ECONOMIC REVIEW

National Bank of the Republic of Kazakhstan

No. 2, Special Edition, 2025

NATIONAL BANK OF KAZAKHSTAN

ECONOMIC REVIEW
National Bank of the Republic of Kazakhstan

Published by: National Bank of the Republic of Kazakhstan

A special edition is dedicated to the V Scientific and Practical Conference of the National Bank of the Republic of Kazakhstan "Monetary Policy and Financial Stability Amid Global and Domestic Shocks".

This issue includes the research results of employees of the National Bank of Kazakhstan, the central banks of Uzbekistan and Azerbaijan, and the academic community, presented at the V Scientific and Practical Conference "Monetary Policy and Financial Stability Amid Global and Domestic Shocks", held on April 30, 2025 in Almaty.

The Conference was attended by independent experts in the field of economics and finance, representatives of the academic community, research centers, financial and international organizations, and government institutions.

The Conference program was formed based on the relevance of the issues and included three sessions.

The first panel, devoted to regional monetary policy challenges, reviewed the challenges facing central banks and presented research related to the monetary policies of Kazakhstan, Uzbekistan and Azerbaijan.

The second panel was devoted to the analysis of consumer patterns in relation to financial stability. The results of research on consumer behavior and the impact of crises on households were reviewed.

The third panel discussed macroeconomic dynamics in the context of price shocks and structural imbalances. Current research was presented on the impact of oil prices on business cycles, the trade-off between government spending and public debt accumulation, business efficiency and the impact of the business environment on the economy.

The conference was a continuation of the National Bank's open monetary policy and a fundamental basis for further work and dialogue with society, experts, researchers and government agencies.
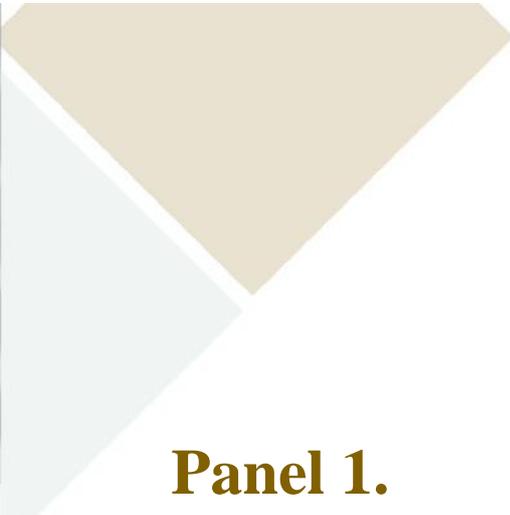
ECONOMIC REVIEW

National Bank of the Republic of Kazakhstan

№ 2, Special Edition, 2025

CONTENTS

Panel 1.
Regional Challenges in Monetary Policy

Inflation – a Monetary Phenomenon Always and Everywhere: a Myth or Reality for Kazakhstan?

Zhuzbayev A. M., National Bank of the Republic of Kazakhstan
Seidakhmetova B. A., National Bank of the Republic of Kazakhstan
Shamar B.Ye., National Bank of the Republic of Kazakhstan
Tolegenova Zh.B., National Bank of the Republic of Kazakhstan

This study is devoted to the analysis of relationship between inflation and money supply in Kazakhstan. The idea of the research is based on the quantitative theory of money, which has again become relevant in recent years. The main objective of the study was to determine the presence of long-term and short-term relationships between these economic variables and to develop appropriate recommendations for implementation of the monetary policy in Kazakhstan. The study used modern econometric methods (wavelet-based analysis, VECM and VAR models) of the time series analysis, which enabled to obtain significant results proving a stable relationship between inflation and money supply over a horizon of up to 10 years. Based on the analysis, episodes of excessive growth in the money supply with the definition of "pro-inflationarity" of its growth were identified, a quantitative assessment of the impact of money supply on inflation in the short and long term was made. The findings provide new prospects for pursuing an effective monetary policy aimed at ensuring macroeconomic stability and reducing inflation risks in Kazakhstan.

https://nationalbank.kz/ru/news/issledovaniya
https://nationalbank.kz/file/download/107909
https://nationalbank.kz/kz/news/issledovaniya
https://nationalbank.kz/file/download/107908

Development of the Near-Term Forecast of Inflation for Uzbekistan: Application of FAVAR and BVAR models

Boymirzaev T., Central Bank of Uzbekistan

This study investigates the application of Factor-Augmented Vector Autoregression (FAVAR) and Bayesian Vector Autoregression (BVAR) models for inflation forecasting. FAVAR models deal with high-dimensional data by extracting latent factors from extensive macroeconomic indicators, while BVAR models incorporate prior distributions to enhance forecast stability and precision in data-limited environments. Employing a comprehensive dataset of Uzbekistan-specific inflation determinants, we conduct an empirical assessment of both models, examining their predictive accuracy. Findings from this research aim to optimize inflation forecasting methodologies, providing the Central Bank of Uzbekistan with robust, data-driven insights for improved policy formulation.

https://www.graduateinstitute.ch/library/publications-institute/development-near-term-forecast-inflation-uzbekistan-application
https://repository.graduateinstitute.ch/nanna/record/319984/files/HEIDWP06-2025.pdf?withWatermark=0&withMetadata=0&registerDownload=1&version=1

Implications of Diverging Monetary Policies on Exchange Rates and Capital Flows: a Policy Perspective for Caucasus and Central Asia countries

Ismayilli I., Central Bank of Azerbaijan

This policy paper delves into the profound effects of diverging monetary policies among major central banks on exchange rates, capital flows, and financial stability, with a particular focus on emerging markets, especially those in the Caucasus and Central Asia. In an era marked by economic fragmentation and heightened geopolitical uncertainty, the misalignment of monetary policies among advanced economies has led to significant financial spillovers, exacerbating currency volatility and disrupting global capital flows. Utilizing a combination of empirical data, case studies, and theoretical frameworks, this paper underscores the unique challenges faced by emerging markets and the Caucasus and Central Asia countries. The paper emphasizes the critical need for enhanced international monetary cooperation, robust macroprudential frameworks, flexible exchange rate regimes, and the establishment of regional financial safety nets. These strategies are indispensable for bolstering financial resilience in the Caucasus and Central Asia region and mitigating the adverse effects of global monetary divergence. By providing a comprehensive analysis and actionable policy recommendations, this paper aims to contribute to the ongoing discourse on monetary policy and financial stability in emerging markets.

1. Introduction

The global economic landscape is increasingly shaped by a confluence of geopolitical uncertainties, supply chain disruptions, and diverging monetary policies among major economies. These factors have created a complex and volatile environment, particularly for emerging markets and developing economies. The Caucasus and Central Asia (CCA) region, with its heavy reliance on commodity exports and integration into global financial markets, is especially vulnerable to these external shocks. This paper seeks to explore the implications of monetary policy divergence on financial stability, capital flows, and inflation dynamics in emerging markets, with a particular focus on the CCA region.

In recent years, the divergence in monetary policies among the world's leading central banks has become more pronounced. The U.S. Federal Reserve's aggressive interest rate hikes have strengthened the U.S. dollar, triggering capital outflows and currency depreciation in emerging markets. Meanwhile, the European Central Bank (ECB) has adopted a more cautious approach to tightening, and the Bank of Japan (BoJ) has maintained accommodative policies. The People's Bank of China (PBoC) has implemented rate cuts and liquidity support to stimulate its slowing economy. These varying policy stances have created a complex global financial environment, complicating the economic management of emerging markets.

This paper aims to provide a comprehensive analysis of these dynamics by incorporating existing data, empirical evidence, and case studies to illustrate the specific challenges faced by the CCA region. By examining the interplay between global monetary policy divergence, exchange rate volatility, and capital flows, the paper highlights the risks posed to regional economies and suggests policy measures to mitigate the impact of global economic fragmentation. The analysis is grounded in theoretical frameworks such as the Mundell-Fleming model and interest rate parity (IRP) condition, which help explain the effects of monetary policy divergence on exchange rates and capital flows.

By providing a detailed analysis and actionable policy recommendations, this paper aims to contribute to the ongoing discourse on monetary policy and financial stability in emerging markets, particularly in the context of the CCA region. The findings and recommendations are intended to

inform policymakers, central bankers, and researchers, helping them navigate the complexities of global monetary divergence and its impact on financial stability.

2. Diverging Monetary Policies: A Global Snapshot

The divergence in monetary policy among the world's leading central banks has become more pronounced in recent years. The U.S. Federal Reserve's aggressive interest rate hikes have strengthened the dollar, triggering capital outflows and currency depreciation in emerging markets. The European Central Bank's moderate tightening, the Bank of Japan's accommodative policies, and the PBoC's liquidity support further complicate the situation.

Figure 1

Interest rates of major advanced economies and China (2019-2025)
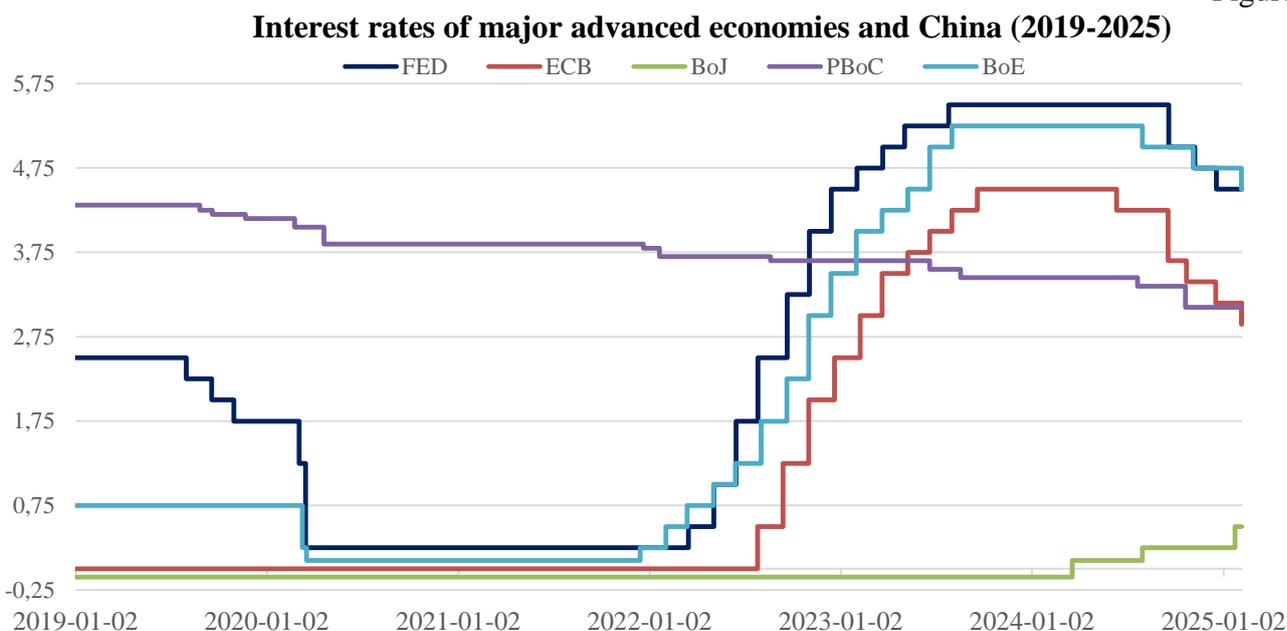
Source: investing.com, fred.stlouisfed.org

Since 2022, the Fed's aggressive rate hikes, reaching 5.5%, have aimed to curb inflation. The ECB has been more cautious in tightening, while the BoJ only recently exited its ultra-low rate policy in response to rising domestic inflation. Meanwhile, the PBoC has taken a divergent approach, implementing rate cuts and liquidity support to stimulate China's slowing economy amid property sector distress and weak domestic demand. The BoE, facing persistent inflationary pressures, raised rates significantly, though its trajectory has been somewhat closer to the Fed's than the ECB's.

Recently, as the Fed, the BoE and ECB begin rate cuts–albeit at different speeds–the BoJ tightens policy, the PBoC continues its accommodative stance, new complexities emerge in global capital allocation. This gap in interest rates from 2019 to 2025 underscores the challenges posed by these varying policies, which are driven by different regional economic priorities. It has led to capital outflows in emerging markets and currency depreciation against the U.S. dollar, complicating their economic management.

The chart illustrates global monetary policy shifts across Emerging Market Economies (EMEs) and Advanced Economies (AEs), highlighting a tightening phase from 2021 to mid-2023 followed by recent easing. This pattern reflects the spillover effects of inflation-driven rate hikes in AEs, which pressured EMEs to raise rates to stabilize currencies and curb capital outflows. The ongoing easing phase suggests growing concerns over slowing growth and financial stability, raising questions about capital flow volatility and exchange rate adjustments in a fragmenting global economy. As geopolitical tensions reshape trade and financial linkages, divergent monetary policy paths may amplify spillovers, necessitating new frameworks for macroprudential coordination.

Figure 2

Change in key policy rates across 83 central banks

increase in policy rate AEs ■ increase in policy rate EMEs ■ decrease in policy rate AEs ■ decrease in policy rate EMEs
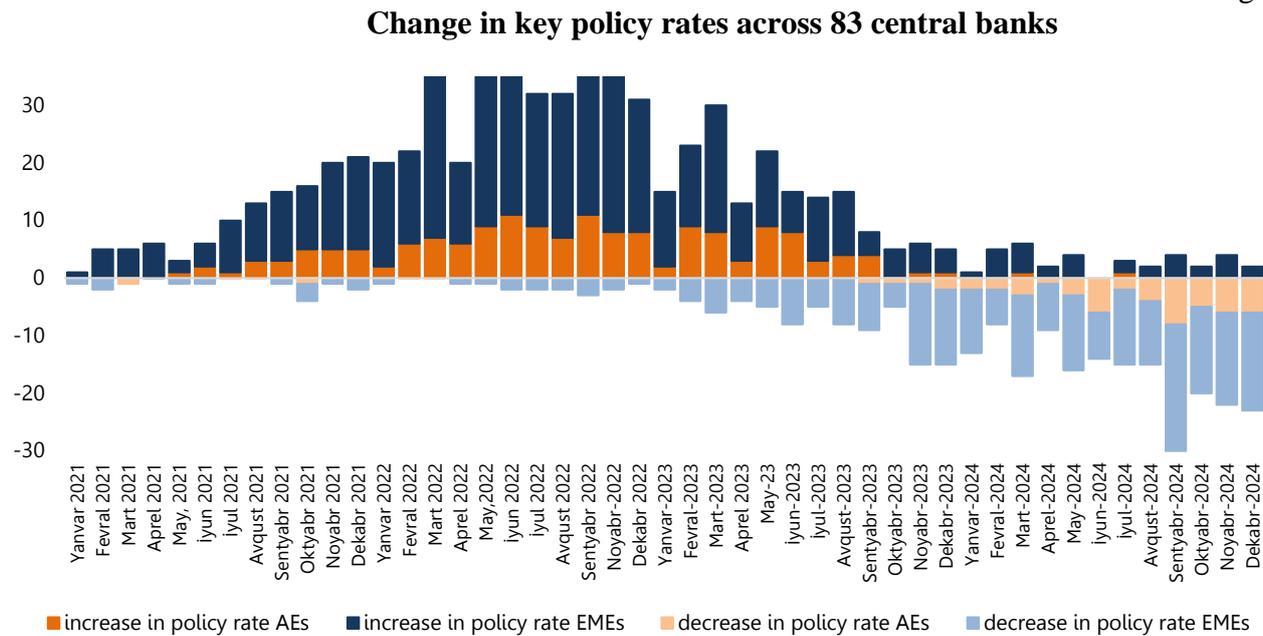
Source: https://www.cbrates.com, centralbanknews.info

3. Interest Rate Differentials and Exchange Rate Volatility

Recent data reveal that interest rate differentials have played a dominant role in capital allocation, with currencies particularly in the Central Asia experiencing significant depreciation against the U.S. dollar. The depreciation trend complicates monetary policy in these economies by increasing the cost of servicing foreign-denominated debt and fueling inflation.

The analysis of Figure 3, which examines the impact of interest rate divergence on exchange rates from 2019 to 2024, reveals several key dynamics between the Federal Reserve (FED) interest rate and various currencies against the US dollar (USD). The FED rate plays a significant role in influencing global currency markets, as changes in U.S. interest rates can affect capital flows and investor behavior. Specially for the Kazakhstani Tenge (KZT), Kyrgyzstani Som (KGS), and Uzbekistani Som (UZS), the exchange rates appear to be sensitive to shifts in the FED rate. Periods of rising FED rates typically correlate with a stronger USD, leading to depreciation in these currencies, as higher U.S. interest rates attract investment flows into dollar-denominated assets. Conversely, when the FED rate is lower or stable, these currencies may experience relative stability or appreciation against the USD, depending on domestic economic conditions. The figure likely highlights specific instances where interest rate divergence led to notable fluctuations in exchange rates, underscoring the interconnectedness of global financial markets and the influence of U.S. monetary policy on emerging market currencies. Overall, the data suggests that the FED's interest rate decisions are a critical factor in shaping the exchange rate dynamics of these currencies against the USD over the analyzed period.

Figure 3

Impact of Interest Rate Divergence on Exchange Rates (2019-2024)

a)FED rate and GEL/USD

b) FED rate and KZT/USD

c) FED rate and AMD/USD

d) FED rate and KGS/USD

e) FED rate and UZS/USD
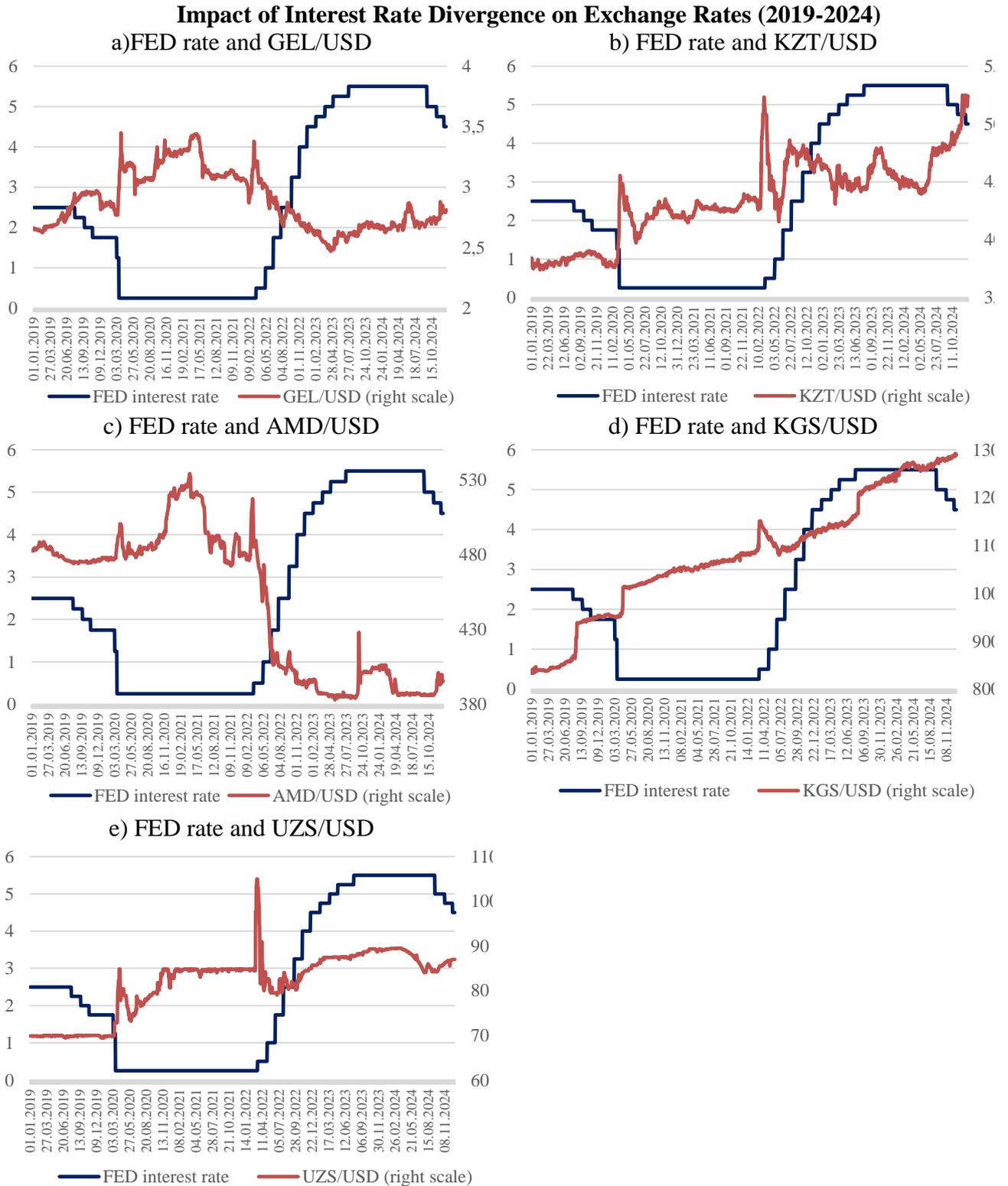
Source: investing.com, fred.stlouisfed.org

4. Theoretical Framework: Understanding the Implications of Diverging Monetary Policies

The Mundell-Fleming model, an extension of the IS-LM framework to open economies, explains how monetary policy divergence impacts exchange rates and capital flows. Under a flexible exchange rate system, expansionary monetary policy (lower interest rates) leads to capital outflows, currency depreciation, and improved net exports. Contractionary monetary policy (higher interest rates) attracts capital inflows, appreciates the currency, and dampens net exports. The strength of these

effects depends on capital mobility, investor expectations, and the degree of monetary policy synchronization among major economies.

According to the interest rate parity (IRP) condition, exchange rate movements adjust to offset interest rate differentials between economies. When the Fed raises rates while the central banks of CCA maintain lower rates, investors shift capital to the U.S., strengthening the dollar and weakening currencies of those countries. These currency adjustments impact global trade and capital flows.

Monetary policy divergence triggers global capital flow adjustments, with three key effects:

a) capital inflows to high-yielding markets: the Fed rate hikes attract global capital into U.S. assets, strengthening the dollar;

b) capital flight from emerging markets: Higher U.S. yields lead to capital outflows from emerging markets, causing currency depreciation and financial strain;

c) volatility in carry trade strategies: Investors borrowing in low-interest currencies (e.g., JPY, EUR) to invest in higher-yielding assets may rapidly unwind positions if interest rate differentials shift unexpectedly, increasing volatility.

Rey (2016) argues that financial globalization has transformed the traditional monetary trilemma into a dilemma, where independent monetary policy becomes difficult due to the dominance of global financial conditions. Even countries with flexible exchange rates remain vulnerable to external monetary shocks due to synchronized capital flows driven by global liquidity conditions. For example, when the U.S. Federal Reserve tightens policy, risk-sensitive capital flows out of emerging markets, increasing financial stress regardless of their exchange rate regimes. This suggests that domestic monetary policies in smaller economies may be increasingly constrained by global financial cycles rather than national macroeconomic conditions.

The classical Mundell-Fleming Trilemma suggests that a country can only achieve two of the following three policy goals: (1) free capital movement, (2) independent monetary policy, and (3) a fixed exchange rate. However, growing empirical evidence suggests that financial markets are now so integrated that even countries with floating exchange rates struggle to maintain full monetary policy autonomy. The U.S. dollar's dominance as the global reserve currency amplifies spillovers, reducing the ability of emerging markets to counteract external shocks through domestic policy adjustments. This "dilemma" highlights the need for enhanced global monetary coordination to mitigate destabilizing capital flow reversals.

These dynamics illustrate how monetary policy divergence fuels financial instability and global liquidity disruptions.

5. Case Studies of Past Monetary Divergences

The 2013 "Taper Reaction " provides a striking example of how monetary tightening in advanced economies – specifically, the Federal Reserve's announcement of reducing asset purchases – triggered sharp capital outflows from emerging markets. Countries such as India, Indonesia, Brazil, Turkey, and South Africa saw rapid currency depreciations and rising bond yields as global investors repositioned portfolios toward safer U.S. assets. Central banks in these economies were forced to raise interest rates preemptively to defend their currencies, tightening domestic financial conditions at a time when their economies required monetary easing.

A bar chart showing capital outflows from selected emerging markets after the Fed's taper announcement.

The 2022-2023 Fed Rate Hike Cycle: The Federal Reserve's aggressive rate hikes from 0.25% in early 2022 to 5.5% by mid-2023 led to a significant appreciation of the U.S. dollar, triggering capital outflows from emerging markets, many of which experienced sharp currency depreciations. Additionally, countries with high levels of dollar-denominated debt, including Turkey and Argentina, faced worsening financial conditions as debt servicing costs surged. This monetary tightening also created policy dilemmas for central banks in emerging economies, forcing them to choose between raising interest rates to stabilize their currencies or maintaining lower rates to support economic growth. These developments illustrate that policy divergence among major central banks is not merely a theoretical concern but a recurring driver of global financial instability.

Figure 4

Capital Outflows from EMEs during 2013 Taper Tantrum (May-Aug)
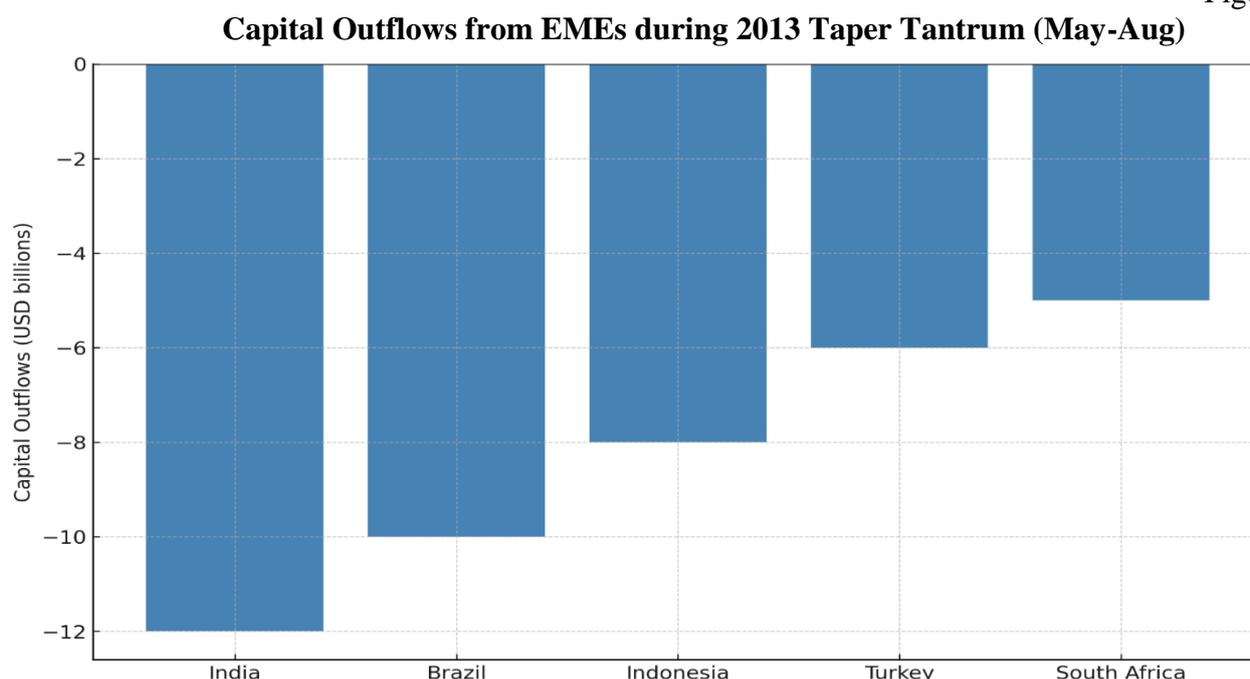
Source: International Monetary Fund (IMF) Global Financial Stability Report (2014), BIS Quarterly Review (2013)

6. Global Liquidity and the Dollar's Role

The role of the U.S. dollar as the global reserve currency makes Federal Reserve policy decisions a key driver of global liquidity conditions, with significant spillover effects on emerging markets. When the Fed maintains low interest rates, as seen in 2020 and 2021, global liquidity expands, encouraging capital flows into emerging markets and leading to higher debt accumulation. However, as the Fed tightened monetary policy in 2022 and 2023 by raising rates to 4.5% and 5.5%, global liquidity declined, and emerging markets faced increasing financial constraints.

