ANALYSIS OF THE IMPACT OF SOCIO-ECONOMIC & REGIONAL CONFLICTS ON UZBEK ECONOMY

CGE MODEL BASED ANALYSIS

DECEMBER, 2022
TASHKENT, UZBEKISTAN
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ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

The recovery of the global economy following the shock of the pandemic besides, the geopolitical crisis between Russia and Ukraine have further hampered slowdown in global trade and economic growth. World Economies have been affected not only by the aftermath of COVID-19, but also by ongoing geopolitical tensions and conflicts. Key questions addressed in this study are: How will trade and welfare of Uzbekistan, be affected in the short run? Which sectors are being most disrupted? Inflation is increasing in many countries, and large economies are increasing interest rates to reign it in. Disruptions in world trade and investment will curb growth in developing countries and add to price pressures, especially if governments impose trade restrictions to shield their economies.

This report identifies five direct trade and inflation channels through which country will be affected by the war in Ukraine. First, higher prices for commodities like food and energy will push up inflation further, in turn eroding the value of incomes and weighing on demand. Second, the exports bans for trading partner (Russia) fuelled prices of commodities that are imported from trade partner to Uzbekistan. Thirdly, remittances channels as well as an historic surge in refugee flows. Fourth, the government expenditures channel. And, reduced business confidence and higher investor uncertainty will weigh on asset prices, tightening financial conditions and potentially spurring capital outflows from emerging markets. From a development perspective, it is crucial to understand how these various factors play out and how they affect country economy.

Trade in food and energy are feeling the most immediate impact of the war. Russia and Ukraine rank among the top seven global producers and exporters of wheat, corn, barley, sunflower seeds, and sunflower oil. Russia is also a major supplier of fossil fuels, such as crude oil and natural gas, in addition to fertilizer and agricultural commodities. Disruptions of these supplies are fueling a surge in prices, with negative consequences for global trade and welfare and asymmetric effects on exporting and importing countries. Exporters gain from higher commodity prices and increase production and shipments, replacing part of the decrease in exports from Ukraine and Russia. Importers are hurt twice: They both consume these commodities and use them as inputs to produce other goods and services for export.

A Dynamic Stochastic General Equilibrium (DSGE) and Computable General Equilibrium (CGE) model quantifies these effects on trade and welfare. GDP drops by 3.2 percent, driven by a contraction in global exports. Exchange rate pass-through the coefficients at (0.26-0.30), obtained from the results of an econometric analysis. Unemployment will increase between 9.7-11.3 percent.
Tight monetary policy: This prompted central banks to tighten monetary policy and more than 45 countries raised interest rates in 2022. For emerging markets and developing countries, the average overall rate increase was 3 percentage points, nearly double that of advanced economies (1.7 percentage points). Central banks use this tool mainly to bring down inflation. However, rising interest rates increase the cost of borrowing. This erodes consumer confidence, leading to job cuts and wage cuts, as well as plummeting share prices. If this process goes too far and too fast, it could lead to a recession. Nevertheless, the Russian Federation decided to lower the key rate to the pre-war level. The Bank of Russia considered a number of factors, such as actual and expected inflation dynamics relative to target and economic transformation processes, risks associated with internal and external conditions, and the reaction of financial markets. Their forecast shows that the current monetary policy stance could reduce annual inflation to 5.0-7.0% in 2023 to return to 4% in 2024. Turkey, on the other hand, despite rising inflationary risks, has decided to keep rates unchanged at 14%.

Capital outflow: Continued inflation will require a sharper tightening of monetary policy, leading to further volatility in the capital market. Higher rates make borrowing more expensive, putting pressure on consumer demand and business expansion, slowing down economic growth. This could lead to an outflow of capital from emerging market economies. In fact, the strength of the US dollar has already coincided with portfolio outflows from emerging markets, putting more pressure on vulnerable economies. On the contrary, lowering the rate in conditions of high inflation, as in Turkey, can reduce macroeconomic stability and the predictability of the economy, and deter foreign and domestic investment. Therefore, even if the base rate is reduced to levels that are comfortable for consumers, but at the same time well below inflation, lenders will be reluctant to lend due to the rapid depreciation of the currency.

Real estate markets: An increase in the interest rate from the central bank means that the commercial bank will earn more on its reserves by keeping its money at the central bank than by lending it. While banks do not directly set mortgage interest rates, they control it through the key rate, which affects the interest rate that banks charge each other for overnight loans to meet their reserve requirements. In Uzbekistan and in countries such as the United States of America and Canada, a large proportion of mortgages are set at fixed rates. Fixed-rate customers are protected from the direct effects of higher interest rates, but will still experience the indirect effects. Higher interest rates mean mortgages will become more expensive, which will affect new buyers, causing house prices to fall. This will make everyone who owns a home feel poorer and therefore cut costs. Then spending cuts will lower inflation and both consumers and businesses will become reluctant to borrow and invest. In Uzbekistan, after a noticeable increase in the cost of housing in the secondary market in the first quarter (soum index - 10%, dollar index - 4.7%), in the second quarter, price growth slowed down and amounted to 2% (soum index). The dollar index, on the contrary, rose to 6.2%. The difference in the two indices is explained by the strengthening of the soum against the dollar in the current quarter. Relatively high real estate prices and, probably, the achievement of a certain potential (threshold) for the growth of average prices could serve as one of the reasons for the slowdown in housing prices. A similar situation is observed in the primary market.
Prices in the II quarter rose by 2.4%. Considering the monthly dynamics, it should be noted that the main growth occurred in April - 2.3%. In May-June, prices for new housing remained virtually unchanged (Figure 1). It is likely that the slowdown in price growth also occurred against the backdrop of stabilization of the national currency.

Investment: According to the Investment Program, in 2022 it was planned to implement 87 projects with the participation of Russian capital with a plan of foreign investments in 2022 in the amount of 2.5 billion US dollars. Of these projects, 32 projects with an investment amount of $1.07 billion in 2022 are being implemented with the participation of companies included in the sanctions list in connection with the conflicts between Russia and Ukraine (Gazprombank, VEU, VTB, Sovcombank, Transcapital Bank, etc. .d.), another 11 investment projects with an investment in 2022 in the amount of $844 million are being implemented jointly by Russian and Western or Chinese investor-lenders or Russian companies not directly included in the sanctions list, but at risk of being included or indirectly related to them (USM Holding, Rosselkhozbank, etc.).

Household income: The incomes of the population were estimated using the analysis of resources/final results (input/output). It is expected to reduce the income of the population by 3.9-4.5% in 2022. The increase in the total income of the population in 2022 is estimated to be 19.7% - 20.3% with 24.2% in 2021. The total income of the population of Uzbekistan is formed mainly due to internal factors. At the same time, in 2021, income from money transfers accounted for 16.6% of the total income of the population, including 11.6% from money transfers from Russia. According to estimates, due to the devaluation of the ruble, the growth of the CPI and the return of 200-600 thousand labor migrants from Russia and Ukraine, remittances will decrease by 10%-45% and amount to 5.2 billion - 3.1 billion US dollars. In this case, the share of remittances in the structure of the total income of the population will decrease within 14.0%-10.2%. Taking into account the fact that the main sources of total income of the population are income from labor activity (wages, self-employment, income from the consumption of agricultural products produced in households - more than 70% of total income), it is advisable to strengthen the implementation of measures to create new jobs and ensuring employment of the population in industries with high value added and wages.

Remittances: For the first time since December 2014, the Bank of Russia began foreign exchange interventions to stabilize the exchange rate of the national currency, and thanks to this, the ruble began to strengthen. (93 rubles as of March 1, 2022). Due to the devaluation of the ruble and the return, remittances of labor migrants from Uzbekistan may decrease: they will decrease by 1.5 billion dollars.

Poverty: According to the forecasts of international organizations and experts, the impact of the Russia-Ukraine conflicts will lead to a decrease in the source of income, an increase in unemployment, and an increase in poverty up to 14.0% (2021 - the poverty rate is 12.1%. Source: Rosstat). In connection with the events in Ukraine and with sanctions on Russia in Uzbekistan, it is expected in 2022 according to IPMI estimates:
these factors can increase the poverty rate to 13.5% or up to 160 thousand people (at 13.5% 4.7 million people) (2021 - the poverty rate is 12.7% or 4.4 million people. Source of the State Statistics Committee of Uzbekistan). Subject to the adoption of additional measures aimed at reducing poverty, providing for the stimulation of employment of the unemployed; entrepreneurship and skills training for the unemployed and returning migrants is expected to reduce poverty by 13.0%. if the return of labor migrants is 150 thousand people, then in this case poverty will increase by 0.4% or by 89 thousand people.

Energy: In the context of the introduction of restrictive measures on the supply of energy carriers to European countries, as well as the curtailment of the activities of large foreign companies in the oil and gas sector, a scenario of a decrease in the volume of energy carrier production in Russia is possible. In the short term, serious consequences for Uzbekistan are not expected. On the contrary, it seems that Russia will be quite interested in maintaining its positions in the energy market of Uzbekistan: at present, Russia accounts for 33-35% in the structure of imported energy carriers. At the same time, destabilization in the world oil and gas markets may have an impact on the rise in prices for oil and oil products, and Russia, accordingly, will increase its prices for the CIS countries, which may lead to an increase in the cost of Russian imported energy carriers and oil products in the domestic market of Uzbekistan, and, as a result, may worsen the foreign trade balance and affect the growth of inflation.

Key findings:

IPMI calculations show that the main driver of consumer price inflation in Uzbekistan is imported inflation, accounting for about 38% of total inflation. The contribution of demand factors, such as the money supply, interest rate and GDP, to inflation is about 29%, while supply factors stimulate inflation by 33%.

Higher inflation mainly affected food prices, especially beef, lamb, and flour. Given that the majority of the population spends on average 40-50 percent of their income on food, further price increases will reduce their existing savings.

Uzbekistan export and import with trading partners are inelastic in short term.

Main price shocks to CPI come out from trading partners.

