Trade, Food Security and the War in Ukraine: The Cases of Egypt and Sudan

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TRADE, FOOD SECURITY AND THE WAR IN UKRAINE: THE CASES OF EGYPT AND SUDAN

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Abstract

The objective of this paper is to examine the nexus between trade, food security and the war in Ukraine with a special focus on Egypt and Sudan. Given the high dependency of the two countries on wheat imports, both experienced high inflation and lower economic growth, threatening their food security. Thus, the contribution of the paper is threefold: first, it examines the macroeconomic implications of the war on the two economies. Second, it analyzes the extent to which food security deteriorated and finally how trade can partially help improve food security in the two countries. To do so, using an error correction model, our results show that the exchange rate pass through was high in Egypt and Sudan and can have long-term implications on inflation. To move forward, we explore how the two countries might develop bilateral capacities targeting agriculture, electricity, and infrastructure with the view to scale-up the economic cooperation. We show, using the trade complementarity index that despite a limited complementarity between their trade structures, there is room to increase their bilateral exports if infrastructure and other behind-the-border barriers are addressed.

ملخص

الهدف من هذه الورقة هو دراسة العلاقة بين التجارة والأمن الغذائي والحرب في أوكرانيا مع التركيز بشكل خاص على مصر والسودان. وبالنظر إلى الاعتماد الكبير للبلدين على واردات القمح، شهد كل منهما تضخما مرتفعا ونموا اقتصاديا منخفضا، مما يهدد أمنهما الغذائي. وبالتالي، فإن مساهمة الورقة هي ثلاثة أضعاف: أولاً، تبحث الآثار الاقتصادية الكلية للحرب على الاقتصادين. ثانيًا، يحلل مدى تدهور الأمن الغذائي وأخيراً كيف يمكن للتجارة أن تساعد جزئيًا في تحسين الأمن الغذائي في البلدين. للقيام بذلك، باستخدام نموذج تصحيح الأخطاء، تظهر نتائجنا أن سعر الصرف الذي يمر به كان مرتفعًا في مصر والسودان ويمكن أن يكون له آثار طويلة الأجل على التضخم. للمضي قدمًا، نستكشف كيف يمكن للبلدين تطوير قدرات ثنائية تستهدف الزراعة والكهرباء والبنية التحتية بهدف توسيع نطاق التعاون الاقتصادي. ونحن نظهر، باستخدام مؤشر التكامل التجاري، أنه على الرغم من التكامل المحدود بين هياكلها التجارية، هناك مجال لزيادة صادراتها الثنائية إذا تمت معالجة البنية التحتية وغيرها من الحواجز خلف الحدود.

1. Introduction

The economic impacts of the war in Ukraine are uncertain and largely speculative, as the war remains unresolved till today. In this regard, several reports and studies described the war as devastating 'three-dimensional crisis' involving high food and energy prices as well as tightening finance that not only have important impacts on their own but could feed into each other to generate vicious cycles of poverty, hunger, food insecurity, and inequalities (see e.g., the UN Global Crisis Response Group 2022a and 2022b).

The cases of Egypt and Sudan are worth investigating for several reasons. First, Egypt and Sudan are more likely to be affected by the three types of shocks in the short to medium terms depending on the duration of the war, diversification of their food and energy imports' sources and strengthening of their economies especially their financial sectors. The African Development Bank (2022) estimated that Russia-Ukraine war (RUW) has disrupted wheat exports and drove wheat prices up by 60% in Africa. In addition, food production is estimated to drop by about 20% reflecting the effects of a two million metric ton fertilizer deficit and hence the continent could lose an estimated USD 11 billion worth of food due to the RUW[4].

Second, in 2020, Egypt and Sudan are among the largest wheat importers from Russia and Ukraine in Africa given that wheat accounted for about 10% and 7% of total imports, respectively, of Sudan and Egypt with more that 80% imported from Russia and Ukraine. Thus, the massive waves of sanctions on the Russian's economy and the disruption of global wheat supply chains including the resulting worldwide inflation make the two countries vulnerable to the 'perfect-storm' effect of the war. Furthermore, the continuing shrinkage of global growth and aggregate demand could significantly reduce domestic absorption, which is expected to preset grave challenges to the ongoing International Monetary Fund (IMF)'s stabilization program in Egypt and could further complicate the recovery from phenomenal inflation in Sudan, especially after the recent political turmoil.

Third, the combined effect of the value-chains' disruption including the reductions of commodity supplies and the resulting global petroleum and food inflation are expected to be transmitted through the external sector to Egypt and Sudan. Indeed, the consumer prices bear the bulk of the adjustment at least in the short to the medium terms. Both countries have already felt the impact of rising consumer prices and weakening of foreign exchange rate due to COVID-19; and the fact that the RUW came at the heels from the pandemic could make matters worse, especially for Sudan, which had been isolated from the global economy due to multiple sanctions imposed since 1993.

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[4] https://www.aa.com.tr/en/africa/wheat-prices-in-africa-up-60-due-to-russia-ukraine-war-afdb/2573858

Against this background, this paper focuses on the major macroeconomic consequences of the RUW on Egypt and Sudan and on how-- in the medium to longer terms—the two countries could enhance their cooperation in strategic developmental projects. That is, the analysis focuses on what the World Trade Organization (2022) termed, the first and second order effects of the RUW. Accordingly, the main questions addressed are; i) how the shock is transmitted to Egypt and Sudan; what are the major affected macroeconomic variables; ii) how the RUW affected food security and, iii) thinking ahead, how might the two countries develop bilateral capacities targeting agriculture, electricity, and infrastructure with the view to scale-up the economic cooperation in the context of African Continental Free Trade Area (AfCFTA) agreement for boosting regional food security. It worth noting that, in the 2023 Feed Africa Summit, the African Development Bank and Africa's development partners committed USD 30 billion to improve food sovereignty to be dispersed though the existing regional structures including AfCFTA[5].

The main findings of the paper show that this crisis revealed the vulnerability of the two countries because of their structural characteristics (especially imports dependency, weak exports competitiveness and lack of FDI in Egypt and political instability, institutions and weak governance, and lack of diversification in Sudan). In addition, using an error correction model, the exchange rate pass through was high in Egypt and Sudan and can have long-term implications on inflation. To move forward, we explore how the two countries might develop bilateral capacities targeting agriculture, electricity, and infrastructure with the view to scale-up the economic cooperation. We show, using the trade complementarity index that despite a limited complementarity between their trade structures, there is room to increase their bilateral exports if infrastructure and other behind-the-border barriers are addressed. In fact, we highlight potential areas for further synergies and resilience building to enhance food sovereignty not only for themselves but also for Africa, especially in the context of 2023 Feed Africa Summit.

The remainder of the paper is organized as follows. Section 2 reviews the literature. Section 3 presents the main macroeconomic developments in the two countries. Section 4 estimates the pass through in Egypt and Sudan. Section 5 presents the recent evolution of food security and section 6 shows how bilateral cooperation (including trade and investment) can partially help the two countries improve their resilience. Section 7 concludes and provides some policy recommendations.

2. Literature review
The onset of the RUW on February 24, 2022, introduced a new challenge to the global economy with tremendous economic repercussions. It could be summarized in i). introducing new uncertainties to the global economy, while it was already affected by COVID-19-related restrictive measures; ii). the rise of commodity prices (particularly food and energy and its implication on food security); iii). rising global inflation; iv). a decline of the global growth; v). lowering trade

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[5] https://www.aa.com.tr/en/africa/donors-pledge-30-billion-for-africa-s-agriculture/2799803

volume and; vi). interruption of the global supply chain and financial sector (Darvas & Martins, 2022; Guenette, Kenworthy, & Wheeler, 2022 and Garicano, Rohner, & Mauro, 2022)[6].

Remarkably, global growth declined in 2022 to 4.1% compared to 5.5% in 2021, a further decline is projected in 2023 to 3.2% (Guenette, Kenworthy, & Wheeler, 2022). Food and energy rising prices would hit global inflation, production costs would increase, and hence the households' purchasing power would be affected. The energy prices were projected to increase by 49% in October 2022 compared to an increase of 52% in 2021 while, non-energy prices were projected to increase by 8% in October 2022 compared to 26% in 2021 (Darvas & Martins, 2022) [7].

Sanctions on trade and financial system imposed on Russia as a response to the war would affect the volume of trade[8]. Global trade is projected to fall by 2.3 percentage points due to prices increase and interruption of transportation as shipping lines would reduce the direct shipping from and to Russia to not violate the international sanctions (CRS, 2022).

In addition, the isolation of the Russian financial system could introduce challenges to globalization and could eventually lead to fragmentations of the global financial system (Tank, 2022). Finally, the welfare of the poor households in developing countries would also be more likely to be affected by the war due to prices increase globally given that the majority of households in Africa allocate the lion's share of spending to food (UNDP, 2022). Longer-term implications would be huge manifested in the fragmentation of the global financial system, more spending on defense, and foreign reserve decomposition (OCED, 2022a).

