



REPUBLIC OF KAZAKHSTAN

SELECTED ISSUES

January 2025

This paper on the Republic of Kazakhstan was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on November 12, 2024.

Copies of this report are available to the public from

International Monetary Fund • Publication Services

PO Box 92780 • Washington, D.C. 20090

Telephone: (202) 623-7430 • Fax: (202) 623-7201

E-mail: publications@imf.org Web: <http://www.imf.org>

International Monetary Fund
Washington, D.C.



REPUBLIC OF KAZAKHSTAN

SELECTED ISSUES

November 12, 2024

Approved By
Middle East and
Central Asia
Department

Prepared By Razan Al Humaidi and Gregorio Impavido
(MCD).

KAZAKHSTAN: TAKING STOCK OF CLIMATE-RELATED CHALLENGES AND POLICIES _____ 3

- A. Climate Change Challenges and Impact Channels _____ 3
- B. Strategies and Policies to Address Climate Change _____ 6
- C. Macroeconomic Impact of Climate Policy Scenarios _____ 7
- D. Policy Considerations _____ 11

FIGURES

- 1. GHG Emissions and Energy Sector Composition _____ 4
- 2. IMF-ENV Scenario Results _____ 8
- 3. CPAT Scenario Results _____ 10
- 4. Fossil Fuel Subsidies _____ 11

ANNEX

- I. IMF-ENV Model Description _____ 14

KAZAKHSTAN: OUTPUT AND FINANCIAL CYCLES _____ 16

- A. Introduction _____ 16
- B. Empirical results _____ 16
- C. Conclusions and Policy Recommendations _____ 21

FIGURES

- 1. Static and Multivariate Cycle Estimates _____ 18
- 2. Contemporaneous Contribution of the Financial Cycle _____ 20
- 3. Historical Contributions of Short and Long-Term Credit _____ 21

TABLES

1. Significance of Different Proxies for the Financial Cycle _____	17
2. Data and Sources _____	24

APPENDIX

I. Data Used to Construct Financial Cycle Proxies _____	23
---	----

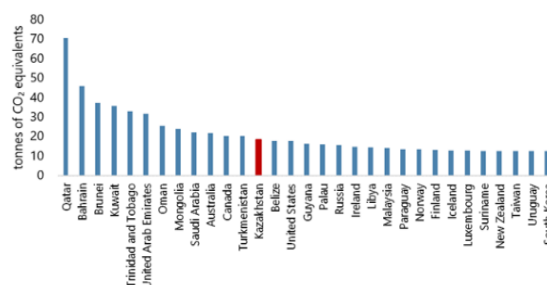
KAZAKHSTAN: TAKING STOCK OF CLIMATE-RELATED CHALLENGES AND POLICIES¹

Kazakhstan is one of the largest emitters of greenhouse gases per capita, and its domestic carbon price is among the lowest in the world. At the same time, it faces increasingly pressing climate-related risks, including from catastrophic natural events, and from potential losses in output and jobs due to global decarbonization. The authorities have made significant progress in tackling these challenges through adaptation, mitigation and transition policies. Looking ahead, more ambitious and comprehensive efforts are needed, including to phase out fossil fuel subsidies, raise carbon prices, and facilitate the transition to renewable energy sources. Other policy priorities include establishing early warning systems for catastrophic climate events, integrating climate considerations in fiscal and monetary policies, and tailoring certain reforms to carbon-intensive sectors. The quantitative analyses presented in this paper show that Kazakhstan is relatively well positioned to address climate-related challenges, as it benefits from substantial policy space, buffers, and significant prospective public resources from future carbon taxation. This will help cushion the potential adverse impacts of economic greening and transformation, especially on the most vulnerable population groups.