Results from the model. Impulse response functions:

- Positive 1% commodity shock. The real growth of Uzbekistan in GDP will go down by 2% compared to the potential output while consumer inflation will go up by 0.4%. In addition, the consequence of shock on output is expected to last for 8 quarters (2 years) and on inflation is 3 quarters assuming the shock is temporary. On the other hand, the inflation in imported goods may go down by 0.3% on the impact of shock. In the labour market, the total employment will reduce by 1% - the same magnitude as the shock. In the trade section, we expect the Uzbek export and import to decline by 1% and 0.4%, respectively.
• 1% positive labour supply shock. At the time of impact, the output of Uzbek economy will decline by 0.2%, consumption by 0.4% and inflation by 0.05%. Although the aftermath of this shock is small compared to commodity price shock, the consequence lasts longer around 10-20 quarters for all the main macroeconomic variables. The shock has negative impact on trade as both export and import reduce by 0.1% and 0.05%.

• 1% positive remittances shock. The GDP of Uzbekistan as a consequence of shock decreases by 0.1% while consumer inflation decreases by 0.005%. At the same time, the Uzbek economy experiences deflation in imported goods by 0.08%. On the trade side, we experience positive account gradually from the impact of the shock. The export declines by 0.2% and import increases by 0.2%. Over the time, export will increase making current account surplus in the long-run. In the labour market the economy is subject to decline in employment by 0.1%.

Policy recommendations:

External shocks are so damaging and cannot be absorbed by flexible exchange rates alone, policymakers should act with FX intervention or crisis-case capital flow management measures to help anchor expectations. In addition, they should proactively reduce their dependence on foreign currency borrowing where debt levels are high. The goal should be to get everyone safely to the other side of this tightening cycle.

• Most central banks will need to continue to tighten monetary policy decisively. This is especially true where inflation expectations begin to weaken. Without action, these countries could face a devastating wage-price spiral that will require stronger monetary tightening, further hurting growth and employment.

• Risks of inflation growth are very significant (for the bulk of the population, additional inflation could be up to 6-7 percentage points in the most negative scenario), which requires urgent measures to be taken to minimize them. Among them are measures to limit the demand for foreign exchange resources (for example, reducing access to foreign exchange resources for companies that purchase goods on the world market that do not belong to the category of essentials), foreign exchange interventions by the Central Bank, and stimulation of the production of import-substituting and localizing products.

• Risks of destabilization of money circulation, caused by the company disconnecting Russia from SWIFT. To minimize them, it is necessary to conduct an inventory of the banking system to assess the degree of vulnerability of national banks from the Russian payment interbank system and take measures for a possible transition to other duplicating payment systems for those banks where such a degree of vulnerability is high.

• Risks for economic growth due to the reduction of imports from Russia. At the end of 2021, Uzbekistan became the first foreign trade partner of Uzbekistan with a turnover of $ 7.5 billion. In the trade turnover with Russia, 70% is accounted for by imports of Russian goods and services, which is $ 5.25 billion. The basis of this import is machinery, mechanisms, metals, wood, medicines and other products important for the national economy of Uzbekistan.
• Delaying implementation of foreign investment projects from Russia will lead to a reduction in the volume of foreign investments planned for 2022 by 18-20%.

• For projects financed jointly with Western countries or China, as well as representing plans for lending, the issue of compensating for the departure of the Russian partner or replacing the Russian partner with another may be considered. If successful, the reduction in the volume of foreign investments for 2022 will be only 9-10%.

• To maintain the level of unemployment, the government will need to take measures to ensure the employment of returning labor migrants. One of the main directions may be to attract returning migrants to the beginning seasonal work in agriculture, who plan to open their own business by providing preferential loans and teaching the basics of successful entrepreneurship (on a free basis), actively attracting them on a vacancies registered in the bank of vacancies on the website mehnat.uz.

Moreover, based on international best practices, the following interventions may be considered:

• Contraction monetary policy

• Social protection.

Ultimately, the suggestion for policy interventions will require a strong policy framework in terms of legal acts and norms as well as sourcing of financial support to first reduce and subsequently eliminate negative affect of conflict.
# TABLE OF CONTENTS

Disclaimer 2  
ACKNOWLEDGEMENTS 3  
EXECUTIVE SUMMARY 4  
1. Introduction 11  
2. Overview of price changes in Uzbekistan 14  
  2.1. Overall CPI 14  
  2.2. World commodity price inflation 19  
  2.3. Imported Inflation from main trading partners 20  
  2.4. Exchange rate and interest rate 21  
  2.5. Investment 23  
  2.6. Migration wave and household welfare 23  
  2.7. Trade 23  
3. Literature Review 37  
  3.1 Theoretical literature review 37  
  3.2 Empirical literature review 38  
4. Model 40  
  4.1 Households 40  
  4.2 Firm 42  
    4.2.1 Domestic intermediate good producers 42  
    4.2.2 Imported intermediate good producers 44  
    4.2.3 Domestic final good producers 45  
  4.3 Central bank 46  
  4.4 Government 47  
  4.5 Market clearing condition 47  
5. Calibration 47  
6. Impulse response functions 49  
  6.1 Labour supply shock 49  
  6.2 Domestic price mark-up shock 50  
  6.3 Shock to remittances 51  
7. Discussion 52  
8. Policy implications and recommendation 53  
REFERENCES 54
1. Introduction

Open markets and free trade have been a basic tenet of the international order emerging out of World War II. Over that period, a large consensus regarding the need to reduce trade costs and prioritise gains from trade led to a continuous deepening of the international trade regime. However, the recovery of the global economy following the shock of the pandemic besides, the geopolitical crisis between Russia and Ukraine have further hampered slowdown in global trade and economic growth. World Economies have been affected not only by the aftermath of COVID-19, but also by ongoing geopolitical tensions and conflicts. According to World Bank projections, the Russian-Ukrainian conflict will lower global economic growth to 2.8% in 2022. Most of these crises have a direct and indirect impact on the economy of Uzbekistan. In the context of an aggravated external situation, at the end of the first quarter, a shortage of basic consumer goods appeared on the world markets, and price growth reached its highest level in 40 years. The imposition of import and export bans by many countries has dealt a severe blow to the logistics and supply chain, resulting in high prices for energy, mineral fertilisers needed for agriculture, and food products around the world. This is due to deterioration of trade, dramatic increase in oil and food prices, and banking activities, sharp decrease in remittances, and essentially the arrival of migrant workers to Uzbekistan. 

What are the key channels through which conflicts tend to have such large and persistent effects?

Tight monetary policy: This prompted central banks to tighten monetary policy and more than 45 countries raised interest rates in 2022. For emerging markets and developing countries, the average overall rate increase was 3 percentage points, nearly double that of advanced economies (1.7 percentage points). Central banks use this tool mainly to bring down inflation. However, rising interest rates increase the cost of borrowing. This erodes consumer confidence, leading to job cuts and wage cuts, as well as plummeting share prices. If this process goes too far and too fast, it could lead to a recession. Nevertheless, the Russian Federation decided to lower the key rate to the pre-war level. The Bank of Russia considered a number of factors, such as actual and expected inflation dynamics relative to target and economic transformation processes, risks associated with internal and external conditions, and the reaction of financial markets. Their forecast shows that the current monetary policy stance could reduce annual inflation to 5.0-7.0% in 2023 to return to 4% in 2024. Turkey, on the other hand, despite rising inflationary risks, has decided to keep rates unchanged at 14%.

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**Household income:** The incomes of the population were estimated using the analysis of resources / final results (input / output). It is expected to reduce the income of the population by 3.9-4.5% in 2022. The increase in the total income of the population in 2022 is estimated to be 19.7% - 20.3% with 24.2% in 2021. The total income of the population of Uzbekistan is formed mainly due to internal factors. At the same time, in 2021, income from money transfers accounted for 16.6% of the total income of the population, including 11.6% from money transfers from Russia. According to estimates, due to the devaluation of the ruble, the growth of the CPI and the return of 200-600 thousand labor migrants from Russia and Ukraine, remittances will decrease by 10%-45% and amount to 5.2 billion - 3.1 billion US dollars. In this case, the share of remittances in the structure of the total income of the population will decrease within 14.0%-10.2%. Taking into account the fact that the main sources of total income of the population are income from labor activity (wages, self-employment, income from the consumption of agricultural products produced in households - more than 70% of total income), it is advisable to strengthen the implementation of measures to create new jobs and ensuring employment of the population in industries with high value added and wages.

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**Poverty:** According to the forecasts of international organizations and experts, the impact of the Russia-Ukraine conflicts will lead to a decrease in the source of income, an increase in unemployment, and an increase in poverty up to 14.0% (2021 - the poverty rate is 12.1%. Source: Rosstat). In connection with the events in Ukraine and with sanctions on Russia in Uzbekistan, it is expected in 2022 according to IPMI estimates: These factors can increase the poverty rate to 13.5% or up to 160 thousand people. (at 13.5% 4.7 million people) (2021 - the poverty rate is 12.7% or 4.4 million people. Source of the State Statistics Committee R.Uzb.). Subject to the adoption of additional measures aimed at reducing poverty, providing for the stimulation of employment of the unemployed; entrepreneurship and skills training for the unemployed and returning migrants is expected to reduce poverty by 13.0%. if the return of labor migrants is 150 thousand people, then in this case poverty will increase by 0.4% or by 89 thousand people.
Energy prices: In the context of the introduction of restrictive measures on the supply of energy carriers to European countries, as well as the curtailment of the activities of large foreign companies in the oil and gas sector, a scenario of a decrease in the volume of energy carrier production in Russia is possible. In the short term, serious consequences for Uzbekistan are not expected. On the contrary, it seems that Russia will be quite interested in maintaining its positions in the energy market of Uzbekistan: at present, Russia accounts for 33-35% in the structure of imported energy carriers. At the same time, destabilization in the world oil and gas markets may have an impact on the rise in prices for oil and oil products, and Russia, accordingly, will increase its prices for the CIS countries, which may lead to an increase in the cost of Russian imported energy carriers and oil products in the domestic market of Uzbekistan, and, as a result, may worsen the foreign trade balance and affect the growth of inflation.