The economic significance of the two warring countries plays a vital role in the depth of the impact. Despite the small size of the two economies (collectively, they account for 2.2% of GDP, 2.2% of exports, and 1.7% imports globally), Russia and Ukraine are among the large producers of key globally traded commodities. Together, they account for around 25% of global wheat exports; Russia is the major player in the international energy market (Guenette, Kenworthy, & Wheeler, 2022). In addition, it is the fourth, seventh and second largest producer of wheat, sugar, and natural gas respectively. Similarly, Ukraine is the fourth and eighth largest exporter of corn and wheat respectively (Aidi, 2022). In terms of contribution to international trade, Russia accounts for 25% of natural gas exports, 14% of fertilizers exports, 11% of crude oil exports, and 18% of coal exports, while Ukraine is the major producer of oil seeds (2/5 of the total production), 50% of neon gas (Guenette, Kenworthy, & Wheeler, 2022). The two economies are impacted by the war,

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[6] In addition, the war is caused intense humanitarian crisis as around 12 million were displaced in addition to 13 million who are in need for urgent human train assistance (Guenette, 2022, p.4).

[7] For more details on prices before and after the war, the share of the two warring countries in trade of energy and non-energy commodities, see Darvas (2022), p.9-11.

[8] US, UK, EU and G7 announced new sanctions on Russia, it includes exports and imports bans from and to Russia, price cap on Russian fossil fuel, sanctions on Russian financial system. For the full list of the sanctions see, Darvas (2022, p.19-21) and Guenette (2022, p.20-21).

Ukraine's economy fell by 45% since the war while, the Russian economy fell by 11% (OECD, 2022b).

Against this background, this section aims at reviewing different studies that have tried to identify the potential economic repercussions of the war on the global economy. The received literature identified several direct and indirect consequences in the short, medium, and long terms, and various channels of transforming the impacts. Some studies focused on trade (Darvas, 2022), other studies focused on the impact on Africa (Chandler, 2022), while the impact on the global economy received a considerable attention. The literature has also addressed various questions related to the impact of the war including the impact on poverty, sustainability, and prosperity (UNDP, 2022).

Methodologically, according to the received literature, there are several approaches to assess the war's economic consequences, one way to capture the impact is by comparing trade volume and prices of different traded commodities before and after the war (see e.g. Darvas ,2022), however, this approach is seen to be imperfect approximation due to several reasons related to the separation of the impact of the war from other potential determinants of the price's performance and trade volume before and after the war [9].

The significance of the warring countries' economies in international trade and transactions is one of the main concerns that could lead to a huge impact, which could have spillover effects on the rest of the world. Based on this importance, the assessment of vulnerability is one of the most prominent approaches for analyzing the impact of the Russia -Ukraine war (Abay, et al., 2023, Ben Hassen & El Bilali, 2022). The vulnerability analysis indicates that the MENA region is the most vulnerable due to its high food dependence on the Black Sea region (Abay et al., 2023) [10]. They investigated the impact of Russia-Ukraine war on global and regional food security. Moreover, they provided descriptive evidence on how food systems and policies can affect price vulnerability in selected countries (Egypt, Sudan, and Yemen). This evidence suggests that the war affects poor and non-poor families differently, as well as rural and urban families; urban poor would suffer more due to social protection and food subsidies missing. Another evidence using the same approach suggested that the world is not likely to face an immediate food shortage, and the availability of food is not at stake at present, based on some stylized facts, e.g., Europe is a net food exporter (Hellegers, 2022)[11]. However, this does not mean that there is no impact, as the war

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[9] For the full details of the reasons why this approach is imperfect see Darvas & Martins (2022), p 3-4.

[10] A group of 25 indicators (dependence on the Black Sea region, current wheat stocks, macro indicators such as prices, inflation, and the external balance) to assess the vulnerability was adopted in this study. Among the MENA region countries, Egypt has been classified as extremely high food consumption directly exposed to export restrictions and low stocks, while Sudan was classified as extremely high food consumption directly exposed to conflict and low stocks.

[11] The paper introduced a set of quantified indicators of dependency and copping, using the data of the FAOSTAT. Key indicators are: 1). the global economy's dependency on wheat, barley, sunflower oil and cereal exports from Russia and Ukraine and other major exporters; 2). countries' dependency on wheat imports from Russia and Ukraine;

is expected to affect countries with limited coping capacity, which is expected to be concentrated in the MENA, Sub Saharan Africa (SSA), especially the Horn of Africa.

Another evidence concluded that there are direct effects of the war represented in the huge impact on Ukraine's exports, shortages of labor resulting from displacement, as well as the disruption of harvest and cultivation. Likewise, the increase of fertilizers prices with trade restrictions would lead to limiting the use of fertilizers and hence affecting crop yield. In addition, the war may lead to jeopardize the sustainable development goals, especially the goal of reducing poverty, eliminating hunger, and responsible consumption and production (Ben Hassen & El Bilali, 2022).

The World Bank report (2022) focuses on reviewing the potential impact based on the economic importance of the two warring countries; the report reviewed the global economic outlook, the sanctions imposed on Russia, and the expected impact that could result from it. According to the report, Central Asia and Europe have been hard hit due to tied linkages with Russia through several spillover channels manifested in remittances flows, disruption of trade and financial flows. While the exposure is small outside of Europe and Central Asia, the impact of the war would have a global effect (through commodity, financial markets, and refugees flow as highlighted by Guenette, Kenworthy, & Wheeler (2022).

At the household level, Abay, et al. (2023) find that the effects are different across households. This finding was drawn from households' data in different countries. In Egypt, the paper relies on data from HIECS, in Sudan, data going back to the 2009 household survey. A review of the data concluded that wheat calorie intake per day declines with wealth. This means that the poor are the most vulnerable. This is further confirmed by UNDP (2022) report on the impact of poverty and prosperity and sustainability. It shows that the war is expected to have an impact on poverty through different channels, in Africa, household spending on food is high, so the welfare will be impacted by the rising food prices leaving a small window to other items, this could lead to high multidimensional poverty, as the remaining spending would not be sufficient. Finally, inequality is expected to expand. The war is expected to have an impact on economic growth through the export expected decline due to the global recession; it would affect exports from the continent to the rest of the world (UNDP, 2022).

Finally, Chepeliev, Maliszewska & Pereira (2023) focus on the importance of the Black Sea region commercially and Europe's dependence on the region using a CGE model with multi region input-output dataset GTAP and GTAP nutritional module. The study employs 33 sectors across 23 regions and countries, and modeled many shocks related to agriculture, trade restrictions, fertilizer restrictions, and weather shocks. Many scenarios involving these channels and their impact on

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3). current food security; 4). its economic and political situation; and 5). the share of income that consumers spend on food in a country (Hellegers, 2022, page 1504).

food and agricultural systems were considered. Another evidence using a quantitative approach introduced by OECD (2022a) using NiGEM global macroeconomic model to measure the effect of the war. The simulation indicates that global growth would decline by 1 percentage point and global inflation would increase by 2.5%.

The depth of the war's likely impacts would rely on several determinants such as dependency on imported commodities (particularly energy and food – wheat), economic linkages with the two warring countries, the exports of agricultural and energy products, whether an economy is net exporter or importer of food and energy. Indeed, net agricultural and energy importers in the third world are particularly venerable while net exporters of food and energy are expected to gain (Garicano, 2022).

Finally, Abay (2023) recommends that in the short term, it is important to diversify sources of wheat with consideration of cost benefit analysis for such policy option. There is an urgent need to protect the poor and vulnerable households in the selected countries. While in the long term, in Egypt, the paper recommends considering land expansion, which is possible through improving water management and modernizing agricultural systems. In Sudan, increasing production and productivity is possible for wheat, as well as producing other crops that could provide foreign exchange. At the external level, Bilali and Hassen (2022) recommend a debt relief for poor and food insecure countries, strengthening food sovereignty, financing agroecology that depends less on external production inputs and replacing wheat and maize with traditional crops.

In a nutshell, the impact of the war will be determined by the duration of the war as well as a policy response (OECD, 2022a). The impact would vary across regions as Europe and Central Asia are expected to be severely impacted by the war due to common borders and tied economic linkages with the two warring countries (Tank, 2022; CRS, 2022; and Guenette, 2022).

3. Overview of Economic Performance

After presenting the main strands of the literature related to the impact of the war on emerging economies, especially Egypt and Sudan, we present the main macroeconomic developments in the two countries after the war. The latter revealed to which extent the two countries are vulnerable to the rest of the world as it exacerbated the existing imbalances that characterize the two countries.

In terms of GDP size, Egypt is the third largest economy in Africa, while Sudan ranked the 17th out of 51 Africa countries in 2021. In addition, the economic performance and the challenges facing each country vary. On the one hand, in the fiscal year 2022/2023 the World Bank estimated Egypt's economic growth at 4.5% down from 6.6% in FY 2021/2022. Moreover, between March and August 2022, the average headline urban and core inflation have accelerated to 13.1% and 13.7% respectively exceeding the Central Bank of Egypt's target of 7% +/-2 percent[12]. The

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[12] https://www.worldbank.org/en/country/egypt/overview.

ongoing RUW is expected to increase the pre-existing pressures on the external accounts and weaken the exchange rate and the debt-to-GDP ratio is expected to exceed the targeted 78% reflecting the adverse valuation effects of the exchange rate depreciation. These developments preset grave challenges to the government programs aiming to alleviate the impact of rising inflation that include widening the coverage of the Takaful and Karama cash transfers.