A. Climate Change Challenges and Impact Channels

1. Kazakhstan is one of the largest emitters of greenhouse gases (GHG) per capita. Its wealth largely stems from oil exports and its energy generation from large coal reserves. More than 80 percent of emissions come from the energy sector in which fossil fuels constitute 98 percent of total supply (Figure 1).² Kazakhstan ratified the Paris Agreement, committing to an unconditional reduction of greenhouse gas (GHG) emissions by 15 percent from 1990 levels by 2030, a target of 25 percent conditional on international support, and aiming for carbon neutrality by 2060.³

Per Capita Greenhouse Gas Emissions, 2022



Source: Our World in Data

¹ The paper was prepared by Razan Al Humaidi and benefited from comments received from the Ministry of Energy, Ecology and Natural Resources, Ministry of Economy, Ministry of Energy, the Economic Research Institute, the European Bank for Reconstruction and Development, and IMF staff. The author is grateful for the help of Hasan Dudu (MCD), Hugo Rojas-Romagosa (RES), and Karlygash Zhunussova (FAD).

² International Energy Agency (2022): "[Kazakhstan Country Profile](#)"

³ Ministry of Ecology and Natural Resources (2023): "[Updated Nationally Determined Contribution of the Republic of Kazakhstan to the Global Response to Climate Change](#)"

2. Multiple risks from climate change and events could substantially weaken economic activity. These include both slow-moving climate change and extreme weather events. Changes and variability in rainfall, reflected in both increasing aridity and drought occurrences, as well as in catastrophic floods, such as in early 2024, are poised to adversely affect agriculture, energy sectors, and water resources.⁴ Additionally, declining water levels in the Caspian Sea jeopardize Kazakhstan's transport infrastructure, maritime transport and connectivity, potentially leading to significant trade and economic disruptions.

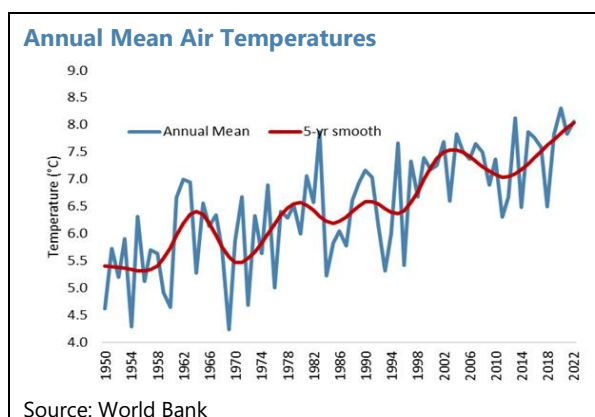
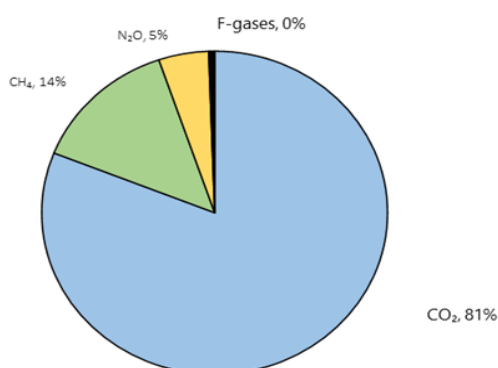
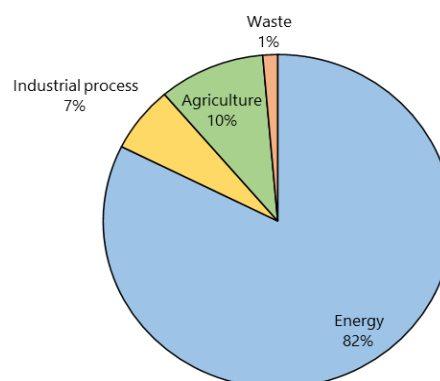


Figure 1. GHG Emissions and Energy Sector Composition

a) GHG Emissions by gas, 2020.

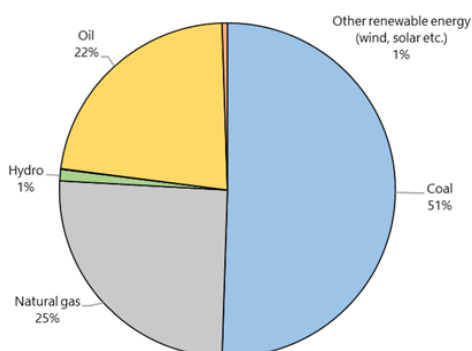


b) GHG Emissions by source, 2020.