Impacts will flow through four main channels. First, higher prices for commodities like food and energy will push up inflation further, in turn eroding the value of incomes and weighing on demand (section 2). Second, the exports bans for trading partner (Russia) fuelled prices of commodities that are imported from trade partner to Uzbekistan. Thirdly, remittances channels as well as an historic surge in refugee flows. Fourth, the government expenditures channel. And, reduced business confidence and higher investor uncertainty will weigh on asset prices, tightening financial conditions and potentially spurring capital outflows from emerging markets.

2. Overview of price changes in Uzbekistan

2.1. Overall CPI

Ensuring inflation at a low level is an important factor in macroeconomic stability, which creates the necessary environment to attract investment, thus economic development to continue structural reforms for New Uzbekistan 2022-2026. However, rising prices on the world market for food and energy resources, problems with international logistics lead to an acceleration of inflation processes in all countries of the world. These factors, in turn, have a primary and secondary impact on our country through the price pass-through and foreign trade. During the second quarter of 2022, rising food and energy prices have stoked inflation even in developed countries, such as the United States of America (9.1%) and the Great Britain (9.4%). The situation in developing countries like Egypt (13.2%), Argentina (54.7%), and Turkey (78.6%) things are even worse. In Uzbekistan, the annual inflation reached 12.2% as of October 2022, where the share of food, non-food, and services have accounted for 5.16%, 4.24%, and 2.81%, respectively.
In October 2022, annual inflation in Uzbekistan accelerated to 12.2%, according to the State Statistics Committee. For comparison: in May the inflation rate was at the level of 11%. In the consumer market in June, goods and services became more expensive by 0.9% on average. In the same month of the previous year, there was deflation in the republic (by 0.2%). Then it was associated with a seasonal factor, since in the summer a number of goods fall in price compared to spring. However, this year food became more expensive by an average of 1.1% in June compared to May (last year there was a drop in prices by 0.9%). Non-food products in June rose in price by 0.9%, and services - by 0.8%. Food products hold the lead in terms of growth and in annual terms. They added 16.5% in 12 months. Non-food products and services over the same period became more expensive by 10.7% and 6.8%, respectively (Figure 1). However, due to soaring food prices, the inflation rate ended up with the rate of 11 percent. At the end of 2022, the inflation rate was 11.97%. At the same time, the share of food inflation was 6.2%, and the share of inflation of non-food goods and services was 3.7% and 1.8%, respectively (Fig. 1). Food inflation has remained around 15% since May 2017 (14.4% in May 2021). Non-food inflation is gradually declining (8.3% in May 2021). Inflation in the services sector, which has been hardest hit by the coronavirus pandemic, has fallen significantly (from 15.2% in 2019 to 7.1% in 2020). In Figure 2, for instance it is observed that the food price (red line) is highest among all and above average CPI (yellow line).
Figure 2: CPI and CPI for different sectors of economy

Source: The State Committee of the Republic of Uzbekistan on Statistics

Figure 3 show the CPI and CPI indicators by sectors of economy and product types. They indicate that the contribution of food prices to CPI was significantly higher than the rest of the sectors/products. Food prices has been increased by 4.4% in the first quarter of 2022 (Figure 2 below). Given the higher weight of food products in the structure of consumer goods (in 2020 - 0.42495) and the fact that the annual inflation of this product group remains high, it is necessary to pay special attention to reducing food inflation.

Figure 3: Weight of CPI components

Source: The State Committee of the Republic of Uzbekistan on Statistics

In Figure 4 and Table 1 show that food prices have the highest contribution to CPI following the Restaurants and Hotel Services. Uzbekistan, one of the largest producers and exporters of food products in the CIS region, high CPI essentially
reflected the food prices. This is an implication that the global factors drive the inflation up. In Figure 4, CPI was decomposed to food, non-food and services. It is detected that the share of food prices in CPI is the highest. Food accounted for about 40-45% increase in the inflation. Hence, it will continue to be the major source of high inflation in the following years. Energy, electricity and service sectors price levels didn’t contribute to overall CPI due to the fact authorities controlled the price level using provisions. Putting it another way, government controlled prices by providing the subsidies to energy producing cites. Food prices has been increased by 4.4% in the first quarter of 2022 (Figure 2 below). Given the higher weight of food products in the structure of consumer goods (in 2020 - 0.42495) and the fact that the annual inflation of this product group remains high, it is necessary to pay special attention to reducing food inflation.

Figure 4. CPI and the price indices in industries
Source: The State Committee of the Republic of Uzbekistan on Statistics
<table>
<thead>
<tr>
<th>Month</th>
<th>CPI</th>
<th>CPI Food</th>
<th>CPI Non-Food</th>
<th>CPI Services</th>
<th>Food and non-alcoholic drinks</th>
<th>Alcoholic drinks, tobacco products</th>
<th>Clothing and footwear</th>
<th>Housing services, water, electricity, gas and other fuels</th>
<th>Household items, appliances and routine home maintenance</th>
<th>Health care</th>
<th>Transport</th>
<th>Information and communication</th>
<th>Leisure, sports and culture</th>
<th>Services in the field of education</th>
<th>Restaurants and hotel services</th>
<th>Insurance and financial services</th>
<th>Household goods and services, social protection and miscellaneous goods and services</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021M01</td>
<td>11.62</td>
<td>15.51</td>
<td>9.05</td>
<td>8.20</td>
<td>15.68</td>
<td>9.46</td>
<td>8.41</td>
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**Source:** The State Committee of the Republic of Uzbekistan on Statistics
2.2. World commodity price inflation

Food prices rose by 19.1% in the first quarter of 2022, according to the Food and Agriculture Organization of the United Nations (FAO). In particular, compared to December 2021, the prices of vegetable oil increased by 39.3%, cereals - by 21.1%, meat - by 8%, dairy products - by 13% and sugar - by 1.3%. In turn, price changes observed in the world market, with a slight delay, began to be felt in the prices of goods in local markets. While prices for vegetable oils in the domestic market fell in January and February, global demand for these products in March, a sharp increase in international quotations and a reduction in supply volumes put pressure on prices in domestic markets. The price of vegetable oil is also directly related to the rise in oil prices on the world market. The external geopolitical situation has a significant impact on the prices of grain products, including wheat and flour, and restrictions imposed on wheat exports by major exporters Russia and Kazakhstan have led to higher prices. In turn, the change in prices for flour is reflected in the cost of pasta, wheat and fodder - in the cost of production of dairy products, cheeses, butter, margarine, and poultry meat produced from its processing. In addition, the rise in the price of sugar and flour led to an increase in the prices of confectionery and soft drinks made from these products. Fruit and vegetable prices declined relatively in February after rising in January, but returned to a higher growth rate by March. This situation, along with exports to neighboring countries and seasonality, is due to the cold weather observed in recent weeks, which for some time delayed the growing season of the new crop of spring vegetables. This situation affects the market conditions on the supply side. The increase in meat imports from Kazakhstan and Belarus led to a decrease in prices in the domestic market.

![Figure 5. World Food Prices 2020-2022](source: Data from the Food and Agriculture Organization of the United Nations)
The FAO Index, which is an alternative indicator of global food prices, also reflects the above, with the annual increase in staple food prices in 2021 the highest in 20 years. At the same time, sugar, grains and oils should be noted among the goods with the largest price increase. This factor can have a direct and indirect impact on domestic prices, given that the domestic market of Uzbekistan is mainly supplied with imports of the main types of food products.

Table 2: Dynamics of price changes for basic goods

<table>
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<tr>
<th>Category</th>
<th>Product</th>
<th>Monthly average</th>
<th>Changes first month</th>
<th>Changes in 12 month</th>
<th>Changes from Jan to Oct</th>
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<td>agricultural raw materials</td>
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<td>Food index commodity prices</td>
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<td>Corn</td>
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<td>Rice</td>
<td>444</td>
<td>-4%</td>
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<td>Sugar</td>
<td>0.42</td>
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<td>Subflower Oil</td>
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<td>459.59</td>
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<td>Russian natural gas</td>
<td>34.35</td>
<td>15%</td>
<td>234%</td>
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</table>

2.3. Imported Inflation from main trading partners

Figure 6 shows that main driver consumer price inflation in Uzbekistan comes from imported inflation, where trading partner’s inflation is significant accounting for around 38% of total inflation. The contribution of demand factors, such as money supply, interest rate and GDP to inflation in Uzbekistan is estimated to be around 29%, whereas the supply factors are driving inflation growth by 33%. Figure 7 show
that inflation in countries trade partners is a major factor influencing inflation in Uzbekistan, as an increase in imported inflation could explain about 38% of headline inflation. Imported inflation accounts for 3.63% of 10.9% in 2022. Russia, China, Kazakhstan, South Korea and Turkey together account for 2.36% of inflation in Uzbekistan. Russia and China made the largest contribution to imported inflation due to the significant share of imports of these countries in total imports of Uzbekistan (21% and 19% respectively) - 0.78% and 0.7%, while the impact of imported inflation from Kazakhstan, South Korea and Turkey is approximately amounted to 0.39%, 0.26% and 0.24% of the total imported inflation.

Russia is one of the main trading partners of Uzbekistan. About 18% of Uzbekistan's foreign trade turnover falls on the Russian Federation. That is why the rise in prices for goods and services imported from Russia affects the level of inflation in Uzbekistan. The rise in prices for goods and services imported from Russia affects the level of inflation in Uzbekistan. Inflation in Uzbekistan in 2021 decelerated to 10%, of which 0.78 percentage points changed under the influence of rising prices in Russia (in 2021, inflation in the Russian Federation is 6.7%). Moreover, the rise in commodity prices led to an increase in production costs by 0.6 percentage points (a direct effect without taking into account intersectoral interactions). Inflation in Uzbekistan in 2021 amounted to 10%, of which 0.78% changed under the influence of rising prices in Russia (in 2021, inflation in the Russian Federation is 6.7%). Moreover, the rise in commodity prices led to a 0.6% increase in production costs (a direct effect, excluding inter-industry interactions).