Table 1

Impact of U.S. Federal Reserve Rate Hikes on emerging market debt and CCA

Date	Fed Interest Rate (%)	CCA-Central government net lending/borrowing (Percentage of GDP)	Global Total Debt-EMEs (Percent of GDP, weighted averages)	CCA-Core consumer price index
2020	0.25	1.9	200.9	6.5
2021	0.25	-3.3	194.7	7.6
2022	4.5	0.2	191.5	13.8
2023	5.5	-0.6	197.1	12.2
2024	4.5	-2.2	N/A	7.6

Source: fred.stlouisfed.org, tradingview.com, bis.org, imf.org

From 2020 to 2024, macroeconomic dynamics in the Central Asia and Caucasus (CCA) region were influenced by shifts in the U.S. Federal Reserve's interest rates, global debt trends, and domestic fiscal and inflationary developments. The Fed's near-zero rates in 2020-2021 supported capital inflows to emerging markets, contributing to a fiscal surplus of 1.9% of GDP in the CCA in 2020. However, as the Fed aggressively raised rates to 5.5% by 2023 to combat inflation, global financial conditions tightened, increasing borrowing costs and contributing to fiscal deficits in the CCA (-0.6% in 2023 and -2.2% in 2024). The region's core inflation surged to 13.8% in 2022, likely due to external price shocks

14

and currency depreciation but moderated to 7.6% by 2024 as monetary tightening took effect. Meanwhile, global total debt in emerging markets decreased from 200.9% of GDP in 2020 to 191.5% in 2022, reflecting deleveraging efforts, before rising again to 197.1% in 2023, possibly due to increased borrowing costs and weaker growth. Overall, the interaction of global monetary policy tightening, inflation dynamics, and fiscal pressures shaped the region's macroeconomic outcomes during this period.

To manage these risks, policymakers in emerging markets must maintain flexible exchange rate regimes to allow for gradual currency adjustments and reduce the risk of sharp financial disruptions. They should also build adequate foreign reserves to stabilize exchange rate volatility and provide a buffer against external shocks. Additionally, exploring international liquidity arrangements, such as regional financial safety nets or access to IMF facilities, can help ensure emergency funding during periods of global financial stress.

7. Capital Flows and Financial Stability

The analysis in the BIS Quarterly Review, September 2024, investigates the role of global factors such as the US dollar, the volatility index, and the policy rate differential in driving capital flows to EMEs. The study reveals that a depreciation of the AE-only US dollar index significantly increases local currency bond and equity flows, while the volatility index primarily influences equity flows.

Figure 5

Standardised impact of global factors and policy rate differential on capital inflows[1]
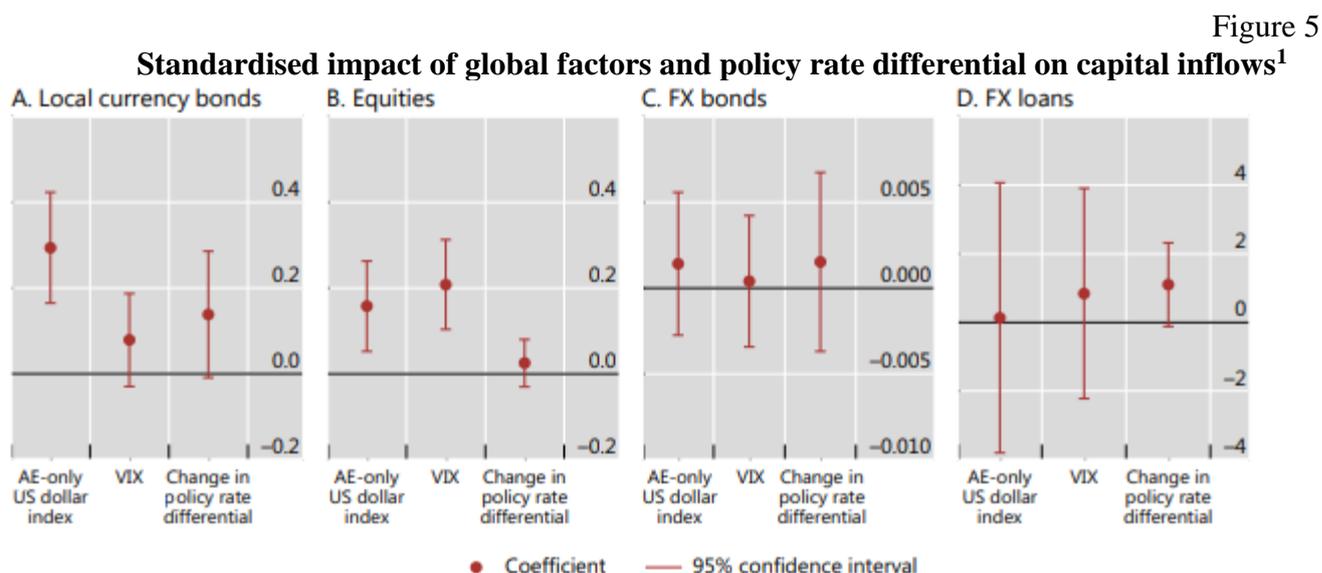
Sources: BIS Quarterly Review, September 2024

The policy rate differential is a key driver of FX loan flows, with an increase boosting these flows in the subsequent quarter. Furthermore, mutual fund flows appear to amplify the sensitivity of local currency asset flows to the US dollar, suggesting a growing role for these funds. The Goldman Sachs Global Financial Conditions Index (FCI) also correlates with capital flows but does not surpass the US dollar's impact on local currency bonds. This research underscores the complex dynamics between global financial conditions, exchange rates, and policy rates in shaping capital flows to EMEs.

---

[1] Each dot shows the change in the ratio of capital flows to total foreign holdings in percentage points in response to a one standard deviation depreciation of the US dollar against AE currencies, a one standard deviation decrease in the VIX or a one standard deviation increase in the change in the policy rate differential. The contemporaneous value of the first two variables and the one-period lagged value of the third variable are included jointly in monthly regressions of portfolio flows and quarterly regressions of FX loan flows, together with one-period lagged dependent variable and controls (US CPI, EME CPI, US industrial production (IP), EME IP, Brent oil price; for equities, EME and US equity market returns are also included).

Figure 6

Capital inflows in CCA

Uzbekistan, USD Million

Kazakhstan, USD Million

Georgia, USD Million

Azerbaijan, USD Million

Armenia, USD Million
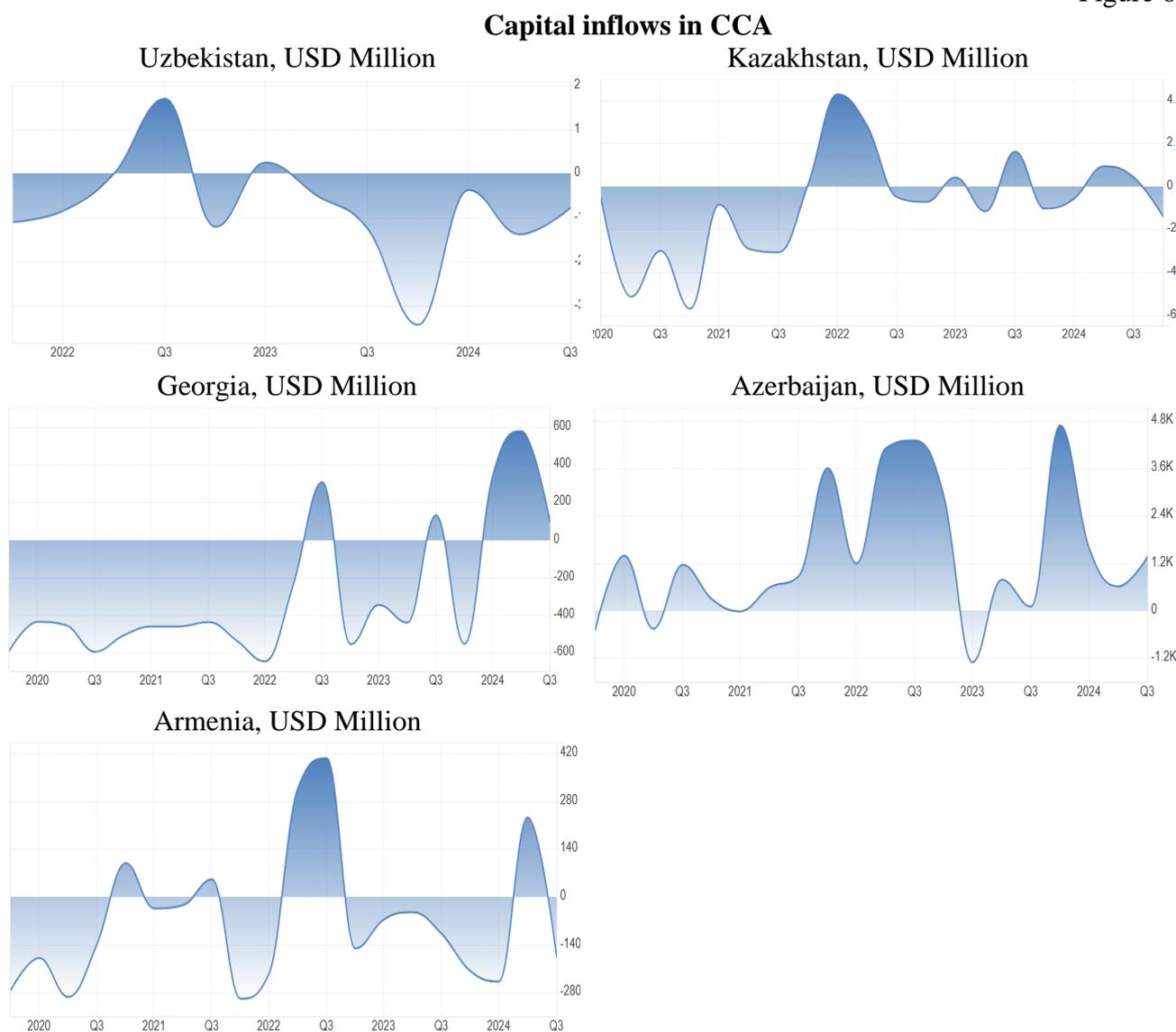
Source: tradingeconomics

Over the past five years (2020–2024), capital flows in the Caucasus and Central Asia (CCA) countries have been highly volatile, reflecting the region's sensitivity to global and regional shocks. The COVID-19 pandemic initially caused significant outflows in 2020, with Georgia recording a deficit of -931.93 USD Million in Q2 2008 and Kazakhstan hitting a record low of -5975.60 USD Million in Q4 2020. Partial recovery occurred in 2021, with Azerbaijan achieving a surplus of 1361.70 USD Million in Q3 2024 and Armenia reaching an all-time high of 405.60 USD Million in Q3 2022. The geopolitical situation in 2022 further disrupted the region, leading to increased remittances in some countries but also causing currency depreciation and capital flight due. By 2024, divergence emerged: energy-exporting countries like Azerbaijan maintained surpluses, peaking at 4681.50 USD Million in Q4 2023, while others like Armenia faced a deficit of -176.20 USD Million in Q3 2024, Kazakhstan recorded a deficit of -1473.10 USD Million in Q4 2024, and Uzbekistan saw a deficit of -1002.24 USD Million in Q3 2024. Overall, the region experienced net outflows, driven by volatile commodity prices, geopolitical risks, and global monetary tightening, underscoring the need for economic diversification, stronger reserves, and regional cooperation to stabilize capital flows.

Figure 7

OFR Financial Stress Index[2]
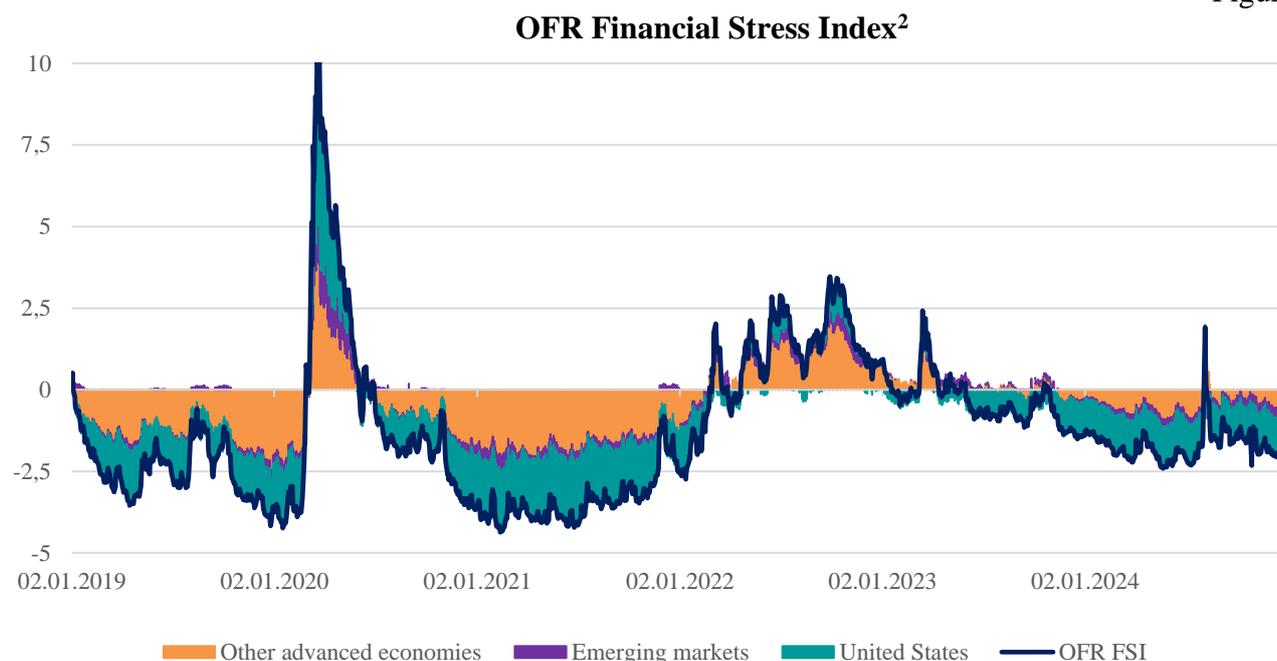
Source: financialresearch.gov

OFR (The Office of Financial Research) Financial Stress Index (FSI) has exhibited significant fluctuations from 2019 to early 2025, reflecting global financial market dynamics. The index spiked dramatically in March 2020, reaching an all-time high of 10.266 amid the COVID-19 pandemic, signaling extreme financial distress. As markets stabilized with monetary and fiscal interventions, the FSI hit a record low of -4.364 in February 2021, indicating below-average stress levels. Throughout 2022 and 2023, the index showed periodic increases in response to monetary policy tightening and global economic uncertainty. By January 2025, the FSI stood at -1.965, suggesting relatively calm financial conditions. The index's movements have been shaped by key market components such as credit conditions, equity valuation, funding stresses, safe-haven demand, and volatility. It remains a critical tool for assessing systemic financial risks, offering insights into market sentiment and economic stability over time.

8. Geopolitical and Fiscal Factors

Geopolitical tensions, including trade wars, sanctions, and political events, have increasingly shaped financial markets in the Central Asia and Caucasus (CCA) region in ways that diverge from traditional economic expectations. For instance, the imposition of sanctions on Russia in 2014 led to a sharp depreciation of the Russian ruble, despite the country's stable monetary policy, which in turn affected neighboring CCA countries, whose economies are closely linked to Russia through trade and remittances. The subsequent imposition of severe sanctions on Russia following in 2022 further disrupted trade, energy supplies, and financial systems, creating heightened uncertainty in the region. These sanctions, targeting Russia's financial sector, oil exports, and access to global markets, led to significant shifts in exchange rates and capital flows in CCA countries.

---

[2] The Office of Financial Research (OFR) Financial Stress Index (OFR FSI) is a daily market-based snapshot of stress in global financial markets. It is constructed from 33 financial market variables, such as yield spreads, valuation measures, and interest rates. The OFR FSI is positive when stress levels are above average, and negative when stress levels are below average.

Figure 8

Remittances in CCA

a)   Azerbaijan, mln $

b)   Armenia, mln $

c)   Georgia, USD Thousands

e)   Kazakhstan, mln $

d)   Uzbekistan, mln $
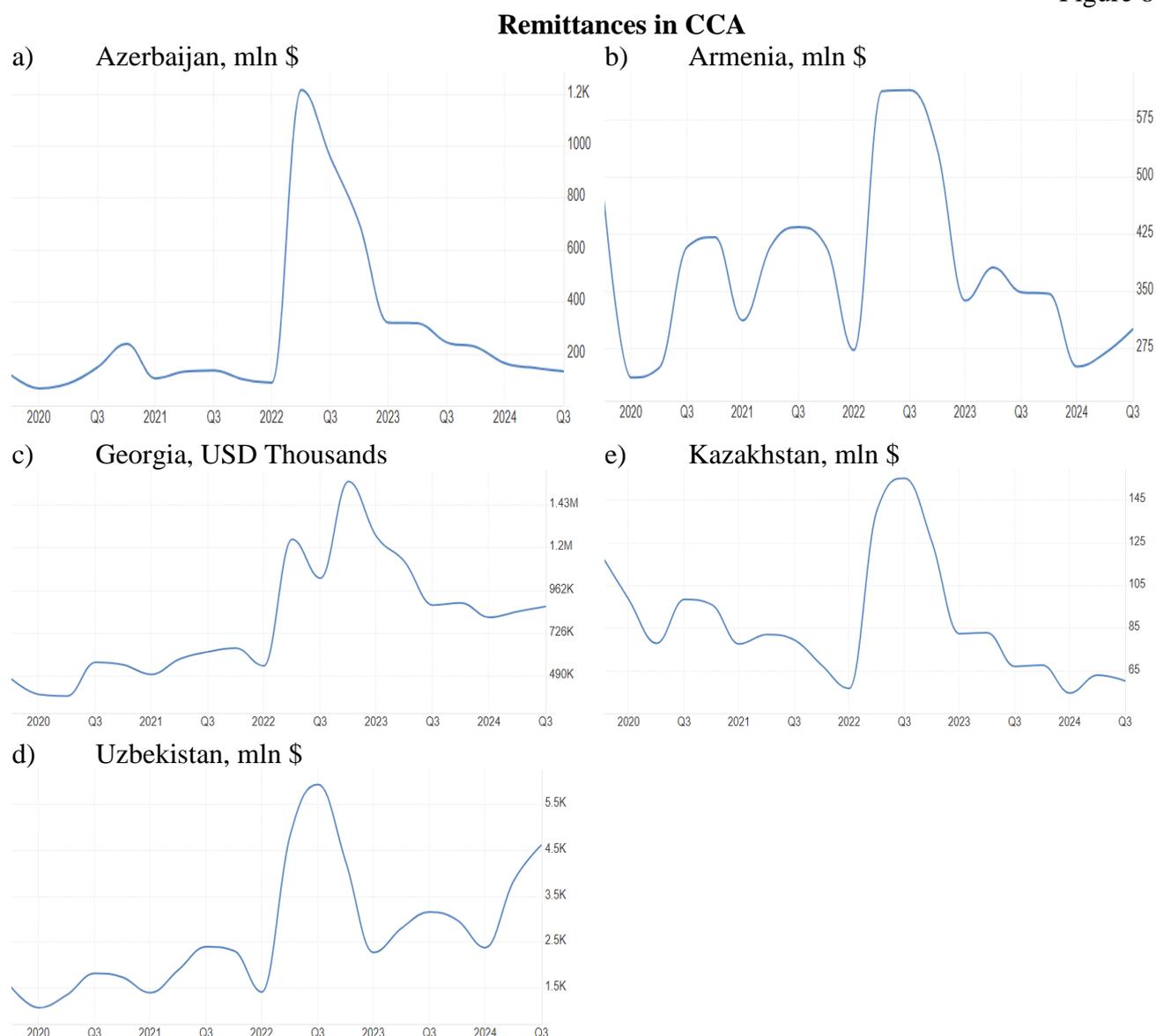
Source: tradingeconomics

The remittance patterns in the CCA region show a significant surge in 2022, followed by a decline or stabilization in subsequent years. The primary driver of this spike was the geopolitical tensions and the resulting Western sanctions on Russia. These factors led to increased migration from Russia to CCA countries, causing a rise in remittance inflows. Additionally, many Russian workers sent larger amounts of money home due to economic uncertainty and financial restrictions. The sharp depreciation of the Russian ruble also prompted accelerated remittance transfers before further declines. However, as migration flows stabilized, Russia adapted to sanctions, and financial restrictions tightened, remittance volumes began to decrease gradually in 2023 and 2024.

The surge in remittances in the CCA region in 2022 brought short-term economic benefits, such as increased household incomes, stronger financial inflows, and business growth. It also led to an influx of skilled migrants, boosting labor force participation. However, the increase was not sustainable, causing economic volatility as remittance flows declined. The surge contributed to inflation, particularly in housing and consumer goods, and made economies vulnerable to external shocks like geopolitical tensions. Additionally, the rapid capital inflows caused currency appreciation, potentially harming export competitiveness.

Geopolitical factors, combined with monetary policy divergence, have exacerbated exchange rate volatility in the region. Broader tensions, such as the U.S.-China trade war, have also affected

CCA economies by altering trade patterns and creating additional risks for investor confidence, contributing to fluctuations in exchange rates.

In the broader context of global financial stability, multilateral coordination becomes critical for managing crises in the CCA. For example, during the COVID-19 pandemic, central banks in the region had to adopt coordinated actions to ensure liquidity and stability in the face of global disruptions. When monetary policies diverge, as seen with the U.S. Federal Reserve's tightening stance and more accommodative policies elsewhere, such coordination can help mitigate spillover effects on exchange rates and capital flows in CCA countries, which are highly sensitive to external shocks due to their reliance on foreign investments, energy exports, and remittances. Strengthening cooperation among central banks and financial institutions could improve regional financial stability and resilience.

Furthermore, investor sentiment plays a critical role in shaping capital flows and exchange rates in the CCA region. During periods of geopolitical uncertainty investors tend to adopt a risk-averse stance, favoring safer assets. This "flight to safety" effect can lead to significant shifts in capital flows, sometimes triggering devaluation of local currencies and exacerbating financial instability. Understanding these behavioral factors is essential for policymakers in the CCA region to anticipate and manage the effects of geopolitical risks, sanctions, and monetary policy divergence, ensuring that capital flows remain stable during times of heightened uncertainty.

9. Policy Implications and Recommendations

Given the risks posed by diverging monetary policies and increasing global economic fragmentation, this paper recommends the following policy measures tailored for the Central Asia and Caucasus region:

1. Strengthening International Monetary Cooperation. To address global financial challenges, countries in the CCA region can benefit from institutionalized spillover monitoring by creating a joint task force within the BIS, IMF, and relevant international and regional financial institutes. This task force would assess and coordinate real-time responses to monetary policy spillovers, particularly as the region is closely linked to Russia and other global economies through trade, remittances, and energy exports. Expanding the IMF's precautionary lending facilities and regional financial safety nets, such as through the Eurasian Development Bank (EDB), Asian Development Bank (ADB) or the Shanghai Cooperation Organization (SCO), would provide crucial support to CCA countries facing external shocks, including capital outflows, currency depreciation, or volatility from geopolitical events. Such measures would enhance their ability to manage external economic shocks more effectively.

2. Enhancing Exchange Rate and Macroprudential Policies. To reduce vulnerabilities to external shocks, CCA countries can adopt or strengthen managed float exchange rate regimes, allowing currencies to absorb shocks without excessive intervention. Building adequate foreign exchange (FX) reserves is essential for mitigating extreme volatility, especially during periods of geopolitical instability or economic uncertainties. Strengthening local currency bond markets can help reduce dependence on foreign-denominated debt, which has proven risky during periods of global liquidity tightening. Expanding FX swap lines and liquidity buffers, both bilaterally with major partners can provide crucial dollar liquidity during times of stress. Additionally, diversifying FX reserve portfolios by increasing holdings of assets like gold, Chinese yuan, or euro can reduce overreliance on the U.S. dollar, which remains sensitive to changes in U.S. monetary policy. Implementing capital flow management measures, such as countercyclical buffers and limits on FX-denominated debt, helps minimize the risks posed by global liquidity shifts and capital flight in times of geopolitical or economic turmoil.

3. Strengthening Fiscal and Structural Policies to Mitigate Spillovers. CCA countries can stabilize their economies by implementing countercyclical fiscal policies that include targeted social and infrastructure spending to support domestic demand during periods of monetary tightening in major economies, such as the U.S. Federal Reserve's interest rate hikes. Diversifying trade and investment partners by strengthening regional trade agreements and enhancing local currency settlement mechanisms would help reduce exposure to external economic shocks. Further, the region can deepen its financial markets by developing local currency bond markets, reducing reliance on

foreign capital and minimizing the risk of capital outflows during periods of tightening global liquidity. Strengthening structural reforms, including improving governance, financial systems, and infrastructure, would enhance economic resilience and reduce vulnerabilities to external monetary shocks.

10. Conclusion

As global monetary fragmentation deepens, the risks of adverse spillovers on exchange rates, capital flows, and financial stability intensify, particularly for emerging markets in regions like Central Asia and the Caucasus. To navigate this evolving economic landscape, policymakers must adopt forward-looking strategies that balance national objectives with broader financial stability concerns. Strengthened multilateral cooperation, including real-time spillover monitoring through joint task forces involving international financial institutions is essential for coordinating responses to global financial disruptions. Additionally, CCA countries can enhance resilience by adopting or strengthen adaptive exchange rate policies, such as managed float regimes, which allow currencies to absorb external shocks without excessive intervention. Building adequate FX reserves, expanding local currency bond markets, and diversifying foreign exchange reserve portfolios can further help mitigate exchange rate volatility and reduce overreliance on the U.S. dollar.

Countercyclical fiscal measures, such as targeted social and infrastructure spending, will provide crucial support during periods of global tightening, while diversifying trade and investment partners through strengthened regional agreements and local currency settlement mechanisms will reduce exposure to external shocks. Furthermore, enhancing global liquidity support frameworks, including expanded IMF lending facilities and regional financial safety nets, will offer vital assistance to CCA countries in managing capital outflows and currency depreciation. By implementing these strategies, emerging markets, especially those in Central Asia and the Caucasus, can better safeguard against global financial volatility, improve their economic resilience, and contribute to broader financial stability in a fragmented global economy.

References

1. Ahmed, S., & Zlate, A. (2014). Capital flows to emerging market economies: A brave new world? Journal of International Money and Finance, 48, 221–248.

2. Ahmed, M. (2020). The role of geopolitical tensions in shaping financial markets and capital flows: An overview. Journal of Geopolitical Economics, 12(4), 322–335.

3. Bank for International Settlements. (2024). The impact of monetary policy divergence on global capital flows. BIS Quarterly Review, September 2024.

4. Blanchard, O., Dell'Ariccia, G., & Mauro, P. (2015). Rethinking macroeconomic policy. IMF Staff Discussion Note, SDN/15/03.

5. European Central Bank. (2019). Monetary policy decisions and their effects on the global financial system. Retrieved from: https://www.ecb.europa.eu

6. Gopinath, G., & Stein, J. (2018). Global financial cycles and capital flows. NBER Working Paper No. 24622.

7. Gourinchas, P.-O., & Jeanne, O. (2013). Monetary policy spillovers and the global financial cycle. American Economic Review, 103(3), 125–130.

8. Gourinchas, P.-O., & Rey, H. (2014). International financial adjustments: The dollar, the euro, and the emerging economies. Journal of International Economics, 94(2), 200-223.

9. International Monetary Fund. (2020). Global financial stability report: Market developments and monetary policy. Retrieved from: https://www.imf.org

10. Obstfeld, M. (2012). Does the current account still matter? American Economic Review, 102(3), 1047-1077.

11. Obstfeld, M., & Rogoff, K. (1995). The mirage of fixed exchange rates. Journal of Economic Perspectives, 9(4), 73–96.

12. Rey, H. (2016). Dilemma not trilemma? Global financial cycles, monetary policy independence, and the challenges for emerging economies. American Economic Review, 106(5), 177–183.

13. Saltelli, A., Ratto, M., Andres, T., Campolongo, F., Cariboni, J., Gatelli, D., Saisana, M., & Tarantola, S. (2008). Global Sensitivity Analysis: The Primer. John Wiley & Sons.

