and baked goods. These commodities make up between 10 and 20 per cent of household outlays in the first four deciles. Thus, the extent to which price increases are passed to them is likely to add further pressure to already food-insecure households.

Table 3: Impact of global price increases on real GDP by sector (%)

	Maize	Wheat	Oils	Fertilizer	Fuel	Total
Agriculture	**0.61**	**0.19**	**0.00**	**-0.74**	**-0.51**	**-0.43**
Industry	**-0.06**	**-0.03**	**-0.01**	**0.03**	**-0.03**	**-0.09**
Mining	**-0.07**	**-0.02**	**-0.02**	**0.03**	**0.90**	**0.83**
Manufacturing	**-0.07**	**-0.04**	**-0.01**	**0.07**	**-0.11**	**-0.18**
Food and beverages	-0.14	-0.12	0.06	-0.06	0.66	0.41
Textiles	-0.03	0.01	-0.02	0.01	0.56	0.53
Wood and products	-0.05	-0.02	-0.02	0.00	0.24	0.14
Chemicals	0.00	0.02	-0.09	0.36	-1.96	-1.67
Non-metallics	-0.02	-0.04	0.00	-0.05	-1.19	-1.30
Machinery	-0.10	-0.04	-0.03	0.02	0.55	0.42

Other machinery	-0.05	-0.04	-0.01	0.00	-0.61	-0.71
Vehicles	-0.08	-0.03	-0.03	0.01	0.52	0.38
Furniture	-0.04	-0.02	-0.02	-0.01	0.20	0.12
Other industry	**-0.02**	**-0.03**	**0.00**	**-0.03**	**-0.99**	**-1.06**
Services	**-0.02**	**-0.01**	**-0.01**	**0.00**	**-0.38**	**-0.41**
Trade and accommodation	-0.04	-0.03	0.00	0.00	-0.55	-0.60
Transport and communication	-0.03	-0.01	-0.01	0.02	-1.25	-1.27
Financial and business	-0.02	-0.01	-0.01	0.01	-0.12	-0.16
Other services	-0.01	0.00	-0.01	-0.01	-0.15	-0.18
Total GDP	**-0.02**	**-0.01**	**-0.01**	**0.00**	**-0.28**	**-0.32**

Source: authors' calculations based on model outputs.

Employment decreases in line with lower economic activity (see Table 4). In the total scenario, overall employment is estimated to decrease by ~223,000 or 1.4 per cent.

Employment losses are broad-based although the largest level declines are experienced in the services sector, which is the largest employer in the country. Losses are concentrated amongst middle and secondary educated workers, largely affecting incomes of households in deciles five to eight.

Table 4: Impact of global price increases on employment by sector (level)

	Maize	Wheat	Oils	Fertilizer	Fuel	Total
Agriculture	**14,800**	**5,300**	**200**	**-16,200**	**-14,200**	**-11,100**
Industry	**-2,700**	**-2,200**	**100**	**-1,500**	**-46,600**	**-52,600**
Mining	**-500**	**0**	**0**	**100**	**5,700**	**5,100**
Manufacturing	**-2,000**	**-1,000**	**0**	**300**	**-7,900**	**-10,000**
Food and beverages	-700	-600	700	-300	3,600	2,000
Textiles	-100	0	-100	-100	1,000	700
Wood and products	-200	-100	-100	-200	100	-200
Chemicals	-200	0	-400	1,100	-12,200	-11,100
Non-metallics	0	-200	0	-200	-2,900	-3,100
Machinery	-400	0	0	200	2,300	2,000
Other machinery	0	0	0	0	-500	-500
Vehicles	-300	-100	-100	-200	500	200
Furniture	-100	0	0	0	200	0
Other industry	**-200**	**-1,200**	**100**	**-1,900**	**-44,400**	**-47,700**
Services	**-4,900**	**-4,100**	**-2,400**	**-4,000**	**-148,500**	**-164,200**
Trade and accommodation	-2,000	-1,800	0	-900	-41,100	-46,100
Transport and communication	-400	-200	-200	300	-36,800	-37,500
Financial and business	-1,000	-700	-800	-700	-21,400	-24,200
Other services	-1,500	-1,400	-1,400	-2,700	-49,200	-56,400
Total GDP	7,200	-1,000	-2,100	-21,700	-209,300	-227,900