2.4. Exchange rate and interest rate

In response to changes in external conditions, the exchange rate of the national currency began to stabilize after the March fluctuations (it depreciated by 5% in March), and the devaluation rate since the beginning of the year was 4.1%. According to preliminary estimates, these devaluation rates are assumed to cover almost all short-term changes (shocks). Russia is an important supplier of essential
goods such as base metals, mineral products and foods. At the same time, the lion share of the export of textiles, fruits and vegetables, and plastics and rubber products from Uzbekistan goes to Russia. On the other hand, when the other trading partners of Uzbekistan will see significant declines in foreign trade and economic growth, it will lead to lowering import demand for goods and services from Uzbekistan.
2.5. Investment

2.6. Migration wave and household welfare

2.7. Trade

According to the State Statistics Committee, real GDP growth in the first quarter of 2022 was 5.8% [1]. By looking at the situation with exports, definitely, one of the main trade partners of Uzbekistan is Russia - it accounts for about 12% of the external trade turnover of the whole of Uzbekistan, according to the State Statistics Committee. In addition, Russia and Ukraine supply 20% of wheat and 30% of grain. The supply shortage of food products from these countries directly affects the global prices for food besides wheat and grain due to price linkages of food prices and thus lead to the soaring overall prices. The prices of grain products including wheat, maize, feed and etc. increased in the price by 17% on average only in March 2022.

Russia is the second largest trading partner of Uzbekistan. Russia was responsible for 12.5% of the total goods and service exports of Uzbekistan in 2021, while Uzbekistan’s import from Russia accounted for 21.4% of its total imports. On the other hand, Ukraine accounted for only 1.4% of Uzbekistan’s total export, when 1.9% of the total import of Uzbekistan came from Ukraine.
In 2021, the total trade between Uzbekistan and Russia amounted to $7.55 billion. The exports were worth $2.1 billion and were dominated by textiles and textile-related products, especially cotton products ($381.6 million or 18.5% of the total export), articles of apparel and clothing accessories ($340.2 million or 16.5%), and services ($350 million or 17%), including air transport services ($150.6 million), railway transport services ($67.8 million), as well as edible fruits ($210.4 million or 10.2%) and vegetables ($75.5 million or 3.7%).

**Share of goods and services in the export of Uzbekistan to Russia**

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<th>Goods/Services</th>
<th>2020 Share</th>
<th>2021 Share</th>
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<tr>
<td>Textiles and textile articles</td>
<td>45.9%</td>
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<tr>
<td>Vegetable products</td>
<td>21.6%</td>
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<tr>
<td>Other products</td>
<td>17.3%</td>
<td>14.3%</td>
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<tr>
<td>Services</td>
<td>15.3%</td>
<td>22.4%</td>
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</table>

**Export to Russia in 2021, mln USD**
Russia is the largest market for textile products “made in Uzbekistan” and accounts for slightly more than 30% of the total textile exports of Uzbekistan, followed by China (20.6%), Turkiye (16.3%) and Kyrgyzstan (13%). Ukraine imported only 1.7% of the export of textiles and textile articles of Uzbekistan.

In terms of the export of vegetable products, Russia was the second largest trade partner, accounting for 22.5% of the export in 2021. In comparison, only 1.2% of the vegetable exports of Uzbekistan went to Ukraine. However, Ukraine was the largest consumer for the exported products of the chemical (or allied) industries in Uzbekistan last year, accounting for nearly 15% of the export of these products.

**Share of the main trading partners in the export of Uzbekistan**

<table>
<thead>
<tr>
<th>Countries</th>
<th>Textiles</th>
<th>Base metals</th>
<th>Vegetable products</th>
<th>Mineral products</th>
<th>Products of the chemical or allied industries</th>
<th>Plastics and Rubber</th>
<th>Vehicles</th>
<th>Other goods</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>30.2%</td>
<td>5.7%</td>
<td>22.6%</td>
<td>9.2%</td>
<td>2.5%</td>
<td>23.3%</td>
<td>3.7%</td>
<td>2.7%</td>
<td>13.8%</td>
</tr>
<tr>
<td>China</td>
<td>20.6%</td>
<td>14.7%</td>
<td>10.8%</td>
<td>58.3%</td>
<td>5.0%</td>
<td>10.8%</td>
<td>0.8%</td>
<td>0.9%</td>
<td>27.3%</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>1.7%</td>
<td>4.5%</td>
<td>16.2%</td>
<td>0.1%</td>
<td>9.3%</td>
<td>15.1%</td>
<td>80.5%</td>
<td>3.8%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Ukraine</td>
<td>1.7%</td>
<td>2.4%</td>
<td>1.2%</td>
<td>0.3%</td>
<td>14.7%</td>
<td>5.4%</td>
<td>2.0%</td>
<td>0.3%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Turkiye</td>
<td>16.3%</td>
<td>54.8%</td>
<td>1.9%</td>
<td>1.7%</td>
<td>8.6%</td>
<td>20.6%</td>
<td>0.4%</td>
<td>9.0%</td>
<td>1.8%</td>
</tr>
<tr>
<td>South Korea</td>
<td>0.2%</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.2%</td>
<td>1.4%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.2%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Iran</td>
<td>4.4%</td>
<td>0.0%</td>
<td>0.9%</td>
<td>0.9%</td>
<td>1.7%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>13.0%</td>
<td>2.6%</td>
<td>9.1%</td>
<td>1.1%</td>
<td>7.0%</td>
<td>8.1%</td>
<td>3.1%</td>
<td>2.1%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>0.8%</td>
<td>1.6%</td>
<td>10.9%</td>
<td>5.8%</td>
<td>11.2%</td>
<td>4.4%</td>
<td>0.4%</td>
<td>2.6%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.9%</td>
<td>0.6%</td>
<td>11.6%</td>
<td>0.6%</td>
<td>0.1%</td>
<td>0.3%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Germany</td>
<td>0.4%</td>
<td>0.4%</td>
<td>0.8%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Other countries</td>
<td>10.7%</td>
<td>13.0%</td>
<td>36.5%</td>
<td>15.7%</td>
<td>26.3%</td>
<td>11.6%</td>
<td>9.1%</td>
<td>86.2%</td>
<td>37.7%</td>
</tr>
</tbody>
</table>

When it comes to export of services, Russia accounts for 14% of the gross exports of services of Uzbekistan. Also, almost a quarter of plastics and rubber exports goes...
to Russia, which is the largest market, followed by Turkiye (20.6%) and Kazakhstan (15.1%).

So far, Uzbekistan’s export to Russia is demonstrating its resilience amid the ongoing war in Ukraine, while the export to Ukraine is affected considerably. In March-October 2022, the Uzbek exports to Russia reached the post-pandemic high, amounting to $2.1 billion in monetary terms (an increase of 47% compared to the same period of 2021). However, it is worth noting that rising global commodity prices have inflated international trade (UNCTAD, 2022). This factor necessitates rigorous analyses, taking into account rising commodity prices.
**Textiles and textile materials.** The export volume of the textile and apparel industry of Uzbekistan reached a combined value of $906 million in the March-October period of 2022 (an increase by 43%, relative to the same period of 2021). Cotton yarn, woven fabrics of cotton, and knitted or crocheted fabrics account for almost a half of the textile exports to Russia.

In this period, the export of cotton yarn grew by 41% in comparison with the same period of 2021. In May 2022, cotton price hit a 11-year high since May 2011, reaching 3.61 USD per kg before slumping back to the pre-war level from July 2022 (World Bank, 2022). Thus, the price-adjusted real growth rate of the cotton yarn exports to Russia stood at 8%, which is significantly lower than the nominal growth rate of 41%.

![Cotton, A Index](chart.png)

Source: The authors; based on World Bank Commodity Price Data

It appears that indirect trade impact of the war in Ukraine is much higher than direct effects through trade with Russia and Ukraine. Uzbekistan’s yarn exports to China and Turkiye have considerably plunged for the period March-October this year. In this period, China’s imports of cotton yarn from Uzbekistan fell by 71% from the same period last year. Slower domestic and foreign demand for China’s apparel amid a concern of global economic slowdown have led to lower yarn imports of China, which is exacerbated by an embargo imposed by the US on cotton and cotton products produced in Xinjiang after the ban became effective from June 2022.

Turkiye’s imports of cotton yarn from Uzbekistan started to decline from July 2022. The decline stems from a combination of factors, including many side effects of the ongoing war in Ukraine and global inflation.
Overall, although Uzbekistan’s export of cotton yarn to Russia grew by 8% in real terms for the period March-October this year, the total exports of cotton yarn declined by 32% as compared to the same period of 2021.

Furthermore, the amount of the exported woven fabrics of cotton to Russia amounted to $65 million in March-October 2022, increasing by 61% (21% at constant prices) compared with the same period of 2021. Despite that the woven fabrics shipments to Russia for the period January-May 2022 declined by 12% as compared to the same period of 2021, it grew by 47% in June-October 2022. At the same time, the exports of these textile products from Uzbekistan to other countries including relatively major markets Kazakhstan, Poland, Ukraine considerably shrunk.
Among the textile products, knitted or crocheted fabrics in the amount of $98 million were exported to Russia that is 86% more than in March-October of 2021 (45% at constant prices).

**Fruits and vegetables.** Russia introduced an embargo on dairy products, meat, fruit and vegetables from the United States and the European Union in August 2014,
responding to the several sanctions imposed by the West against Russia in the context of the geopolitical tension and conflicts in Ukraine. In September 2021, the ban on imports was extended until at least 31 December 2022. The import ban also affects Canada, Australia, and Ukraine.

Moreover, Russia’s imports of vegetables and fruits from some alternative sources in the long distance (e.g., Thailand) were affected since Russian freighter airlines were forced to stop their services due to the international sanctions\(^2\).

Exports of fruits and vegetables from Uzbekistan to Russia in the period March-October of 2022 increased by 32% as compared to the same period of the last year. While Uzbekistan exported 338 thousand tons of fruits and vegetables in the first ten months of the last year, this indicator increased to 447 thousand tons for the same period of 2022.

Russia remains to be the main export market for the Uzbek fruits and vegetables, followed by Kazakhstan, China, and Kyrgyzstan.

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2 [https://www.nationthailand.com/business/40013630](https://www.nationthailand.com/business/40013630)
On the import side, in 2021, Uzbekistan imports from Russia totalled $5.5 billion. They were led by base metals ($1.3 billion or 24% of the imports from Russia), mineral products ($642.3 million or 11.8%), machinery and mechanical appliances ($621.3 million or 11.4%), and prepared foodstuffs and beverages ($349.1 million or 6.4%), fats and oils of animal or vegetable origin and their breakdown products ($375 million or 6.9%).