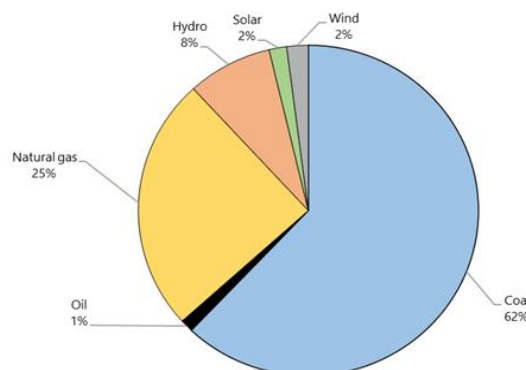


Source: IMF and World bank CPAT Tool

c) Total energy supply by source, 2022



d) Electricity generation by source, 2022.



Source: International Energy Association

⁴ Such climate changes could lead to reductions in wheat yield by up to 37 percent by 2030, and up to 50 percent by 2050. See "Kazakhstan May Suffer Economic Losses in Wheat Production Due to Climate Change," UNDP, 2020.

3. In the longer-term, decarbonization could generate significant risks of stranded assets, as well as job and export losses. Transition risks are exacerbated by limited economic diversification: coal represents more than 50 percent of total domestic energy supply (Figure 1) and carbon-intensive industries (oil, mineral, chemical, and metal sectors) provide nearly 80 percent of total export value. Some partner countries have embarked on policies to meet their net-zero emission objectives, such as the European *Carbon Border Adjustment Mechanism* (CBAM) mechanism aiming to raise import tariffs according to the carbon footprint of imported goods.⁵ Projections by the World Bank indicate that Kazakhstan could face export revenue losses exceeding US\$ 250 million annually because of the CBAM by 2035, particularly impacting the iron and steel industries.⁶

4. These risks could severely aggravate inequalities in the most exposed regions. Natural disasters can disproportionately affect rural areas as aridification affects water availability for agriculture sector and these communities tend to face limited mobility and reduced access to early warning systems and rescue services. Transition risks vary significantly by sector and geographical location, with communities that are geographically isolated and heavily reliant on fossil fuel (e.g. coal) productions, being particularly exposed.

5. Declining hydrocarbon revenues will have increasing fiscal policy implications. Oil export proceeds account for 26 percent of government revenues. Although Kazakhstan has maintained reserves in its National Fund (NFRK) amounting to 22 percent of its GDP, lower future oil prices due to global decarbonization would significantly weaken the public financial situation. During the period 2018–2022, IMF staff estimated that the fiscal breakeven oil price was around US\$95 per barrel, above the oil price levels observed over the past five years. Previous IMF analysis indicate that a 40 percent decline in oil revenues starting in 2028 relative to current baseline projections may lead to a permanent decrease of the non-oil primary balance (NOPB) by approximately 0.5 percent of GDP annually.⁷

6. Monetary policy may have to manage climate-related exchange rate and inflationary pressures, in addition to the broader impact on the economy. For instance, these pressures could reflect changes in agricultural and energy prices, including given the costs of transitioning to a greener energy mix. More broadly, uncertainties brought about by climate change may make economic forecasting and monetary policy implementation and effectiveness more challenging.

7. The financial sector is also susceptible to climate change due to its large exposure to carbon-intensive sectors. The 2023 Financial Sector Assessment Program (FSAP) highlighted that

⁵ "[Carbon Border Adjustment Mechanism](#)," European Commission (2023). The CBAM currently applies to six product categories (aluminum, cement, electricity, fertilizers, hydrogen, iron and steel) and is expected to cover all sectors by 2030. As a result, the World Bank estimates that Kazakhstan may lose export revenue of more than US\$ 250 million annually by 2035.