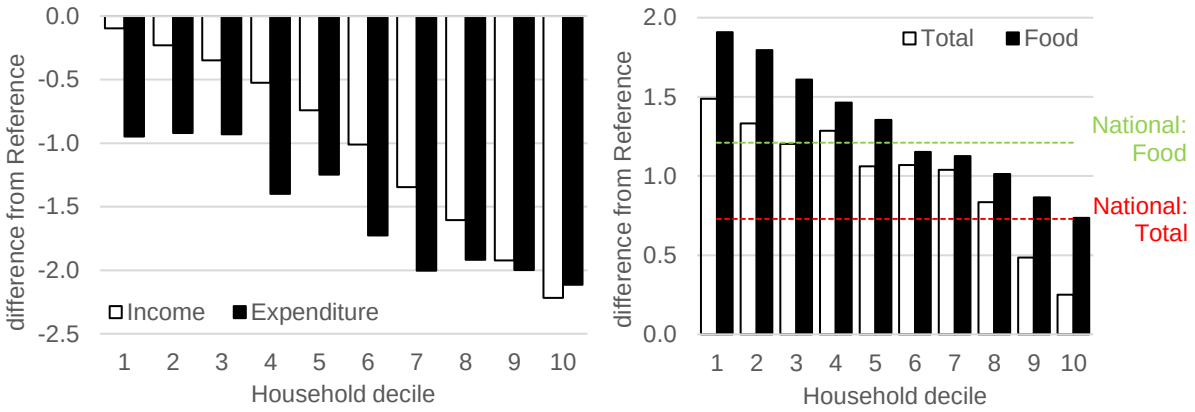
Source: authors' calculations based on model outputs.

Household income and consumption decrease because of employment losses (see Figure 6 left). Declines are largest amongst higher-income households, which derive larger shares of income from employment. Lower-income households (deciles three and below) are dependent on state transfers, which make up the bulk their incomes (50 per cent or more). As government transfers do not decrease, the incomes of poorer households are more resilient to the change in global prices.

Despite a milder negative impact on incomes compared with wealthier households, there is a disproportionately stronger fall in spending for lower-income households. This is caused by a few factors. First, lower-income households experience stronger price effects. Overall, prices in the economy are 0.7 higher. Lower-income households, however, experience increases of more than 1 per cent, as illustrated in Figure 6. The chart further shows that, although food prices increase by 1.2 per cent, lower-income households experience larger increases than higher-income households.

Second, lower-income households have a larger budget share allocated to food and public transport. With few substitute commodities, limited savings, or access to credit, there is limited ability to absorb the higher prices, resulting instead in a real reduction in purchases of food, fuel, and transport services. This illustrates how vulnerable poorer households are to global price shocks.

Figure 6: Global price impact on real household income and expenditure (left), change in relative price index (right)