Share of goods and services in the import of Uzbekistan from Russia
The volume of imports of vehicles (other than railway or tramway rolling-stock) reached $187.2 million (3.4%). Also, Russia as a supplier of plastics and products from them ($158.8 million or 2.9%), papers and paperboard ($149 million or 2.7%) is considered an important trading partner of Uzbekistan.

*Import from Russia in 2021, mln USD*
Uzbekistan is heavily dependent on Russia for import of these products. In 2021, 43.9% of the base metals imports of Uzbekistan came from Russia, while 32.5% of the total imported foodstuffs and beverages was supplied by manufacturers in Russia. Furthermore, Russia was the second largest partner to Uzbekistan for the imports of mineral products, representing 28.7% of Uzbekistan's total imports.

**Share of the main trading partners in the imports of Uzbekistan**

<table>
<thead>
<tr>
<th>Countries</th>
<th>Machinery and mechanical appliances</th>
<th>Base metal s</th>
<th>Products of the chemical or allied industries</th>
<th>Vehi cles</th>
<th>Mineral pro duc ts</th>
<th>Plas tics and rub ber</th>
<th>Veg etable pro duc ts</th>
<th>Pre pare d food stuff s</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>10.7%</td>
<td>43.9%</td>
<td>15.4%</td>
<td>11.3%</td>
<td>28.7%</td>
<td>16.3%</td>
<td>3.8%</td>
<td>32.5%</td>
<td>27.9%</td>
</tr>
<tr>
<td>China</td>
<td>38.5%</td>
<td>14.0%</td>
<td>17.8%</td>
<td>19.7%</td>
<td>0.5%</td>
<td>31.2%</td>
<td>4.1%</td>
<td>0.6%</td>
<td>14.4%</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>0.8%</td>
<td>19.5%</td>
<td>1.8%</td>
<td>5.1%</td>
<td>32.6%</td>
<td>1.7%</td>
<td>73.4%</td>
<td>5.5%</td>
<td>5.5%</td>
</tr>
<tr>
<td>Ukraine</td>
<td>1.2%</td>
<td>5.9%</td>
<td>3.4%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.5%</td>
<td>0.1%</td>
<td>3.2%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Turkiye</td>
<td>14.0%</td>
<td>4.5%</td>
<td>7.8%</td>
<td>1.3%</td>
<td>0.4%</td>
<td>8.4%</td>
<td>2.7%</td>
<td>1.6%</td>
<td>5.9%</td>
</tr>
<tr>
<td>South Korea</td>
<td>7.1%</td>
<td>3.8%</td>
<td>1.9%</td>
<td>33.7%</td>
<td>0.4%</td>
<td>14.1%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Iran</td>
<td>0.4%</td>
<td>2.0%</td>
<td>1.3%</td>
<td>0.0%</td>
<td>0.3%</td>
<td>5.6%</td>
<td>2.1%</td>
<td>0.1%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>0.2%</td>
<td>1.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>3.4%</td>
<td>0.1%</td>
<td>0.7%</td>
<td>0.2%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>0.0%</td>
<td>0.9%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>2.6%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>28.4%</td>
<td>2.5%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Germany</td>
<td>4.8%</td>
<td>0.5%</td>
<td>4.5%</td>
<td>2.2%</td>
<td>0.2%</td>
<td>2.2%</td>
<td>0.3%</td>
<td>1.3%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Other countries</td>
<td>22.5%</td>
<td>4.0%</td>
<td>46.1%</td>
<td>26.3%</td>
<td>2.4%</td>
<td>17.3%</td>
<td>12.5%</td>
<td>54.6%</td>
<td>36.1%</td>
</tr>
</tbody>
</table>

**Iron and steel.** In 2021, iron and steel accounted for 56% of the base metals' imports of Uzbekistan from Russia, while articles of iron or steel added up to another 32%.

On the one hand, due to the Western sanctions against the Russian iron and steel industry, iron and steel exporters of Russia are diverting their exports to Asia, sometimes offering up to 40% discount. On the other hand, the low production of Ukrainian steelmakers caused by the destruction of productive capacity in the two largest enterprises of iron and steel industry of Ukraine (Azovstal and Ilyich Iron and Steel Works of Mariupol) and logistical problems has given the opportunity to the
Russian steelmakers to compensate for the import losses in the main export markets of Ukraine.

Uzbekistan’s imports of iron and steel from Russia during March-October 2022 increased by as much as 75% to 1 million tons as compared to the same period 2021, while the volume of iron and steel imports from Ukraine declined by 86%, from 104 thousand tons to 14 tons. Prior to the war Ukraine was chasing after China to become the third largest supplier of iron and steel to Uzbekistan. As Uzbekistan’s demand for iron and steel has increased, the “lost” import from Ukraine has been compensated by an increase in the import from Kazakhstan and Russia. Overall, in the first ten month of 2022, Uzbekistan imported iron and steel in the amount of 2.2 million tons, up by 15% compared to the same period of the last year.

Iron and steel imports

However, as iron and steel prices surge, increased cost for these metal hurts Uzbek manufacturers, putting upward pressure on inflation.
Base Metals Price Index*, 2016 = 100

Mineral products. Mineral fuels, oils and products of their distillation; bituminous substances; mineral waxes account for 70-75% of the imports of Uzbekistan of mineral products. In January-October 2022, Uzbekistan imported mineral products worth $1.7 billion, decreasing by 3% relative to the same period of 2021.
Food and beverages.

### Fuels, oils and products of their distillation

### Prepared foodstuffs
It is observed from the figures and facts provided above that food prices, machinery energy prices in producing agricultural products directly affects the global prices since Russia is a major supplier of these products in global markets. On top of this, Russia and Ukraine are main suppliers of chemicals and fertilisers used in production of agricultural products and this in turn leads to further hikes in prices because of shortage in supply in the global market of food.

3. Literature Review

3.1 Theoretical literature review

Geopolitical risks are likely to affect international trade by raising the costs to private agents engaging in international business through not only new risks being created but also via escalation of existing risks. This line of reasoning is validated by the
international monetary fund (IMF) that highlighted geopolitical uncertainties as a salient risk to the economic outlook (International Monetary Fund 2017). Furthermore, wars and other militarized conflicts may affect trade among partners as those events are mostly followed by the partial or total trade embargoes (Glick and Taylor 2010). At this point, Glick and Taylor (2010) and International Monetary Fund (2017) theoretically and empirically illustrate that there are the direct effects of geopolitical risks on the trade flows. On the other hand, there could be the indirect effects of geopolitical risks on trade flows via the investment channel. For instance, geopolitical risks can cause the decline of investments due to the increasing costs of doing business and transaction; thus, geopolitical risks can indirectly affect exporting and importing decisions of firms (Balcilar et al. 2018). In addition, geopolitical risks can affect the trade via the exchange rate, the fiscal policy, and the monetary policy channels. According to the theoretical models, the real value of the exchange rates is mainly determined by expectations (Engel 2014). At this stage, geopolitical risks can affect the expectations on monetary and fiscal policy, and these issues can provide significant effects on the exchange rates, thus can affect trade flows (Mueller et al. 2017).

3.2 Empirical literature review

There are previous papers in the literature for analyzing the effects of conflict, terrorism, war, and violence on trade flows. For instance, Pollins (1989a) examines the impact of international politics upon trade flows. It is found that cooperation and international conflict affect trade flows significantly and continuously implying the importance of cooperation among nations. By using the trade patterns between major powers at the beginning of the twentieth century, namely the U.S., the Great Britain, France, Germany, Russia, and Italy, Morrow et al. (1998, 1999) show that common interests and mutual democratic institutions increase trade flows between those countries. Barbieri and Levy (1999) show that war has almost no statistically significant effect on trade flows and even when war causes a decrease, this is almost always temporary. Anderton and Carter (2001) mostly provide the supportive evidence for the trade disruption premise implying that a war depress trade between countries compared to the pre- and the post-war periods. Martin et al. (2008) examine the interaction between military conflicts and trade. The authors find that military conflicts substantially decrease trade openness and the probability of escalation is lower in countries that trade bilaterally. Interestingly, multilateral trade openness increases the probability of bilateral war as it decreases the bilateral trade dependence between counties. With the data of extending back to 1870, Glick and Taylor (2010) find strong and persistent impacts of wars not only on the trade but also the national income and the global economic welfare. Qureshi (2013) documents the negative effects of the regional conflict on trade flows by using both intrastate and international warfare in neighboring states in 145 countries over the
period 1948–2006. It is also noted that even if the trading partners are not engaged in any conflict themselves, they are still affected. Lastly, Caldara and Iacoviello (2018) show that geopolitical risks cause a persistent decrease in international trade, and also industrial production and employment in the U.S.
4. Model

The paper develops a structural dynamic model for a small open economy, following Dib 2011 with domestic and import goods producers. The economy is populated with the following agents: a representative household, domestic good producers and importers, government and a monetary authority. Domestic households have access to incomplete international financial markets, but they must pay a risk premium that is increasing in the foreign-debt-to-output ratio. The production side of the economy consists of final goods producers, domestic and intermediate good producers. Due to the nature of the Uzbek economy, we assume that intermediate goods is equivalent to commodity goods.

4.1 Households

The representative household derives utility from consumption, $C_t$, and disutility from labor, $N_t$. Households maximize their lifetime utility by controlling the level of consumption, labour hours, domestic and foreign bond holdings. They also choose the level of capital services provided to the firms, their capital utilization rate and investment level. Households own the capital stock and increase its volume by investing in additional physical capital ($I_t$) or increasing its utilization rate, $u_t$, defined as $u_t = \frac{K_t}{K_{t-1}}$. Then, they supply labour and capital to domestic intermediate firms and receive total factor payment net of cost associated with variations in the degree of capital utilization, $P_{dt} r^K K_t + P_{dt} w N_t - P_{dt} \psi (u_t) K_t$. where $P_{dt}$ is price of domestic intermediate goods, $Kt$ is capital stock and $r^K$ is rental rate\(^3\). Note, consumers receive a wage deflated by producer price (intermediate goods price) since intermediate firms are the ones that hire the labour.