Since the portioning of the country in 2011, Sudan has been facing a deep economic crisis manifested in negative economic growth rates, high inflation rates, successive waves of exchange rate depreciation, trade account persistent deficit, deteriorating macroeconomic conditions and longstanding political instability that further increased in May 2023. Sudan economic growth recorded negative growth since 2018, reflecting the deepening of the economic crisis. A contraction of 4% in GDP was recorded in 2020, while, it has declined slightly in 2022 to 1% (MoF, 2023) (Figure 1b). Contraction of growth comes from the interruption of economic activities due to COVID19, the inherited economic crisis, the political instability, and other structural factors (Elbadawi et.al., 2023). Unlink Sudan, Egypt's economy achieved high growth rates recently, since 2017\2018 it has been growing except in the last quarter of 2019\2020 when the growth rate was negative due to COVID-19, it reached a peak in the first quarter of the fiscal year 2021/2022 as the economy grew by 9.8%, and in the first quarter of 2022\2023, the economy grew by 4.4% (Figure 1a). Despite Egypt's macroeconomic resilience, thanks to different stabilization policies adopted between 2014 and 2016, most of its structural problems have not been addressed, which has affected the ability of the Egyptian economy to boost the real economy, generate jobs and to have more sustainable economic growth (Amer et al. 2021).
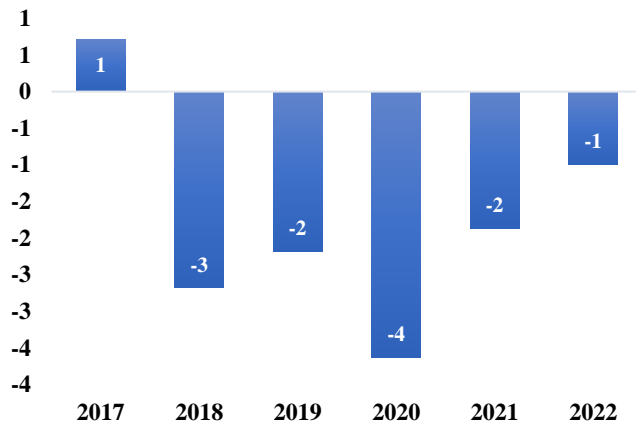
Figure 1. Real GDP Growth (y-o-y, %) in Egypt and Sudan

(a): GDP Growth in Egypt
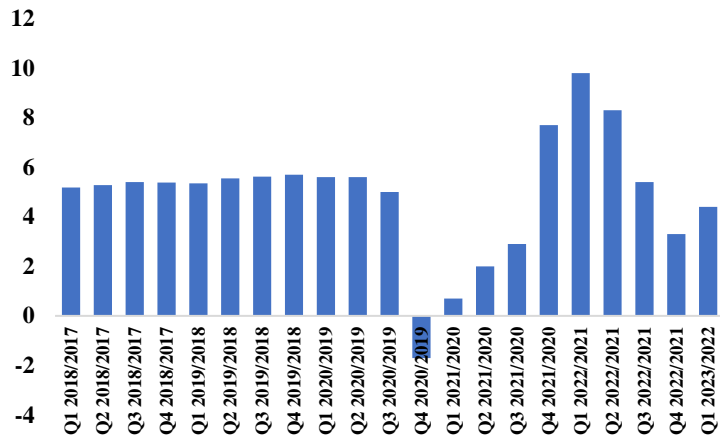
Source: Ministry of Planning and Economic Development online dataset.

(b): GDP Growth in Sudan

Source: The World Bank Group, World Development Indicators.

As per inflation, both Egypt and Sudan experienced high waves of inflation in the wake of the war in Ukraine. Figure 2a and b show that, in Egypt, both headline and core inflations increased significantly to reach around 32% and 40% in February 2023 (Figure 2a). However, prices of fruits and vegetables were more volatile (Figure 2b) reaching a peak of 48% in April 2022, right after the war.

Figure 2. Evolution of Inflation in Egypt

(a) Headline and Core Inflation in Egypt
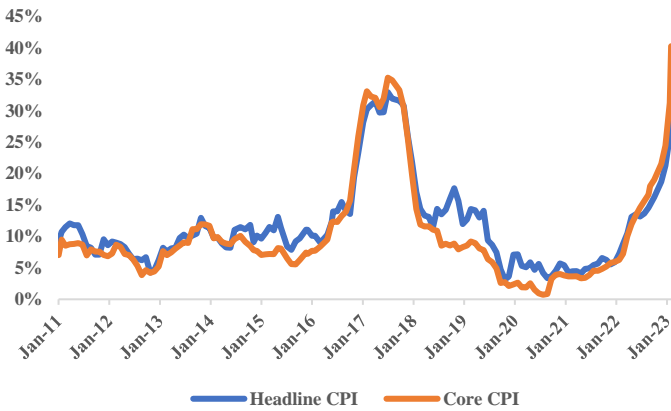
(b) Volatile and Administered Prices in Egypt
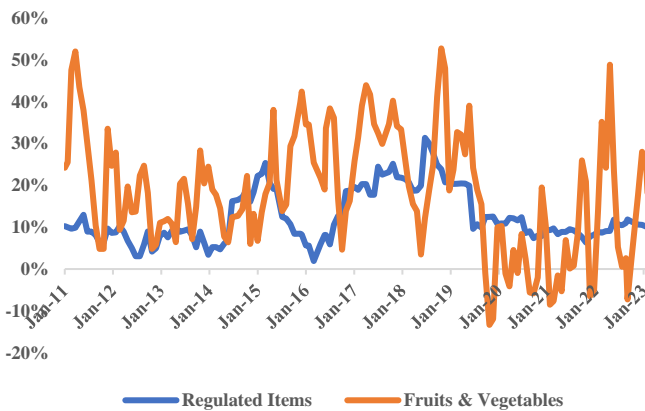
Source: Central Bank of Egypt

As per Sudan, in recent years, inflation rates have escalated to an unprecedented level in the history of the Sudan economy. Inflation was about 14% in January 2011, however, it rose to 52% by January 2018, then escalated to its highest level in January 2021, when it reached 304%, before declining again to 260% in January 2022, and a further decrease to 84% in January 2023 (Figure 3a) driven by transportation, housing, and food (Figure 3b). Between 2021 and 2022, inflation dropped by 120.3% down from 359.1%, and during October 2022 and January 2023, staple food prices have declined by about 25% across all markets. However, in the same period, energy price has increased by 40% and the fertilizers price soared by 425%. As a result, the number of people facing acute food insecurity has increased by 4.3 million up from 11.7 million in 2022.

Figure 3. Evolution of Inflation in Sudan

(a) Headline and core inflation in Sudan (%)
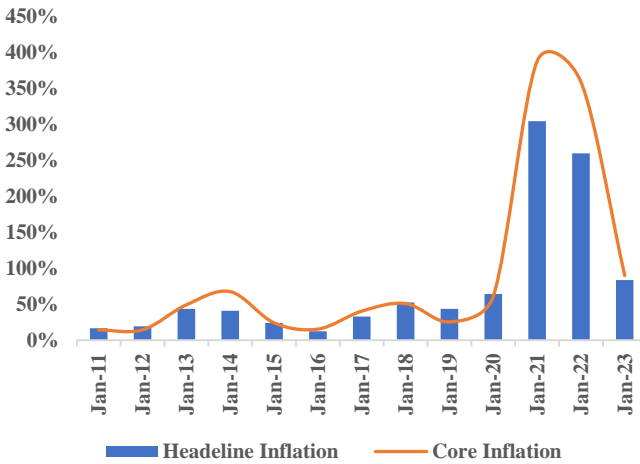
(b) Food, housing, and transportation inflation in Sudan
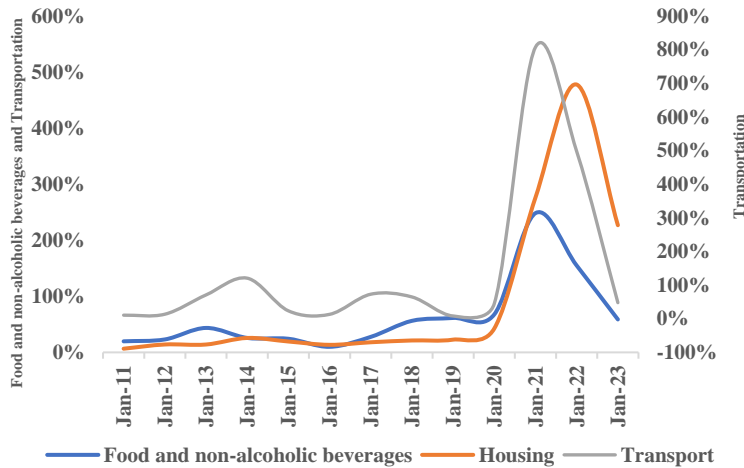
Source: Sudan Central Bureau of Statistics.

One of the main reasons behind the surge in inflation was the evolution of the exchange rate in the two countries. First, in Egypt, despite the floating that took place in 2016 with the IMF program, the Central Bank of Egypt (CBE) adopted an administered exchange rate regime (Figure 4a). While such policy was not sustainable with the surge in external debt and the scarcity of foreign currencies in the economy, the CBE started a series of currency devaluation early 2022 until the dollar reached an official rate of 31 EGP/USD in May 2023, up from 15.6 EGP/USD in March 2022. At the same time, Egypt's foreign debt (Figure 5a and b) increased to reach significantly high levels with the share of external debt in national income increased from 21.1 per cent in 2016 to 32.4 percent in 2022. Moreover, between 2019 and 2022, the share of short-term debt to foreign reserves increased, putting further pressure on Egypt's foreign currency (pressured by the decrease in tourism, exports, and FDI between 2019 and 2022). This led the Egyptian government to announce the floatation of its currency in October 2022 and conclude another loan with the IMF

and other international financial institutions of 9 billion USD after the one of 2016 (12 billion USD). Yet, it is important to note that, despite the devaluations, the exchange rate remains relatively managed, which explains the widening gap between the official rate (31 EGP/USD) and the black market one (around 38 EGP/USD) as per May 2023.