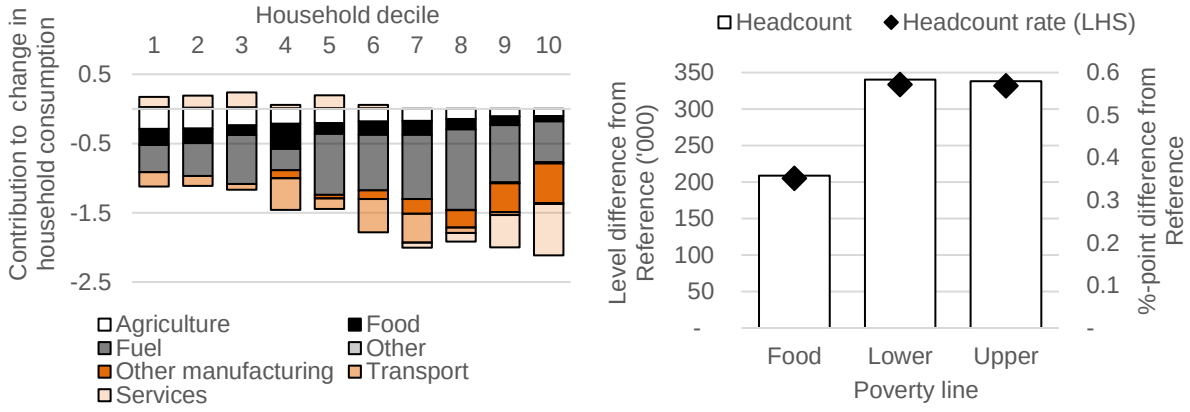


Source: authors' calculations based on model outputs.

As Figure 7 (left) shows, lower consumption in lower-income households is concentrated in food (agriculture and manufactured) and fuel, which comprise more than a quarter of their consumption. The decline in middle- and higher-income households is larger in fuel, services, and other manufacturing commodities. The smaller declines in food indicate that some substitution in consumption takes place to compensate for the higher cost of food.

Poverty levels and rates increase due to the global price shocks. The number of people living below the upper poverty line increases by nearly 340,000, while the number of people living below the lower poverty line rises by nearly 340,000. The larger increase in the number of people below the lower poverty line highlights the vulnerability of the already-poor to price increases. Food poverty increases, with the number of people living below the food poverty line rising by just over 200,000 (Figure 7, right). The depth and severity of poverty are also higher, with both the poverty gap index and squared poverty gap index rising under global price increases.

Figure 7: Global price increase impact on real household consumption by commodity group (left), change in poverty (right)



Source: authors' calculations based on model outputs.

6 Impacts of relief measures

Table 5 compares the sectoral impact of relief measures to ease the impact of the global price increase. As noted above we simulated the impact of the fuel levy relief that was implemented in South Africa as well as two hypothetical alternatives: one focused on subsidizing agricultural production and one supporting poorer households with an additional cash transfer. The results show that the fuel relief provided by government reduced some of the negative impacts of global price increases on economic activity, but these were minor. Table 5 shows that the fuel levy relief reduced the overall impact on GDP by 0.02 percentage points. Most of this would, unsurprisingly, be apportioned to fuel-intensive sectors such as agriculture, petrochemicals, and transport services.

The alternative policies modelled also show a minor effect on GVA, with the agricultural subsidy easing the total effect by 0.02 percentage points, and the cash transfer having virtually no impact on GVA. However, the alternative measures tend to support a wider set of industries than in the case of the fuel levy. The agricultural subsidy has a stimulatory effect on agricultural and food production. The cash transfer helps industries that make consumer goods, such as food and textiles, but is detrimental to heavier industries (non-metallic minerals, machinery, vehicles, construction, and electricity).

Table 5: Impact of government interventions (including global price shock) on real GDP by sector (%)

	Global price impact	Fuel relief	Agriculture subsidy	Cash transfer
Agriculture	**-0.43**	**-0.37**	**0.86**	**-0.33**
Industry	**-0.09**	**-0.10**	**-0.13**	**-0.14**
Mining	**0.83**	**0.84**	**0.78**	**0.81**
Manufacturing	**-0.18**	**-0.16**	**-0.17**	**-0.19**
Food and beverages	0.41	0.41	0.52	0.53
Textiles	0.53	0.53	0.50	0.64
Wood and products	0.14	0.15	0.12	0.13
Chemicals	-1.67	-1.53	-1.62	-1.64
Non-metallics	-1.30	-1.39	-1.39	-1.51
Machinery	0.42	0.39	0.30	0.23
Other machinery	-0.71	-0.77	-0.84	-0.89
Vehicles	0.38	0.37	0.32	0.27
Furniture	0.12	0.10	0.08	0.07

Other industry	**-1.06**	**-1.12**	**-1.14**	**-1.21**
Services	**-0.41**	**-0.38**	**-0.41**	**-0.41**
Trade and accommodation	-0.60	-0.57	-0.58	-0.62
Transport and communication	-1.27	-1.17	-1.29	-1.26
Financial and business	-0.16	-0.15	-0.17	-0.15
Other services	-0.18	-0.17	-0.17	-0.17
Total GDP	**-0.32**	**-0.30**	**-0.30**	**-0.33**