14. St. Louis Federal Reserve. (2021). Effective Federal Funds Rate (FEDFUNDS). Retrieved from: https://fred.stlouisfed.org/series/DFEDTARU

15. St. Louis Federal Reserve. (2024). Exchange rate movements and monetary policy shifts. Retrieved from: https://fred.stlouisfed.org

16. World Bank. (2019). Global Economic Prospects: Slow Growth, Policy Challenges. World Bank.

17. Additional References (Online Sources Used in Paper):

18. Investing.com. (2024). Exchange rate movements of major currencies. Retrieved from: https://www.investing.com/currencies

19. Central Bank Rates. (2024). Global interest rate trends and policy changes. Retrieved from: https://www.cbrates.com

20. Financial Research. (2024). Office of Financial Research (OFR) Financial Stress Index. Retrieved from: https://www.financialresearch.gov

21. https://www.imf.org/en/Publications/REO/MECA

22. https://tradingeconomics.com

Panel 2.
Consumer Patterns and Financial Stability

The COVID-19 Pandemic and Consumer Demand:
High-Frequency Data Analysis

Aldashev A., International School of Economics, Kazakh-British Technical University
Batkeyev B., International School of Economics, Kazakh-British Technical University

In this paper, the authors analyze the impact of lockdowns during the COVID-19 pandemic on consumption using high-frequency data from the geo-analytics.kz resource. This data includes transactions conducted through cash registers in Almaty and its suburbs on a daily basis and disaggregated at the level of polygons of approximately 500 by 500 meters.
This study was conducted as part of a research grant provided by the National Bank of Kazakhstan. This special issue of the National Bank of Kazakhstan's Economic Review presents a summary of the report presented at the conference.

Key Words: consumer demand, consumption, pandemics, COVID-19, transactions, high-frequency data.
JEL-classification: D12, E21, C55, C81.

Restrictions caused by the coronavirus pandemic were introduced in Kazakhstan on March 16, 2020, when a state of emergency was declared, which lasted until May 11. At the same time, gradual easing of the lockdown was introduced on April 28. Figure 1 shows that immediately after the imposition of the state of emergency, there was a sharp decrease in the volume of transactions. After the easing of quarantine measures, their recovery began.

Figure 1

Transaction volume in the time of emergency
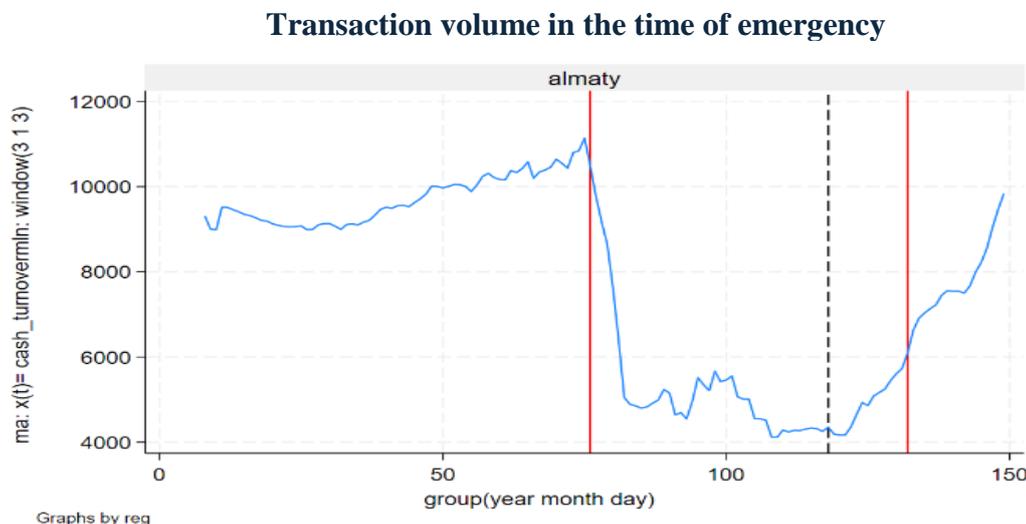
Red lines show the beginning and end of the emergency regime, and black dotted line – easing of restrictions

After the epidemiological situation worsened, strict quarantine restrictions were introduced on July 5. The quarantine restrictions were then extended and finally lifted on August 5. Figure 2 shows that July also saw a decrease in transaction volume, but this decline was softer than the drop in April. This was due to less stringent restrictions in July compared to the state of emergency in March-April. For example, from March 16 to April 28, there were restrictions on the movement of people, personal and public transport. Compared to the state of emergency, during the second lockdown, financial institutions, business centers, catering facilities (subject to sanitary regulations), etc. were allowed to operate. Also, the increasing role of online shopping helped to smooth out the shocks. The PWC study "Analysis of the retail e-commerce market in Kazakhstan" shows a significant increase in sales in the

e-commerce market in 2020 compared to 2019. If we compare by quarters, in Q1 2020 the volume increased by 47% compared to Q1 2019. In Q2 (which included the state of emergency), this increase was already 59%. And in Q3 (which included the second wave of restrictions), the growth was 167%. That is, the first wave of restrictions spurred the e-commerce market, and by the second wave, businesses and consumers were able to adapt better. This is also consistent with the NielsenIQ's study, which points to a change in the shopping route (i.e. combining offline and online shopping) as one of the trends that emerged during the pandemic.

Figure 2

Transaction volume during the second lockdown
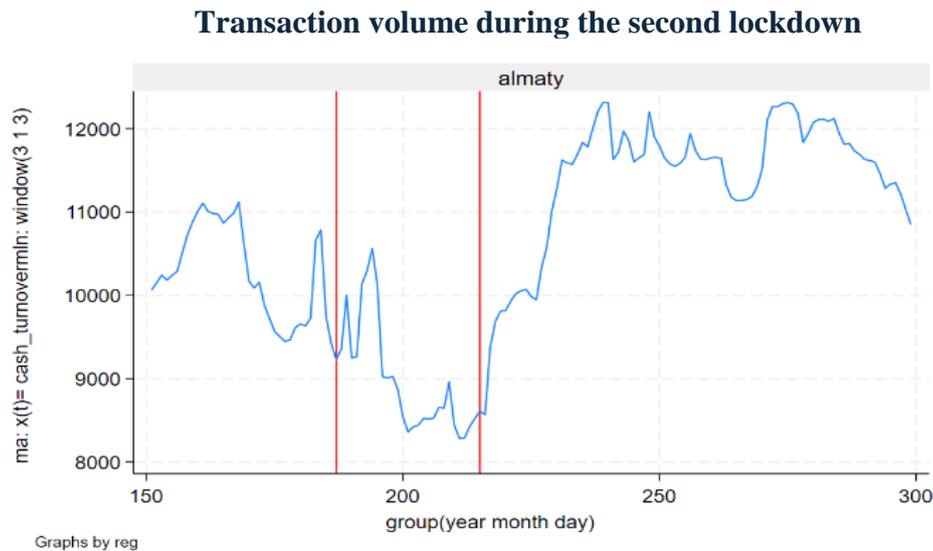
Red lines show the beginning and end of quarantine measures.

The results of the regression analysis show an interesting relationship: the volume of transactions and the number of active firms increased in the suburbs of Almaty during the lockdown. This may have been due to the fact that suburban residents made purchases in the city before the lockdown. When entry into the city was restricted, they were forced to make purchases outside the city. Also, the volume and number of transactions and the number of active firms decreased more in the city during the lockdown compared to the suburbs, so the effect of business closure in the city is potentially stronger. But the question is, which businesses suffered the most? To answer this question, we could use information on the number of cash registers. In particular, large shopping malls, supermarkets, entertainment centers usually have several cash registers, since they simultaneously serve a large number of people. Having information on the number of active firms and the number of cash registers per day in each district, we could limit the sample to only those observations in which the excess cash registers (number of cash registers - number of active firms) are zero, thereby excluding data on large shopping malls/supermarkets from the sample.

Excluding shopping malls and supermarkets from the analysis, we see that the effect of the lockdown was roughly the same in the city and suburbs. That is, the main difference between the city and suburbs during the lockdown was driven by restrictions on the operation of large shopping malls and supermarkets. Next, we analyzed transactions by economic activity. Analysis of the impact of the COVID-19 pandemic indirectly points to reduction in consumption – 11 out of 14 economic activities experienced a decrease in turnover. However, 8 of these activities recovered over the next few months, while the remaining 3 recovered in 2021 only. Household consumption should mainly be reflected in transactions under the CCEA "wholesale and retail trade", "provision of accommodation and catering services", and "arts, entertainment and recreation". The analysis showed that the volume of transactions (and therefore household consumption) in "wholesale and retail trade" decreased during the lockdown, but recovered over the next 2-3 months. The category of "provision of accommodation and catering services" showed recovery at the beginning of 2021, and the category of "arts, entertainment, recreation" – only by the end of 2021, when restrictions on holding mass events were lifted.

Identification of Monetary Shocks under the Inflation Targeting Regime: the Impact of Monetary Policy on Consumer Behavior in Kazakhstan

Andruss Yu. V., National Bank of the Republic of Kazakhstan[1]

The objective of this study is to develop an exogenous measure of monetary shocks for Kazakhstan based on the projected values of the National Bank of the Republic of Kazakhstan and subsequently assess their impact on macroeconomic indicators – GDP, inflation and components of personal consumption – since standard methodologies may not accurately identify monetary policy shocks under the inflation targeting regime. The calculation of shocks is based on the specification presented in the study by Romer & Romer (2004); subsequent assessment of the impact on the economy is carried out using the VAR, local projections, and state-dependent local projections methodologies.

The results of the study prove the effectiveness of monetary policy in identifying shocks, taking into account the transition to the inflation targeting regime. Tightening of monetary policy is accompanied by deceleration in inflation over a horizon of up to two years. An analysis of the reaction of consumption showed that services and non-food products are particularly sensitive to changes in monetary policy. However, with a relatively higher level of household debt, the reaction of consumption becomes weaker.

Key Words: monetary policy shocks, inflation targeting, personal consumption, local projections.
JEL-classification: E52, E58, E31, E21, E32.

1. Introduction

The effect of monetary shocks[2] on macroeconomic indicators is one of the widely discussed topics in macroeconomic literature. In this context, the correct identification of monetary shocks is of particular importance, since the reliability of conclusions about the impact of monetary policy (MP) on the economy largely depends on such identification.

The identification of monetary shocks remains a topic of active discussion in research. To assess the impact of monetary policy on economic variables, it is necessary to use an exogenous measure of monetary shock, i.e. one that does not reflect an automatic response to changes in economic conditions.

One of the most common methodologies for analyzing the impact of monetary policy is the VAR methodology. A common outcome in relation to price level dynamics is an initial increase in the inflation rate in response to a positive monetary policy shock, which contradicts the theory. This phenomenon is called the "price puzzle" and is followed by a subsequent decline in prices (Sims, 1992).

The alteration of monetary policy regimes also complicates the process of monetary shock measurement. With Kazakhstan's transition to an inflation targeting regime, the assumptions underlying the monetary policy decisions have changed. Members of the Monetary Policy Committee (MPC) have begun to pay special attention to the projected values of macroeconomic indicators. In this regard, the standard VAR methodology may not accurately identify monetary shocks.

Romer & Romer (2004) proposed a new approach to measuring monetary shocks, called narrative in the literature, since shocks are identified manually based on collected data from meeting minutes and forecasts. This methodology has become quite popular in the literature, especially in studies for countries that have switched to an inflation targeting regime. The results obtained using this methodology demonstrate a more pronounced impact of monetary shocks on key macroeconomic indicators, including inflation. In addition, the narrative approach allows to significantly reduce the

---

[2] Monetary policy shocks

price puzzle effect, which may indicate that it takes into account aspects of the decision-making that are almost impossible to capture in standard VAR models.

In their study, Romer & Romer (2004) use projected values (Greenbook) and the target interest rate to identify monetary shocks. The results show that monetary policy has a significant, relatively faster and statistically significant impact on both GDP and inflation. The effects are significantly more pronounced and occur with a shorter time lag than results based on traditional approaches to measuring the impact of monetary policy, such as VAR models.

Cloyne and Hürtgen (2012) adapted the Romer & Romer specification to measure monetary shocks in the UK. The study also confirmed that including predicting information in the shock identification process has a significant impact on the results. One of the key findings was the elimination of the price puzzle effect in impulse responses, which remains when using traditional methods for measuring the impact of monetary policy on the price level. Champagne and Sekkel (2018) also use the Romer & Romer methodology to identify monetary shocks in Canada. A significant innovation in their study was the expansion of the range of variables used in shock identification. In addition to projected values, the authors include external factors such as the level and change in the US Federal Reserve rate, as well as the level and change in the exchange rate. Such changes allow for the influence of external economic conditions, which may be important for Canada as a small open economy. Such changes to the standard methodology are found only in this paper. The results of the study confirm that excluding forward-looking values from the identification process leads to the emergence of a price puzzle. In addition, the authors confirm that the nature of monetary policy implementation in Canada has changed since the transition to inflation targeting.

There are other examples of applying the Romer & Romer methodology in the literature. For example, Beckers (2020) calculated monetary shocks for Australia, Kilman (2022) – for Sweden. The significance of this approach also lies in the fact that the calculated series of monetary shocks can be used further to analyze the impact of monetary policy on the economy. For example, Batsukh et al. (2025), using the shocks of Beckers (2020), analyze the response of investment, housing prices and other macroeconomic indicators to monetary policy in Australia. Chernis and Luu (2018) use the shocks calculated by Champagne and Sekkel (2018) to estimate the impact of monetary policy on consumption.

Thus, constructing a similar series of monetary shocks for Kazakhstan may be an important step for a more accurate assessment of the effect of monetary policy under the inflation targeting regime. In addition, the data set generated during the study may become a useful basis for further research aimed at studying the transmission channels and the behavior of macroeconomic indicators in response to changes in the base rate.

The use of a new measure of narrative monetary shocks will ensure a more accurate assessment of the effect of the pursued monetary policy on macro indicators, including consumption. This study will assess the impact of monetary shocks on consumer behavior. The results prove that the calculated shocks are exogenous to other macroeconomic variables and, thus, reflect the pure impact of monetary policy, isolated from the natural reaction of the economy to changing conditions.

2. Assessing Monetary Policy Shocks based on Projections under the Inflation Targeting Regime

In this Section, monetary shocks for Kazakhstan will be assessed using Romer & Romer specification (2004).

A special feature of the Romer & Romer methodology is the consideration of projected values in identifying shocks, whereby the MPC makes a decision. Consequently, historical values of inflation and GDP growth forecasts were used to calculate shocks. These projected values were presented to the MPC members as part of the presentation of the Green Book – an internal medium-term macroeconomic forecast prepared by the forecasting team of the National Bank of Kazakhstan. The source of the data were slides from the final presentations made at the MPC meetings before making a decision on the base rate.

The equation for the MPC decision-making has the following presentation:
$$R_t = f(\Omega_t) + \varepsilon_t \quad,$$

where

R_t – the decision on the base rate made,

$f(\Omega_t)$ – function f of the MPC members' reaction to available information Ω_t, which affects the decision-making on the base rate,

ε_t – an exogenous component, which characterizes the MP pursued.

This approach is particularly interesting from an econometric point of view, as it helps to avoid some of the difficulties in assessing the impact of monetary policy on the economy. For example, econometricians often encounter the "simultaneity problem". The difficulty in this case is the fact that both monetary policy affects macroeconomic indicators and the economy affects monetary policy at the same time. The narrative method used will help to isolate the intentions of the monetary policy from the reaction to the economy.

The first stage of the study is collecting data on the base rate. The second stage is collecting projected values of GDP and inflation. The third stage is isolating the component that is a predictable reaction to changes in the economy, from the base rate.

The equation for this stage is as follows:

$$\Delta i_m = \alpha + \beta_1 i_{m-1} + \sum_{j=-1}^{2} \lambda_j \, \hat{y}_{m,j} + \sum_{j=-1}^{2} \theta_j \, \pi_{m,j} + \sum_{j=-1}^{2} \gamma_j \left(\hat{y}_{m,j} - \hat{y}_{m-1,j} \right)$$

$$+ \sum_{j=-1}^{2} \rho_j \left(\pi_{m,j} - \pi_{m-1,j} \right) + \beta_2 \Delta RER_{t-1} + \beta_3 \Delta Brent_{t-d14} + \beta_4 u_{t-1} + \varepsilon_m,$$

where

Δi_m – change in the base rate measured by the frequency of MPC meetings (m – $meeting$);

i_{m-1} – a base rate value as set at the previous meeting,

$\hat{y}_{m,j}$ – a value of GDP growth as projected at the time of the meeting m for quarter j,

$\pi_{m,j}$ – inflation rate as projected at the time of the meeting m for quarter j,

$\hat{y}_{m,j} - \hat{y}_{m-1,j}$ – a change in the projection of GDP growth compared to the previous meeting,

$\pi_{m,j} - \pi_{m-1,j}$ – a change in the projection of inflation compared to the previous meeting,

u_{t-1} – inflation rate in the previous month,

ΔRER_{t-1} – a change in the real exchange rate,

$\Delta Brent_{t-d14}$ – a change in the Brent oil price,

ε_m – MP shock.

The equation for Kazakhstan slightly differs from the Romer & Romer specification due to the inclusion of real exchange rate and oil price shocks in the equation. Kazakhstan is a small open economy and is vulnerable to changes in the periods of oil price fluctuations. To control for changes in economic conditions, which may also be separately taken into account by the MPC members, the equation controls for changes in the real exchange rate and oil price 14 days before the MPC meeting date. Similar deviations from the standard specification can be found in the research literature on assessment of monetary shocks in other countries. For example, Champagne and Sekkel (2018) include changes in the exchange rate and the US Federal Reserve rate in the assessment of monetary shocks in Canada. Such deviations may be explained by specifics of individual economies and the influence of variables on the decision-making of individual central banks.

Subscript m indicates the date of the MPC meeting at which the decision on the base rate is made. The date of the meeting is understood to be the moment of actual decision, not its official publication. Publication of the adopted decision occurs several days after the decision is made. Information on the dates of MPC meetings was obtained from the calendars of forecasting rounds starting from 2016.

Since the MPC members are presented with projected values of macro indicators by quarters, the subscript j indicates the quarter of the projected value relative to the decision date. The regression equation takes into account the projected values of inflation and GDP growth for the first and second quarters after the quarter of the MPC meeting date. It also includes a nowcast (an operational forecast of current values) of GDP growth and inflation. The nowcast is compiled by the forecasting team during

the corresponding forecasting round, since actual data for the current period at the time of the meeting has not yet been published. The equation also controls for the historical value of the growth rate of the corresponding macroeconomic indicator for the previous period.

According to the Romer & Romer specification, the level and changes of projected values relative to the previous meeting may influence the decision-making by the MPC. For example, in the inter-forecast period, the value will change only for the nowcast of the previous meeting, provided that official statistics for the period are released (in the inter-forecast period, the nowcast value of the quarter of the forecasting round will be regarded as the value for the previous quarter). The inflation figure will change in the inter-forecast period, since official data is published without a significant lag.

The previous value of the base rate is also included in the model in order to capture the possible inclination of the MPC to return to some average value (mean-reverting behavior). A negative statistically significant coefficient may indicate the inclination of the MPC to lower the rate at its high values.

In addition to the above variables, external shocks that significantly influenced the results were taken into account. The effect of geopolitical situation was taken into account by introducing a binary variable. Due to the significant effect of the one-off increase in the base rate at the beginning of the COVID-19 pandemic, this observation was excluded from the time series, as it significantly distorted the results of the tests conducted and affected the stability of estimates. The broader effect of the pandemic was already included in the projected values for the corresponding period. This practice is acceptable in the research literature, including when taking into account the shock of the pandemic.

2.2. Data

As mentioned earlier, to collect the information set, the final versions of the Green Book (medium-term forecasts) presentations of the National Bank are used. The presentations contain the values of GDP growth and inflation at the time of the MPC meeting in real time.

The forecasts that are presented to the MPC members include quarterly values of growth of macroeconomic indicators, including GDP and inflation, nowcast for the current period, as well as historical values of macroeconomic indicators available at the time of decision-making. The Green Book is one of the key analytical materials of the National Bank considered in the decision-making.

The data may be revised. The use of data from presentations allows preserving the information Ω_t that was available to the MPC members at the time of the decision. The values of macro-indicators have not been changed if the published data currently differs from the values indicated in the Green Paper presentation.

There are four forecasting rounds at the National Bank during a year (in February, May, August and November). The decision on the base rate is made eight times a year, except for sharp changes in the macroeconomic situation. This means that a decision made in the inter-forecast period is not accompanied by an update of the forecast values. If a decision was made in the inter-forecast period, the data will include the projected values of the previous round, adapted to the change in the current quarter. In more detail, the inflation value for the next quarter during the current meeting will become the value of the current quarter of the next meeting in the inter-forecast period. If at the time of the inter-forecast decision the values of one of the macro indicators for the previous period (for example, inflation) were published, then the nowcast values from the previous decision on the base rate are changed to the published actual values.

In order to exclude the allowed period of adaptation to the inflation targeting regime, the set used will include data from the second forecasting round of 2016 (May-June 2016). The final set includes data considered by the MPC during the period of 74 meetings (6th month of 2016 – 3rd month of 2025).

Thus, the shock values obtained from the series can be interpreted as changes in the monetary policy that are not a reaction to current or expected economic conditions. The calculated monetary shocks most accurately reflect the monetary policy pursued by the National Bank, excluding the natural impact of changes in economic conditions. These values will be further reduced to monthly and quarterly frequencies to assess the impact of monetary policy on macroeconomic indicators.

2.3. The Results of the MP Shocks Calculation

Table 1 presents the results of calculating the new measure of monetary shocks based on projected values taken into account by the MPC when deciding on the base rate during the inflation targeting regime. The results demonstrate the following. Coefficients of real GDP growth are summed to 0.01, while the sum of coefficients of the GDP forecast revision is (-)0.045. The aggregated coefficients show that a (+)1 pp change in the real GDP growth forecast leads to a
(-)0.035 reduction in the base rate. Coefficients of the projected inflation growth are summed to 0.05, while the sum of the coefficients of the inflation forecast revision is 0.42. Thus, a (+)1 pp increase in the inflation forecast is translated into a 0.47 increase in the base rate.

Table 1

Determinants for the Decision-Making on the Base Rate

Variable		Coefficient	Standard Error
C (Constant)		12.8***	(3.324)
Initial base rate		-0.079**	(0.0303)
Inflation growth projections (quarters)	-1	-0.046*	(0.025)
	0	-0.04	(0.04)
	1	0.29***	(0.054)
	2	-0.16***	(0.051)
Revision of the inflation growth forecast vs. the preceding round (quarters)	-1	0.323***	(0.103)
	0	-0.039	(0.138)
	1	0.009	(0.187)
	2	0.125	(0.116)
Projections of the GDP growth (quarters)	-1	-0.02	(0.039)
	0	-0.006	(0.07)
	1	0.0808	(0.069)
	2	-0.045	(0.052)
Revision of the GDP growth forecast vs. the preceding round (quarters)	-1	0.036	(0.113)
	0	-0.098	(0.145)
	1	0.287**	(0.141)
	2	-0.199**	(0.096)
Unemployment rate in the previous month		-2.573***	(0.658)
RER (USD)		0.00091	(0.00583)
Brent oil price		0.00063	(0.00254)
R^2	0.74		

Note: (***: $p<0.01$, **: $p<0.05$, *: $p<0.1$)

The monetary policy pursued is also positively related to changes in the oil price and the real exchange rate, although the coefficients are not statistically significant. The unemployment rate is negatively related to changes in monetary policy. It is worth taking into account that official unemployment data in Kazakhstan rarely undergo significant changes in magnitude. The new measure of monetary shocks obtained based on the projected values is presented in Figure 1. The normality of distribution of the obtained monetary shocks is confirmed by the Jarque-Bera test; the shocks are stationary. The source of shocks can be personal assumptions of the MPC members regarding the further development of the economy. It is important to note that personal expert judgments are independent of the values presented during the presentation of the Green Book by the forecasting team. Changes in the inflation target, changing the format of the inflation target to point values, the MPC composition, or the policy – can also be sources of the calculated shocks.

Figure 1

A new assessment of monetary shocks based on projections
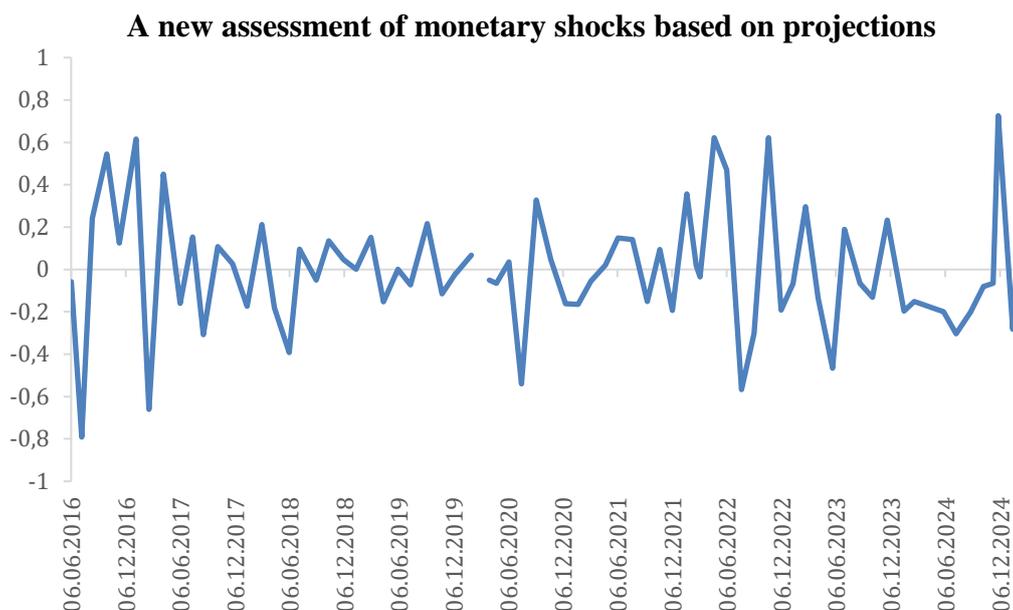
3. The Macroeconomic Application of the New Measure of Monetary Shocks

The next stage of the analysis is to use the new measure of monetary policy shocks to assess its impact on the economy. At this stage, an assessment will be made using a fairly simple VAR model. Next, the impact of monetary policy on consumer demand components will be assessed depending on various household debt regimes using the local projections methodology to construct impulse responses (state-dependent local projections). At the VAR methodology stage, the following endogenous variables will be included in the model: 1) the logarithm of the short-term economic indicator (STEI), which is the closest proxy indicator of GDP, covering about ⅔ of the economy's output, 2) the logarithm of the price index, 3) a new measure of monetary shock in accumulated terms. The following exogenous variables were used: 1) the coronavirus pandemic shock (March 2020-March 2021), the geopolitical situation shock (since March 2022), 3) the logarithm of Brent oil price in real terms.

It would have been possible to include other variables that could potentially affect the STEI and inflation in the VAR. However, since the shock is calculated using information about a future GDP growth and inflation, the shock is "cleared" of their effects. However, adding the monthly STEI and inflation data reduces the risk of bias in the coefficients by taking into account the higher frequency of observations. This may be important given that quarterly data was used to calculate the shocks. To convert the new measure of monetary shock to a monthly frequency, each resulting shock was assigned to the corresponding month. In months when no shocks occurred, the shock value was set to zero. Since VARs are usually constructed using levels of macro variables, including the interest rate level, the new measure of monetary shock was converted to a cumulative form to interpret the results:

$$cum.\,shock_t = \sum_{i=1}^{t} \mu_t$$

Figure 2 shows the dynamics of the actual base rate and the accumulated monetary shock. The accumulated shock reflects the component of the rate change that is not determined by current macroeconomic conditions – this is the "cleared" rate, demonstrating the exogenous reaction of the monetary policy.