As it was mentioned before, the Egyptian government implemented several stabilization reforms through two main IMF programs. In 2016, the Government of Egypt (GoE) concluded an agreement with the IMF and implemented a reform program. Significant reforms, including sharp reductions in energy subsidies and a freeze in public sector hires markedly improved macroeconomic aggregates but did not result in improved incomes and employment prospects for the majority of the population (Heintz, 2018). Indeed, in 2019, GDP growth reached 5.6 per cent, the inflation rate decreased to 9.4 per cent, the unemployment rate declined to 7.9 per cent, the overall fiscal deficit dropped to 8.0 per cent – after having peaked at 16.5 per cent in 2014 (World Bank 2017) – and international reserves increased to reach US$44 billion after plummeting to $14.9 billion in 2013. Yet, poverty increased, inequality has deepened, and the living standard of the middle class has deteriorated as wages and pensions have not kept up with inflation. With the increase in external debt, the GoE concluded another loan with the IMF with a special focus on structural reforms and improving the competition policy on the Egyptian market.
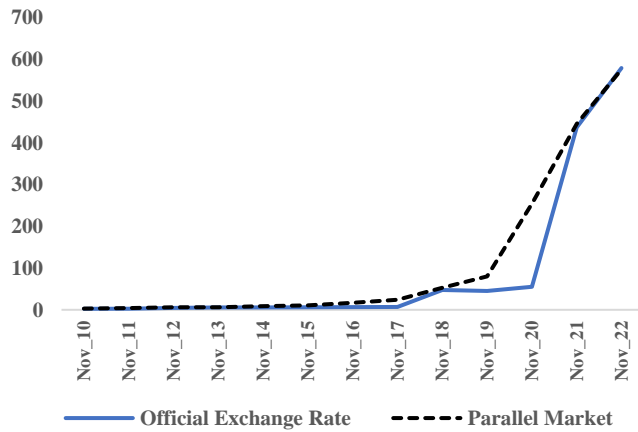
Figure 4. Evolution of the exchange rate in Egypt and Sudan

(a) Official exchange rate in Egypt
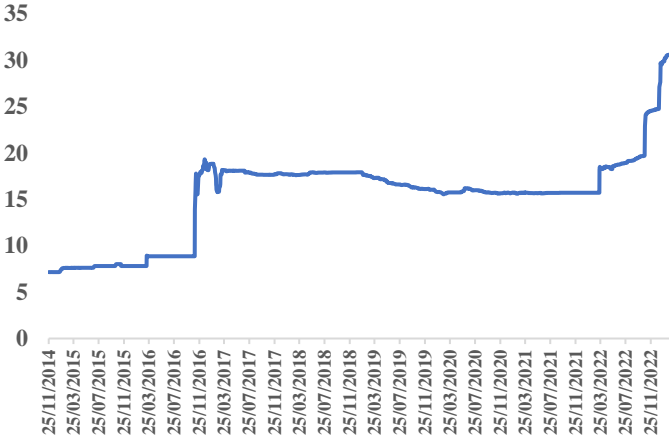
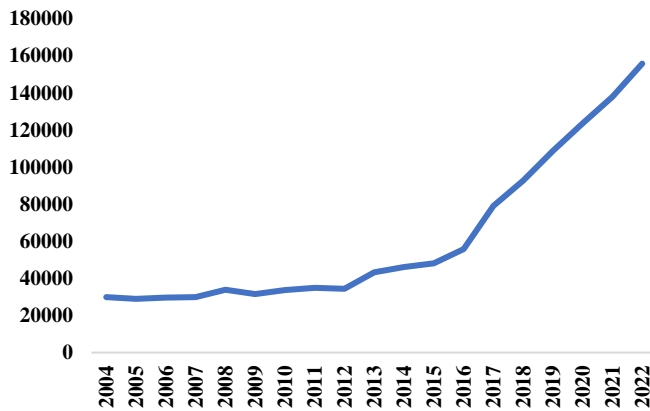Source: Central Bank of Egypt.

(b) Parallel and official exchange rate in Sudan
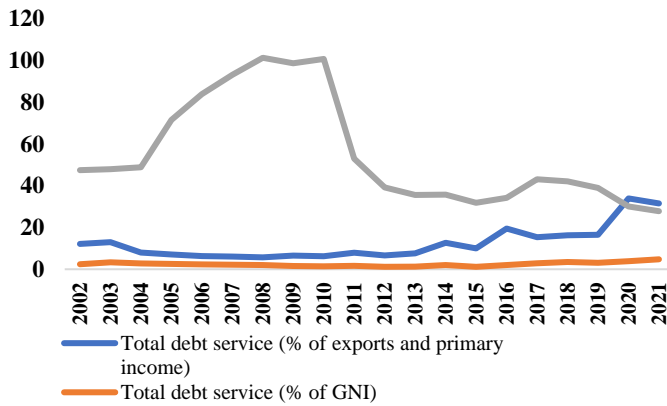

Source: CBoS.

Figure 5. Egypt's External Debt

(a) Level of External Debt (USD)

Source: Central Bank of Egypt

(b) Debt Service (%)

Source: Central Bank of Egypt.

In Sudan, exchange rate has been highly deteriorating since the secession. More particularly, in recent years, the exchange rate has suffered from two issues: firstly, the continuous deterioration of the exchange rate in the parallel market, and secondly, the widening gap between the official and parallel exchange rates. Successive governments focused their interventions on unifying the exchange rate, the CBoS moved from a fixed exchange rate regime to a managed float exchange rate, accordingly the gap has getting small by the end of 2018, official rate was 48 SDG\US$ while, it was 53 SDG/USD in the parallel market. However, that policy was no longer effective as the government of Omar al-Bashir's fell in April 2019 because of the December revolution. Thus, the main result of the policy was setting the official rate at 55 SDG/USD, by the end of 2020, the gap between the two rates widened, the CBoS adopted a managed float exchange rate in the context of the IMF-SMP which was adopted since February 2021, accompanied with other structural reforms (fuel subsidies removing). Again, exchange rates witnessed a rise in the parallel market, so the CBoS took a decision to fully liberalize the exchange rate in March 2022. The core causes of both exchange rate deterioration and high inflation rates could be summarized in Lack of sound macroeconomic management, monetization of the fiscal deficit due to lack of real resources to finance the expanded government expenditure, business environment, trade deficit and the gap of external resources, and most recently, COVID-19 pandemic and the political crisis in the country (Suliman, 2012, Elbadawi et al, 2023).

Sudan faces a large and unsustainable External Debt burden that increased to unsustainable levels. In 2019, it reached USD 56.3 billion, it worth 199% of GDP compared to 188% in 2018. The majority of external debt is in arrears (for instance, around 85% of total external debt in 2019 was arrears). Paris Club and Multilateral institutions (WB, IMF and AFDB) are the big lenders to the country where 48% of external debt is sourced. External balance has been deteriorating since 2012 for instance, trade balance performance shows that the country plunged back to massive trade deficit after a decade of relative stability. The trade deficit exceeded USD 6 billion in 2015. This is basically due to the loss of the majority of oil exports as a direct impact of South Sudan secession in 2011. The weakness of competitiveness of the Sudanese exports is also a major determinant of this trend. The most of government spending were directed to strategic commodity subsidies, wages, and salaries while, the social protection and development were receiving fewer resources. For instance, the distribution of federal government budget during 2016-2019 was dominated by compensations of employees (30%), subsidies (28%), purchasing of goods and services (government operations) (12%), social benefits (health insurance, lifesaving medicine, cash supports) (6%).

At the level of multilateral arrears, in March 2021, Sudan cleared its arrears to IDA through bridge loan (USD 1.15) provided by the United States. The country is eligible for access to around USD 2 billion from IDA, private sector support through (IFC) and insurance against the political risks through (MIGA). Those achievement opened the door for Sudan to reach the decision point in HIPC and restored it`s full engagement with IFIs. The potential concessional finance and donor's

commitment will allow the country to mitigate the impact of ongoing reforms and realize the development. Sudan has been incorporated in SSTL since 1996 which putting the country in a long isolation from the international community. The United States left Sudan from States Sponsors of Terrorism in September 2020. Elbadawi et al. (2023) argue that, in Sudan, due to the limited external financing, monetization of the deficit becomes unavoidable, fueling a vicious cycle of exchange rate depreciation and deficit expansion. The regime, therefore, callously pursued its expansive pre-secession macroeconomic policy, igniting a major inflationary spiral, driven by food price inflation.

Since the debt relief is possible through Highly Indebted Poor Countries (HIPC), the government of Sudan started to solve external debt accumulation issue through joining to HIPC. The road towards debt relief passes through several stages. To reach the decision point in HIPC, a country should be eligible to IDA, keeping good records of economic reform and prepare the poverty Reduction Strategy Paper (PRSP). In fulfilling those requirements, the Sudanese authorities undertaken many actions and implemented several reform measures: the country kept a good record of economic reform through Staff-Monitored Program (IMF - SMP) that has approved by the IMF for monitoring the reform records of the home-grown policy agenda aiming at "stabilizing the economy, improving competitiveness, and strengthening governance" [13]. In the context of IMF -SMP, the Sudanese authorities committed to undertake several economic reform measures. "Fuel subsidies reform, exchange rates unification and allowing banks and foreign exchange bureaus to set market rate subject on moving with a band and gradual adjustment to customs exchange rate" [14]. Recently, the Sudanese authorities removed fuel subsidies and unified exchange rates in February 2021.