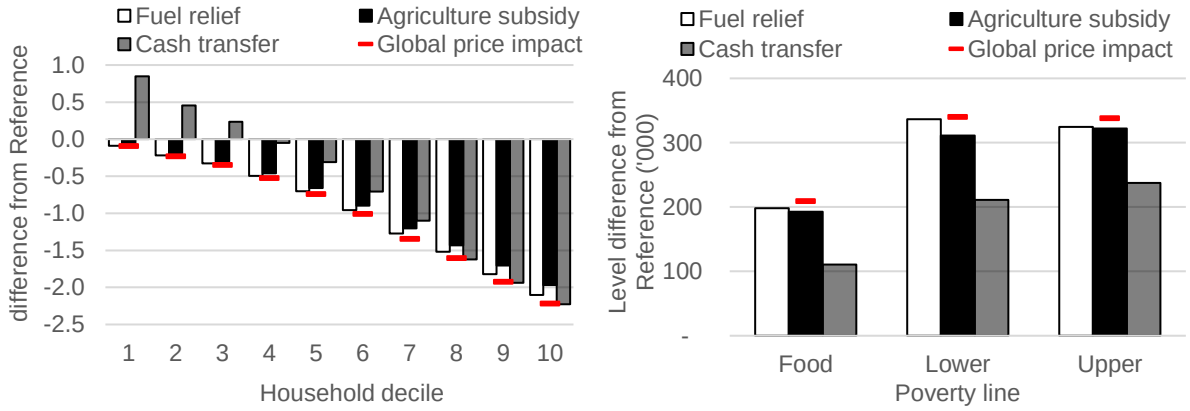
Source: authors' calculations based on model outputs.

More noteworthy differences emerge when comparing the impact on welfare (shown in Figure 8). The fuel levy relief is estimated to have been less effective than would be the case with alternative policy measures with the same fiscal cost. Also, it is the least pro-poor of the policies simulated. The mitigative impact of the fuel levy relief is stronger for households in the upper half of the income distribution than it is for the three lowest-income deciles. This is further demonstrated by the shallow improvement in the number of people under the three poverty lines. The combined scenario estimates that an additional ~210,000 people fall below the food poverty line because of the global price shock—the fuel levy relief is expected to reduce this by ~11,000 people.

As described above the agricultural subsidy scenario has the same impact on domestic production as the fuel levy relief scenario. It also cushions the impact more on households in the lowest three deciles and reduces the number of people falling below the food poverty line by ~16,000 people.

Cash transfers provide more pronounced relief to lower-income households, because the policy measure affects their purchasing power and their ability to absorb food price shocks more directly. For households in the first three deciles, cash transfers more than offset the impact of the global shocks on their income. In the fourth to seventh deciles, the relief is still stronger than would be expected from the other two policy scenarios. The measure prevents half of the people estimated to fall below the food poverty line from doing so. Although the policy measure does not relieve the loss in GDP, the results indicate that it provides meaningful support to poorer households, which, in turn, prevents a deterioration in production in the food and textile industries.

Figure 8: Impact of government interventions (including global price shock) on real household income (left) poverty (right)



Source: authors' calculations based on model outputs.

7 Discussion

Geopolitical tensions between Russia and Ukraine escalated in February 2022 following the Russian invasion of Ukraine. Given both countries' importance in the global trade of several cereal, chemical, and energy commodities, the war caused significant disruptions to supply chains, raised the prices of these commodities, and raised the cost of trade more generally.

This paper explored the impact of rising global prices in 2022 driven primarily by the Russia–Ukraine war. The results show that the rise in global prices has had a negative impact on economic activity, employment, and household welfare. For most sectors it is the increase in fuel prices that harms their production. In the agricultural sector it is a combination of higher fuel and fertilizer prices. In the food sector production is negatively affected by rising world prices of major cereals.