Figure 2

The new measure of monetary policy shock in accumulated terms and the actual base rate
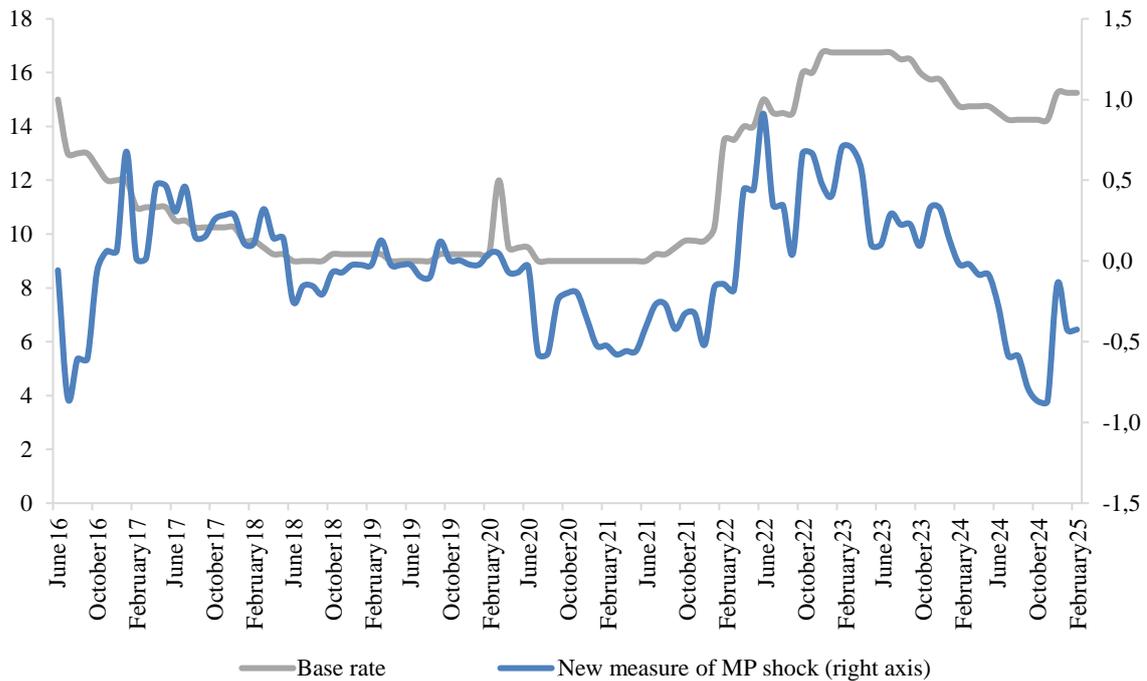
The accumulated shock was placed last in the order of variables in the VAR, following the recursive identification strategy of Christiano et al. (1996). It is assumed that monetary policy can respond to current values of macroeconomic variables, but does not affect them in the same period. The number of lags for the VAR was determined using AIC (5). The data covers the period from the 6th month of 2016 to the 2nd month of 2025, resulting in 94 observations.

The VAR is calculated as:

$$X_t = B(L)X_{t-1} + \epsilon_t,$$

where $B(L)$ – is a lag polynomial .

Vector X_t is presented as [*STEI Price_index New_measure_of_shock*]. STEI volumes have been inflation-adjusted; variables of STEI and price indices were de-seasonalized and differentiated.

Figures 3 and 4 show the impulse responses of the STEI and the price level to a monetary policy shock of (+)1 pp. Figure 3 shows the responses in cumulative terms, and Figure 4 shows them by month.

Figure 3

Accumulated impulse responses of STEI and inflation to the MP shock (+1 pp)
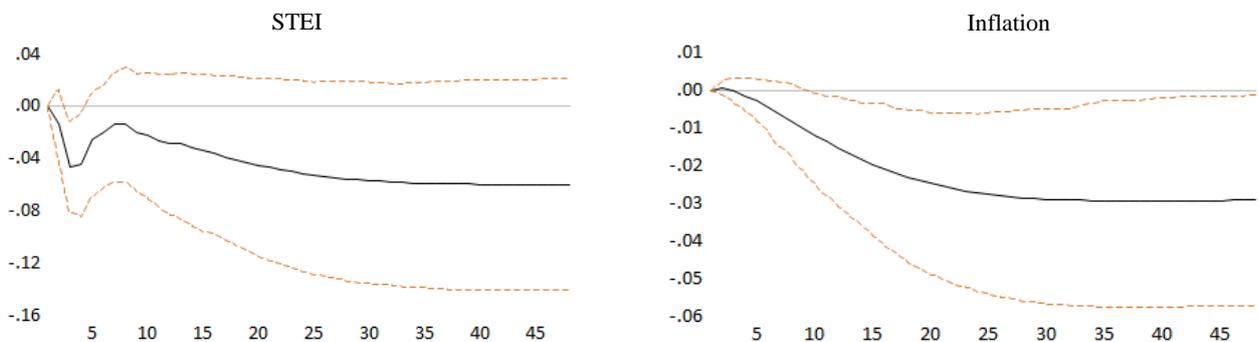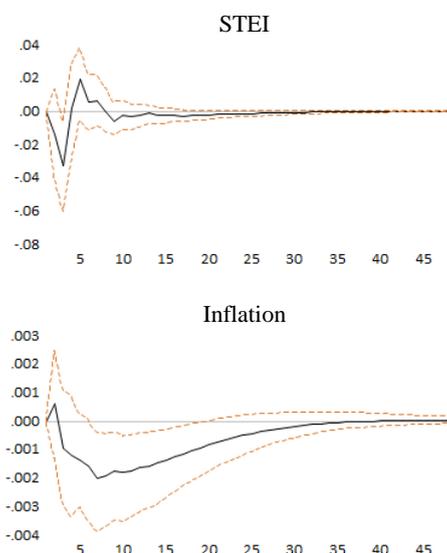
Figure 4

Impulse responses of STEI and inflation to the MP shock (+1 pp)
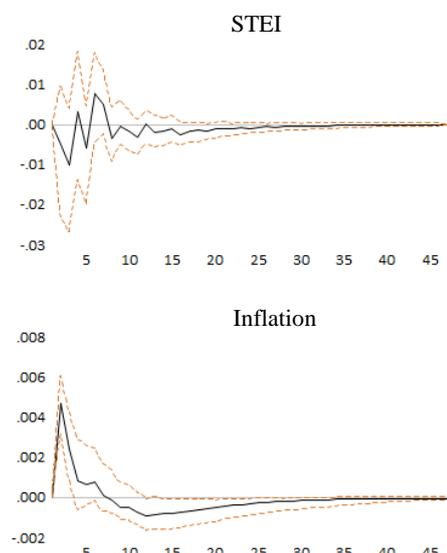(by months)

Impulse responses using the new measure of monetary shock (+1 pp)

Impulse responses using the base rate (+1 pp)

In response to a shock (+1 pp), the STEI volume shrinks to about 3.2% after three months, but this effect is not long-lasting. There is also some increase in the price level immediately after the monetary shock. Such behavior of prices in impulse responses is not uncommon in the literature, as mentioned earlier, and is known as the price puzzle – a phenomenon in which inflation temporarily rises after a rate hike, contrary to standard expectations. However, when replacing the new measure of monetary shock with the value of the base rate, the price puzzle effect becomes much more pronounced. The effect of monetary policy on the STEI and inflation is less clear and weaker.

The emergence of a more pronounced price puzzle effect may prove that the model does not incorporate enough information about the future state of the economy (Romer & Romer, 2004; Sims, 1992; Champagne & Sekkel, 2018). In the conditions when the VAR does not take into account the projected values (i.e. when using the base rate rather than the new measure of monetary policy shock), the base rate increase may be interpreted as an exogenous shock rather than a response to the projected acceleration of inflation. This likely leads to an overestimation of its magnitude and the appearance of a positive inflation response. Perhaps, using a longer-term forecast horizon (e.g. 4 quarters ahead of the date of decision-making) will eliminate the price puzzle effect. The obtained results using the new measure of monetary shock show that a (+) 1 pp increase in the shock causes deceleration in inflation to (-) 0.2% after seven months (the maximum decrease by months).

4. The Macroeconomic Application of the New Measure of Monetary Shocks
4.1. Equation Specifications

The next stage of the analysis is to use the new measure of monetary shocks to estimate the impact of monetary policy on the components of personal consumption published by the Bureau of National Statistics with a quarterly frequency (the "Expenditures and Income of the Population of the Republic of Kazakhstan" spreadsheet).

For this stage of the analysis, the local projections methodology presented by Jordà (2005) will be used. The methodology consists of calculating separate linear regressions for each time horizon after the shock. Following the methodology, the coefficient of the shock variable in each period will be the

value of the impulse response. The methodology is often used in modern literature. The advantage of using local projections is that they are robust to specification errors, which can be a fairly common problem when using the VAR.

The linear projection model looks like this:

$$y_{t+h} = \alpha_h + \theta_h(L)x_t + \beta_h\varepsilon_t + u_{t+h},$$
$$\text{for } h = 1, 2, 3, ..., H,$$

where $y_{t+h} = [CPI\ food\ nonfood\ services\ clothes\ furniture\ restaurants$
$transport\ tobacco\ entertainment\ education\ health]$'.

Vector y_{t+h} includes variables used to assess the response from the MP in this study. Vector x_t – control variables (*controls*),

$x_t = [GDP\ CPI\ Brent\ income\ covid\ z_{t-1}]$'.

$z_{t-1} = [0\ food\ nonfood\ services\ clothes\ furniture\ restaurants\ transport$
$tobacco\ entertainment\ education\ health]$'.

Each of variables from vector z_{t-1} is added in the regression to the vector of control variables x_t when estimating impulse responses. $\theta_h(L)$ – lag polynomial.

The β_h coefficient will be showing how variable y will be changing over h periods after shock ε, which occurred in the period t. β_h will be calculated for each h of impulse response. In other words, impulse responses represent the sequence of calculated β_h for each time horizon h for   each variable of vector y.

Since the monetary shock measure used is derived from the current and expected state of the economy, the inclusion of additional macro variables is not mandatory. For example, a (+)1 pp increase in the shock will affect the inflation dynamics as follows (Figure 5).

Figure 5

Impact of shock (+1 pp) on inflation*
(Local Projections method)

*Newey-West corrected standard errors
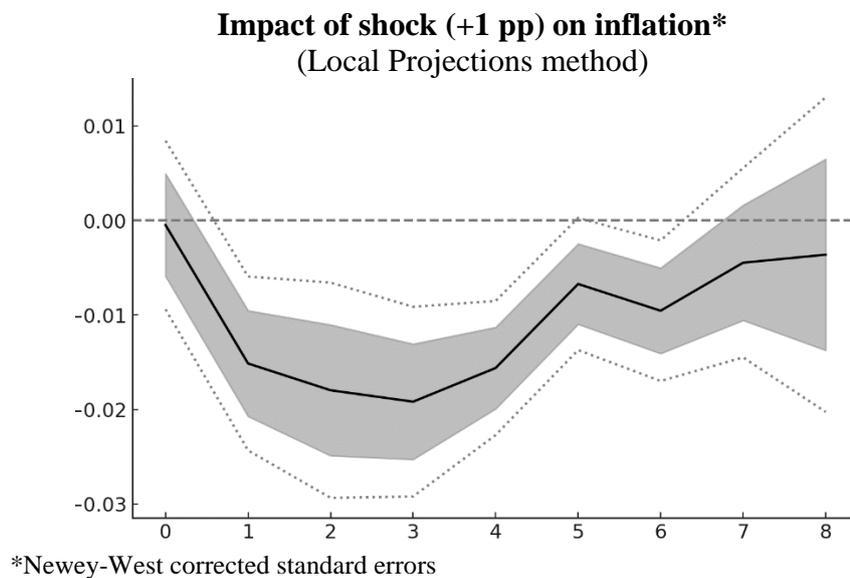
In general, the obtained dynamics correspond to the impulse response calculated on the basis of the VAR model: the largest decrease is observed in 2-3 quarters after the shock. By the 8th quarter (i.e., approximately two years later), the impact weakens remarkably and becomes statistically insignificant. Such dynamics show that the new measure of monetary shocks really takes into account the current state of the economy. It is also important to note that when using quarterly data and GDP values (the VAR used the STEI values), the price puzzle effect disappears. However, given the possible limitations of the model specification, adding some control variables can help reduce the potential bias of the estimates. Adding lags of GDP growth, inflation, growth of real income of the population and the price of oil, as shown in the equation above, is appropriate in the context of analyzing the dynamics of consumption.

Since quarterly data is used in the calculation, the shock measure must be normalized to a quarterly frequency. To do this, monetary policy shocks occurring in the three months of the corresponding quarter were aggregated.

4.2. Results

Impulse responses of consumption components calculated using the local projections methodology are presented in Figure 6. According to the results, the services category demonstrates the greatest sensitivity to changes in the monetary policy (the maximum response is about (-) 6% in the second quarter after the shock of (+) 1 pp). Among the subcategories, the most noticeable decline is observed in the segments of restaurant services, entertainment and education. One may note the growth in consumption of food products after a positive monetary shock, which may indicate a shift in the population's preferences in favor of home consumption. Such dynamics corresponds to the observed reduction in demand for restaurant services and entertainment during this period. A negative reaction is also seen in the consumption of non-food products. Demand for furniture significantly decreases already in the first quarter after the shock, while the greatest decline in purchases of clothes occurs in the second and third quarters. Probably, the decrease in demand for furniture is driven by its complementarity with the purchase of housing. In the context of tightening monetary policy, consumers stay off large investments, including real estate and related durable goods.

Figure 6

Impact of shock (+1 pp) on consumption components*

Education services   Healthcare services
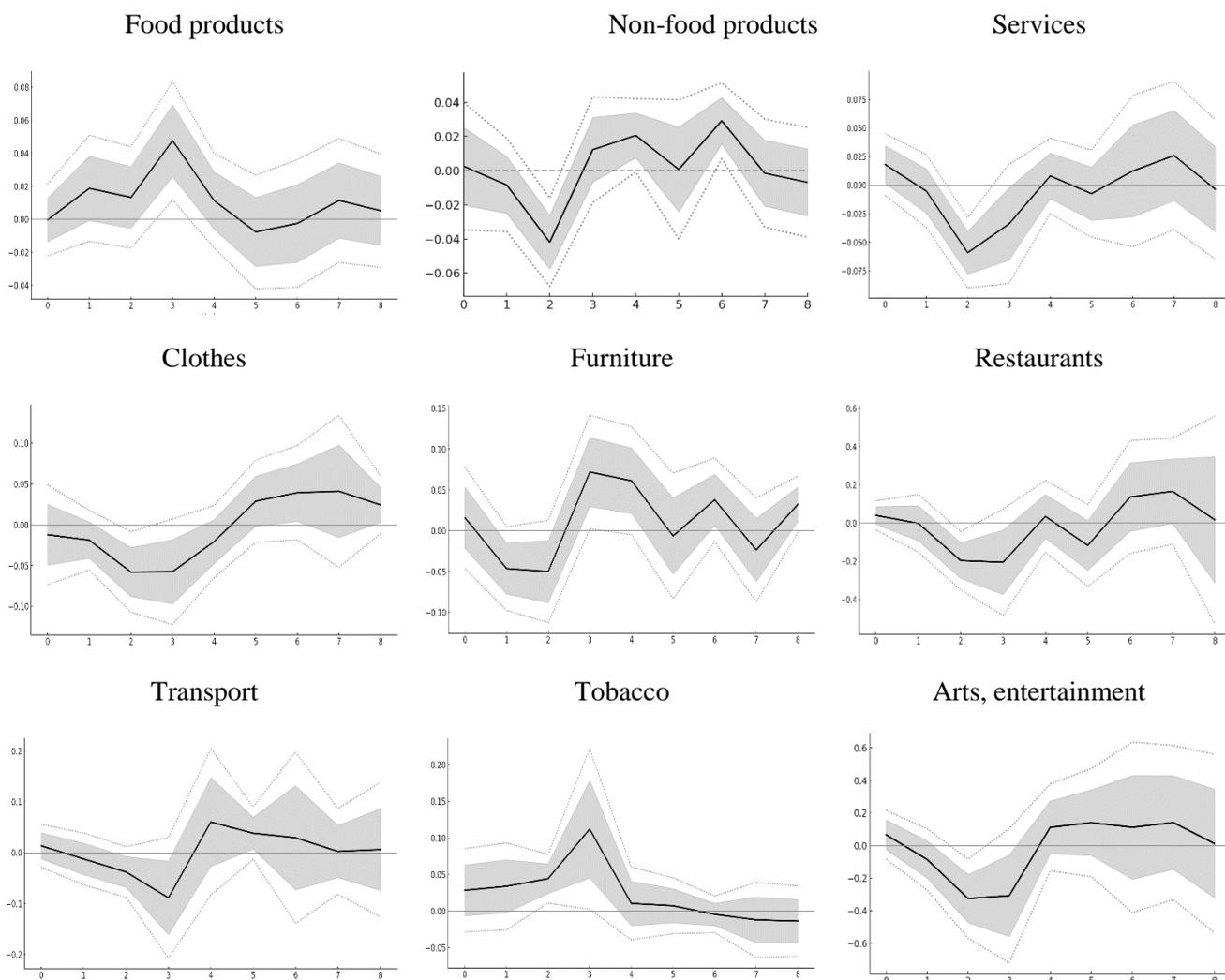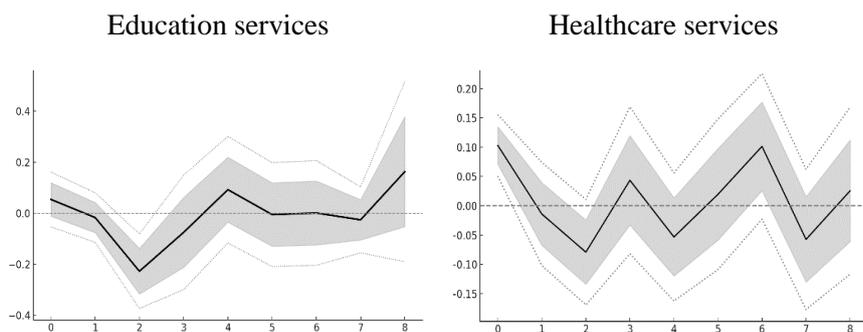
*Newey-West corrected standard errors

4.3. The Impact of Monetary Shock on Consumption based on the Current Debt of the Population

There are enough studies in the literature that take into account various states of the economy to assess the impact of monetary policy. Most often, business cycle phases are considered as states. Using business cycle phases as a criterion for differentiating economic states may not be informative enough in the context of consumption. The level of consumer debt may better explain the behavioral response of the population to changes in the base rate, being a more sensitive indicator of the state in terms of consumption.

In recent periods, the level of household debt in Kazakhstan has been increasing, which is confirmed by the growth in the loan-to-household income ratio (World Bank Group, 2025). Therefore, taking into account the current state of the economy from the side of personal loans may be interesting for analyzing the effects of monetary policy.

Alpanda and Zubairy (2018) also used the local projections method in their analysis of the effect of monetary shocks to construct impulse responses of various macroeconomic variables to a monetary shock in the US economy. At the same time, the authors took into account the level of household debt at the time of changes in monetary policy. The results of the study show that the monetary policy may become less effective during the periods of relatively higher household debt. The intended difference is that in a highly indebted household environment, the response to monetary policy may differ. For example, when monetary policy is eased (under a negative shock), some part of the population may be sufficiently indebted to benefit from the credit conditions. As a result, monetary policy changes may be less effective.

Impulse responses will be estimated for household debt states in the Kazakh economy following the methodology presented by Alpanda and Zubairy (2018). The transmission mechanisms influencing the response are the subject of a more detailed study. Presumably, if the results show a significant divergence in the response, it would be worthwhile to consider in detail the influence of the interest rate channel and the household asset channel, which has not been considered in detail in the literature for Kazakhstan to date.

A specific feature of this stage of the study will also be the use of a new measure of monetary shocks as a monetary policy variable. Batsukh et al. (2025) use monetary shocks obtained using the Romer & Romer methodology to assess the impact of monetary policy in different household debt states. The results show that impulse responses of the variables are weaker during periods of high debt.

The equation based on the state of the economy will have the following form:

$$y_{t+h} = (I_{t-1})[\alpha_h^H + \theta_h^H(L)x_t + \beta_h^H \varepsilon_t] + (1 - I_{t-1})[\alpha_h^L + \theta_h^L(L)x_t + \beta_h^L \varepsilon_t] + u_{t+h},$$

where $I_{t-1} \in \{0,1\}$, whereby $I_{t-1} = 1$, if the level of household debt D_t *(debt-to-GDP ratio)* exceeds that of the trend. The level of debt is defined by the deviation of the total personal loan debt to GDP over the past year from the trend line:

$$D_t = \frac{Volume\ of\ personal\ debt_t}{\sum_{t=-3}^{t=0} GDP_t}$$

35

The trend line was determined using the Hodrick-Prescott filter with a high parameter ($\lambda = 10^4$). The choice of λ value is explained by the assumption that loan cycles are twice longer than business cycles (Ravn and Uhlig, 2005).

4.4. Results

Impulse responses were calculated for three broad consumption categories: food, non-food, and services. Consistent with the results, the responses in the relatively low household debt conditions are larger in magnitude. The path of responses in the low-debt state is also similar to the results of the baseline specification, but the amplitude of the responses is somewhat larger. In the relatively high-debt state of the population, the impulse responses are statistically insignificant at most horizons (Figure 7).

Figure 7

Impulse responses of consumption components based on the debt burden of the population*

Baseline specification   Low-debt state   High-debt state

Consumption of food products

Consumption of non-food products

Consumption of services
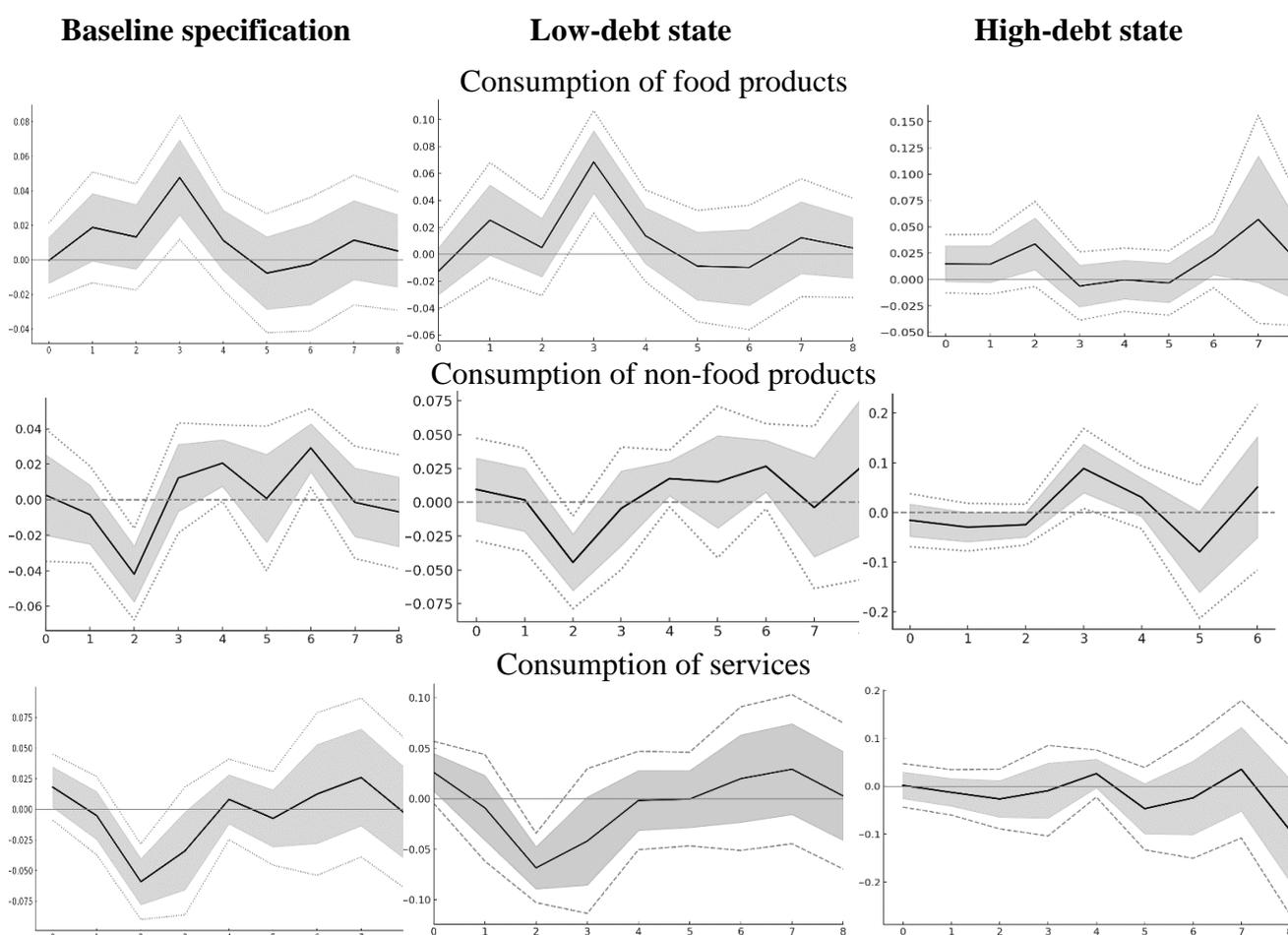
*Newey-West corrected standard errors

Overall, these results suggest that the effectiveness of monetary policy decreases with a relatively higher level of household debt. This conclusion is consistent with the results of previous studies for other countries.

An increase in the base rate usually leads to decreased consumption. However, as the results show, with a high level of debt burden, this mechanism weakens – the population, already constrained in spending, reacts less strongly to a change in the rate. In other words, the behavior of the population practically does not change, because most of the population initially did not plan to take new loans, reducing consumption before the monetary policy shock.

It may be worth paying attention to one of the MP transmission channels, which has so far been little studied in the realities of Kazakhstan – the home equity channel. When the base rate decreases,

real estate prices usually rise. This increases the value of the population's property, and homeowners have the opportunity to take additional loans secured by their real estate. However, with an already high level of debt, this channel works worse. People with an already large volume of loans may not plan to take new loans. Banks may also refuse borrowers more often. As a result, the effect of monetary policy is weaker.

An additional factor is the dynamics of prices in the housing market. In the context of monetary tightening, a decline in real estate prices may cause the population to experience a decrease in their own "wealth". Under normal conditions, this may lead to reduction in consumption. However, if housing is considered an asset that cannot be sold, this channel may work less effectively. Moreover, mortgage borrowers may be less likely to perceive an increase or decrease in the market value of housing as a signal to change their consumer decisions. It is worth taking into consideration that mortgage loans are also included in the volume of personal loans used to determine the state of household debt. A detailed study of these mechanisms is a topic for further research.

Taken together, these factors indicate that in conditions of high household debt, the sensitivity of the economy to monetary tightening is reduced, and its impact on consumer demand is lower in magnitude.

5. Finding

Assessing the impact of monetary shocks is a common topic in macroeconomic research. However, the results of assessments often vary depending on the methodology used. For example, in studies based on VAR models, the impact of monetary shocks on GDP and inflation may be weak. Studies that use the Romer & Romer (2004) specification often demonstrate more significant effects. One possible explanation is that the narrative approach allows for the inclusion of projected values that are taken into consideration by the MPC members in their decision-making. It is virtually impossible to take this information into account when using standard VARs.

As part of this study, a new dataset was created, including the projected values prepared by the National Bank forecasting team, as well as information on the current state of the economy, which is potentially taken into account by the MPC members in their decision-making. The dataset enabled us to construct a new measure of monetary shocks for Kazakhstan, which is especially relevant in the context of transition to the inflation targeting regime since 2015.

The results of the study demonstrate differences in impulse responses compared to a more traditional approach. First, when taking into account the projected values, the impact of monetary shocks on GDP and inflation is more pronounced. Second, the price puzzle effect is significantly reduced, which may indicate greater accuracy and validity of using the new measure of shocks in analyzing the effectiveness of monetary policy. Since shocks take into account a significant amount of information about the current and expected state of the economy, their use allows for a more accurate assessment of the monetary policy impact on individual components of consumption. In this study, we used the local projections methodology, which allows us to avoid the identification error that can occur when using VAR models.

The results show that demand for services and certain categories of non-food products demonstrates increased sensitivity to changes in monetary policy. At the same time, with a high level of household debt, responses of various components of consumption become less pronounced. Such dynamics may be caused by specifics of people's behavior under the debt burden and is a topic for further research in the field of monetary policy transmission mechanisms.

References

1.   Alpanda, S., & Zubairy, S. (2019). Household debt overhang and transmission of monetary policy. Journal of Money, Credit and Banking, 51(5), 1265-1307.