As a response to the increasing inflation, the two governments undertook some policy responses to mitigate the crisis. In Egypt, the government decided to curb state spending and putting costly projects on hold. The Central Bank raised interest rates four times in 2022. In addition, for social policies, coverage under the conditional cash transfer programs known as Takaful and Karama (Solidarity and Dignity) has expanded (2.7 billion pounds will be allocated to include 450,000 new families). In addition, the government implemented new programs to provide cash transfers to irregular workers. 190.5 billion pounds have been allocated to the National Authority for Social Insurance to disburse pension increases by 13%, with a minimum of 120 pounds, in addition to increasing the tax exemption limit from 24 to 30 thousand pounds. As per the case of Sudan, in collaboration with the international community, the World Bank in particular, Sudan introduced a universal quasi basic income the so called the Sudan Family Support Program (SFSP) however it stopped after the October 2021 military takeover. SFSP is a cash transfers introduced as a mitigation measure for the hardship reforms, the program was intended to transfer an amount per

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[13] For more details see IMF Sudan Country Report No 20\289.
[14] Those measures were the main structural benchmarks of the IMF – SMP, see the IMF -SMP for Sudan 2020 document.

person for six months, In February 2021, the program was formally launched with commitments of \$820 million in donor financing and IDA Pre-Arrears Clearance Grants (Elbadawi et.al, 2023). Thus, the two countries share some similarities pertaining to high inflation, a managed exchange rate, several currency devaluations, a surge in the external debt, a widening gap between the official and the unofficial exchange rate. Yet, it is clear that, in the two countries, there is a strong correlation between the exchange rate and the inflation developments. This is why the next section analyzes the exchange rate pass-through to inflation.

4. Pass-Through in Egypt and Sudan

The immediate impact of the RUW is expected to raise global inflation, exacerbate the external accounts' pressures; depreciate exchange rate; raise public debt; limit the fiscal space and hence feed inflation in both countries. Thus, a dynamic Purchasing Power Parity (PPP) will be estimated for each country. The PPP is key building block in an open economy macroeconomic model, and is also used in voluminous literature focusing on the exchange-rate pass-through and cross-country comparisons, (see e.g., Goldberg and Knetter,1997; Sekine, 2006; Takhtamanova, 2008; and Jooste and Jhaveri 2014). Typically, the PPP, or the law of one price, is expressed as:

$$E^h P^f / P^h \equiv 1 \tag{1}$$

Where E^h is the exchange rate of the domestic country's currency per unit of foreign country's price; P^h is the domestic country's price, P^f is the foreign country's price in own currency. However, identity (1) may not hold due to; i) the differences of the baskets of goods to compare purchasing power across countries, ii) the presence of trade controls, taxes and quotas, iii) the prevalence of administered prices and exchange rates. Thus, the econometric specification we adopt is as follows:

$$p_t^h = \alpha + e_t^h + p_t^f \tag{2}$$

Where α accounts for the frictions between the domestic country and foreign ones; t indexes time, and the rest of variables are defined as before with low case lettering representing the log-form. Since the law of one price is an identity, there is no a priori reason for placing the domestic prices on the left-hand side and the exchange rate corrected for foreign prices movements on the right. Hence, the structural model of Equation (2) could be expressed in following vector error correction system (VERS) of general order p assuming all variables are first-order integrated;

$$\Delta y_t = a_0 + a_{1t} - \Pi y_{t-1} + \Lambda x_t + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t,$$

$$\Delta x_t = a_{0x} + \sum_{i=1}^{p-1} \Gamma_{xi} \Delta y_{t-i} + v_{tx}, \qquad\qquad t = 1,2,....,n \tag{3}$$

where, y is 2x1 vector containing the jointly determined endogenous variables p^h_t and e^h_t x is a vector containing the p^f_t and other deterministic terms; and the errors ε_t and v_{tx} are distributed as; $\mu_t = \begin{pmatrix} \varepsilon_t \\ v_t \end{pmatrix} \sim iid(0, \Sigma)$, where Σ is asymptotic positive-defined matrix. The intercept and trend coefficients a_0 and a_{1t} are $2_y x1$ vectors. $\Pi = \alpha\beta'$ is the long-run multiplier matrix, α and β' are respectively (2 x r) and (3xr) each with full-rank order r; and r is the number of expected cointegrating vectors. $\Gamma_{1y}, \Gamma_{2y}, ..., \Gamma_{p-1y}$ are 2x3 coefficients matrix capturing the short-run dynamics and Ψ_y is $2_y xq$ matrix of coefficients on the first difference of exogenously determined foreign inflation (see Pesaran and Pesaran (2009) for further details).

The endogenous variable includes the CPIs of Egypt and Sudan. Our explanatory variables are the nominal effective exchange rate (NEER, an increase refers to a depreciation) and foreign inflation proxied by the CPI of the USA. Monthly data are used (between 2012-2022). While the NEER comes from Bruegel dataset, both domestic and foreign CPI come from the International Financial Statistics of the IMF. It is important to note that, although both Egypt and Sudan have experiences of controls that have led to the emergence of the parallel exchange rate market before the recent reform, it was difficult to obtain a long time series for the black market rate in both economies, this why we opted for the NEER.

Since, testing for cointegration is sensitive to the lag-order of the VAR underlying the analysis and whether a constant and trend are forced into the cointegrating vector; the unit root testing is used to ascertain the variables' stationarity and the Johansen test is used to determine the order of cointegration; also, Akaike information criterion and Schwarz Bayesian criterion are utilized for the selection of the lag-order of the VAR (two lags).

Table 1 presents the results of pass-through in both Egypt and Sudan. As it was mentioned before, the VECM helps us analyze long-run equilibrium relationships among our two variables of interest (inflation and exchange rate) and short-run deviations from that equilibrium. Moreover, the adjustment coefficients show us how the short-run deviations or disequilibrium are corrected. While the error correction term is negative, lower than one, and statistically significant in the two economies, it is higher in Egypt. In addition, the lagged value of CPI plays a significant role in explaining domestic inflation, showing how there is a strong inertia. Both foreign inflation and NEER are not statistically significant in the short run, but highly significant in the long run in the two economies. Indeed, an increase in NEER (referring to its depreciation) is associated with a higher inflation, especially in Sudan because of its lack of diversification.

Table 1. Pass-Through in Egypt and Sudan

Vector error-correction model		
ΔLn(CPI)		
	Sudan	Egypt
Error	-0.0126***	-0.122***
	(0.00303)	(0.0334)
ΔLn(CPI)(-1)	0.568***	0.271***
	(0.0778)	(0.0864)
ΔLn(NEER)(-1)	0.00161	0.00477
	(0.0210)	(0.0184)
ΔLn(CPI*)(-1)	-0.414	0.0373
	(0.956)	(0.272)
Cointegrating equations		
Ln(CPI)		
	Sudan	Egypt
Ln(NEER)	1.454***	0.312***
	(0.148)	(0.0279)
Ln(CPI*)	2.557***	0.122
	(0.124)	(0.249)
Observations	130	130
chi2	718.632	145.525
P>chi2	0.000	0.000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

We further explore the causal relationship between these variables using the Granger causality test. Table 2 shows that, as expected, the causality runs from the NEER to domestic CPI in the two countries (as we reject the null hypothesis that NEER does not Granger cause CPI).

Table 2. Granger causality Wald tests

		Sudan			Egypt		
Equation	Excluded	chi2	df	Prob > chi2	chi2	df	Prob > chi2
Ln(CPI)	Ln(NEER)	0.933	2	0.627	5.502	2	0.064
Ln(CPI)	Ln(CPI)*	5.830	2	0.054	3.296	2	0.192
Ln(NEER)	Ln(CPI)	23.315	2	0.000	5.021	2	0.081
Ln(NEER)	Ln(CPI)*	0.250	2	0.882	4.437	2	0.109
Ln(CPI)*	Ln(CPI)	9.537	2	0.008	1.668	2	0.434
Ln(CPI)*	Ln(NEER)	0.125	2	0.939	1.737	2	0.419

Source: Authors' own elaboration using Stata.

This exercise shows that significant evidence of pass-through is interpreted as signs of vulnerability to the global food and energy prices shocks, which can affect food security. At the domestic level, the high prices of energy and fertilizers are expected to raise the cost of production in agriculture (a major sector in Sudan) which could lead to changes in the crops mix, and further threaten food security, which is analyzed in the next section.

5. Food Security

Food security in Egypt and Sudan remains a major issue, as the two countries are heavy importers of wheat. Figure 6 shows that both countries are highly dependent on cereals imports at the African and global level (Figure 6a). In addition, Russian and Ukraine have the lion shares in the imports as they represent, together, 55% of Egypt's and 35% of Sudan's imports of cereals. Thus, reliance on imported wheat is one of the main indicators of the Egypt and Sudan vulnerability to the war.

Figure 6. Import dependency of Egypt and Sudan

(a) Share of African in global cereals imports for major African importers
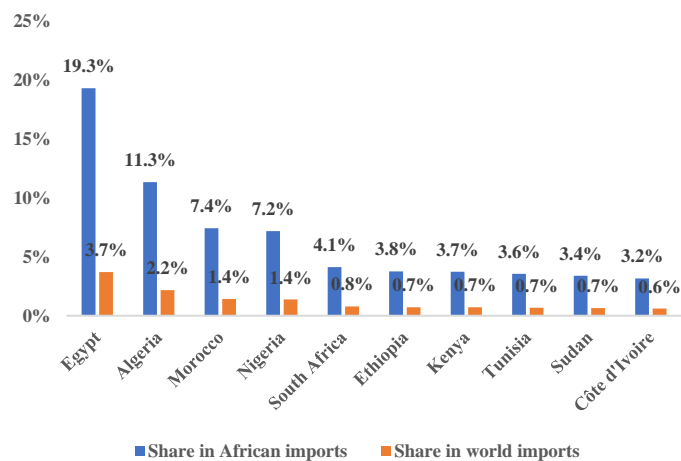
Source: Authors' elaboration, based on ITC website.
Note: Figures are averages over the period 2017–2021.