Households also receive profit or dividend payments, $Div_t$, from monopolistically competitive intermediate good producers as they own these firms. They also receive remittances from abroad $TR_t$ net of tax payments to the government (mainly from Russia)\(^4\). Households hold their wealth in the form of domestic bonds, $B_t$, and foreign bonds, $F_t$, where the latter is denominated in the foreign currency. Bonds are one-period securities with nominal return $r_t$ and $r_t^*$ respectively and foreign bonds.

The preferences of household are constant relative risk aversion type (CRA utility function, which is additively separable into consumption and labor:

---

\(^3\) According to the source of the remittances account for the large proportion of GDP, 16-17%

\(^4\) The persistence parameter is calibrated to 0.9
E \left( \sum_{t=0}^{\infty} \beta^t \left( \frac{C^t}{1-\sigma} - \frac{\epsilon^t N^t}{1+\gamma} \right) \right)

Subject to

\[ C_t + I_t + \frac{\beta_t}{\rho_t} + \frac{SF_t}{\rho_t} + \frac{T_t}{\rho_t} = \frac{p_{dt_t}}{p_t} \omega N_t + \frac{D_{vt_t}}{p_t} + (1 + r_{t-1})B_{t-1} + \frac{p_{dt_t}}{p_t} r_t u_{t-1} K_t - \psi(u) \tag{3.1} \]

and capital accumulation function

\[ \tilde{k}_t = (1 - \delta) \tilde{k}_{t-1} + [1 - \Gamma \left( \frac{\epsilon^t_{t-1}}{\epsilon_t} \right)] I_t \tag{3.2} \]

where \( \beta \) is the discount factor, \( \sigma \) is the degree of relative risk aversion, \( \gamma \) represents the inverse of elasticity of labour (Frisch elasticity) with respect to real wages. By Bahadir, Chatterjee, and Lebesmehlbacher 2018, we assume that remittances follows AR (1) process for simplicity. Since the practice of remittances are quite widespread across the country and time, we assume higher persistence parameter.\(^5\)

The function \( \Gamma \) in equation (3.2) summarises the technology which transforms investment into installed capital following the paper by Christiano, Eichenbaum, and Evans (2005). There is an empirical evidence as for why adjustment cost has to be included in the model. This specific functional form is motivated by empirical finding that investment exhibits a hump-shaped response to a monetary policy shock.

The optimal conditions from above problem gives us labour demand, Euler equation, UIP conditions, Tobin Q equation and investment demand equations:

\[ \epsilon_t N_t = \frac{p_{dt}}{p_t} \omega C_t^{-\sigma} \tag{3.3} \]

\[ (1 + r_t) = (1 + r_{t-1}) \frac{E_t \phi(f_{t-1}) S_{t+1}}{p_t} \tag{3.4} \]

\[ \ln \ln S_t = \ln \ln E_t S_t - r_t + r_{t-1} - \phi f_{t-1} \tag{3.5} \]

\[ Q_t = \beta E_t \frac{\lambda_{t+1}}{\lambda_t} Q_{t+1}(t - \delta) + \frac{p_{dt+1}}{p_t} \left( r K_{t+1} u_{t+1} K_t - \psi(u_{t+1}) K_t \right) \tag{3.6} \]

\[ 1 = Q_t \left( 1 - \Gamma \left( \frac{\epsilon^t_{t-1}}{\epsilon_t} \right) - \Gamma \left( \frac{\epsilon^t_{t-1}}{\epsilon_t} \right) \right) + \beta E_t Q_{t+1} \frac{\lambda_{t+1}}{\lambda_t} \Gamma'' \left( \frac{\epsilon^t_{t-1}}{\epsilon_t} \right) \left( \frac{\epsilon^t_{t-1}}{\epsilon_t} \right)^2 \tag{3.7} \]

\(^5\) The persistence parameter is calibrated to 0.9
Equation (3.4) represents Uncovered Interest Parity (UIP) condition, which determines short-run nominal exchange rate. We assume that premium on foreign bond holdings is \( \phi(f_{t-1}) = \exp \exp (-f_{t-1}) \) following the paper by Adoffson et al. (2007). The idea of risk premium originally stems from the paper of (Schmitt-Grohe and Uribe (2004)). The current model has incomplete financial markets implying households access only risk-free foreign bonds whose rate of return is exogenously determined. As a result, the steady-state of the model depends on initial conditions. To achieve a balanced growth path in the long-run, we have to include the above term in UIP equation.

Equation (3.6) states that the value of the installed capital, Tobin Q, depends on its future value net of depreciation rate and expected future return as rental rate taking into account the cost associated with variation in the degree of capital utilization. The shadow value of installed capital is defined as the ratio of the marginal value of installed capital, \( \mu_t \), and the marginal value of consumption, \( \lambda_t \). Equation (3.7) determines the motion for the investment function. The current level of investment depends on past as well as future inflation and subject to investment-specific shock, \( \varepsilon_t \).

4.2 Firm

4.2.1 Domestic intermediate good producers

There is a continuum of domestic producers indexed by \( j \in [0, 1] \), each producing distinct home intermediate goods using capital and labour as inputs and exposed to stochastic technology growth. The final output is then delivered to domestic and foreign retailers where the latter represents the exporting sector. The production function is subject to a Cobb-Douglas technology:

\[
Y_t(j) = A_t^\kappa K_t(j)N_t^{1-\alpha} - \phi_y
\]

where \( A_t \) is productivity shock, \( A_t = \alpha + \rho A_{t-1} + \eta_t^a \) and \( \kappa = u_t K_{t-1} \) is is effective utilised capital stock, \( N_t \) is homogeneous labour hired by firm, and \( \phi_y \) is a fixed cost enabling zero profits in steady state. The minimisation problem for these firms is:

\[
\omega_t N_t r_t \kappa_t(j) - \lambda_t^{\kappa_t} \left( Y_t - A_t^\kappa K_t(j)N_t^{1-\alpha} - \phi_y \right)
\]
Then first order conditions with respect to $N_t$ and $\tilde{K}_t$ are:

$$
\omega_t - \lambda_t (1 - \alpha) A K_t^{\alpha}(j) N_t^{-\alpha} = 0
$$

3.10

$$
\sigma_t^{\alpha - 1} - \lambda_t \alpha A K_t^{\alpha}(j) N_t^{1 - \alpha} = 0
$$

3.11

The Lagrangian parameter, $\lambda_t$, represents the real marginal cost, which is derived by combining equations (3.10) and (3.11):

$$
mc_t = \frac{\omega_t^{1 - \alpha} \lambda_t}{\alpha A (1 - \alpha) N_t^{\alpha - 1} }
$$

3.12

The domestic intermediate goods is divided into home and exporting part as follows:

$$
Y_t(j) = Y_{dt}(j) + X_t(j)
$$

3.13

For simplicity we assume that domestic producers cannot price discriminate, then export price is simply $S_t p_{xt} = P_{dt}$ according the law of one price. Here we assume that Uzbek exporters set prices in foreign currency (close to reality). Optimal export demand for each differentiated good is:

$$
X_t(j) = \left( \frac{P_{xt}(j)}{P_{xt}} \right)^{-\sigma_t} X_t(j)
$$

3.14

where $\sigma_t \in [0, \infty]$ is elasticity of substitution across differentiated exporting goods.

Furthermore, as the UK economy is small relative to the foreign economy, the export sector accounts for a negligible size of the whole world economy. Therefore, the aggregate demand for export can be written as:

$$
X_t = \left( \frac{P_{xt}}{P_{xt}^*} \right)^{-\sigma_t} Y_t^*
$$

3.15

The foreign variables, $P^*$ and $Y^*$, are world price and world output respectively, which are exogenous in the model. They are defined as the first-order autoregressive process with an i.i.d. normal error terms (log-linear form):
\[
\ln \ln y_t^* = \ln p_{df} \ln y_{t-1}^* + \ln \epsilon_t
\]

3.16

\[
\ln \ln p_t^* = \ln p_{dfo} \ln p_{t-1}^* + \ln \epsilon_t
\]

3.17

Price-setting behavior of firms. The fraction, \( \tau \), of domestic firms are subject to price stickiness through Calvo (1983) model. Thus, in every period, a fraction \( \tau \) of home intermediate firm faces a probability \( 1 - \xi_d \) that it can reset its price. On the other hand, those firms that are not allowed to re-optimise their price are allowed for partial indexation to last period’s inflation rate (Adolfson et al. 2007):

\[
P_{dt}(j) = \left( \frac{p_{dt-1}}{p_{dt-2}} \right)^{qd} p_{dt-1}(j)
\]

3.18

where \( q_d \) is indexation parameter. This mechanism facilitates a lagged term in the Phillips curve. The paper assumes that intermediate goods producers operate under a monopolistic competition. Therefore, a firm with price-setting power will maximize its expected profit stream, using the household’s marginal utility, \( \Lambda_t \), as the discount factor. The re-optimised new price is \( P_{dt} \) for domestic intermediate firms. If firms with probability \( \xi_{dt} \) are not allowed to change their prices during \( t \) periods, the price in period \( t \) will be

\[
\prod_{k=1}^{t} \pi_{d,k-1}^{qd} P_{dt} = \frac{p_{dt-1}}{p_{d,0}} P_{dt}
\]

where \( \pi_d \) is domestic intermediate goods inflation. The firm who does not reset its price for \( t \) periods ahead faces the following optimization problem:

\[
\text{Max} \sum_{t=0}^{\infty} \left( \beta \xi_d \right)^t \left( p_{dt}^q \prod_{k=1}^{t} \pi_{d,k-1}^q - mc \right) Y_{dt}^d +
\]

Subject to

\[
Y_{dt}(j) = \left( \frac{p_{dt}^q \prod_{k=1}^{t} \pi_{d,k-1}^q}{p_{dt}} \right)^{-s_d} Y_{dt}
\]

3.19

As result, we have an optimal equation for domestic intermediate goods prices Phillips curve:
\[
\pi_{dt} = \frac{\beta}{1+\beta_{q_2}} E\pi_{dt+1} + \frac{\theta}{1+\beta_{\phi_1}} \pi_{dt-1} + \frac{(1-\gamma)(1-\beta)}{\chi(1+\beta_{\phi_1})} (\alpha r_k + (1 - \alpha) ln\omega_t - lnA_t)
\]