2.   Batsukh, K., Groshenny, N., & Javed, N. (2025). Monetary policy transmission and household indebtedness in Australia(No. 2025-13). Centre for Applied Macroeconomic Analysis, Crawford School of Public Policy, The Australian National University.

3.   Beckers, B. (2020). Credit spreads, monetary policy and the price puzzle. Reserve Bank of Australia.

4.   Champagne, J., & Sekkel, R. (2018). Changes in monetary regimes and the identification of monetary policy shocks: Narrative evidence from Canada. Journal of Monetary Economics, 99, 72-87.

5.   Chernis, T., & Luu, C. (2018). Disaggregating household sensitivity to monetary policy by expenditure category (No. 2018-32). Bank of Canada.

6.   Cloyne, J., & Hürtgen, P. (2016). The macroeconomic effects of monetary policy: a new measure for the United Kingdom. American Economic Journal: Macroeconomics, 8(4), 75-102.

7.   Jordà, Ò. (2005). Estimation and inference of impulse responses by local projections. American economic review, 95(1), 161-182.

8.   Kilman, J. (2022). Monetary policy shocks for Sweden (No. 2022: 18). Working paper.

9.   Ravn, M. O., & Uhlig, H. (2002). On adjusting the Hodrick-Prescott filter for the frequency of observations. Review of economics and statistics, 84(2), 371-376.

10. Romer, C. D., & Romer, D. H. (2004). A new measure of monetary shocks: Derivation and implications. American economic review, 94(4), 1055-1084.

11. Sims, C. A. (1992). Interpreting the macroeconomic time series facts: The effects of monetary policy. European economic review, 36(5), 975-1000.

12. World Bank Group. (2025). Kazakhstan Monthly Economic Update - April 2025. Retrieved from https://www.worldbank.org/en/country/kazakhstan/publication/monthly-economic-update
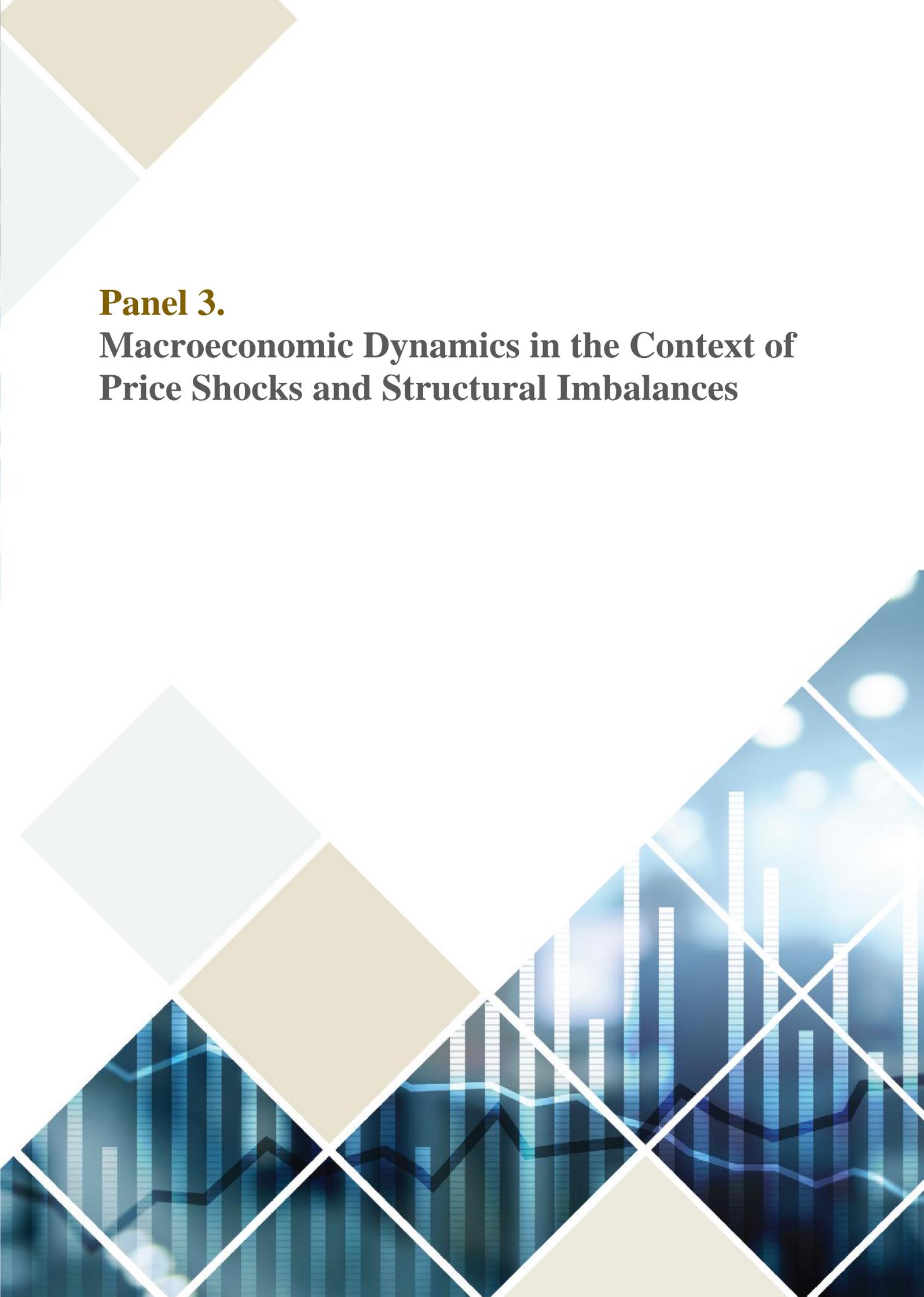
Special Edition, 2025   Andruss Yu. V: Identification of Monetary Shocks
       under the Inflation Targeting Regime: the Impact of Monetary Policy on Consumer Behavior in Kazakhstan

38

Panel 3.
Macroeconomic Dynamics in the Context of Price Shocks and Structural Imbalances

The Impact of Oil Prices on Kazakhstan's Business Cycles:
An Empirical Approach Considering Asymmetry

Akhmet A. R., National Bank of the Republic of Kazakhstan
Mussa A., National Bank of the Republic of Kazakhstan

This study examines the impact of global oil price fluctuations on Kazakhstan's business cycles using vector autoregression models (VAR, TVAR) and the Markovswitching model (MSM). This approach allows for the consideration of both linear and nonlinear relationships, as well as the asymmetry in the economy's response to oil price changes across different economic cycles. The results indicate that negative oil price shocks exert the most pronounced effect on Kazakhstan's GDP during crisis periods, whereas positive shocks remain statistically insignificant. The threshold value for the quarterly dynamics of real oil prices, identified in the TVAR model, is -14%, beyond which the impact of oil prices on GDP becomes significantly more pronounced. This finding highlights the Kazakh economy's sensitivity to major oil market shocks. The analysis using the MSM model confirmed a high probability of transitioning into a crisis regime in the event of a substantial decline in oil prices. The study's conclusions contribute to the existing literature and provide an empirical foundation for the development of economic policies aimed at enhancing the resilience of Kazakhstan's economy to commodity price volatility.

https://nationalbank.kz/en/news/issledovaniya
https://nationalbank.kz/file/download/108745
https://nationalbank.kz/kz/news/issledovaniya
https://nationalbank.kz/file/download/108743
https://nationalbank.kz/ru/news/issledovaniya
https://nationalbank.kz/file/download/108744

DSGE Model for Fiscal Policy Analysis

Rysbayeva A., National Bank of the Republic of Kazakhstan
Khakimzhanov S., National Bank of the Republic of Kazakhstan

This paper develops an open economy dynamic stochastic general equilibrium (DSGE) model for fiscal policy analysis. Unlike existing models, our framework incorporates several key features: a comprehensive fiscal block with distortionary taxes and a National Fund (oil fund) component, as well as non-Ricardian households that reflect the real economic structure. In addition, the model emphasises fiscal transfers, which represent a substantial share of total government spending. The main research questions the paper tries to answer is to evaluate optimal fiscal regimes under alternative government revenue structures to finance public expenditures. The fiscal multiplier of government transfers is estimated as part of this analysis.

1. Introduction

The World Bank report for Kazakhstan on fiscal policy states that the government is expected to continue its expansionary stance with an elevated budget deficit in 2025. While public debt remains relatively low, the deficit is primarily financed through withdrawals from the National Oil Fund (Sovereign Wealth Fund) and increased domestic borrowing, raising concerns about long-term fiscal sustainability. Consequently, there is an ongoing debate about whether raising the VAT rate by 4% could be a viable solution to finance government spending as Kazakhstan faces a growing budget deficit driven by tax collection challenges. This paper seeks to address this issue within the framework of a DSGE model. The current paper, to our knowledge, is one of the first papers that study the dynamics of the economy in response to fiscal shocks within the framework of the general equilibrium model for Kazakhstan.

The key trade-off in macroeconomic policy, especially fiscal policy, lies between the present and the future. In response to government spending shocks, fiscal authorities must choose an optimal financing mix: domestic debt, taxes, and, in resource economies like Kazakhstan, foreign assets (sovereign wealth funds). This choice—between net debt (domestic debt minus foreign assets) and taxes—in fact embodies the trade-off between current and future consumption. The government can tax residents now, reducing current consumption, or borrow, deferring the cost to the future through lower transfers or Ricardian equivalence.

This paper explores the trade-off between present and future consumption within a DSGE framework. Particularly, the study examines the economic consequences of financing government spending through taxes, debt issuance, and oil revenues, with a focus on assessing the associated short- and long-term costs and benefits. One modelling approach involves allowing economic policy to shift the steady state, enabling rapid transitions and permanent changes in the debt stock, but requiring careful tracking of multiple steady states. Alternatively, a single steady state can be used, with a gradual convergence over time that reflects the costs of deleveraging. This paper adopts the latter approach for its relative simplicity, despite its slow convergence, as the two approaches yield similar outcomes from both policy and welfare perspectives.

Another key aspect of fiscal policy is its redistributive role. To capture this, the model incorporates two household types: one that receives government transfers and another that finances them. This setup reflects the government's social security function. The model allows the government to use three types of taxes: lump-sum, consumption, and personal income taxes. The lump-sum tax is the most efficient and redistributive, as it does not introduce distortions and can be used to fund large spending shocks, given the affected household's access to perfect financial markets. It is also highly redistributive because it targets one household type while the proceeds benefit the other.

In contrast to the lump-sum tax, the burden of consumption (henceforth VAT) and personal income taxes (henceforth PIT) affects both household types. However, the consumption tax places a heavier burden on wealthier households, who tend to consume more, while the personal income tax primarily impacts poorer households, whose income is derived solely from wages.

In this paper, we build a benchmark fiscal DSGE model calibrated for Kazakhstan's data. DSGE models have become a widely used and reliable framework for assessing alternative policy options. As a result, they are used to evaluate the consequences of policies on the general economy, estimate the fiscal multiplier, and explore the interaction between fiscal and monetary policies. Relevant studies include Coenen et al. 2012, Christiano, Eichenbaum, and Rebelo 2011, and Cogan et al. 2010 on fiscal multipliers, Gali and Monacelli 2008 on optimal fiscal and monetary policies, Stahler and C. Thomas 2012 for fiscal policy simulation purposes and the¨ inclusion of sovereign wealth funds in the paper by BerghoLt and Larsen 2016. The current paper closely follows Kraay 2012 on fiscal transfer multipliers, and Zubairy 2014 and Djinkpo 2019 on the financing methods of government spending.

The second research question considered in this paper is whether the fiscal multiplier depends on the source of financing. The fiscal multiplier by definition is the reaction of output to changes in selected fiscal instruments on the revenue and expenditure sides. Much of the research on fiscal multipliers has used partial equilibrium models. Although these models have been extended to various dimensions, the identification issue remains unclear. Alternatively, structural models such as DSGE could be used to ensure that the identified shocks capture the true structural shocks.

There is a large volume of literature on fiscal multiplier estimation. The variety in the estimation value has been subject to methods employed, fiscal instrument, the data range and the structure of the economy such as the share of credit constrained households. The previous study on fiscal multiplier for Kazakhstan (Rysbayeva et al (2024)) has been estimated to be 0.43 and 0.22 for non-oil and total GDP, respectively, using the SVAR approach and recursive identification scheme. We aim to assess whether the estimates derived from the DSGE model fall within this range.

The present paper calibrates fiscal DSGE model to Kazakhstan. The standard general equilibrium framework is modified to account for features of the Kazakhstan's economy to allow for a realistic analysis of the effects of fiscal policy. In specific, we make two assumptions in the current model. First, we expand the role of fiscal transfers. Data from Kazakhstan indicate that fiscal transfers account for approximately 27% of total government spending, common feature for developing countries. Second, we allow for credit constrained households.

The presence of credit constrained households undermines the Ricardian equivalence theorem, implying that the level of government debt influences household behaviour. This occurs because credit-constrained households cannot smooth consumption over time. Ricardian equivalence suggests that consumers anticipate future taxes following a rise in government expenditures and accordingly adjust their consumption behaviour. Distinguishing households based on their access to credit markets is particularly relevant in modern economies as we face income and wealth inequality, resulting in a larger share of non-Ricardian households who are financially constrained.

The rest of the paper is organised as follows. After this introduction, Section 2 describes the underlying DSGE model and Section 3 presents the calibration of parameters. Section 4 discusses the results. The last section concludes.

2. Model

This section presents the details of the open economy DSGE model for Kazakhstan with a fiscal block. The model is being calibrated for the economy of Kazakhstan, with calibration strategy to be reported in the next section.

The home country consists of a continuum of households, domestic and exporting firms, the government, and an inflation-targeting central bank. Intermediate goods markets feature monopolistic competition, while labour market features perfect competition, where the latter assumes the negligible share of labour unions in the economy. The main attribute of the current model is a detailed description of the fiscal block. The paper examines different scenarios for ways of financing the government expenditures: lump-sum tax, distortionary tax, new debt and oil fund transfers. The latter source of

funding is of utmost importance since in Kazakhstan the oil fund makes up a significant share of budget revenues[1]. Although the accumulation of National Fund (henceforth NF) is contingent on the oil price, the transfers to the budget are independent of the actual oil price.

Households. All households are infinitely living but they differ in their access to the financial market, which is a one-period bond market. A fraction κ of population can smooth their consumption decisions over the time in response to shocks as they have access to credit markets. On the other hand, the remaining fraction, $1 - \kappa$, the non-Ricardian households are completely excluded from the financial market. In other words, they do not own any assets and consume their labour income as they do not save and are not aware of any intertemporal trading opportunities.

Ricardian households. All individuals have identical preferences over a real consumption, C_t and hours worked, N_t, and maximises a lifetime utility function:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^{R\,1-\sigma}}{1-\sigma} - A_n \frac{N_t^{R\,1+\gamma}}{1+\gamma} \right]$$

subject to

$$C_t^R(1+\tau_t^c) + \frac{B_t^R}{P_t} + \frac{S_t B_t^{fR}}{P_t} + T_t^R = w_t N_t^R (1 - \tau_t^n) + \frac{Div_t^R}{P_t} + (1 + r_{t-1}) \frac{B_{t-1}^R}{P_t}$$

$$+ (1 + r_{t-1}^*) \frac{S_t B_{t-1}^{fR}}{P_t} - \frac{v}{2} S_t \left(\frac{B_t^{fR}}{P_t} - \frac{B_{ss}^{fR}}{P_{ss}} \right)^2 \tag{2.1}$$

where β is discount factor, E_0 is expectation operator conditional on the information available at period 0. σ is the degree of relative risk aversion and its reciprocal, $\frac{1}{\sigma}$, measures the inter-temporal elasticity of substitution of consumption between two periods; γ represents the inverse of elasticity of labour (Frisch elasticity) with respect to real wage, and A_n is the disutility weight of labour.

Foreign bonds are denominated in foreign currency and issued by the world economy. Assuming incomplete international asset markets, we allow only for risk-free bonds to be traded across countries. To pin down the steady-state value of foreign bond stocks, we follow Ghironi and Melits 2005, where the term, $\frac{v}{2} S_t \left(\frac{B_t^{fR}}{P_t} - \frac{B_{ss}^{fR}}{P_{ss}} \right)$, captures the per-capita cost of holding foreign bonds in excess of the steady-state value. In other words, households pay costs to domestic financial intermediaries when adjusting their bond holdings. Following the literature, to ensure that the net foreign asset position of the economy is pinned down we employ costs of adjusting foreign bond holdings. Financial intermediaries are then assumed to rebate the revenues from bond-holding fees to domestic households. The authors report that the appropriate choices of parameter values entail negligible effect on model dynamics and ensure long-run mean reversion of stock variable.

Equation 2.1 represents the budget constraint of households and suggests that households consume, pay lump-sum taxes and buy both risk-free domestic and foreign bonds. And they cover these expenses by income from labour, profits from domestic intermediate good producers and any additional savings, which is due at period t. Here, S_t is the nominal exchange rate defined as the domestic currency value of one unit of foreign currency (a rise in S indicates a nominal depreciation).

The household utility maximisation problem using Lagrangian form yields the optimal equations for labour supply, Euler equation and Uncovered Interest Rate Parity condition (UIP), respectively:

$$\beta E_t \frac{C_{t+1}^{R-\sigma}}{C_t^{R-\sigma}} \frac{P_t}{P_{t+1}} (1 + r_t) = 1 \tag{2.2}$$

$$(1 + r_t)\left(1 - \frac{v}{2} S_t \left(\frac{B_t^{fR}}{P_t} - \frac{B_{ss}^{fR}}{P_{ss}} \right)\right) = (1 + r_t^*) \frac{E_t S_{t+1}}{S_t} \tag{2.3}$$

$$A_n N_t^{R\gamma} = \frac{1 - \tau_t^n}{1 + \tau_t^c} w_t C_t^{R-\sigma} \tag{2.4}$$

---

[1] According to the data, around 38% on average for 2005-2022

Non-Ricardian households. For the non-Ricardian or hand-to-mouth households, labour income and transfers from the government are their only source of income. Therefore, their budget constraint reads as:

$$(1 + \tau_t^c)C_t^{NR} = w_t N_t^{NR}(1 - \tau_t^n) + G_t^{NR} \tag{2.5}$$

where we assume that transfers from the government G_t^{NR} is equal to total government spending as government does not engage in purchasing of goods and services.

Similar to Ricardian households, the hand-to-mouth households have the same utility function as the intertemporal optimising households, which they maximise subject to their budget constraint (2.5):

$$E_0 \sum_{t=0}^{\infty} \beta^t \varepsilon_t^b \Big[\frac{C_t^{NR\,1-\sigma}}{1-\sigma} - \varepsilon_t^{Ns} A_n \frac{N_t^{NR\,1+\gamma}}{1+\gamma} \Big]$$

The first-order conditions give the optimal labour supply equation:

$$\varepsilon_t^{Ns} A_n N_t^{NR\gamma} = \frac{1 - \tau_t^n}{1 + \tau_t^c} w_t C_t^{NR-\sigma} \tag{2.6}$$

Next, we aggregate measures of household:

$$N_t = \kappa N_t^R + (1 - \kappa) N_t^{NR} \tag{2.7}$$

where $\kappa \in [0,1)$ is the share of Ricardian households in the economy. Equivalently, we assume that the same distribution holds for aggregate consumption:

$$C_t = \kappa C_t^R + (1 - \kappa) C_t^{NR} \tag{2.8}$$

To get an aggregate measure that can be used for market clearing condition, we rescale the variables specific to Ricardian households such as $X_t \in [Div_t, B_t^f, B_t, T_t]$, by their share in the aggregate employment:

$$X_t = \kappa X_t^R$$

and similarly for government transfers:

$$G_t^{NR} = \frac{G_t}{1 - \kappa}$$

Static problem of Households. For both types of households, aggregate consumption C_t is a constant-elasticity-of-substitution (CES) function of domestic, C_t^d and imported goods, C_t^f:

$$C_t^i = \Big[\omega^{\frac{1}{\theta}} (C_t^{i\,d})^{\frac{\theta-1}{\theta}} + (1-\omega)^{\frac{1}{\theta}} (C_t^{i\,f})^{\frac{\theta-1}{\theta}} \Big]^{\frac{\theta}{\theta-1}}, \quad \text{for} \quad i = R, NR \tag{2.9}$$

where ω indicates the home bias and $\theta > 0$ is the intratemporal elasticity of substitution between domestic and foreign goods. By maximizing (2.9) subject to the budget constraint $P_t^d C_t^d + S_t P_t^* C_t^f = P_t C_t$, we obtain the optimal demand functions for both consumption goods:

$$C_t^d = \omega \Big[\frac{P_t^d}{P_t} \Big]^{-\theta} C_t \tag{2.10}$$

$$C_t^f = (1 - \omega) Q_t^{-\theta} C_t \tag{2.11}$$

where Q_t is real exchange rate. In this setup, we assume producer currency pricing (PCP) for importers such that they price their goods in foreign currency. The expression for the aggregate CPI can be obtained by plugging (2.10) and (2.11) back into the budget constraint:

$$P_t = \big\{ (1-\omega)(S_t P_t^*)^{1-\theta} + \omega (P_t^d)^{1-\theta} \big\}^{\frac{1}{1-\theta}}. \tag{2.12}$$

Firms. There are two categories of firms operating in the economy: domestic intermediate good producers and domestic final good producers. The domestic intermediate firms operate in a monopolistic competitive environment, and using labour as input, they produce goods which they sell to a final good producer who uses a continuum of these intermediate goods in her production. We also assume that importers are perfectly competitive and sell their final goods directly to households in the foreign currency. The exporting firms supplies oil in a competitive market where the price of oil is determined by the global market.

Final good producers. The final good producer aggregates the intermediate goods into homogenous good using the technology by Dixit and Stiglitz 1977:

$$Y_t^d = \left(\int_0^1 Y_t^d(j)^{\frac{\varepsilon-1}{\varepsilon}} \, di \right)^{\frac{\varepsilon}{\varepsilon-1}}$$

(2.13)

where ε is elasticity of substitution between intermediate goods. Profit maximisation then yields the optimal demand for intermediate good j:

$$Y_t^d(j) = \left(\frac{P_t^d(j)}{P_t^d} \right)^{-\varepsilon} Y_t^d$$

(2.14)

Using the expression (2.14), we derive the equation for price index:

$$P_t^d = \left(\int_0^1 P_t^d(j)^{1-\varepsilon} dj \right)^{\frac{1}{1-\varepsilon}}$$

(2.15)

Intermediate good producers. Each differentiated firms hires labour using the production function with a total factor productivity, z_t, and constant returns to scale to labour techhology:

$$Y_t(j) = z_t N_t(j),$$

(2.16)

Since intermediate producers cannot adjust prices to maximize profit each period, they minimise total cost subject to (2.14) and (2.16):

$$\min_{\{N_t(j)\}} P_t w_t N_t(j) - \lambda_t P_t^d \left(\left(\frac{P_t(j)}{P_t} \right)^{-\varepsilon} Y_t - z_t N_t(j) \right)$$

There is a wedge between the real wage received by households and the real wage paid by firms. Consequently, the first order condition yields an expression for real marginal cost that takes into account the relative price, $p_t^d = \frac{P_t^d}{P_t}$:

$$mc_t = \lambda_t = \frac{w_t}{z_t p_t^d}$$

(2.17)

Due to assumption of representative firm that makes $N_t(j) = N_t$ and common wage for all intermediate goods w_t, we may also drop the reference j, which leads to the same marginal cost across intermediate good producers.

Firms are not freely able to adjust price each period. They choose prices a la Calvo with a fixed probability $1-\xi$ that a firm can adjust its price. In other words, the probability that a firm is unable to change the price for k periods is ξ^k. Firms' dynamics problem is formulated by maximising the stream of future profits up to k periods with a discount factor of $\beta^k \frac{C_{t+k}}{C_t}$. The dynamic problem of an updating firm which keeps prices fixed for k period is as follows:

$$\max_{\{P_t^d(i)^\sharp\}} E_t \sum_{k=0}^{\infty} (\xi)^k \lambda_{t,t+k} \frac{Y_{t+k}(i)}{P_{t+k}^d} (P_t^d p_t^{\sharp d(i)} - mc_{t+k} P_{t+k}^d)$$

subject to optimal demand function:

$$Y_{t+k}^d(i) = \left(\frac{P_t^d p_t^{\sharp d}(i)}{P_{t+k}^d} \right)^{-\varepsilon} Y_{t+k}^d$$

where the stochastic discount factor $\lambda_t = \frac{C_{t+k}}{C_t}$, $P_t^{d\,\sharp} = \frac{P_t^{d\,\sharp}}{P_t}$ is reset price, and mc_t is a real marginal cost. In the long-run all prices will grow at the same rate, $\bar{\pi}$ assuming zero steady-state in this model. This also eliminates the welfare cost of price dispersion in the steady state. The solution for the above formula yields an optimal expression for the reset price:

$$p_t^{\sharp d} = \frac{\sum_{k=0}^{\infty} (\xi)^k \lambda_{t,t+k} y_{t+k}^d mc_{t+k} P_{t+k}^{d\,\varepsilon} P_t^{d\,-\varepsilon}}{\sum_{k=0}^{\infty} (\xi)^k \lambda_{t,t+k} Y_{t+k}^d P_{t+k}^{d\,\varepsilon-1} P_t^{d\,1-\varepsilon}}$$

(2.18)

By writing the condition (2.18) recursively, we obtain the following expression:

$$p_t^{\sharp d} = \frac{\varepsilon}{\varepsilon - 1} \frac{x_{1t}}{x_{2t}}$$

(2.19)

where $x_{1t} = y_t^d mc_t + \xi \lambda_{t,t+1} \pi_{t+1}^{d\,\varepsilon} x_{1,t+1}$ and $x_{2t} = y_t^d + \xi \lambda_{t,t+1} \pi_{t+1}^{d\,\varepsilon-1} x_{2,t+1}$. Using price level expression (2.15), we can write the aggregate domestic price index as:

$$P_t^d = [\xi P_{t-1}^{d\,\varepsilon-1} + (1-\xi)P_t^{\sharp\,d}]^{\frac{1}{1-\varepsilon}}$$

Rearranging the above equation gives us

$$1 = \xi\pi_{t-1}^{d\,\varepsilon-1} + (1-\xi)p_t^{d\sharp} \tag{2.20}$$

Exporting firms. The representative oil firm operates in a perfectly competitive international oil market and takes the oil price P_t^{*o} as exogenous. For simplicity,

$$\ln\left(\frac{Y_t^O}{\overline{Y^O}}\right) = \rho_O \ln\left(\frac{Y_{t-1}^O}{\overline{Y^O}}\right) + \varepsilon_t^O, \tag{2.21}$$

We assume an exogenous oil sector as we trust our model provides an adequate framework since the oil sector is typically segmented from the rest of the economy and this structure is sufficient for examining the effects of oil revenues on the non-oil economy. Kazakhstan as a small open economy, cannot influence the oil price and hence,

$$\ln\left(\frac{P_t^{*O}}{\overline{P^{*O}}}\right) = \rho_{po} \ln\left(\frac{P_{t-1}^{*O}}{\overline{P^{*O}}}\right) + \varepsilon_t^{PO}, \tag{2.22}$$

where P_t^{*O} is oil price denoted in foreign currency.

Monetary policy. For simplicity, we approximate the behaviour of Central Bank with a Taylor rule that targets the CPI inflation rate:

$$\left(\frac{R_t}{R}\right) = \left(\frac{R_{t-1}}{R}\right)^\mu [((\frac{\pi_t}{\pi})^{\alpha_\pi} \left(\frac{Y_t^d}{Y^d}\right)^{\alpha_y}]^{1-\mu} \exp(e_t^r) \tag{2.23}$$

Fiscal policy. In the paper, we assume that oil is exported entirely and not used domestically. The government may finance its spending with lump-sum tax revenues (T) collected from Ricardian households, distortionary taxes such as VAT and PIT, transfers from the national fund (TR_t), and new public debt B_t. The budget constraint for the government is:

$$G_t + \frac{(1+r_{t-1})}{1+\pi_t}B_{t-1} = T_t + \tau_t^c C_t + \tau_t^n Nw + B_t + Q_t TR_t \tag{2.24}$$

The proceeds of oil revenues are directly accrued to the National Fund (NF_t), assuming that the government can access $1-\phi = 0.99$ share of funds each period:

$$nf_t^* = (1-\phi)[(1+rr_{t-1}^*)nf_{t-1}^* + p_t^{*o}Y_t^o] - \psi_{tr}(d_{t-1} - \bar{d}) \tag{2.25}$$

where p_t^{*o} is the real world price of oil, nf_t^* is a stock of the accumulated National Fund denoted in foreign real price, and $d_t = \frac{B_t}{Y_t}$ is debt-to-gdp ratio. In this setup, the transfer from the National fund is:

$$TR_t = \phi[(1+rr_{t-1}^*)nf_{t-1}^* + p_t^{*o}Y_t^o] + \psi_{tr}(d_{t-1} - \bar{d}) \tag{2.26}$$

The equation (2.25) is an accounting equation. Re-arranging above two equations above yields the following:

$$nf_t^* = (1+rr_{t-1}^*)nf_{t-1}^* + p_t^{*o}Y_t^o] - TR_t$$

which assumes that the oil fund is continuously replenished by oil revenues, with a fraction ϕ allocated to the government budget each period to reflect actual practice. The government subsidies to non-Ricardian households are G_t, which is financed by different sources of revenues including: lump sum taxes, T_t, distortionary taxes such as the tax rate on wage income, τ_t^n, and tax rate on consumption, τ_t^c, transfers from the oil fund, tr_t, and new debt, B_t.