(b) Share of Russia and Ukraine in global cereals imports for major African importers
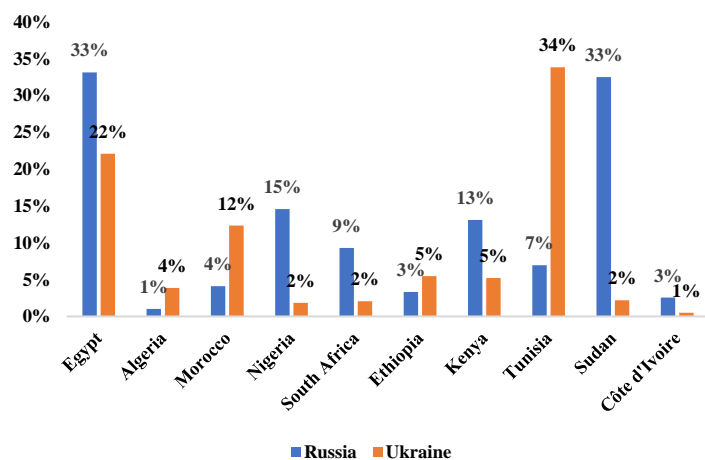
Source: Authors' elaboration, based on ITC website.
Note: Figures are averages over the period 2017–2021.

More specifically, Table 3 shows the total imports of wheat and wheat flour in the last three years (2020-2022) in Sudan, wheat imports increased in 2022 from 1.33 million to 1.81 metric tons. In

Egypt, these figures are also high as, in 2021; Egypt imported 4.53 billion USD in wheat, becoming the first largest importer of wheat in the world. At the same year, wheat was the second most imported product in Egypt (primarily from Russia, Ukraine, Romania, Australia, and France). In 2021, Egypt imported 5.5 million tons of wheat.

Table 3. Wheat imports in Sudan (million metric tons)

Metric Tons	2020	2021	2022
Wheat	1470546	1097465	1680681
W-Flour	293981	235268	127226
Total	1764527	1332733	1807907

Source: FAO (2023).

In Sudan, food security situation was expected to improve before the conflict eruption, according to (FAO, 2023) as cereal production in Sudan was expected to increase in 2023, the forecasting of sorghum and millet production was an increase in production for both crops 5.2 and 1.7 million tons with a surplus of 484000 and 679000 of sorghum and millet respectively. Yet, Sudan requires around 3.6 million of cereal (mostly wheat) to be imported from abroad to meet cereal demand. Before the fighting, 11.7 million are projected to face high acute food insecurity during (June-September 2022) with a current 9.6 million are already in acute food insecurity. Furthermore, the projections indicate that 19 million people in Sudan to face hunger due to current fighting, one third of the population was already facing hunger (WFP). This is attributed to conflict, prices significant increase, and reduced harvest (IPC), inputs price increase (fuel), poor harvest and climate related events (floods) (WFP)[15]. In the meantime, the former transitional government reduced wheat subsidies, Tables 4 and 5 show wheat subsides performance and budget allocated to this purpose.

Table 4. Wheat subsidies policy in Sudan

	Wheat Subsidies (%)			
	In percent of GDP (%)	Share of expenditure (%)	Share in total subsidies (%)	Subsidies share in expenditure (%)
2017	1.5	10.7	34.6	30.8
2018	0.6	3.8	6.6	57.1
2019	1	5.1	8.1	63.3
2020	1.2	8.8	32.2	27.5
2021	1.4	7.8	63.6	12.3
2022	0.06	0.5	1.8	27.3
2023	0.02	0.13	1.4	9.3

IMF (2020) and MoFEP (2023).

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[15] Sudan | World Food Programme (wfp.org)

Table 5. Performance of wheat subsides expenditure, total expenditure and commodity subsidies

	Expenditure	Subsidies	Wheat
2017	113.5	35	12.1
2018	229.3	130.9	8.6
2019	378.8	239.9	19.5
2020	612.7	168.2	54.1
2021	1814.9	222.9	141.8
2022	3429.4	931	17
2023	8195.8	760.3	10.3

IMF (2020) and MoFEP (2023).

More specifically, Table 6 compares food security in both Sudan and Egypt using the food security environment index developed by the Economist Intelligence Unit (EIU). Compared to 2021, most of Egypt's sub-indices deteriorated in 2022, while some of them improved in Sudan. While both affordability and sustainability are moderate in Egypt and very weak in Sudan, availability and quality of food (dietary diversity, nutritional standards, micronutrient availability, protein quality, and food safety) are weak in both Egypt and Sudan.

More importantly, some components are rather alarming such as the change in average food cost and the proportion of population under global poverty line in Sudan, and trade in agriculture products in Egypt (being the largest importer of wheat). This performance is explained by several structural challenges in the two countries pertaining to access to agricultural inputs and agriculture research and development in Egypt and supply chain infrastructure in Sudan. These challenges are amplified by climate change related problems related to water stress, political commitment to adaptation and disaster risk management.

This food security problem becomes particularly important with poverty rates that remain high in the two countries. In Egypt, official estimates for 2020 showed that 29.7 percent of the Egyptian population was poor up from 27.8 percent in 2015. In Sudan, poverty rate reached 46.5 in 2009 and 32% in 2020. Conflict regions registered higher poverty rates, while it has increased in the rest of the regions. The main drivers of poverty in Sudan are the armed conflict and civil wars, economic mismanagement (lack of sound economic policy), economic instability and low job creation [16]. These figures, in the two countries, are expected to further increase with the surge in inflation.

Thus, to address food security in Egypt and Sudan, a more comprehensive approach is needed. The latter must focus on structural challenges that characterize the agriculture sector. Yet, trade can also be an important tool that can partially mitigate this problem. Indeed, Aboushady and Zaki

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[16] For more in-depth analysis of poverty see the poverty reduction strategy paper (PRSP-2021).

(2023) show that trade in agricultural and food sectors can improve food security (Barlow et al., 2020; Smith and Glauber, 2020; Martin, 2017; Brooks and Matthews, 2015; FAO, 2015; Clapp. 2014; Matthews, 2014). At the same time, trade liberalization can also involve some risks to food security. In fact, international trade can make food more accessible by enabling products to flow from surplus to deficit areas. Trade flows can make food more accessible and more affordable thanks to more open trade policies. This is why the next section analyses the trade potential between these two countries.

Table 6. Food Security in Egypt and Sudan

Series		Egypt Score	Δ	Rank	Δ		Sudan Score	Δ	Rank	Δ	Average score (all countries) (all countries)
FOOD SECURITY ENVIRONMENT		**56.0**	**-2.5**	**77**	**▼6**		**42.8**	**+4.0**	**105**	**▲6**	**62.2**
1) AFFORDABILITY		65.2	-7.7	=66	▼4		35.2	+5.9	106	▲6	69.0
2) AVAILABILITY		54.2	-0.1	73	▲4		48.2	+7.1	92	▲13	57.8
3) QUALITY AND SAFETY		45.9	-0.8	101	▲3		53.9	+0.6	=86	↔	65.9
4) SUSTAINABILITY AND ADAPTATION		55.8	+0.1	51	▼4		35.7	+1.2	109	▲2	54.1
1) AFFORDABILITY		**65.2**	**-7.7**	**=66**	**▼4**		**35.2**	**+5.9**	**106**	**▲6**	**69.0**
1.1) Change in average food costs		70.5	-29.5	=70	▼69		0.0	0	=105	▲2	70.7
1.2) Proportion of population under global poverty line		70.7	0	75	↔		55.3	0	85	↔	76.6
1.3) Inequality-adjusted income index		45.5	0	76	↔		36.9	0	95	↔	55.5
1.4) Agricultural trade		32.7	-3.7	113	▼1		37.2	+1.7	112	▲1	67.6
1.5) Food safety net programmes		100.0	0	=1	↔		53.7	+26.9	72	▲11	72.4
2) AVAILABILITY		**54.2**	**-0.1**	**73**	**▲4**		**48.2**	**+7.1**	**92**	**▲13**	**57.8**
2.1) Access to agricultural inputs		25.3	0	=104	▼2		59.5	+0.6	54	▼5	57.6
2.2) Agricultural research and development		35.7	+1.8	78	▲5		53.6	-0.9	46	▼7	47.1
2.3) Farm infrastructure		85.6	-0.4	4	▲1		47.7	+0.8	86	▼2	55.7
2.4) Volatility of agricultural production		85.0	0	=30	↔		40.8	+3.4	=97	▲4	68.7
2.5) Food loss		69.6	-0.6	82	▼1		69.8	+8.7	81	▲16	75.5
2.6) Supply chain infrastructure		50.9	0	50	▼1		20.2	0	102	▲2	47.8
2.7) Sufficiency of supply		44.5	-1.7	76	▲4		72.0	+48.1	=56	▲43	61.9
2.8) Political and social barriers to access		52.4	0	70	↔		16.2	0	112	↔	58.7
2.9) Food security and access policy commitments		47.5	0	=69	▼2		47.5	0	=69	▼2	47.1

Table 6. Food Security in Egypt and Sudan (contd.)