4.2.2 Imported intermediate good producers

There is a continuum of domestic importers indexed by \( j \in [0, 1] \) import a homogeneous intermediate goods produced abroad for the foreign price, \( p^* \). Each importer uses this imported good to produce a differentiated good, \( y_{ft}(j) \), which is sold in a home monopolistically competitive market to produce the imported-composite good, \( y_f \). As in the domestic-intermediate goods sector, importers can change their prices only when they receive a random signal. The constant probability of receiving such a signal is \( (1 - \epsilon f) \). Similar to domestic intermediate good producers their optimal behaviour will result in Phillips curve for import prices:

\[
\pi_{ft} = \frac{\beta}{1+\beta_{q_2}} E\pi_{ft-1} + \frac{(1-\gamma)(1-\beta)}{\chi(1+\beta_{\phi_1})} (lnP_t^* + lnS_t + lnP_{ft}) + ln\epsilon_{ft}
\]

4.2.3 Domestic final good producers

Prior to producing final goods, these firms aggregate differentiated intermediate goods into composite goods. The domestic and imported composite goods, \( y_{dt} \) and \( y_{ft} \), are produced using, respectively, a continuum of domestic and imported intermediate goods, \( y_{dt}(j) \) and \( y_{ft}(j) \), and the CES aggregate technology:

\[
Y_{dt} = \left[ \frac{1}{0} \int (Y_{dt}(j))^{\frac{1}{x_d}} dy \right]^{\frac{1}{x_d} - 1}
\]

Similar for imported goods:

\[
Y_{ft} = \left[ \frac{1}{0} \int (Y_{ft}(j))^{\frac{1}{x_f}} dy \right]^{\frac{1}{x_f} - 1}
\]

where \( x_d \in [0, \infty) \) is elasticity of substitution across differentiated domestic intermediate goods. The final good, \( z_t \), is produced using domestic and imported composite goods, and the following aggregate technology:

\[
Z_t = \left[ \frac{1}{\nu} Y_{dt}^{\frac{1}{\nu}-1} + (1 - \nu) \epsilon_{ft}^{\frac{1}{\nu}-1} \right]^{\frac{1}{\nu}}
\]
where $\tau$ is a positive share of domestic goods in the production of the final good, and $\nu$ is the elasticity of substitution between domestic and imported goods. The value of $\tau > 1/2$ implies a bias towards domestic goods relative to imported goods from the rest of the world. And $\varepsilon^c_i$ is a random preference shock for foreign imported goods, which is i.i.d. with zero mean. The final good is used for home consumption and investment, so that:

$$Z_t = C_t + I_t + G_t$$  \hspace{1cm} (3.25)

The competitive firm chooses $y_{dt}$ and $y_{ft}$ to maximize its profit. The maximization problem is:

$$P_t Z_t - P_{dt} Y_{dt} - P_{ft} Y_{ft}$$  \hspace{1cm} (3.26)

subject to the budget constraint for final good producers is:

$$P_t Z_t = P_{dt} Y_{dt} + P_{ft} Y_{ft}$$  \hspace{1cm} (3.27)

According to a zero-profit condition of final good firms, substitution of optimal input demand functions yields:

$$P_t = \tau P_{dt} + (1 - \tau)P_{ft}$$  \hspace{1cm} (3.28)

The above equation shows that headline CPI inflation of Uzbekistan is weighted average of domestic prices and imported prices. To conclude, the consumer inflation depends on both domestic marginal cost (aggregate demand channel) and any movements in the price of imported inputs. On the other hand, one could derive the demand for home and imported intermediate goods by maximising total output production (3.24) subject to budget constraint (3.26), which yields:

$$Y_{dt} = \omega \left( \frac{P_{dt}}{P_t} \right)^{-\nu} Z_t$$  \hspace{1cm} (3.29)

$$Y_{ft} = (1 - \omega) \left( \frac{P_{ft}}{P_t} \right)^{-\nu} Z_t \varepsilon^c_t$$  \hspace{1cm} (3.30)

The domestic demand for home goods is proportional to final consumption, $Z_t$ and negatively depends on its own relative price where the weight is elasticity of
substitution between home and foreign goods. According to equation (3.29), the higher is the elasticity the higher is the impact of relative prices on the demand of home non-traded intermediate goods. In Section 6 we discuss the calibration of this parameter, which is quite important for the dynamics of traded goods, especially the demand for imported goods.\footnote{Discussion is in Section 5}

4.3 Central bank

The behaviour of the central bank is approximated with Taylor rule, which specifies how central bank adjusts the short term nominal interest rate in response to inflation and output gap:

\[
\frac{r - r^*_t}{r^*_t} = \left( \frac{\pi_t}{\pi^*_t} \right)^\mu \left( \frac{y^*_t}{y^*_t} \right)^\nu \left( \frac{\pi_t}{\pi^*_t} \right)^{1-\mu} \epsilon^r_t
\]

where $\pi_t$ is consumer price inflation, $\epsilon^r_t$ follows AR(1) process with i.i.d shock.

4.4 Government

The government in this economy collects lump sum tax revenues from households, issues government bonds, $B_t$, and spends resources on government consumption of the final domestic good, $G_t$, so that the budget is balanced each period. Therefore, the government budget constraint is given by:

\[
G_t + \left( 1 + r_{t-1} \right) B_{t-1} = B_t + T_t
\]

4.5 Market clearing condition

The consolidated budget constraint of households generates the accumulation of net foreign assets. The combination of household budget constraint with government resource constraint gives us the evolution of net foreign assets:

\[
\frac{S_F^t}{p_t} - \frac{S_F^{t-1}}{p_t} \left( 1 + r^*_{t-1} \right) = \frac{S^p p_t^\alpha X_t}{p_t} - \frac{p^M}{p_t} M_t
\]
\[ f_t = \frac{s_{F_t}}{p_{t\delta}} \]

where \( f_t \) is real debt to output ratio.

5. Calibration

The paper calibrates its all parameters based on the estimation result of previous literature and data (ratios). There are 28 parameters. The table below shows the values of these parameters. The discount factor is calibrated to 0.99, implying an almost 1% quarterly (or 4% annual) rate of interest in a steady-state. The value is somewhat close to other literature (Minford, Theodoridis, and Meenagh (2009)). The quarterly capital depreciation rate is set to 0.021 following \texttt{smts2007shocks} to produce a 8.4% annual depreciation rate. There are other fixed model parameters, which were calibrated to match the Uzbek data characteristics. For instance, the quarterly steady-state output growth is 1.5%. The following variables were calibrated to match the steady-state (average) features of each times series:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \beta )</td>
<td>Discount factor</td>
<td>0.99</td>
</tr>
<tr>
<td>( \delta )</td>
<td>Depreciation rate</td>
<td>0.021</td>
</tr>
<tr>
<td>Calibrated parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \alpha )</td>
<td>Share of capital in production</td>
<td>0.3</td>
</tr>
<tr>
<td>( \sigma )</td>
<td>Risk aversion</td>
<td>2.96</td>
</tr>
<tr>
<td>( \gamma )</td>
<td>Inverse of Frisch labour supply elasticity</td>
<td>2.00</td>
</tr>
<tr>
<td>( \Gamma''(1) )</td>
<td>Investment adjustment cost</td>
<td>1.12</td>
</tr>
<tr>
<td>( \rho_x )</td>
<td>EOS between home and foreign goods for foreign producers</td>
<td>1.77</td>
</tr>
<tr>
<td>( \rho_{tr} )</td>
<td>AR(1) parameter for remittances</td>
<td>0.9</td>
</tr>
<tr>
<td>( \nu )</td>
<td>EOS between home and foreign goods for home consumers</td>
<td>0.81</td>
</tr>
<tr>
<td>( \psi )</td>
<td>Elasticity of capital util</td>
<td>3.07</td>
</tr>
<tr>
<td>( \phi_y )</td>
<td>Share of fixed cost</td>
<td>1.4</td>
</tr>
<tr>
<td>( \tau )</td>
<td>Home bias</td>
<td>0.6</td>
</tr>
<tr>
<td>Taylor rule</td>
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<td></td>
</tr>
<tr>
<td>$r_p$</td>
<td>Response to inflation</td>
<td>2.5</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------</td>
<td>-----</td>
</tr>
<tr>
<td>$r_y$</td>
<td>Response to output</td>
<td>0.05</td>
</tr>
<tr>
<td>$\mu$</td>
<td>Interest rate smoothing</td>
<td>0.7</td>
</tr>
</tbody>
</table>

**Calvo parameters**

<table>
<thead>
<tr>
<th>$\varphi_d$</th>
<th>Home price indexation</th>
<th>0.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\varphi_f$</td>
<td>Imported price indexation</td>
<td>0.3</td>
</tr>
<tr>
<td>$\xi_d$</td>
<td>Home price rigidity</td>
<td>0.6</td>
</tr>
<tr>
<td>$\xi_f$</td>
<td>Imported price rigidity</td>
<td>0.7</td>
</tr>
</tbody>
</table>

government to output ratio is 0.17, consumption to output ratio is 0.6, $\frac{I}{Y}$ equals to 0.3, $\frac{K}{Y}$ is 0.08, $\frac{X}{Y}$ is 0.23, $\frac{TR}{Y}$ is 0.16 and $\frac{M}{Y}$ is 0.37. These values are also in line with work of Sadykov et al. 2018a.

On the household side, the relative risk aversion in the utility function for consumption ($\sigma$) is 2.96 following the paper by Gandelman and Hernandez-Murillo 2015, implying that movement in consumption is less sensitive to changes in interest rate. Similarly, the coefficient of the inverse of Frisch labour supply elasticity ($\gamma$) of 2.00 indicates that working hours weakly respond as the wage rate alters. The previous estimation for Uzbek data suggest an elasticity of 20.00 (ABDURAKHMANOV and ZOKIROVA 2019). However, one should be cautious about estimated based on micro and macro data. To be on the safest side, we fix the elasticity to much lower level but still keep it elastic. The substitution rate between domestic and foreign goods is inelastic as the elasticity for imports is 0.81, consistent with previous estimates (Olimov and Sirajiddinov 2008). On the other hand, the elasticity for exports ($\rho_x$) is higher (1.77) implying that foreign consumers hold a large basket of goods making their consumption choice more sensitive to relative price changes. We assume that to produce final consumer goods, domestic firms combine both home and imported inputs where these two goods have low elasticity of substitution. In contrast, we assume that world has variety of goods and thus, they the domestic goods can easily be replaced by foreign goods.