Following the literature, let us assume that the government spending rule is exogenous:

$$G_t - \bar{G} = \rho_g(G_{t-1} - \bar{G}) + \epsilon_t^g \tag{2.27}$$

where G_t is government spending assumed to be a transfer to non-Ricardian household. We assume revenue side follows Taylor rule manner:

$$T_t - \bar{T} = \rho_T(T_{t-1} - \bar{T}) + (1-\rho_T)\psi_T(d_{t-1} - \bar{d}) + \epsilon_t^T, \tag{2.28}$$

$$\tau_t^n - \bar{\tau^n} = \rho_n(\tau_{t-1}^n - \bar{\tau^n}) + (1-\rho_n)\psi_n(d_{t-1} - \bar{d}) + \epsilon_t^n, \tag{2.29}$$

$$\tau_t^c - \bar{\tau^c} = \rho_c(\tau_{t-1}^c - \bar{\tau^c}) + (1-\rho_c)\psi_c(d_{t-1} - \bar{d}) + \epsilon_{t,}^c \tag{2.30}$$

Above equations imply that the fiscal rule is manipulated by the parameter ψ: for small values we assume the spending is financed by new debt whereas large magnitude indicates both debt and other forms of revenues. For example, when ψ_c is small, then taxes are less responsive to debt and

government spending is primarily financed by issuing debt. The values of larger ψ_c correspond with taxes rising more aggressively in response to a deficit, and so government spending is financed by higher taxes than the baseline case.

Market clearing. In equilibrium, all markets must clear. The evolution of country's net foreign asset position is derived by substituting the government budget constraint and intermediate firm's profit conditions into merged household budget constraint:

$$\frac{P_t^d Y_t^d - C_t}{Q_t} = -b_t^f + \frac{1 + r_{t-1}^*}{1 + \pi_t^*} b_{t-1}^f - tr_t + \frac{v}{2} Q_t (b_t^f - b_{ss}^f)^2 \tag{2.31}$$

where b_t^f is foreign asset net position of Kazakhstan denoted in real value. The equilibrium resource constraint satisfies:

$$Y_t = p_{dt} Y_{dt} + Q_t p_t^{*o} Y_t^o \tag{2.32}$$

with $p_t^d = \frac{P_t^d}{P_t}$ implying the relative domestic prices and p_t^{*O} is the real price of oil in foreign currency. The demand and supply for the intermediate goods market are also equalised:

$$Y_t^d = C_t^d \tag{2.33}$$

3. Data

Calibration. The parameters of the model are calibrated. The discount factor is $\beta = 0.99$, which implies a steady-state annualised real interest rate of 4 percent. The relative risk aversion coefficient, σ, is calibrated to 1.00 and the inverse of the elasticity of labour supply, γ, is set to 0.8 close to the paper by Adilkhanova 2019. The Armington elasticity substitution between foreign and domestic goods, θ, is set be 1.9. The share of imports in consumption basket, $1 - \omega$, is set to 0.4 according to the data. As noted by Konebayev 2023, the share of non-Ricardian households by survey lies between 53.8% and 87.7%. We set the share, κ, to 0.66. Following Harrison, R. Thomas, and De Weymarn 2011, parameter on foreign bond adjustment cost is 0.01. The consumption tax rate and labour income tax rate are 4% and 2.55%, respectively. This is because instead of targeting the official statutory rates, we align with the steady-state shares of tax revenues that fund government expenditures. Data indicate that approximately 38% of government spending is financed through transfers from the oil fund, 18% by VAT, 8% by PIT and the rest covered by other taxes or non-tax revenues. The price rigidity is set to 0.6 implying average price duration of 2.5 quarters. The elasticity of substitution between different domestic goods is set to 6 to match the steady-state markup of 20%. For the fiscal policy block, the persistence in policy parameters such as ρ_g is set to 0.9 assuming higher persistence in spending rule. We think this is a valid assumption as the literature agrees. Regarding the debt feedback rule, the fiscal regime parameters are configured to facilitate comparisons, with the objective of having government revenue sourced at 40%.

Table 1

Parameter calibration

Parameters	Values	Source and Target
Structural parameters		
Discounting factor (β)	0.99	Annualized real interest rate of 4%
Constant in the labor disutility function	5.26	Estimated
Relative risk aversion (σ)	1.00	Assumption
Inverse of Frisch elasticity (γ)	0.8	Assumption
Elasticity of substitution b/w domestic goods(ε)	6.0	20% price markup at the steady state
Price rigidity (ξ)	0.6	price duration of 2.5 quarters
Share of Ricardian households (κ_n)	0.34	Konebayev 2023
Home bias in consumption(ω)	0.6	Data
Elasticity of substitution b/w dom.foreign (θ)	1.9	Devarajan, Go, and Robinson 2023
Cost parameter: foreign bonds(v)	0.01	Harrison, R. Thomas, and De Weymarn 2011
Labour income tax rate(PIT) (τ_n)	0.0255	Data
Consumption tax rate(VAT) (τ_c)	0.04	Data

Policy parameters			
Response of lump-sum tax to debt (ψ_T)	0.2	Zubairy 2014	
Response of oil transfers to debt (ψ_{tr})	0.25	Zubairy 2014	
Response of income tax to debt (ψ_n)	0.30	1% increase in tax rate	
Response of VAT to debt (ψ_{tr})	0.22	1% increase in tax rate	
Persistence in government spending rule (ρ_g)	0.9	Assumption	
Persistence in lump-sum tax rule (ρ_T)	0.9	Assumption	
Persistence in income tax rule (ρ_g)	0.9	Assumption	
Persistence in VAT tax rule (ρ_g)	09	Assumption	
Persistence in monetary rule (μ)	0.7	Assumption	
Interest rate response to inflation (rp_π)	1.6	Assumption	
Interest rate response to output (rp_y)	0.01	Assumption	
Steady-state parameters			
Targeted inflation (π^*)	0.00	Annualized inflation target 0%	
Debt to GDP ratio $\left(\frac{B_{ss}}{Y_{ss}}\right)$	0.3	Data	
Non-oil to total GDP ratio $\left(\frac{Y^d_{ss}}{Y_{ss}}\right)$	0.88	Assumption	
Foreign debt to GDP ratio $\left(\frac{B^f_{ss}}{Y_{ss}}\right)$	0.1	Assumption	
Government spending to GDP ratio $\left(\frac{G_{ss}}{Y_{ss}}\right)$	0.25	Data	
National fund to GDP ratio	0.3	Data	
NF transfers to government spending $\left(\frac{tr_{ss}}{G_{ss}}\right)$	0.36	Data	

Model fit. Table 3.2 presents key business cycle moments under the benchmark calibration of the model. All variables are log-transformed and HP-filtered. The data values cover the period from 2005Q1 to

2024Q3, providing a concise description of the economic dynamics around 20 years. The table illustrates that the model closely matches the observed volatility in labour, GDP and imports, while significantly underestimates the volatility in consumption movement while overestimates the movement in exports. The latter is due to the model's assumption that all exports consist of oil and are treated as exogenous. In addition, the model also attempts to replicate the correlation between key aggregate variables and GDP. The model's replication ability in general is accurate except for labour and exports. The model's capacity to replicate the business cycle dynamics is satisfactory, particularly, for GDP, imports, and labour. Although some differences exist, they could be attributed to assumptions underlying the model.

Table 2

Table 3.2: Volatilities and co-movements of key variables

Moments	σ_y	σ_c/σ_y	σ_n/σ_y	σ_{yo}/σ_y	σ_{cf}/σ_y
Data	0.06	2.73	0.46	1.28	1.88
Model	0.02	1.13	0.53	0.52	2.23
	$\rho(y,y)$	$\rho(c,y)$	$\rho(n,y)$	$\rho(yo,y)$	$\rho(cf,y)$
Data	1.00	0.65	0.36	0.34	0.34
Model	1.00	0.98	0.99	0.05	0.39

Note: σ and ρ are the standard deviation and correlation parameters, respectively. c is consumption, n is labour hours, yo is export of oil, cf is imports.

4. Results

Impulse responses. Before we begin the examination of the fiscal regime comparison, we must define a rule for regime identification as shown in Table 4.1 where 40% of revenue sources will be

lump sum, VAT, PIT, debt or oil revenues, depending on the value of the parameter ψ in equations 2.28-2.30. The table below shows the value of ψ for each regime. We have identified five policy regimes, with their respective financing shares presented in Table 4.1. For instance, under regime 3, a new government spending is financed through a combination of new debt (5%), oil revenue from National Fund (40%), and lump-sum tax (55%).

Table 3

Parameter values under different policy regimes

Regimes	ψ_T	ψ_{tr}	ψ_c	ψ_n
Debt (60%), LS tax (40%)	0.02	0	0	0
Debt (40%), LS tax (60%)	0.04	0	0	0
Debt (5%), oil revenue (40%), LS tax (55%)	0.2	0.25	0	0
Debt (11%), VAT (40%), LS tax (49%)	0.2	0	0.22	0
Debt (11%), PIT (40%), LS tax (49%)	0.2	0	0	0.30

Figure 1

Response to 1% positive government spending shock. Model 3
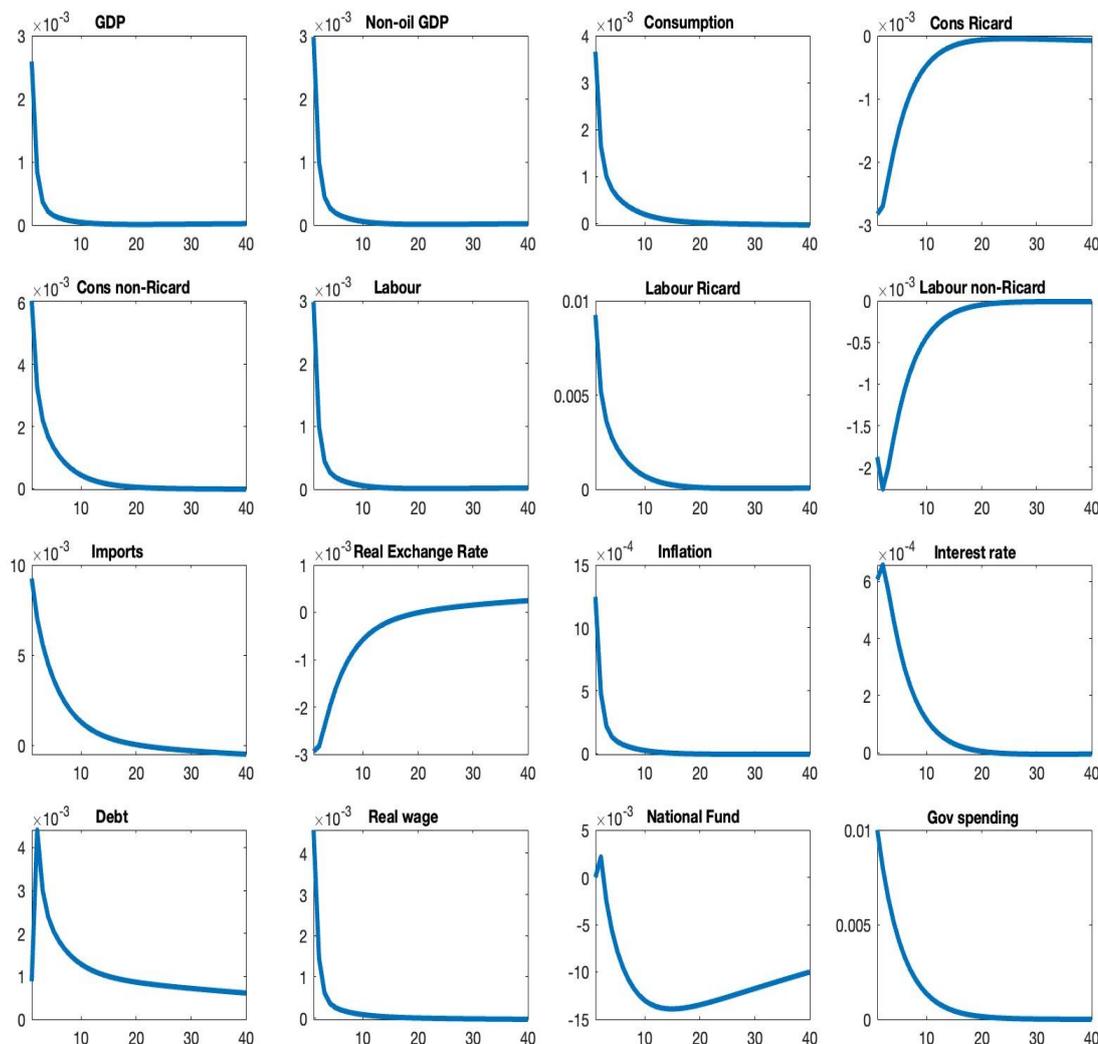
The first step of the analysis involves the identification of the transmission mechanism of the fiscal spending shock. Figure 1 presents the model implied impulse response of key variables following a shock to government spending, which is assumed to be transfers to rule-of-thump households. While

horizontal axis depicts periods in quarters, the vertical axis shows percentage deviation from the steady-state. As can be seen in the graph, total consumption rises — a feature that is observed in the data for Kazakhstan. The household demand for domestic and imported consumption rises. The former is due to a positive response of consumption demanded by credit- constrained households, while the latter is due to an appreciation of the real exchange rate. What stands out here is that the increase of government expenditure implies an increase of domestic debt, which crowds out the consumption of Ricardian households. As mentioned above, stickiness in price decisions of firms leads to a rise in real wage in response to an increase in labour demand. The increase in real wage entails a rise in marginal cost and hence in domestic inflation, which eventually triggers upward pressure on overall consumer inflation. Monetary authority then increases the interest rate, thereby appreciating the exchange rate. As the government spending is partly financed by oil revenues, the value of National fund decreases.

The model also highlights the distributional effects of government transfers. To increase transfers to non-Ricardian households, the government issues debt, effectively borrowing from Ricardian households and inducing a negative wealth effect that reduces their consumption. This redistribution of resources raises the question of the policy's consequences, which must be evaluated not only in terms of aggregate economic outcomes but, more importantly, in relation to household welfare. The next section addresses this issue in detail.

Figure 2

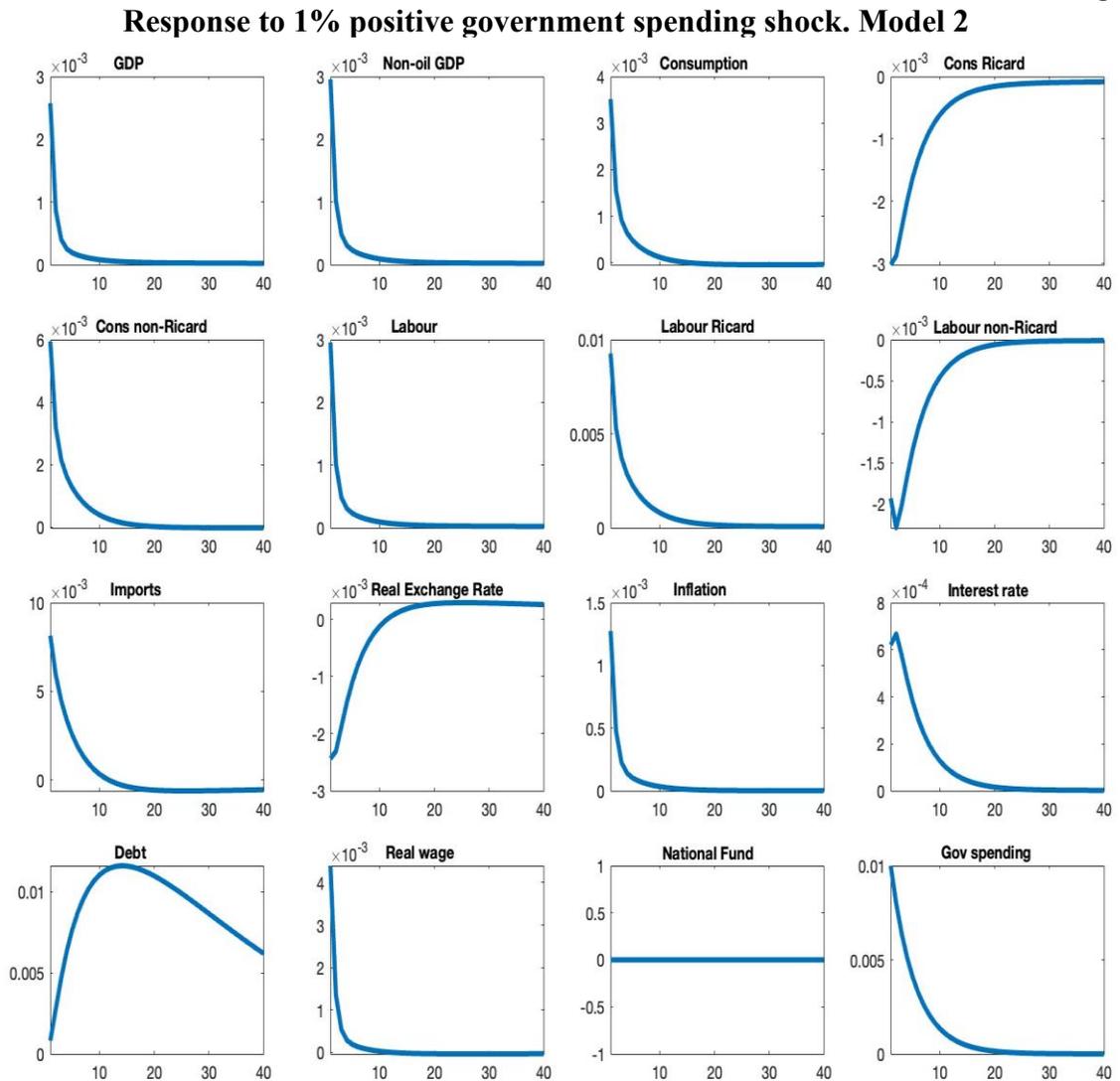**Response to 1% positive government spending shock. Model 2**

Figure 2 displays a similar dynamic pattern for the same shock with the same magnitude, but under a different fiscal regime — Model 2. While the sign and general direction of the responses are

consistent, there are notable differences in the real exchange rate, imports, debt, and the oil fund. Specifically, the real exchange rate appreciates more sharply and for a longer duration when funded by the National Fund, whereas cumulative imports over 40 periods are greater under regime 3. Conversely, debt accumulation is larger and more prolonged under regime 2, which is consistent with the assumption that government revenues in this regime mainly come from new debt and lump-sum taxes.

Policy regimes. This section compares alternative policy regimes concerning the revenue side of the government budget constraint. The central question addressed is: if the government chooses to increase transfers to non-Ricardian households, what is the most appropriate financing mechanism? The options include oil revenues from the National Fund, raising tax rates, increasing lump-sum taxes, or issuing new debt. To provide a comprehensive assessment, the analysis is conducted from multiple perspectives, specifically, focusing on short-run deviations from the steady state, household welfare, and the fiscal multiplier. The discussion begins with an examination of short-run deviations.

Short-run deviation. The Table 4 shows the percentage deviation of key variables from their steady-state values in response to a 1% government spending shock, accumulated over a 10-year horizon. Several conclusions emerge from these results.

Table 4

Effect of 1% shock to government spending over 10 years

Financing mix	GDP	Non-oil GDP	Cons_Ricard	Cons_nonRicard	National Fund	Import	Gov debt	Labour_Ricard	Labour-nonRicard	Inflation
Lump-sum tax (40%), Debt(60%)	**0.467**	**0.534**	-1.721	1.468	0.000	1.181	3.097	2.778	-1.205	0.213
Debt (40%) and Lump-sum tax (60%)	**0.467**	**0.534**	-1.721	1.468	0.000	1.181	1.982	2.778	-1.205	0.213
Debt (5%), oil revenue (40%) and lump-sum tax (55%)	0.350	0.422	-1.249	1.610	**-4.654**	**4.245**	0.194	2.435	-1.137	**0.187**
Debt (11%), VAT(40%) and lump-sum tax (49%)	0.092	0.110	-1.539	0.848	0.000	0.962	0.473	1.790	-1.192	0.212
Debt(11%) and PIT(40%) and Lump-sum tax (49%)	-0.075	-0.078	-1.903	0.772	0.000	1.080	0.433	1.805	-1.536	0.234

Note: All values represent percentage deviations from their respective steady-state levels.

First, the distributional effect of government transfers is evident: consumption for Ricardian households falls while increases for non-Ricardian. Likewise for their respective labour. Second, when government spending is financed through oil revenues—as is common practice in Kazakhstan—the National Fund decreases by 4.65% and imports rise by 4.25% consistent with findings in the literature and media reports. Third, even under distortionary taxation, the model indicates a substantial accumulation of public debt.

In terms of optimal policy, the choice depends on the prioritisation of objectives by the policy maker, whether it is non-oil GDP, National Fund, imports or inflation stabilisation. From a central bank perspective, financing through oil revenues appears preferable, while for policy authorities pursuing diversification of economy (non-oil GDP) is combination of debt issuance and lump-sum taxation emerges as the more favourable strategy.

Household's welfare. Now, let us determine the optimal policy in terms of household's welfare. The Table 4.3 incorporates the household's lifetime utility estimated by the formula:

$$V(B, NF, B^f) = \sum_{t=1}^{T} \beta^t U_t + \beta^{T+1} \frac{U_{ss}}{1 - \beta},$$

where U_t is the utility of the households computed by equations (2.1), $\beta = 0.99$. The variable W in the table is weighted average of lifetime utility for total households:

$$W = \kappa V_R + (1 - \kappa)V_{NR},$$

where κ is share of Ricardian households. The values reported in the table represent percentage deviations from the benchmark model, which assumes government spending is financed by 60% debt and 40% lump-sum taxation. Negative values, highlighted in red, indicate welfare losses compared to the benchmark model. The results suggest that financing through oil revenues yields the most adverse outcome for overall household welfare. On the other hand, the optimal policy would involve either a combination of lump-sum taxes and new debt or reliance on VAT taxation.

Table 5

Household's Lifetime Welfare, % difference relative to benchmark

Financing mix	V_R	V_{NR}	W
Debt (60%), LS tax (40%) – benchmark	0.000	0.000	0.000
Debt (40%), LS tax (60%)	0.000	0.000	0.000
Debt (5%), NF (40%) and LS tax (55%)	(0.790)	(0.220)	(0.530)
Debt (11%), VAT (40%), LS tax (49%)	(1.310)	1.430	(0.005)
Debt (11%), PIT (40%), LS tax (49%)	(0.930)	1.180	(0.030)

Fiscal multiplier. This section reports on a quantitative measure of the effect of fiscal policy on output by estimating the fiscal multiplier. We define cumulative multiplier as the expected cumulative change in output given one unit change in government spending:

$$m_t = \frac{\sum_{t=0}^{T} \triangle Y_t}{\sum_{t=0}^{T} \triangle G_t}$$

The estimators are calculated from the impulse responses of exogenous government spending shocks. The interpretation of multiplier is that one unit increase in government spending increases GDP by the corresponding multiplier in unit of currency.

Table 6

Spending multiplier for total GDP

	impact	4Q	LR
Debt	0.74	0.4	0.34
Debt and lump-sum tax	0.74	0.4	0.34
Debt and oil funds	0.75	0.38	0.25
Debt and VAT	0.76	0.41	0.07
Debt and PIT	0.73	0.37	-0.05

Table 7

Spending multiplier for non-oil GDP

	Fiscal multiplier		
	impact	4Q	LR
Debt	1.17	0.64	0.53
Debt and lump-sum tax	1.17	0.64	0.53
Debt and oil funds	1.18	0.62	0.42
Debt and VAT	1.19	0.65	0.11
Debt and PIT	1.15	0.59	-0.08

The Table 6 - 7 reports on the estimated fiscal multiplier for government transfers. The total GDP impact multiplier is below one. For example, oil revenue financing yields a multiplier of 0.75,

implying that a 100 tenge increase in spending raises GDP by 75 tenge. VAT financing produces the highest short-run multiplier, while a combination of debt and lump-sum tax yields the highest long-run effect. For non-oil GDP, impact multipliers exceed one and are generally larger than for total GDP, with VAT financing again performing best and PIT financing worst in the short-run. In the long run, PIT financing results in a negative multiplier, while the debt and lump-sum mix remains optimal.

Figure 3

Estimated spending multiplier

(a) Total GDP multiplier	(b) Non-oil GDP multiplier
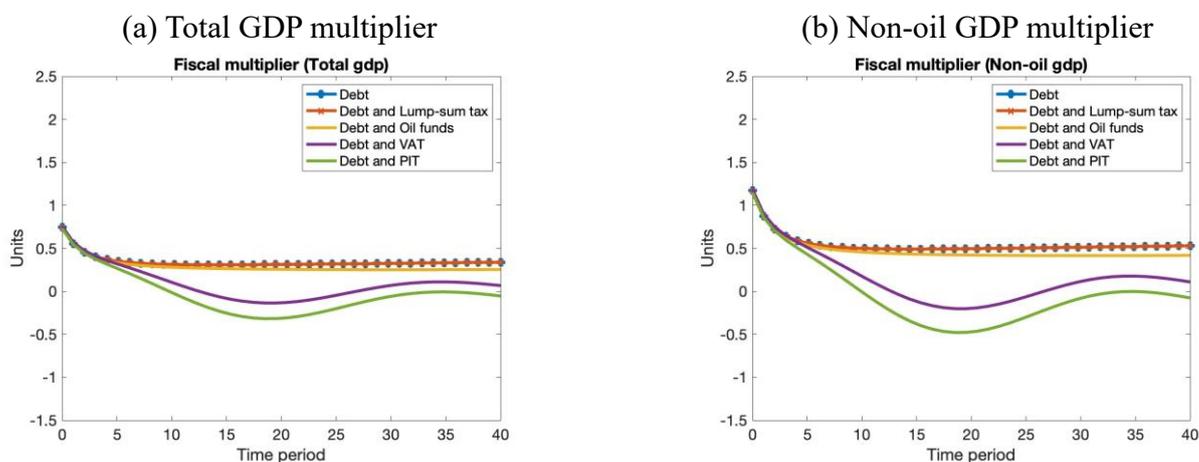
The fiscal multiplier dynamics is illustrated in Figures 3. In line with the literature, all fiscal regimes exhibit similar effects in the initial periods following the shock, with divergence emerging after approximately five quarters. Distortionary taxes produce the weakest outcomes within 4 quarters, whereas the remaining regimes perform comparably. Notably, the combination of lump-sum taxation and debt results in slightly higher multipliers than oil revenue financing.

The findings also show that fiscal multiplier estimates vary by the source of financing, particularly over the long term. Additionally, the DSGE model results differ substantially from previous SVAR-based estimates for Kazakhstan, which report multipliers of 0.4 for non-oil GDP and 0.22 for total GDP. While this study confirms the relative ordering, the DSGE model produces values approximately three times higher. This discrepancy reflects differences in scope: earlier estimates covered total government spending, while the current analysis focuses specifically on government transfers, which primarily influence aggregate demand rather than aggregate supply of the economy.