Relative to other developing countries (see Arndt et al. 2023), impacts in South Africa are found to be below the median. This is because most of the country's exposure to the war is indirect. The increase in the fuel price is the dominant transmission channel due to the country's high import dependence on crude oil and refined fuel products. This is unsurprising given its broad linkages across the economy. Agriculture price increases have a smaller impact, affecting specific activities in the manufactured food industry, but these activities produce important staples in South African diets. The impacts of fertilizer price increases are smaller overall but have the largest negative impact in crop-growing segments of the agricultural sector. These results are in line with those presented by Arndt et al. (2023) and further highlight that the effects are unevenly distributed across different industries and household groups.

The rise in global prices negatively affects all households through the impact on income, which falls due to lower production, as well as the impact on local prices, which increases as higher costs are passed to consumers. Lower-income households are particularly negatively affected as food and fuel comprise a larger share of their expenditure baskets. Given the concentration of grains and starches in their household food budgets, lower-income households are found to be affected more by large price increases than high-income households. This leads to a large increase in extreme poverty, as measured by the food poverty line. Lower-income households are found to be particularly vulnerable, with the number of people falling below the lower poverty line rising by more than that falling below the upper poverty line.

Given the tight fiscal and monetary policy environment and the urgency to provide additional support to households, government interventions have been limited. In addition to existing relief measures, the South African government responded to the crisis by implementing a fuel relief policy by temporarily suspending the general fuel levy. The reduction brought some relief to consumers, although our analysis shows that these were less pro-poor than options that would support poorer households more directly, through a cash transfer, or indirectly, by providing support to the agricultural sector to ease cost pressures in the food value chain. Indeed, other policy actions were possible. In a review of vulnerability across countries, Abay et al. (2023) identify export restrictions among food exporters, tax relief for firms, salary increases for civil servants, and currency devaluations as being part of a mix of policy interventions to respond to the crisis. We did not include these policy alternatives in this study.

The analysis shows that cash transfers provide the most relief to low-income households without significantly worsening, or improving, the real GDP impact. This finding is in line with Amaglobeli et al. (2023), who argue that targeted support to households through cash transfers is a more cost-effective way of supporting vulnerable households than broader mechanisms which cushion the pass-through of global prices to domestic consumers.

The analysis shows that the type of policy response to global price shocks matters. In the South African case explored here, subsidizing fuel and agricultural activity had the most mitigative effect on GDP, although this was not especially large. Meanwhile, although cash transfers do not relieve the GDP effect, they have strong potential to prevent a larger increase in poverty. The policy choices for governments need to consider both the intended support—supporting vulnerable households or supporting domestic production, for example—and how quickly they can implement and deliver these policies to targeted industries and households.

As an administered price, changes to the fuel levy regime are easily implementable in South Africa and come into effect in the following calendar month. Implementing cash transfers is also mostly achievable, given South Africa's experience in delivering social grants to targeted households and more recently the social relief of distress grant, originally provided as income support in response to the COVID-19 pandemic. However, subsidies to support farmers are less common outside of support to obtain land and tax rebates for diesel.

Future global price shocks are likely, whether spurred by geopolitical tensions, climatic extremes, or natural disasters. Ex-ante analysis of the potential effects of global price shocks helps to identify the types of sectors and households that could be affected, the channels by which they are vulnerable, and the expected magnitude, given the structural characteristics of the country. This can help guide a menu of policy options to respond to these shocks and can identify ways to build resilience to these types of shocks.

While this analysis aims to comprehensively include the relevant channels through which the war affects the South African economy, shortcomings are present, particularly on the capacity to cushion shocks through storage. Sihlobo (2022) reports that nearly 50 per cent of total wheat imports needed in 2021/22 were already stockpiled by the week of 11 April 2022. This means that the impact on local wheat prices and supply could be smaller than indicated by the modelling results. As crude oil is wholly imported in South Africa, understanding the importance and modelling the impact of oil reserves could be an area for future research.