On the production side, the share of fixed cost is 40%, while the share of capital is 30% following Group 2018. The parameter governing the elasticity of equilibrium investment adjustment cost ($S^*(1)$) is as low as 1.12, while the parameter of the degree of capital utilisation is 3.07. That is, a 1% drop in rental rate is equivalent to 3.07% fall in capital efficiency rate.
The parameters on inflation dynamics incorporate price stickiness and price indexation parameters. The latter parameters estimates range between 0.1 to 0.4 implying that price inflation is not persistent. On the other hand, the average price duration for importing goods is over 3 quarters while 2.5 quarters for domestically produced goods.

On the policy side of the central bank, the indexation on interest rate is 0.7, while the weight on inflation is 1.75 and 0.035 for output. Although the inflation parameter is similar to other literature (Sadykov et al. 2018b), the coefficient on output feedback is much lower (0.3 versus 0.035). The results of the paper shows that one has to estimate these coefficients for Uzbek data as the model is quite sensitive to them.

6. Impulse response functions

This section of the paper presents a response of main macroeconomic variables to various shocks including labour supply, mark-up shocks and shocks to remittances.

6.1 Labour supply shock

We first consider the impact of labour supply shock. This shock is equivalent to COVID shock of 2020. As we know, the main impact of COVID was a lay-off of employment, which had a huge negative impact of GDP. In the current setup, a positive labour supply shock takes the form of an increase in the disutility of labour. As can be seen from Figure 1, the employment declines while real wage increases. Thus, consumption and investment falls in response to decreasing total output. A negative supply shock induces an increase in inflation, which leads to contractionary monetary policy. As a consequence nominal exchange rate (NER) appreciates. The price of imported goods become more expensive. In the trade side of the economy, export volume falls (due to model structure) and so is the imports. According to the literature, Uzbek economy has a low substitution effect between domestic and imported goods. The model assumes that the production of final output requires both domestic and imported goods. Therefore, a decrease in domestic intermediate goods (commodity) entails a fall in import demands.
5.2 Domestic price mark-up shock

The domestic mark-up shock is equivalent to commodity price shock. Note, in our model, firms do not price differentiate between export and domestic prices (commodity producers sell goods at the same price both abroad and in local market). The dynamics under the mark-up shock is displayed in Figure 2. An increase in prices of domestic commodity goods (intermediate goods) reduces the volume of exports. The past literature demonstrated that domestic export goods are highly replaceable in foreign market. Therefore, the quantity decreases in response to price movement. For the same reason as before, import decreases as well. As a result, total output falls in the economy. There is also a considerable decline in labour as production drops. The direct effect of shock results in higher inflation and hence interest rate increases, which causes exchange rate to appreciate. Over the time, however, the exchange rate depreciates to smooth current account.
5.3 Shock to remittances

The Ukrainian war and the recent political issues in Russia had a huge impact on employees working in nearby countries (especially in Russia), who send their incomes to home (Uzbekistan). For this reason, we would like to present an expected consequence if this continues to be a long-run problem in the future. Figure 3 illustrates a dynamics for a positive shock to remittances. An increase in remittances result in a rise in household consumption and investment. The employment level falls. However, aggregate output still falls as export volume decreases. There is a fall in exports mainly due to a significant appreciation of the currency. There is a limited movement in nominal interest rate - monetary authorities do not respond to this shock much since there is a negligible movements in consumer price inflation. Nevertheless, we expect to have a current account surplus.
6. Discussion

In this paper we consider different scenarios under recent major shocks that triggered a significant movement in Uzbek economy. They are COVID shock (equivalent to labour supply shock), Ukrainian war (commodity price shock) and shocks to remittances, which accounts to a considerable part of GDP. According to IRFs described in Section 5.1, COVID shock decreases consumption, investment and output due to a significant decline in labour supply. As a result, the economy experiences a high inflation and monetary authorities decreases interest rate to alleviate this effect. In the trade side of the economy, we expect a decline in both export and import volumes. In particular, the import declines because there is a reduction in domestic intermediate goods production, which in composite produces a final goods delivered to households. Another major episode that occurred in recent years is Ukrainian-Russia war. This equivalent to a rise in commodity prices and a decline in remittances. We have separately considered the consequence of each shock. A rise in remittances increases consumption and investment opportunities, but decreases the overall employment level. The GDP will keep declining mainly due to exports. We assume that exchange rate appreciates as remittance level increases (the demand for Uzbek currency increases). The imports are expected to increase due to a rise in incomes. The other consequence of War is substantial increase in
commodity prices. The main impact essentially falls on inflation and monetary policy moves towards contractionary policy. As a consequence, exchange rate appreciates. However, in the near future (few quarters), it will start depreciating. The output falls and so is consumption and import volumes. Since domestic production declines, it has a negative impact on labour market (unemployment rises).

7. Policy implications and recommendation

The IMF estimates that growth recovery is expected to continue in 2022, but uncertainty remains high. The main factor influencing the growth of the general price level is imported inflation. There was a slowdown in inflation starting from 2018, but starting from 2022, prices began to accelerate. There are risks of stagflation processes in the world. Therefore, continued tight monetary policy is required to contain inflation and bring lending growth in line with the need to maintain external and internal economic stability. Restraining credit growth and phasing out directed lending would help contain inflationary pressures, avoid excessive external deficits, and prevent a potentially costly boom-and-bust cycle (reducing concessional loans to agriculture). Exchange rate flexibility must be maintained to ensure that the economy can adapt to economic fundamentals.
REFERENCES


Appendix A

In this appendix, We report the log–linearized representation of structural model

\[ \ln \omega_t = y \ln n_t + \sigma \ln c_t + \ln p_{dt} + \ln \epsilon_t^\omega \] \hfill (7.1)

\[ \ln c_t = E_t \ln c_{t+1} - \frac{1}{\sigma} (r_t - E_{t+1} \pi_t) + \frac{1}{\sigma} \ln \epsilon_t^c \] \hfill (7.2)

\[ \ln n_t = (1 + \frac{\psi(1)}{\psi(1)^{\nu}}) r_k_t - \ln \omega_t + \ln k_{t-1} \] \hfill (7.3)

\[ r_t = \mu r_{t-1} + (1 - \mu)(r_{t-1} + r_{Y_t}) + \ln \epsilon_r^r \] \hfill (7.4)

\[ \ln \nu_t = \frac{1}{y} \ln \nu_{t-1} + \frac{\beta}{y} \ln \nu_t + \frac{1}{(1 + y)^{\nu}} \ln q_t^{\nu} + \ln \epsilon_t^{nu} \] \hfill (7.5)

\[ \ln \kappa_t = (1 - \sigma) \ln k_{t-1} + \sigma \rho \] \hfill (7.6)

\[ q_t = \beta E_t \frac{\psi(1)}{\psi(1)^{\nu}} (q_{t+1}(1 - \sigma) + \frac{p_{dt+1}}{p_{t+1}} [r_k_{t+1} + \psi(Y_{t+1}) - \psi(U_{t+1})]) \] \hfill (7.7)

\[ \ln z_t = \frac{1}{y} \ln n_t + \frac{1}{y} \ln \nu_t + \frac{1}{y} \ln g_t + r_k^{x*} \psi(1) r_k_t \] \hfill (7.8)

\[ \ln s_t = E_t s_{t+1} - r_t + \phi f_{t-1} \] \hfill (7.9)

\[ \ln x_t = \ln Y_t - p_x \ln p_{dt} - s_t - \ln p_t \] \hfill (7.10)

\[ \ln y_t = \phi (a \ln k_{t-1} + (1 - \alpha) \ln n_t + \alpha \frac{\psi(1)}{\psi(1)} r_k_t + \ln \lambda_t) \] \hfill (7.11)

\[ t_r = \rho_t t_{r,t} + \epsilon_t \] \hfill (7.12)

\[ f_t = \frac{1}{1 + y} f_{t-1} (1 + r) + f_{r,t-1}^r + \frac{\lambda}{y} ([\ln p_{dt} + \ln x_t - \ln p_{t^*}) - \frac{M}{y} (\ln p_f^f + \ln y_t - \ln p_{f,t}) \] \hfill (7.13)

\[ \pi_{dt} = p_{dt} - p_{dt-1} \] \hfill (7.14)

\[ \pi_{dt} = \frac{1}{1 + y} \ln \pi_{dt+1} + \frac{\psi(1)}{1 + y} \ln \pi_{dt-1} + \frac{1}{1 + y} \ln \pi_{dt+1} \] \hfill (7.15)

\[ \pi_{ft} = \frac{1}{1 + y} \ln \pi_{ft+1} + \frac{\psi(1)}{1 + y} \ln \pi_{ft-1} + \frac{1}{1 + y} \ln \pi_{ft+1} \] \hfill (7.16)

\[ y_t = y_{dt} + x_t \] \hfill (7.17)

\[ y_{dt} = \ln z_t - v (\ln p_{dt} - \ln p_f) \] \hfill (7.18)

\[ y_{ft} = \ln z_t - v (\ln p_f - \ln p_{ft}) + \epsilon_{dt} \] \hfill (7.19)

\[ \ln p_{dt} = \ln p_{dt} - (1 - v)p_{ft} \] \hfill (7.20)

\[ \ln p_{ft} = \pi_{ft} + \ln p_{ft-1} \] \hfill (7.21)

\[ \ln r_t = \rho_r \ln r_{t-1} + \ln \epsilon_r \] \hfill (7.22)

\[ \ln y_t = \rho_y \ln y_{t-1} + \ln \epsilon_y \] \hfill (7.23)

\[ \ln p_t = \rho_{pf} \ln p_{t-1} + \ln \epsilon_p \] \hfill (7.24)