In conclusion, addressing the initial research question of the optimal fiscal policy for financing additional government transfers reveals a complex answer. The preferred approach depends on policy priorities, whether the focus is household welfare, inflation stability, non-oil GDP growth (as part of diversification efforts), or stock of the National Fund. However, the analysis indicates that financing through oil revenues, though common in commodity-exporting countries, performs poorly in terms of fiscal multipliers, household welfare, and overall economic outcomes. In contrast, mix of debt and taxes emerges as the least distortionary option, delivering the highest short-term multiplier, and minimum welfare losses.

5. Conclusion

The current paper builds a small open economy DSGE model for Kazakhstan for fiscal policy analysis. The model features an extended fiscal block, including lump-sum and distortionary taxes as well as an oil fund accumulation mechanism. The paper examined the key fiscal policy challenge of optimally financing a spending shock, framing it as a trade-off between present and future consumption, while also analysing the redistributive effects of policy choices. The findings are largely intuitive: financing a spending shock through debt helps smooth current consumption, but it reduces consumption in the future. In this model, domestic debt and the government's net foreign assets

represent the two stock variables that capture, implement, and carry forward this intertemporal trade-off.

The paper addresses two key objectives. First, in the context of Kazakhstan's current policy debate on increasing the VAT rate by 4% to address a growing budget deficit, the study evaluates alternative fiscal rules based on government revenue sources: lump-sum tax, VAT, PIT, oil revenues, and debt. The results indicate that the optimal approach depends on policy priorities, such as household welfare, inflation stability, non-oil GDP growth, National Fund preservation, or fiscal multiplier outcomes.

The social costs of a spending shock arise both from debt accumulation and from immediate spending cuts triggered by higher taxes. Drawing down foreign assets is the least efficient financing strategy, as it leads to an appreciation of the real exchange rate and domestic goods. A more effective policy mix combines domestic debt at the onset with tax adjustments. This approach benefits from a relatively weaker exchange rate, a smaller increase in net government debt, and a faster return to the steady-state level of net debt.

The findings suggest that oil revenues and PIT are the least favourable in terms of household welfare compared to VAT. VAT taxation emerges as the most favourable option when the policy objective is enhancing the short-run fiscal multiplier and household welfare maximisation, particularly benefiting those households lacking access to credit markets. In contrast, if the policy goal to achieve short-run inflation stabilisation, financing through oil revenues is the most optimal approach.

The paper also estimates government transfer multipliers both for total and non-oil GDP. Consistent with the existing literature, multipliers are higher for nonoil GDP. While short-run multipliers are similar across regimes for the first five quarters, divergence occurs thereafter, with PIT and VAT yielding the lowest long-run multipliers. For the short-run up to four quarters the highest multiplier is for new debt financing.

In summary, this paper represents one of the first attempts to model fiscal policy within a DSGE framework. However, to enable a more thorough analysis of fiscal policy impacts, further refinements are necessary—both in the estimation of model parameters and in the structure of the model itself.

References

1. Adilkhanova, Zarina (2019). "Microlevel analyses of DSGE model parameters: Evidence from Kazakhstan". In: NAC Analytica Wroking Papers 2.

2. BerghoLt, Drago and Vegard H Larsen (2016). "Business cycles in an oil economy: Lessons from Norway". In.

3. Christiano, Lawrence, Martin Eichenbaum, and Sergio Rebelo (2011). "When is the government spending multiplier large?" In: Journal of Political Economy 119.1, pp. 78–121.

4. Coenen, Gunter et al. (2012). "Effects of fiscal stimulus in structural models". In:American Economic Journal: Macroeconomics 4.1, pp. 22–68.

5. Cogan, John F et al. (2010). "New Keynesian versus old Keynesian government spending multipliers". In: Journal of Economic dynamics and control 34.3, pp. 281–295.

6. Devarajan, Shantayanan, Delfin S Go, and Sherman Robinson (2023). "Trade elasticities in aggregate models". In: Prospects.

7. Dixit, Avinash K and Joseph E Stiglitz (1977). "Monopolistic competition and optimum product diversity". In: The American economic review 67.3, pp. 297–308.

8. Djinkpo, Medard (2019). "A DSGE model for fiscal policy analysis in The Gambia". In.

9. Gali, Jordi and Tommaso Monacelli (2008). "Optimal monetary and fiscal policy in a currency union". In: Journal of international economics 76.1, pp. 116–132.

10. Gal´ı, Jordi, J David Lopez-Salido, and Javier Vall´ es (2007). "Understanding the effects of gov-´ ernment spending on consumption". In: Journal of the european economic association 5.1, pp. 227–270.

11. Ghironi, Fabio and Marc J Melits (2005). "International trade and macroeconomic dynamics with heterogeneous firms". In: The Quarterly Journal of Economics 120.3, pp. 865–915.

12. Harrison, Richard, Ryland Thomas, and Iain De Weymarn (2011). "The impact of permanent energy price shocks on the UK economy". In.

13. Konebayev, Erlan (2023). "Estimation of a small open economy DSGE model for Kazakhstan". In: Post-Communist Economies 35.7, pp. 670–707.

14. Kraay, Aart (2012). "How large is the government spending multiplier? Evidence from World Bank lending". In: The Quarterly Journal of Economics 127.2, pp. 829–887.

15. Stahler, Nikolai and Carlos Thomas (2012). "FiMod—A DSGE model for fiscal policy simulations". In: Economic modelling 29.2, pp. 239–261.

16. Zubairy, Sarah (2014). "On fiscal multipliers: Estimates from a medium scale DSGE model". In:

17. International Economic Review 55.1, pp. 169–195.

Appendix

Steady-state equations

In this section, we will compute the steady state of the model.

$$A_n n^{R\gamma} = w\frac{1-\tau_n}{1+\tau_c}c^{R-\sigma} \tag{1}$$

$$A_n n^{NR\gamma} = w\frac{1-\tau_n}{1+\tau_c}c^{NR-\sigma} \tag{2}$$

$$c^{NR}(1-\tau_c) = w(1-\tau_n)n^{NR} + g^{NR} \tag{3}$$

$$g^{NR} = \frac{g}{1-\kappa} \tag{4}$$

$$n = \kappa n^R + (1-\kappa)n^{NR} \tag{5}$$

$$c = \kappa c^R + (1-\kappa)c^{NR} \tag{6}$$

$$y^d = zN \tag{7}$$

$$c^d = y^d \tag{8}$$

$$mc = \frac{w}{zp^d} \tag{9}$$

$$nf = \frac{(1-\rho_{nf})p^o y^o}{1-(1-\rho_{nf})(1+r^*)} \tag{10}$$

$$tr = \rho_{nf}((1+r^*)nf + p^o y^o) \tag{11}$$

$$c^d = \omega p^{d-\theta}c \tag{12}$$

$$c^f = (1-\omega)q^{-\theta}c \tag{13}$$

$$p^d = \frac{P^d}{P}$$

$$1 = \omega p^{d\,1-\theta} + (1-\omega)q^{1-\theta} \tag{14}$$

$$\frac{p^d y^d - c}{q} = r^* b^f - tr \tag{15}$$

$$div = p^d y^d - wN \tag{16}$$

$$0 = \frac{r}{\pi}b + g - T - qtr - \tau_c c - \tau_n nw \tag{17}$$

$$y = p^d y^d + qp^o y^o \tag{18}$$

Insolvent firms: Identification and consequences in Kazakhstan

Rustanov S., National Bank of the Republic of Kazakhstan
Ybrayev Z., National Bank of the Republic of Kazakhstan
Kuandykov B., National Bank of the Republic of Kazakhstan
Khakimzhanov S., National Bank of the Republic of Kazakhstan

This paper brings a novel empirical evidence on financially distressed firms, specifically, from the perspective of a developing economy. A distressed condition depicts both cash flow and balance sheet insolvency, which however continues to operate, likely provided with some external support. We apply two identification strategies in order to detect insolvent firms. First, interest coverage ratio approach describes companies that are unable to serve debts as they fall due. Second, balance-sheet approach is relevant for firms with negative equity. We document that share of insolvent firms is decreasing in Kazakhstan as well as they are less profitable, produce less investment and employment when compared to healthy companies. They are more leveraged and less able to serve their due debt, also their share generally rises with firm size and age. Importantly, we find that an increase in the share of insolvent firms also diminishes the financial activity of healthy companies in the given industry.

1. Introduction

There is a rapidly growing area of investigation in the academic literature dedicated to identifying unviable firms, also referred to as insolvent or zombie firms, and examining the impact of their operations on the economy. They are often defined as unprofitable or insolvent but continue to operate in the market rather than exiting through takeover or bankruptcy (Banerjee and Hofmann, 2022). The notion of unviable firms and their effects was initially identified in Japan, where unviable firms were linked to the country's prolonged economic stagnation (Caballero et el., 2008). Studies on unviable firms usually focus on developing methodologies to detect unviability, analyzing the issues associated with their persistence, and assessing their impact on resource allocation and economic growth. In this study, the term insolvent is used to refer to unviable firms.

In many countries it is documented that the share of unviable firms has increased over the past 30 years. Some studies associate this trend with prolonged periods of low interest rates, as well as with government support programs implemented during times of economic crisis. Moreover, a sharp increase in the proportion of unviable firms has been documented following economic downturns, such as the recessions of the early 2000s and the 2008 global financial crisis (Albuquerque and Iyer, 2023).

Unviability among firms presents a significant challenge for emerging economies, where institutional development, financial infrastructure, and firm resilience often lag behind more advanced markets. In such contexts, the presence of financially distressed firms can have far-reaching implications not only for individual stakeholders but also for industry-level dynamics and macroeconomic stability. Kazakhstan, as a resource-dependent and transition economy, offers a compelling case for examining how insolvent firms influence broader economic performance.

While extensive literature exists on the causes and consequences of unviability in developed economies, relatively little empirical research has focused on the impact of insolvent firms in post-Soviet or Central Asian contexts. In Kazakhstan, firm unprofitability or insolvency, despite continuing their business, remains a persistent issue, reflecting structural weaknesses in corporate governance, market competition and credit allocation. Yet, the extent to which these firms distort economic efficiency, depress investment and employment, or impose risks on the financial system remains underexplored.

This paper seeks to fill this gap by investigating whether insolvent firms in Kazakhstan exhibit lower economic viability, measured through investment, employment, and profitability, relative to solvent firms. We apply two identification strategies in order to detect unviability of firms. First, interest coverage ratio approach describes companies that are unable to serve debts as they fall due. Second, balance-sheet approach is relevant for firms with negative equity. Additionally, we examine whether a higher concentration of insolvent firms within a given industry adversely affects the financial performance of otherwise healthy companies in the same sector.

We document that the share of insolvent firms in Kazakhstan is declining with their associated possesion of economic resources. Such companies produce less investment, employment and profitability when compared to healthy companies. They are more leveraged and less able to serve their due debt, also their share generally rises with firm size and age. Importantly, we find that an increase in the share of insolvent firms also diminishes the financial activity of healthy companies in the given industry. Our findings aim to inform both policy and regulatory approaches to managing firm insolvency in developing and transitional economies.

The rest of the paper is organized as follows. Section 2 provides relevant literature review. Section 3 and 4 explains our measures of insolvency and describes the data we use in our paper as well as characteristics of insolvent firms. Section 5 lays out our empirical analysis and performs our econometrics tests. Section 6 concludes.

2. Literature Review

Research in this field is conducted along various lines of inquiry, either at the level of individual countries or encompassing multiple countries.

A number of studies investigate the characteristics of zombie firms using country-specific data. For instance, Bonfim et al. (2023) identified unviable firms as those with negative equity, further distinguishing between operational zombies and financial zombies based on the extent of asset deterioration and liability growth based on Portugal firms' data. On the other hand, Schivardi et al. (2017) identify zombie firms as those that meet specific criteria for low profitability and excessive leverage using two definitions applied on Italian firms: (1) ROA below the "prime rate" – a benchmark for the risk-adjusted market cost of capital – and its leverage exceeds a specified threshold. (2) EBITDA-to-interest ratio below 1. Carreira et al. (2022) use a combination of ROA (EBIDTA/assets), leverage ratio (debt/assets), and firm age to find zombie firms in Portugal. In addition, Favara et al. (2021) assess zombification of a firm in the United States if an interest coverage ratio is below one, a leverage ratio above the annual median, and negative sales growth in three consecutive years.

Cross country investigation uses a similar definition of zombie firms – based on an interest coverage ratio (ICR) below 1, complemented by Tobin's Q falling below the industry median for two consecutive years – Banerjee and Hofmann (2022) examined publicly listed firms in OECD countries. Similarly, Adalet McGowan et el. (2017) based on firms of several countries of OECD use interest coverage ratio less than 1 for 3 consecutive years and firms older than 10 years' approach to identify unviable firms. Altman et el. (2024) based their research to identify zombie firms in top 20 GDP economies propose own method by taking 3 year moving average of EBITDA/Interest expense less than 1 and 3 year moving average of Altman's Z-score.

In contrast, several studies (Banerjee and Hofmann, 2022; Favara et al., 2021) also compare the share of unviable firms between listed and non-listed companies. The share of zombie firms is found to be higher among publicly listed firms than among their non-listed counterparts. Non-listed firms are generally smaller in size and potentially more vulnerable. According to the studies the observed difference in the share of inefficient firms is attributed to several factors, namely, larger firms are more likely to access government subsidies, banks and other creditors are less inclined to recognize defaults by large publicly listed firms and are more likely to engage in debt restructuring; bankruptcy is considered as a last resort. Given their systemic importance, large firms typically carry greater economic weight, which creates incentives for public support. Moreover, non-listed firms are more likely to exit the market compared to publicly listed firms.

Among the most common findings in the academic literature on zombie firms are that zombie firms tend to be smaller in size, less productive, more highly leveraged, invest less in fixed capital, and gradually reduce both their asset base and employment levels over time. They hinder the growth of more productive firms, create barriers to market entry for new firms and constrain the growth of young firms.

In many recent publications, indicators of insolvency and unprofitability are predominantly used as the primary criteria for identifying zombie firms. Many approaches to identifying zombie firms are based on interest coverage ratios (Adalet McGowan et al., 2017; Edward I. Altman et al., 2023, among others), while others rely on leverage ratios (Bonfim et al., 2022), and a few utilize both methods (Alvarez et al., 2022). Building on these studies, and considering that non-viable firms have not yet been examined in the context of Kazakhstan, this paper assesses zombie firms using the Interest Coverage Ratio (ICR) and leverage indicators.
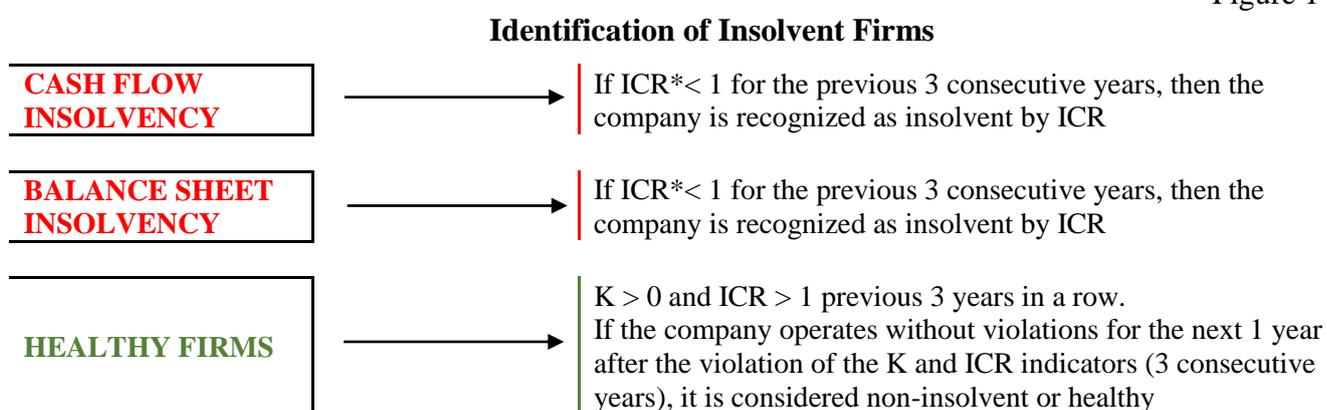
3. Identifying insolvent firms

The main goal of this study is to examine the share of companies that are technically or commercially insolvent, to document their main characteristics and effects (if any) in Kazakhstan. Our approach to define an insolvent company is close to Alvarez et.el. (2022) and Sahin (2024) in classifying financially distressed companies, as well as to Bonfim et.al. (2023) in classifying unviable (so called zombie) firms. In this section, the definitions of an insolvent company are introduced.

We use two definitions of firm insolvency based on its balance sheet and income statements. A firm is a balance sheet or technically insolvent if the value of its assets is less than the amount of its all liabilities. A cash flow or commercial insolvency condition occurs when a firm is unable to pay its debt as they come due (Udofia, 2019). Balance sheet insolvency can serve as an early indication of accumulated ongoing and long term liability contracts, despite being commercially solvent. It is also assumed that cash flow insolvency is more probable to occur compared to technical one, as it depends only on a single debt payment that could be past due (ibid). For instance, in Turkey Sahin (2024) shows the share of firms with interest coverage ratio less than 1 for 3 consecutive years, which is around 17% between 2012-2022, while the share of firms with negative equity for a minimum of 3 consecutive years fluctuated around 10%.

In a number of literature technical and commercial insolvency measures are used as a main criterion to define zombie firms. Many methods for defining zombie firms are relied on firms' interest coverage ratios (Adalet McGowan et el., 2017; Edward I. Altman et el., 2023, etc.), some on leverage (Bonfim et el., 2022) and few on both (Alvarez et.el., 2022). Following them we define a firm as technically or balance sheet insolvent, when its book equity is negative for 3 consecutive years, while a cash flow or commercial insolvency condition in our study is referred to the interest coverage ratio less than 1 for at least 3 years in a row (Figure 1). Interest coverage ratio is calculated as the ratio of EBIT to interest expenses. Firm's negative equity occurs when its liabilities value exceeds its assets value.

Figure 1

Identification of Insolvent Firms

CASH FLOW INSOLVENCY	→	If ICR*< 1 for the previous 3 consecutive years, then the company is recognized as insolvent by ICR
BALANCE SHEET INSOLVENCY	→	If ICR*< 1 for the previous 3 consecutive years, then the company is recognized as insolvent by ICR
HEALTHY FIRMS	→	K > 0 and ICR > 1 previous 3 years in a row. If the company operates without violations for the next 1 year after the violation of the K and ICR indicators (3 consecutive years), it is considered non-insolvent or healthy

Source: Authors' own adaption. Note: ICR = EBIT/Interest Expense and K is Equity

We do not place any age restriction on our measures of insolvencies as in Alvarez et el. (2022) or Sahin (2024) in identifying distressed companies. Firstly, from age perspective our aim is not to differentiate young startups from other firms, but to document whether insolvency condition is common at firms' younger stage. Secondly, Bureau's sample of data covers about 10% of all registered firms in Kazakhstan for a period and even less included in our sample, which has only 8% of companies that at least 5 years old. Furthermore, the share of insolvent companies among young firms is relatively small (Figure 3), so suggesting that insolvency condition is not a feature of younger firms only within the sample.

There is a link between the two measures of insolvency. Commercially solvent company may be technically insolvent. Udofia (2019) argues that such companies may have long-dated liabilities which its assets do not meet as a probable result of poor management. Despite their negative equity, ability to pay its due debts could still be from their assets or from third parties. We find that in Kazakhstan around 74% of balance sheet insolvent companies are still capable of meeting their due debts. In contrast, a commercially insolvent company may be technically solvent. Cash flow insolvency of such firms might be owing to the large share of long term assets that are not liquid enough to pay due debts. The assets of these firms exceed its liabilities, though they might face some liquidity shortage. However, there are only 35% of the commercially insolvent firms that have positive equity in Kazakhstan.

4. Data description and characteristics of firms

In our study, firm-level data that covers small, medium and large firms in a de-identified form, comes from Bureau of National Statistics of the Republic of Kazakhstan on an annual basis, and are used to calculate firm insolvencies and other variables based on their balance sheet and income statements between 2010 and 2023. In addition to the parameters of the balance sheet and income statements as well as other information on the financial and economic activities of firms, reporting forms also include separate national and other statistical classifications of firm-respondents. The range of respondents is limited to legal entities, where educational, healthcare organizations, banks, insurance organizations, pension funds, public foundations and public associations are excluded by Bureau of National Statistics.

There were approximately 560 thousand firms registered in Kazakhstan in 2023. Their number had risen by 25% for the last 6 years. The majority of registered companies (88%) is micro firms with up to 15 employees. Taking into account the specifics of Bureau's survey, only 11% on average of all firms in Kazakhstan is available at the Bureau. The average number of respondents for large, medium and small-sized enterprises, that report to the Bureau, is 44426 for a period between 2010 and 2023 with approximately 69% of micro firms.

Using Bureau's data, we remove firms which do not have or do not report data on assets and sales for a given period. To calculate interest coverage ratio, only those respondents who had nonzero and nonempty data in EBIT for at least 3 consecutive years were included to our sample. Extreme values found in all firm financial ratios in the sample are winsorised at the 1st and 99th percentiles to mitigate the effect of outliers. The sample is used to calculate both measures of insolvencies as well as other variables under the study. So our final sample comprises 110,835 (respondent-year) observations, which includes 28,326 unique respondents or on average 9,236 firms per period. The majority of respondents are from manufacturing, agriculture, wholesale and retail trade, and the smallest proportion are from representatives of other service activities.

Based on the methodology, from the specified sample of observations (total firms), we identify two categories of insolvent companies: those with negative capital for 3 consecutive years (12,599 observations) and those with ICR less than 1 for 3 consecutive years (3,395 observations). Comparison of indicators of firms in three categories (1) total firms, (2) firms with negative capital and (3) firms with ICR less than 1 reveals deep contrasts in their financial health and operational efficiency. Total firms serve as a benchmark and exhibit wide variance in size and performance. Their mean asset base stands at around 11 billion, with positive average EBIT and a strong median ICR of 2.56, reflecting relative financial stability.

In contrast, firms with negative capital for 3 consecutive years are markedly weaker. Although smaller on average with assets mean of 6.3 billion, these firms carry significantly higher liabilities-to-assets (2.38) and financial debt-to-assets (1.05) ratios, indicating severe over-leverage. Their EBIT is almost negligible or negative, and they show poor profitability with a negative EBIT-to-assets ratio (-0.10). The average ICR here drops to just 4.24, with a median of -0.02, exposing a widespread inability to cover interest costs from earnings.

Firms with ICR < 1 for 3 consecutive years reflect a different type of risk - cash flow stress rather than just balance sheet erosion. These firms actually have a higher average asset base (10.7 billion) compared to the negative equity group. However, their average EBIT is significantly negative (-0.86 billion), and EBIT-to-assets (-0.17) further indicates operational underperformance. These firms also suffer from reduced efficiency (sales-to-assets: 0.97) and low profitability. Notably, the median ICR is -1.54, and the average plunges to -22.39, highlighting an acute inability to service debt from operational income.

Table 1

Descriptive statistics

	Firms with negative equity for 3 consecutive years					
	Obs.	**Mean**	**Median**	**Std. Dev.**	**P25%**	**P75%**
Assets	12 599	5,3	0,4	56,0	0,1	2,3
Sales	12 599	2,8	0,2	15,0	0,0	1,2
EBIT	12 599	0,1	0,0	8,0	-0,1	0,0
Financial debt	7 307	8,7	0,6	71,4	0,1	3,7
Loans	4 166	7,3	0,7	71,1	0,1	3,6
Log(assets)	12 599	12,7	12,8	2,7	10,9	14,6
Log(sales)	12 599	12,3	12,4	2,5	10,7	14,0
Age	12 484	12,5	12,1	5,5	8,4	16,2
Sales to assets	12 599	2,8	0,8	6,8	0,3	2,3
Investments or d(fixed assets)	11 900	0,1	-0,1	1,4	-0,2	0,0
Liabilities to assets	12 599	2,4	1,6	1,8	1,2	2,6
Financial debt to assets	7 307	1,0	0,7	1,1	0,2	1,4
Payables to assets	12 155	1,2	0,9	1,2	0,3	1,5
Interest expense to fin. debt	4 609	0,2	0,1	0,6	0,0	0,1
EBIT to assets	12 599	-0,1	0,0	0,8	-0,2	0,1
Interest coverage ratio	4 939	4,2	0,0	159,1	-3,1	1,7
	Firms with ICR less than 1 for 3 consecutive years					
	Obs.	**Mean**	**Median**	**Std. Dev.**	**P25%**	**P75%**
Assets	3 395	10,7	2,1	34,2	0,5	8,0
Sales	3 395	4,2	0,6	14,6	0,1	2,5
EBIT	3 395	-0,9	-0,1	5,6	-0,4	0,0
Financial debt	3 153	9,9	1,1	35,7	0,1	5,8
Loans	2 314	5,6	0,6	18,6	0,1	4,0
Log(assets)	3 395	14,4	14,6	2,1	13,0	15,9
Log(sales)	3 395	13,2	13,4	2,4	11,9	14,7
Age	3 371	12,9	12,2	5,8	8,3	17,1
Sales to assets	3 395	1,0	0,3	2,8	0,1	0,9
Investments or d(fixed assets)	3 348	0,1	-0,1	1,1	-0,2	0,0
Liabilities to assets	3 379	1,7	1,2	1,5	0,9	1,9
Financial debt to assets	3 153	0,9	0,6	1,0	0,2	1,1
Payables to assets	3 297	0,6	0,3	0,8	0,1	0,8
Interest expense to fin. debt	3 163	0,2	0,1	0,6	0,0	0,1
EBIT to assets	3 395	-0,2	0,0	0,5	-0,2	0,0
Interest coverage ratio	3 395	-22,4	-1,5	71,7	-7,1	0,0

Bureau of National Statistics of Kazakhstan, authors' calculations.
Note: Total assets, sales, EBIT, financial debt and loans are denominated in national currency (in billion tenge). Age in years. All ratios are winsorised at the 1st and 99th percentiles.

Despite some overlap in financial distress indicators, the groups differ fundamentally in structure. Firms with negative capital for 3 consecutive years are critically insolvent and over-

leveraged, posing long-term solvency risks. Firms with ICR < 1 for 3 consecutive years, on the other hand, signal near-term liquidity and interest servicing concerns, potentially due to weak earnings rather than excessive debt.

  Characteristics of insolvent firms. Further, to explore the characteristics of insolvent firms, we start by calculating their proportion in the sample as well as across different industries using our two measures. To determine the share of cash flow or balance sheet insolvent firms, the number of such firms is divided by the total number of firms in the sample. The total shares of two insolvency metrics are illustrated in figure 2, while the shares across industries are expressed as percentages in table 2.

  In general, from the Figure 2 we see that share of insolvent companies in Kazakhstan is decreasing, whether we identify them through balance-sheet or income statement. The proportion of balance-sheet insolvent companies is around 11% on average, while the share of cash flow insolvent firms is roughly 3%. The trend in the share of balance sheet and cash flow insolvent firms from 2012 to 2023, illustrated on figure 2, shows a peak of 13.0% and 4.1% respectively at the start of the period, supposedly coinciding with the end of the 2008–2009 recession, as many (Banarjee and Hofmann, 2022; Albuquerque and Iyer, 2023) document the increase of unviable firms' share few years following economic downturn. Furthermore, there was some upturn in the shares of insolvent companies in 2017 and 2018, though less noticeable for cash flow insolvent ones. These uptick trends also coincided with the economic slowdown of Kazakhstan in 2015 and 2016 as a consequence of a sharp decline in global oil prices. However, we do not see any clear growth trends in the shares of insolvent companies due to COVID-19 pandemic, which might be a result of comprehensive government support measures of SMEs, including tax relief, loan deferrals and subsidized lending.