3) QUALITY AND SAFETY		**45.9**	**-0.8**	**101**	**▲ 3**		**53.9**	**+0.6**	**=86**	**↔**	**65.9**
3.1) Dietary diversity		35.5	0	107	↔		44.1	0	86	▼ 1	52.5
3.2) Nutritional standards		0.0	0	=109	↔		57.1	0	=64	▲ 5	63.7
3.3) Micronutrient availability		59.7	0	89	↔		67.7	0	=68	↔	67.8
3.4) Protein quality		63.5	-3.8	66	▼ 10		56.7	+2.5	72	▲ 3	68.5
3.5) Food safety		71.1	0	79	▼ 1		43.9	+0.4	94	▲ 1	76.4
4) SUSTAINABILITY AND ADAPTATION		**55.8**	**+0.1**	**51**	**▼ 4**		**35.7**	**+1.2**	**109**	**▲ 2**	**54.1**
4.1) Exposure		76.8	0	=16	↔		70.0	0	48	↔	67.9
4.2) Water		36.2	0	=57	▲ 1		13.8	0	=98	↔	41.2
4.3) Land		65.3	0	38	↔		56.1	+6.6	82	▲ 12	61.3
4.4) Oceans, rivers and lakes		40.2	0	=54	↔		34.7	0	72	↔	41.5
4.5) Political commitment to adaptation		32.3	+0.6	=92	↔		32.3	+0.8	=92	▲ 1	55.8
4.6) Disaster risk management		87.8	0	30	▼ 2		5.2	0	93	▼ 3	55.7

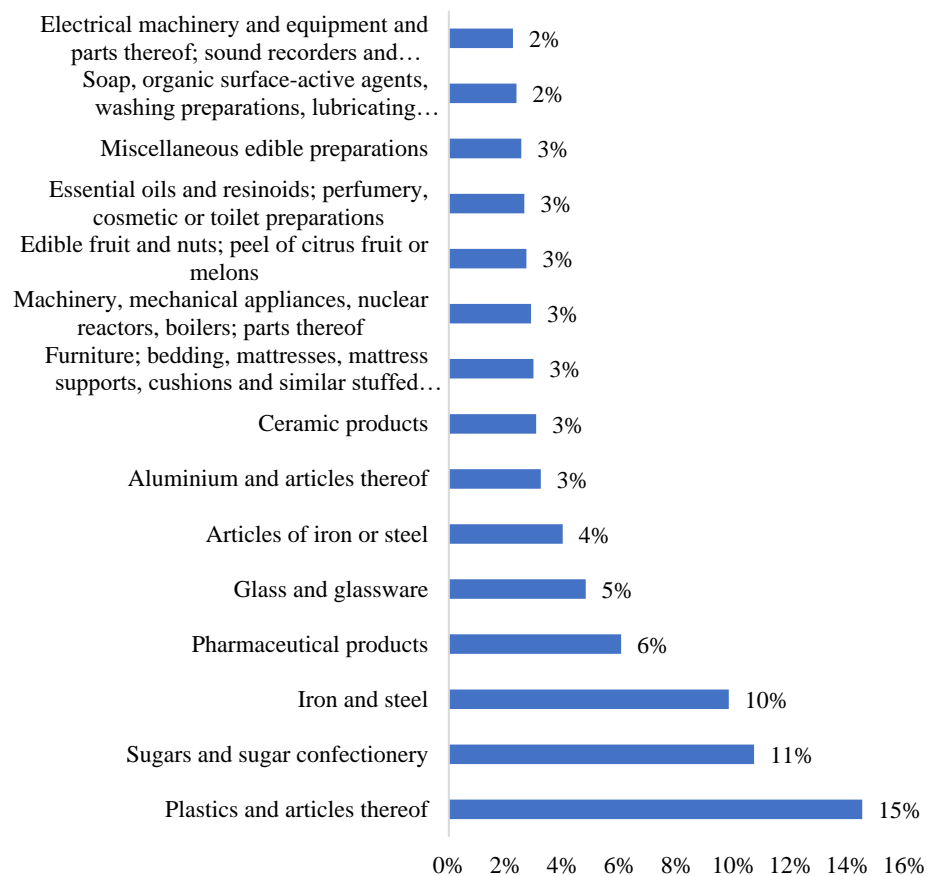**6. Building resilience: Sudan and Egypt Trade Relations**

6.1. Overview of Trade Relations

Historically, Egypt and Sudan have singed numerous deals relating to Nile water agreement in 1959; economic integration in 1983, the Four Freedoms Agreement (FFA) dealing with freedom of movement, residence, work, and ownership in 2014; and more recently, the two countries signed military cooperation and infrastructural development protocols in 2023. Despite the geostrategic interactions, the relations between the two countries soured during the rule of *Al Ingaz* (1989-2018). However, both countries shared common interest in cooperation in the Nile water negotiations between upstream and downstream riparian states. After the December 2019 revolution, the two countries signed deals to upgrade the electricity interconnection to supply Sudan by 700MW per year including scaling-up bilateral trade.

The two countries have great potential to become strategic corridors for food security and energy transmission in Africa benefiting from existing AfCFTA and FFA structures. In addition, the harmonization of the positions of the two countries regarding the Ethiopian renaissance dam crisis could further boost infrastructural developments in electricity and roads as well as in trade and investments flows to increase the potential of collaboration that could reduce the impact of food, energy fertilizers prices shocks.
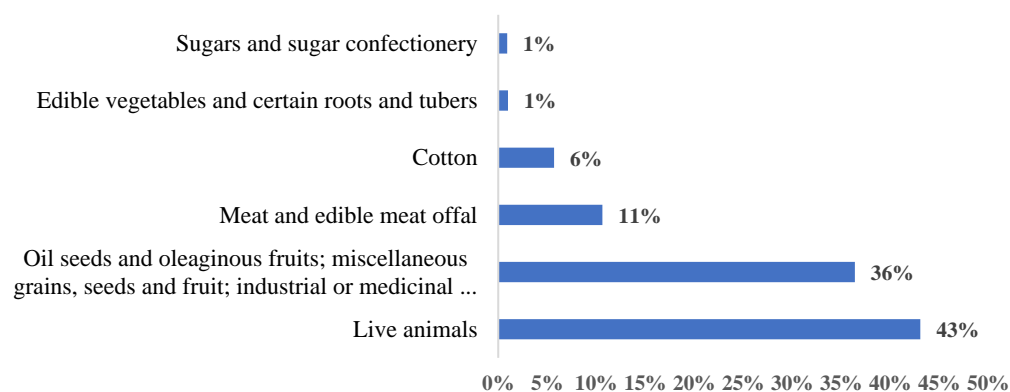
At the trade level, Sudan is a regional trade partner to Egypt where annual trade exchange between the two countries reached almost $1 billion in 2021, with Sudan being a strategic source of livestock to Egypt. More particularly, while Sudan came as the second-largest market for Egyptian exports after Libya. Egypt's trade exchange with Sudan reached $1.4 billion in 2022, up from $1.2 billion a year earlier, including $929.2 million in Egyptian exports and $504.4 million in imports. Figure 8 shows the share of top products exported by Egypt to Sudan. Among these products, plastics, sugar confectionaries and iron are ranked first followed by other manufactured products such as pharmaceuticals, furniture, machinery, and electrical products. Exports from Sudan to Egypt are rather different as they are primarily concentrated in live animals, oil seeds and meat (see Figure 9). Over time, bilateral trade between these two counties remains low, but stable from Egypt to Sudan and increasing from Sudan to Egypt (Figure 10).

**Figure 8. Share of Top Exports from Egypt to Sudan (%)**

Category	Share
Electrical machinery and equipment and parts thereof; sound recorders and…	2%
Soap, organic surface-active agents, washing preparations, lubricating…	2%
Miscellaneous edible preparations	3%
Essential oils and resinoids; perfumery, cosmetic or toilet preparations	3%
Edible fruit and nuts; peel of citrus fruit or melons	3%
Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	3%
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed…	3%
Ceramic products	3%
Aluminium and articles thereof	3%
Articles of iron or steel	4%
Glass and glassware	5%
Pharmaceutical products	6%
Iron and steel	10%
Sugars and sugar confectionery	11%
Plastics and articles thereof	15%

Source: Authors' own elaboration using the International Trade Center dataset.

Figure 9. Share of Top Exports from Sudan to Egypt (thousands USD)

Category	Share
Sugars and sugar confectionery	1%
Edible vegetables and certain roots and tubers	1%
Cotton	6%
Meat and edible meat offal	11%
Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal ...	36%
Live animals	43%

Source: Authors' own elaboration using the International Trade Center dataset.