This study focuses on isolating the channels by which the global price shock has affected production and household consumption. In reality, households have confronted several shocks, not all of which are directly attributed to the war. These include lingering effects of restrained activity due to COVID-19 lockdowns and rapidly tightening monetary policy. In 2022 the South African Reserve Bank (SARB) increased interest rates by 325 percentage points. This will have placed further pressure on household consumption and welfare. Policy decisions by the SARB were also excluded from this analysis. Thus, interactions between price shocks and key policy decisions affecting household consumption can also highlight the overall household vulnerability at the time.

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Appendix

Table A1: 2019 Social Accounting Matrix accounts

Activities	Plastic products	Other mineral mining	Other passenger transport
Agriculture: Wheat	Non-metallic minerals	Meat	Land freight transport
Agriculture: Maize	Iron and steel	Fish	Other freight transport
Agriculture: Other cereals	Non-ferrous metals	Vegetables	Supporting transport services
Agriculture: Vegetables	Metal products	Oils and fats	Communications
Agriculture: Other fruit	Machinery	Dairy products	Financial services
Agriculture: Grapes	Electrical machinery	Grain mill products	Business services
Agriculture: Oil seeds	Scientific equipment	Starches products	Government services
Agriculture: Tubers	Vehicles	Animal feed	Other services n.e.c.
Agriculture: Pulses	Other transport equipment	Bakery products	**Factors of production**
Agriculture: Sugarcane	Furniture	Sugar	Lab: Primary (Gr 1–7)
Agriculture: Other	Other manufacturing	Confectionary products	Lab: Middle (Gr 8–10)
Agriculture: Live animal	Electricity	Pasta products	Lab: Secondary (Gr 11–-12)
Forestry	Natural water	Food n.e.c.	Lab: Tertiary (> Gr 12)
Fishing	Construction	Beverages and tobacco	Capital
Coal and lignite mining	Trade services	Textiles	Land
Gold mining	Hotels and accommodation	Clothing	**Households**
Other metal ore mining	Land passenger transport	Leather products	Percentile 1–10
Other mineral mining	Land freight transport	Footwear	Percentile 10–20
Meat	Other passenger transport	Wood products	Percentile 20–30
Fish	Other freight transport	Paper	Percentile 30–40
Vegetables	Supporting transport services	Printing	Percentile 40–50
Oils and fats	Communications	Petroleum products	Percentile 50–60
Dairy products	Financial services	Fertilizer	Percentile 60–70
Grain mill products	Business services	Basic chemicals	Percentile 70–80
Starches products	Government services	Other chemicals	Percentile 80–90
Animal feed	Other services n.e.c.	Rubber	Percentile 90–92
Bakery products	**Commodities**	Plastic products	Percentile 92–94
Sugar	Agriculture: Wheat	Non-metallic minerals	Percentile 94–96
Confectionary products	Agriculture: Maize	Iron and steel	Percentile 96–98
Pasta products	Agriculture: Other cereals	Non-ferrous metals	Percentile 98–100
Food n.e.c.	Agriculture: Vegetables	Metal products	**Other accounts**
Beverages and tobacco	Agriculture: Other fruit	Machinery	Trade and transport margins
Textiles	Agriculture: Grapes	Electrical machinery	Enterprises
Clothing	Agriculture: Oil seeds	Scientific equipment	Government services
Leather products	Agriculture: Tubers	Vehicles	Taxes: Activity
Footwear	Agriculture: Pulses	Other transport equipment	Taxes: Direct
Wood products	Agriculture: Sugarcane	Furniture	Taxes: Import
Paper	Agriculture: Other	Other manufacturing	Taxes: Sales
Printing	Agriculture: Live animal	Electricity	Savings and investment
Petroleum products	Forestry	Natural water	Changes in stocks
Fertilizer	Fishing	Construction	Rest of world
Basic chemicals	Coal and lignite mining	Trade services	
Other chemicals	Crude oil	Hotels and accommodation	
Rubber	Other metal ore mining	Land passenger transport	

Note: ‘n.e.c.’ stands for ‘not elsewhere classified’.

Source: 2019 South Africa Social Accounting Matrix (Davies and van Seventer 2020).