Figure 2

Share of insolvent firms in Kazakhstan
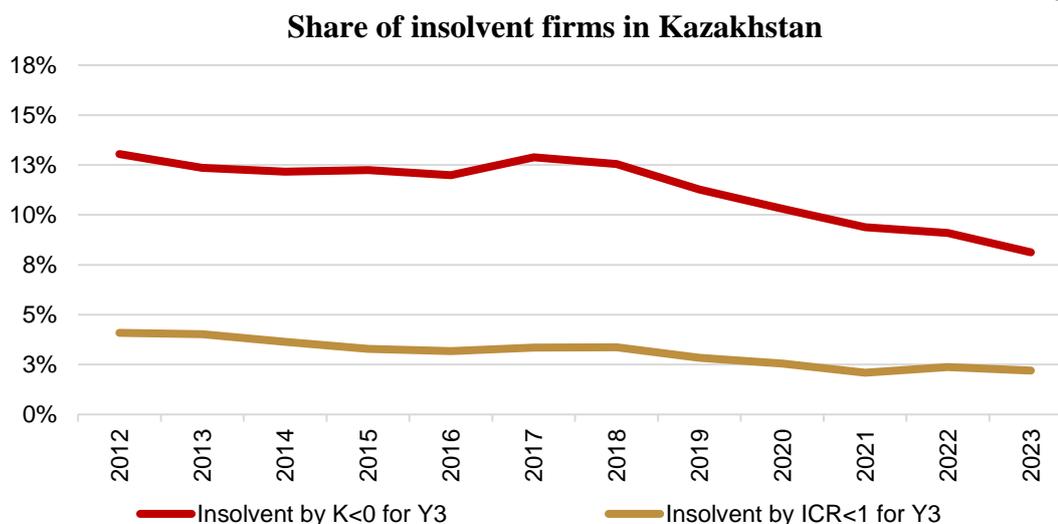
  Additional descriptive evidence is provided by the distribution of the insolvent firms shares across industries over the full sample period (2012–2023), as presented in Table 2. Both measures exhibit substantial variation among different sectors. Specifically, the share of cash flow insolvent firms varies from 0.3% in sector "N. Administrative and support service activities" to 5.2% in sector "C. Manufacturing", while the balance sheet insolvent firms' share ranges from 3.4% in "K. Financial and insurance activities" to 19.9% in "B. Mining and quarrying". The reason of these differences in shares might be related to business characteristics of each industry as well as the level of government support allocated to each sector. Another point to note is that the share of insolvent firms identified through balance sheet is more than twice higher than that of cash flow insolvent firms over the whole period. Such difference suggests that operating business in Kazakhstan is a prevalent practice among firms, although cause analysis of insolvent firms' share differences is beyond the scope of this study.

Table 2

**Share of insolvent firms across industries**

Industry	Share of cash flow insolvent firms	Share of balance sheet insolvent firms
A. Agriculture	4.6%	12.1%
B. Mining and quarrying	4.4%	19.9%
C. Manufacturing	5.2%	12.8%
D. Electricity, gas, steam and air conditioning supply	4.0%	15.5%
E. Water supply; sewerage, waste management and remediation activities	1.8%	7.0%
F. Construction	1.6%	8.6%
G. Wholesale and retail trade; repair of motor vehicles and motorcycles	3.3%	11.3%
H. Transportation and storage	4.7%	16.6%
I. Accommodation and food service activities	2.3%	12.8%
J. Information and communication	1.8%	8.8%
K. Financial and insurance activities	4.3%	3.4%
L. Real estate activities	2.6%	12.6%
M. Professional, scientific and technical activities	1.1%	8.6%
N. Administrative and support service activities	0.3%	9.5%
R. Arts, entertainment and recreation	1.5%	8.9%
S. Other service activities	0.4%	9.1%
Total	**3.1%**	**11.4%**

Next, we explore the dynamics of insolvent companies' share within the total sample along both size and age dimensions. Figure 3 illustrates that the probability of a firm becoming an insolvent generally rises with firm size. In particular, the share of cash flow insolvent firms grows to a peak of 21.8% as the asset size of a company increases up to 50 billion KZT and then it remains stable at around 20% amongst firms from 50 to 500 billion KZT in assets before sharply decreasing to the lowest 2.3% level for the largest firms. The share of balance sheet insolvent firms also tends to increase with size but only up to 50 billion in its assets, then gradually declining to the lowest rate of 6.8% for very large firms. These findings align with evidence from Japan (Hoshi, 2006), which suggest that larger firms are more often protected and turn into unviability, although this trend may reverse for firms that are exceptionally large. The reason of larger firms being more likely unviable is that larger firms are rather to receive government support, as policymakers may aim to avoid significant job losses as a result of the failure of such firms, especially during economic downturns (Adalet McGowan et el, 2017). It is also believed that creditors might have incentives to keep large companies afloat instead of bankrupting them.
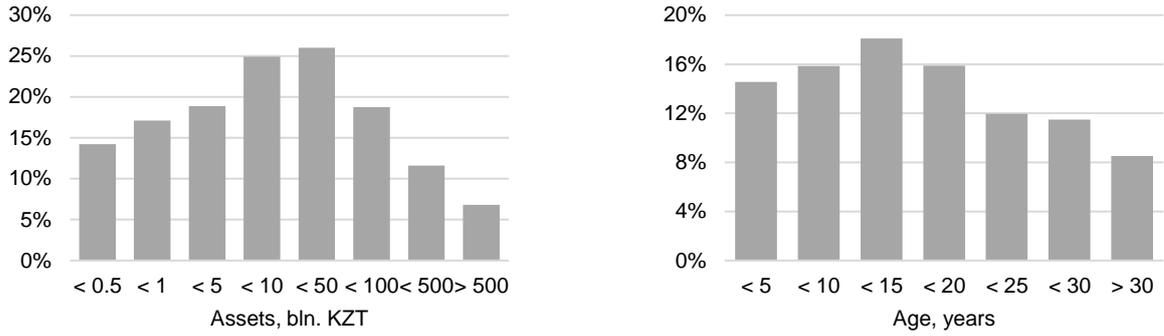
Figure 3

Share of insolvent firms in each size (assets) and age category (2012-2023)

a) Cash flow insolvency
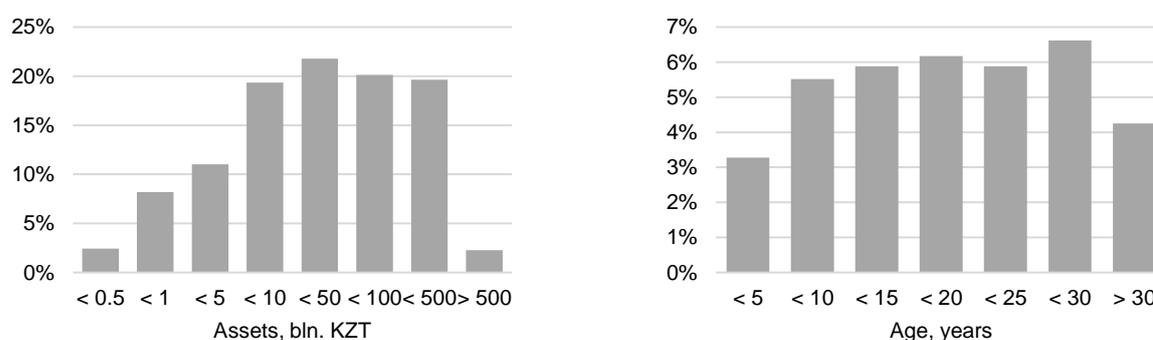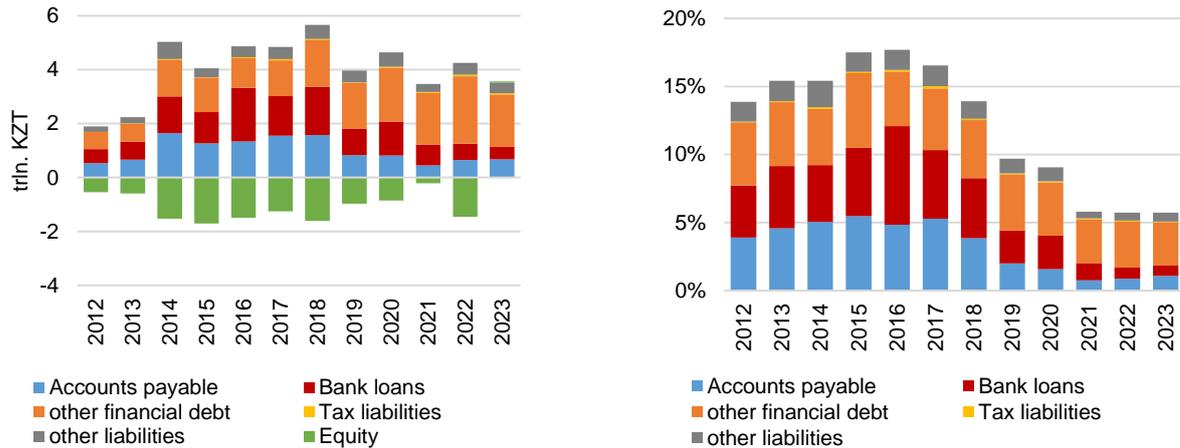
в) Balance sheet insolvency

Similarly, we see that the share of insolvent companies under the age of 5 shows the lowest level of insolvency based on income statement and their share increases with age until they reach 30 years in business. This share then significantly decreases when firms become older. On the other hand, the proportion of balance sheet insolvent firms peaks in a group of 10-15 years old companies and then it continues decreasing to the minimum level of 8.5% for the oldest firms. These trends in share distribution of insolvent firms by age seem to be related to firms' share distribution by asset size, indicating some correlation as older firms more likely to be larger in size.

Figure 4

Funding structure of insolvent firms

a) Cash flow insolvency
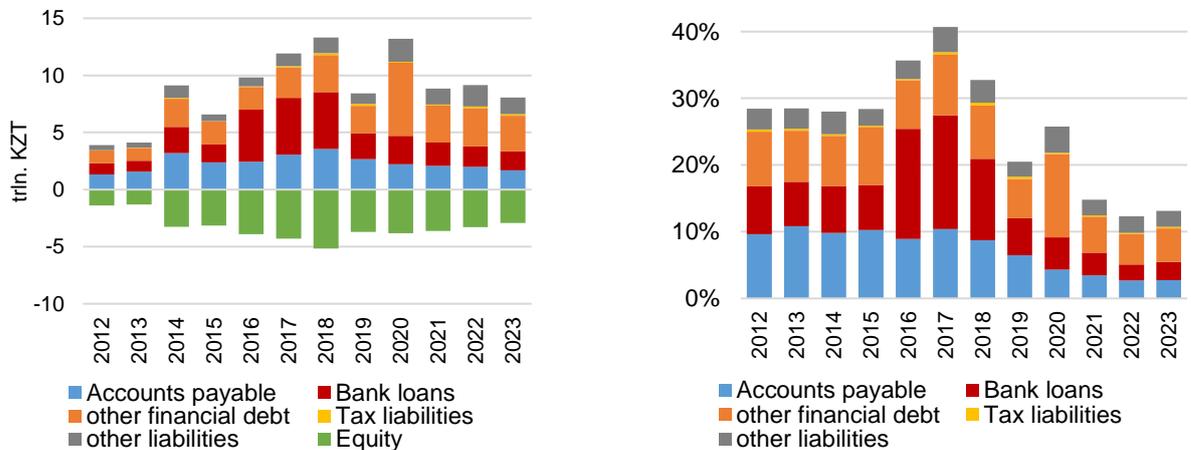

в) Balance sheet insolvency

Figure 4 presents, on the left, the total funding structure of insolvent firms in absolute terms, and on the right, their proportion of liabilities relative to all firms liabilities in the sample, thereby

indicating the extent of resources allocated to insolvent firms. The liabilities of insolvent firms are mainly concentrated in financial debt, including bank loans, and accounts payable. As the proportion of insolvent firms declines, their associated share of liabilities also diminish, indicating a reduced possesion of economic resources by these entities.

Life cycle of insolvent firms. In previous section the main facts of sample data were displayed and specific distinctions in data of insolvent firms were introduced. In this section some facts about the life cycle of insolvent firms is documented before and after their first insolvency was registered. Insolvent firms are compared to those that recover from our definition of insolvency. Recovered or non-insolvent firms are also considered to be healthy, so we use these three terms interchangeably in this section.

Figure 5

Insolvent firms life cycle
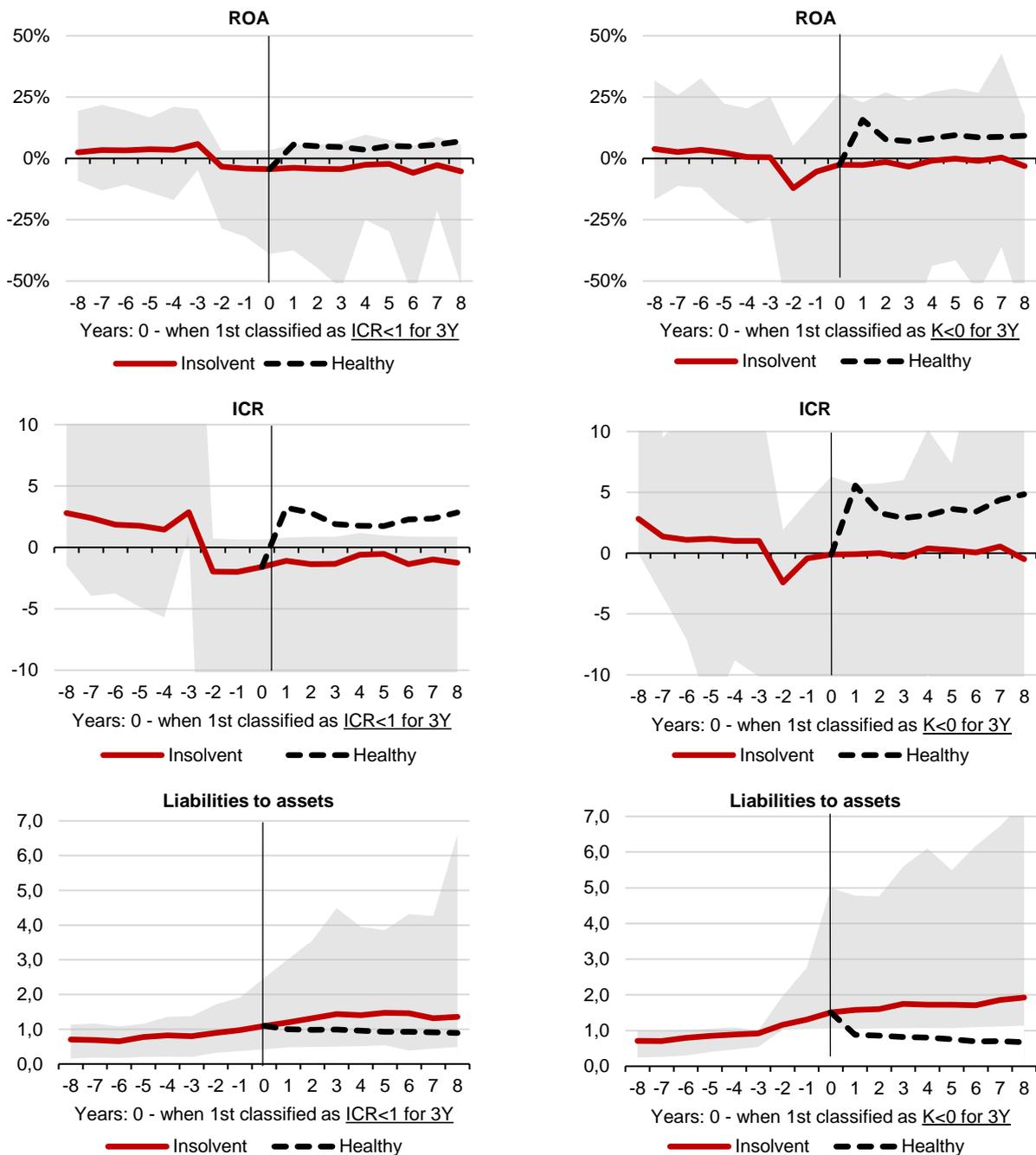
In order to understand the life cycle of insolvent firms we define the first entrance of firms (that had ever been insolvent) to both metrics of insolvency between 2012 and 2023, signing the entrance

as t=0. The periods that precede time t assigned corresponding lags, while subsequent periods to t set respective leads. Those firms that recover from insolvency conditions are grouped as healthy or non-insolvent, while the rest remaining as insolvent. To illustrate the dynamics of profitability and solvency of insolvent firms we take the medians of ROA, ICR and liabilities to assets ratios from t-8 to t+8 (figure 5).

The figure 5 reports that the performance of insolvent firms in terms of asset profitability is around two times below that of sample median even eight years before a company first classified as cash flow or balance sheet insolvent. Such difference shows that assets of insolvent firms generate significantly less profits and raises concerns about their ability to remain in business. Interestingly, those that become cash flow insolvent improve their profitability up to sample average from t-8 to t-3, while balance sheet insolvent firms' ROA ratio continue to deteriorate. Furthermore, performance of insolvent firms worsens significantly in t-2, which is clearly reflected by our definition of insolvent firms, namely by low profit or negative equity. At the same time, their ICR decline and leverage increase substantially before they first classified as insolvent.

Following insolvency from t to t+8, firms show some improvement in performance of ROA, especially technically insolvent ones, but both type of the insolvent firms remain far behind their recovered counterparts. Eight years after becoming insolvent, those still operating exhibit significantly lower profitability, less solvency and higher leverage compared to non-insolvent firms. Specifically, ROA of both type of insolvent companies is negative on average for 8 years of life after the first case of insolvency and remains on average from 9 to 12 percentage points below that of healthy firms. Moreover, during the post-insolvency period operational income of balance sheet insolvent firms is not sufficient to cover interest expenses throughout the life cycle, while EBIT of recovered counterparts 4 times above interest expenses on average. Interestingly, the longer the companies survive from t to t+8 the higher the liabilities to assets ratio of cash flow insolvent firms, whereas that ratio decreases gradually for healthy ones to 0.89 at t+8. The fact that cash flow insolvent firms more leveraged while balance sheet insolvent ones have low ICR show similarities of both metrics of insolvency. These metrics by definition have respectively low ICR and high leverage for cash flow and balance sheet insolvent firms.

5. Empirical Analysis

In this section we empirically investigate that insolvent firms produce less investment, employment and profitability, when compared to healthy companies. We also find that an increase in the share of insolvent firms also diminishes the financial activity of healthy companies in the given industry. Finally, we argue that insolvent firms have greater bank borrowing, which potentially increases systemic risks in the financial sector.

Firm Insolvency and Financial Performance. First of all, we aim to track if the firm's insolvency identification generates any negative consequences for its financial outcome. For this purpose, we estimate the following model:

$$Fin_{i,c,t} = \alpha_1 + \alpha_2 leverage_{i,c,t} + \alpha_3 Size_{i,c,t} + \alpha_4 X_{i,c,t} + \delta_{c,t} + \varepsilon_{i,c,t}, \tag{1}$$

where Fin is the measure of the firm's i financial performance (K or ICR), which operates in sector c, and at year t. At the same time, K stands for balance-sheet insolvency approach, or ICR refers for liquidity insolvency; X_{tj} are the measures of other firm-level characteristics and business rates. Leverage is the leverage measure for firm i, industry c, at year t; Finally, $X_{i,c,t}$ are the measures of other firm-level characteristics and interest rates; $\delta_{c,t}$ are time- and sector-fixed effects. The standard errors are clustered at the firm and section-year level.

We use two-way fixed effects model to isolate time- and sector-specific factors that might otherwise pollute our key regression results. Estimation results presented in columns 1 to 4 of Table 3 illustrates that insolvent firms on average produce less investment, employment and profitability, compared to healthy companies in their respective industries. We also mention that various financial characteristics, such as size and age, have different effects on sales-to-assets financial measures compared to other metrics of the firms' performance. This might suggest inadequate use of sales as a

proxy for firm's operational existence. Hence, we conclude, that profitability as a financial health metric, might better capture firm's economic health in addition to generation of employment and investment.

Table 3

Balance sheet Insolvent firms & Financial Performance

	Sales to assets	ROA	d(Employment)	d(Fixed Assets)
Insolvent_by_K	-0.273***	0.038***	-0.042***	-0.001
	(0.049)	(0.010)	(0.012)	(0.037)
Size	-1.283***	0.011***	0.041***	0.227***
	(0.017)	(0.004)	(0.004)	(0.013)
Financial Debt	0.041	-0.192***	0.013*	0.061***
	(0.030)	(0.006)	(0.007)	(0.023)
Age	0.127***	0.004***	-0.015***	-0.043***
	(0.004)	(0.001)	(0.001)	(0.003)
Constant	17.783***	-0.056	-0.341***	-2.335***
	(0.226)	(0.048)	(0.056)	(0.175)
Observations	46730	46730	46730	45520
R^2	0.154	0.029	0.009	0.013

Standard errors in parentheses: *p<0.10, **p<0.05, ***p<0.01
Note: Insolvent_by_K stands for a firm identified as insolvent by balance sheet approach.

Table 4 presents estimates of similar tests, but for companies with identification built on balance-sheet approach rather than on liquidity approach. Here again, the estimation results presented in columns 1 to 4 of Table 4 clearly shows that insolvent companies on average also produce statistically significantly less financial results. In particular, flow-based insolvent companies make rather less investment, employment and profitability, when compared to healthy companies. Since both of our results provide similar logic, we deem our results to be robust for out first empirical tests. Having established that insolvent companies do have micro-foundations, we process further to see if they can negative spillover impact on "healthy" firms. Our results provide additional corroboration on insolvency features, which is often left under-studied in the literature, especially for developing and emerging economies.

Table 4

Cash flow Insolvent Firms & Financial Performance

	Sales to assets	ROA	d(Employment)	d(Fixed Assets)
Insolvent_by_ICR	-0,226***	-0,153***	-0,023	-0,113***
	(0,048)	(0,010)	(0,012)	(0,036)
Size	-1,278***	0,009***	0,041***	0,227***
	(0,017)	(0,004)	(0,004)	(0,013)
Financial Debt	0,019	-0,179***	0,009	0,067***
	(0,029)	(0,006)	(0,007)	(0,022)
Age	0,125***	0,004***	-0,016***	-0,044***
	(0,004)	(0,001)	(0,001)	(0,003)
Constant	17,714***	-0,028	-0,353***	-2,324***
	(0,226)	(0,048)	(0,056)	(0,174)
Observations	46730	46730	46730	45520
R^2	0,154	0,035	0,009	0,013

Standard errors in parentheses: *p<0.10, **p<0.05, ***p<0.01
Note: Insolvent_by_ICR stands for a firm identified as insolvent by cash flow approach.

Negative Impact of Insolvent Firms on "Healthy" Companies. Next, we examine the link between insolvent firms and their economic and financial impact on "healthy" companies by estimating the following model:

$$Econ_{i,c,t} = \alpha_1 + \alpha_2 NonInsolvent_{i,c,t} + \alpha_3 ShareInsolvent_{i,c,t} + \alpha_4(NonInsolvent_{i,c,t} *$$
$$ShareInsolvent_{i,c,t}) + \alpha_5 X_{i,c,t} + \varepsilon_{t,j} \tag{2}$$

where $Econ_{i,c,t}$ is either employment, investment or profitability measures for the firm i, operating in sector c, at each given year t; $NonInsolvent_{i,c,t}$ is a "healthy" company, and $ShareInsolvent_{i,c,t}$ stands for a share of insolvent firms in the particular industry c at time t. The model also includes firm and time fixed effects to account for both firm-level time-invariant heterogeneity and economic cycle fluctuations, respectively. The standard errors are clustered at the sector level.

Table 5 demonstrates that "healthy" (solvent) firms are positively associated with key financial measures of the firm, such as investment, employment, and profitability. At the same time, the coefficient on interaction term is negative, which suggests that an increase in the share of insolvent firms within the sector decreases the positive impact of solvent firms. Overall, this finding proposed that insolvent companies that continue to consume scarce productive resources of the economy and divest investment, sales and employment away from well-functioning firms.

Table 5

Effect of Cash Flow Insolvent Firms on other firms

	ROA	d(Employment)	d(Employment)
Non-insolvent_by_ICR	0.252***	-0.007	0.257***
	(0.037)	(0.028)	(0.094)
Share_of_ICR	0.211	-0.873**	0.301
	(0.463)	(0.342)	(1.170)
Non-insolvent_by_ICR × Share_of_ICR	-0.905*	0.245	-1.909
	(0.464)	(0.343)	(1.172)
Constant	-0.056	0.041	0.086
	(0.037)	(0.027)	(0.093)
Observations	110835	110835	100228
R^2	0.002	0.001	0.000

Standard errors in parentheses: *p<0.10, **p<0.05, ***p<0.01

However, when we consider insolvent firms, which were identified by flow-based methods, Table 6 shows that an increase in the share of insolvent companies, do not necessarily bring about the downturn in the financial performance of "healthy" firms. That might be explained by the historical patterns of a large number of companies in Kazakhstan that are 'balance-sheet insolvent', but generate positive sales.

Table 6

Effect of Balance Sheet Insolvent Firms on other firms

	Sales to Assets	d(Employment)	d(Fixed Assets)
Non-insolvent_by_K	-0.648***	0.084***	0.068
	(0.206)	(0.025)	(0.090)
Share_of_K	-7.378***	0.754***	0.313
	(1.315)	(0.162)	(0.569)
Non-insolvent_by_K × Share_of_K	1.641	-0.200	0.151
	(1.287)	(0.159)	(0.569)
Constant	4.264***	-0.155***	0.128
	(0.206)	(0.025)	(0.090)
Observations	110835	110835	100228
R^2	0.001	0.001	0.000

Standard errors in parentheses: *p<0.10, **p<0.05, ***p<0.01

6. Conclusion

This paper brings a novel empirical evidence on financially distressed firms, specifically, from the perspective of a developing economy. A distressed condition depicts both cash-flow and balance sheet insolvency of a firm, which still continues to operate. This study investigates whether insolvent firms in Kazakhstan exhibit lower economic viability, measured through investment, employment, and profitability, relative to solvent firms. We apply two identification strategies in order to detect unviability of firms. First, interest coverage ratio approach describes companies that are unable to serve debts as they fall due. Second, balance-sheet approach is relevant for firms with negative equity. Additionally, we examine whether a higher concentration of insolvent firms within a given industry adversely affects the financial performance of otherwise healthy companies in the same sector.

We document that the share of insolvent firms in Kazakhstan is declining with their associated possesion of economic resources. Such companies produce less investment, employment and profitability when compared to healthy companies. They are more leveraged and less able to serve their due debt, their share generally rises with firm size and age. Importantly, we find that an increase in the share of insolvent firms also diminishes the financial activity of healthy companies in the given industry. Our findings aim to inform both policy and regulatory approaches to managing firm insolvency in developing and transitional economies.

References

1. Acharya, V. V., M. Crosignani, T. Eisert, and C. Eufinger (2024). Zombie credit and (dis-) inflation: evidence from europe. The Journal of Finance 79 (3), 1883–1929.

2. Acharya, V. V., M. Crosignani, T. Eisert, and S. Steffen (2022). Zombie lending: Theoretical, international, and historical perspectives. Annual Review of Financial Economics 14 (1), 21–38.

3. Adalet McGowan, M., D. Andrews, and V. Millot (2018). The walking dead? Zombie firms and productivity performance in OECD countries. Economic Policy 33 (96), 685–736.

4. Altman, E. I., R. Dai, and W. Wang (2024). Global zombie companies: measurements, determinants, and outcomes. Journal of International Business Studies 55 (6), 723–744.

5. Laura Alvarez, L., M. Garcia-Posada, and S. Mayordomo (2021). Distressed firms, zombie firms and zombie lending: a taxonomy. Available at SSRN 3949415

6. Banerjee, R. and B. Hofmann (2018). The rise of zombie firms: causes and consequences. BIS Quarterly Review Spetember .

7. Bonfim, D., G. Cerqueiro, H. Degryse, and S. Ongena (2023). On-site inspecting zombie lending. Management Science 69 (5), 2547–2567.

8. Caballero, R. J., T. Hoshi, and A. K. Kashyap (2008). Zombie lending and depressed restructuring in japan. American economic review 98 (5), 1943–1977.

9. Carreira, C., P. Teixeira, and E. Nieto-Carrillo (2022). Recovery and exit of zombie firms in portugal. Small Business Economics 59 (2), 491–519.

10. Favara, G., C. Minoiu, and A. Perez-Orive (2021). Us zombie firms: how many and how consequential?

11. Hoshi, T. (2006). Economics of the living dead. The Japanese Economic Review 57 (1), 30–49.

12. Sahin, B. C. (2024). Zombie firms, firm-bank relationship and spillover. Technical report, Research and Monetary Policy Department, Central Bank of the Republic of Turkey.

13. Schivardi, F., E. Sette, and G. Tabellini (2022). Credit misallocation during the European financial crisis. The Economic Journal 132 (641), 391–423.

14. Udofia, D. K. (2019). Establishing corporate insolvency: The balance sheet insolvency test. Available at SSRN 3355248.