Figure 10. Share of bilateral exports to world exports (%)
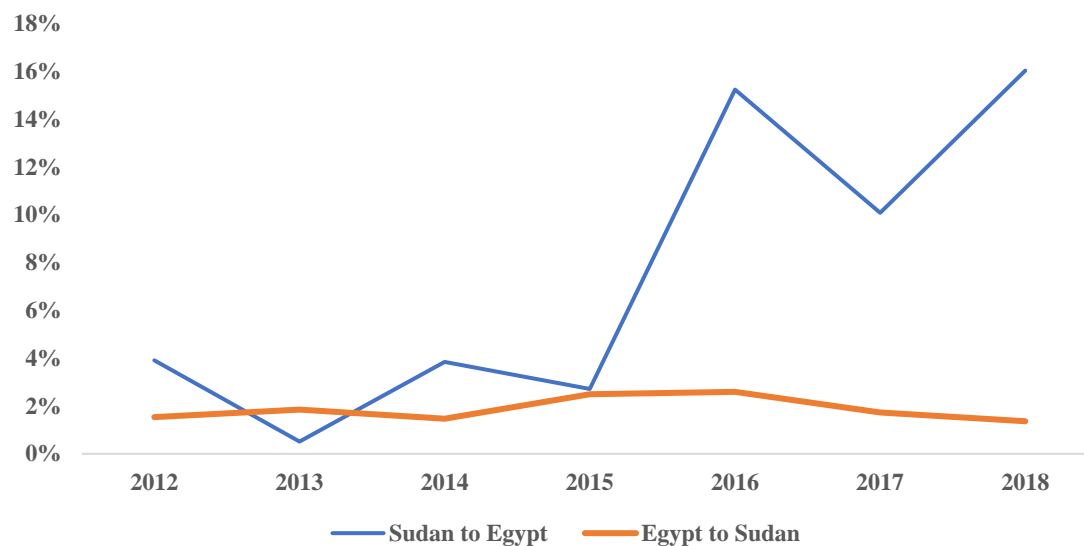
Source: Authors' own elaboration using the International Trade Center dataset.

## 6.2. Trade Complementarity between Egypt and Sudan

To further grasp to what extent trade in Egypt and Sudan is complementary, we present here the trade complementarity index that is a type of overlap index. It measures the degree to which the export pattern of one country matches the import pattern of another. A high degree of complementarity is assumed to indicate more favorable prospects for a successful trade arrangement. This index takes a value between 0 and 100, with zero indicating no overlap and 100 indicating a perfect match in the import/export pattern. However, high complementarity indices may be misleading if the countries are geographically distant, or if the size difference in the economies is large (i.e., a match in percentage terms does not imply a match in levels). There is also an aggregation bias given that the more the data are aggregated, the more likely one can obtain a high complementarity between two countries. To calculate this index, we use the following formula:

$$\left(1 - \left(\sum_i \left|\frac{\sum_w m_{iwd}}{\sum_w M_{wd}} - \frac{\sum_w x_{isw}}{\sum_w X_{sw}}\right|\right) \div 2\right) \times 100$$

Where d is the importing country of interest, s is the exporting country of interest, w is the set of all countries in the world, i is the set of industries, x is the commodity export flow, X is the total export flow, m the commodity import flow, and M the total import flow. In words, we take the sum of the absolute value of the difference between the sectoral import shares of one country and the sectoral export shares of the other. Dividing it by 2 coverts this to a number between 0 and 1, with zero indicating all shares matched and 1 indicating none did. Subtracting from one reverses the sign, and multiplying by 100 puts the measure in percentage terms.

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Figure 11 presents the results of this index between Egypt, Sudan, and some selected African countries. While Egypt's exports match more Sudan's imports (47%), the matching is lower the other way round (27%). For Egypt, this index is lower than with other economies such as South Africa, Morocco, and Kenya.

Figure 11. Complementarity Index between Egypt, Sudan, and Selected African Countries
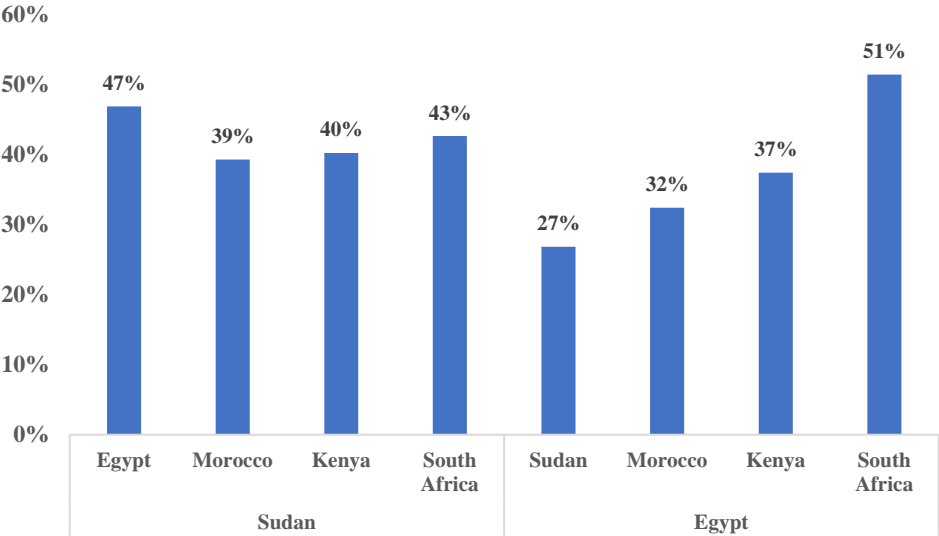
Source: Authors' own elaboration using the International Trade Center dataset.

Hence, from a trade perspective, while Sudanese meat is important for Egypt, the latter is an important source of manufactured products and to a much lesser extent food product. This is the current structure of bilateral trade might not help improve the status of food security in the two countries. Alternative venues in investment could be considered as it will be shown in the next section.

6.3. The Way Forward between Egypt and Sudan

As it was mentioned before, while trade is somehow complementary and might be necessary to increase cooperation between Egypt and Sudan and to improve food security, it is not sufficient. First, trade level is still modest because of several structural bottlenecks that require deep structural reforms pertaining to the improvement of the quality of infrastructure (road one), reducing red tape barriers and corruption in customs authorities, and addressing non-tariff measures and informal trade between the two countries.

In addition to trade, Egypt has strategic agricultural and animal production investment plans in Sudan[17]. In fact, bearing in mind that more than 90% of Sudan's land is arable, sound investments

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[17] There are nearly 229 Egyptian projects being implemented in Sudan, with up to $10.8 billion in investments. Nearly 315 Sudanese companies also operate in the Egyptian market, with some $97 million in investments.

can help the two countries achieve a higher food security[18]. Moreover, at the infrastructural level, Egypt is currently perceived as the regional energy power (with the electric interconnection line with Sudan). The two countries were also planning to build a 570-kilometer (354-mile) railway to facilitate the movement of goods between the two countries[19]. Finally, the government of Egypt expressed its interest to develop the transport sector and the port of Wadi Halfa. All these developments are likely to improve infrastructure and thus trade between the two economies. Yet, with the conflict eruption, such project might be halted as the situation in Sudan is already starting to have spillover effects on neighboring countries and the massive influx of refugees in Egypt is likely to increase.

7. Conclusions and policy implications

RUW introduced new challenges and risks to the under-recovery global economy, prices, volume of trade, and global economic prospects are likely to be affected by the war. The impact of the war varies from one country to another based on the economic linkages between an economy and the two warring countries, whether an economy is a net exporter\importer of food and energy. Hence, the objective of this paper is to examine the nexus between trade, food security and the war in Ukraine with a special focus on Egypt and Sudan. Given the high dependency of the two countries on wheat imports, both experienced high inflation and lower economic growth, threatening their food security.

Thus, the contribution of the paper is threefold: first, it examines the macroeconomic implications of the war on the two economies. Second, it analyzes the extent to which food security deteriorated and finally how trade can partially help improve food security in the two countries. To do so, using an error correction model, our results show that the exchange rate pass through was high in Egypt and Sudan and can have long term implications on inflation. To move forward, we explore how the two countries might develop bilateral capacities targeting agriculture, electricity, and infrastructure with the view to scale-up the economic cooperation. We show, using the trade complementarity index that, despite a limited complementarity between their trade structures, there is room to increase their bilateral exports if infrastructure and other behind-the-border barriers are addressed.

From a policy perspective, both internal and bilateral policies are needed. For Egypt, at the internal level, while the Central Bank of Egypt announced the adoption of a free-floating exchange rate regime in October 2022, this policy has to be more sustainable in the medium term to avoid managing an overvaluation of the Egyptian pound to reduce the burden on foreign exchanges and on the real sector that has to adjust to keep the currency stable. While this is necessary to improve the competitiveness of exports, more reforms are needed to foster and diversify domestic

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[18] https://www.al-monitor.com/originals/2021/04/egypt-promotes-economic-ties-sudan
[19] https://www.al-monitor.com/originals/2023/05/egypts-economy-braces-new-hit-sudan-conflict

production and remove administrative and unjustified non-tariff measures that affect exports and therefore production and job creation (Youssef and Zaki 2019). At the social policy level, while different measures can help reduce the negative effects of the war on vulnerable categories, social policies remain largely reactive, not proactive. This is why more proactive policies that provide workers with social security and help them being promoted to get out of vulnerability are necessary (Zaki, 2022). For Sudan, there is a dire need to promote food sovereignty by adopting comprehensive agricultural sector development as described in (Elbadawi et al., 2022). Second, it is crucial to diversify wheat sources and reduce the dependency on black sea wheat (importing wheat from other destinations). Addressing major macroeconomic imbalances and realizing the potentials of lifting the sanctions that have been imposed on Sudan's economy should be considered at the national level. Furthermore, the ongoing conflict will have a huge impact that require considerable investment which requires institutional reform. At the bilateral level, there is a great potential to improve bilateral cooperation between the two countries at the trade, investment, and infrastructure levels. While Sudan has a comparative advantage in agricultural (e.g, arable land, water sources), Egypt can invest in this sector and in infrastructure to improve food security in the two economies. More flexibility on implementing the four freedoms agreement between the two countries is recommended and facilitation of bilateral investment would benefit the citizens in Sudan and Egypt.

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