⁶ World Bank (2022): "*Kazakhstan Country Climate and Development Report*"

⁷ IMF (2022): "*Republic of Kazakhstan: Selected Issues Paper on Climate Change and Structural Transformation*" (Country Report No. 2022/114)

loans to electricity, fossil energy, and heavy industry sectors represent about 50 percent of banks' corporate lending portfolios.⁸ As a result, banks could face material losses from rapid global decarbonization, especially once the above broader effects on the economy are factored in.

B. Strategies and Policies to Address Climate Change

8. National strategies and action plans underpin Kazakhstan's commitment to address climate change. The *Doctrine for Carbon Neutrality* lays out a path to carbon neutrality by 2060, covering energy sector modernization, sustainable agriculture, waste management, and green finance. The *Environmental Code* introduces the "polluter pays" principle and the Emissions Trading System (ETS) and the updated version (2021) focuses on ensuring that corporations responsible for 80 percent of GHG emissions follow international best practices by transitioning to greener technologies by 2025. Finally, the government is currently developing further actions plans that include specific reforms for sectors that are carbon-intensive and heavily impacted by climate change and related policies, as well as measures to develop green finance initiatives and ensuring a just transition.

9. The Emissions Trading System, in place since 2013, is being gradually improved. The ETS is a cap-and-trade system where the highest emitters in sectors such as energy, mining, specific manufacturing (i.e., 212 facilities representing 43 percent of total national CO₂ emissions) are registered and subject to emission caps. Enhancements were made to the ETS in 2016, introducing distribution coefficients for greenhouse gas emissions based on industry-average benchmarks of emissions intensity of output instead of average historical CO₂ emissions. In addition to the ETS, the *Qazaq Green Certificate Program* was launched in 2021 to promote renewable energy development by enabling the trading of green certificates that represent the environmental benefits of electricity generated from renewable sources.

10. Energy tariff reforms and efficiency regulations have also progressed. The ETS carbon price of US\$1.10/tCO₂ is among the lowest in the world. Ongoing reforms have several objectives:⁹ increase cost recovery (from 85 to 100 percent by 2026); upgrade energy infrastructure; and reduce energy intensity in industrial sectors (by 7 percent in 2026 relative to 2019 levels).¹⁰ A "tariff in exchange for investment" program was also introduced to accelerate investment in infrastructure and electricity generation capacity. In addition, energy efficiency regulation has been enhanced to address inefficiencies in industrial and building sectors, as heating of residential and commercial

⁸ IMF (2024) "Republic of Kazakhstan: Financial Sector Assessment Program-Technical Note on Astana International Financial Center and the Kazakhstan Financial System" (Country Report No. 2024/313)

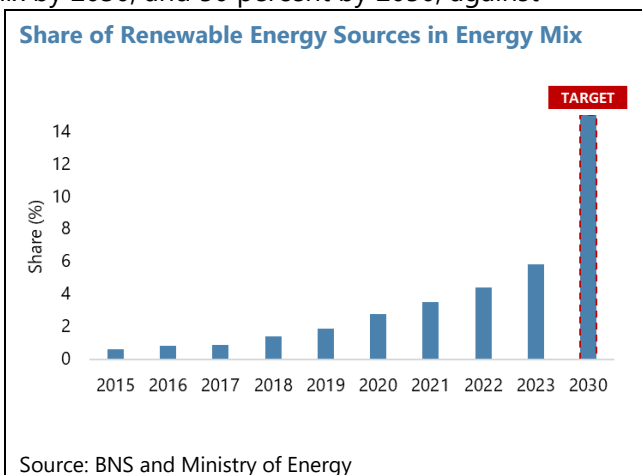
⁹ International Energy Agency (2022): "[Kazakhstan Energy Conservation and Energy Efficiency Law](#)."

"[Increase of Tariffs for Public Utilities to be Phased](#)," Official Information Source of the Prime Minister of the Republic of Kazakhstan. World Bank (2024) "[Empowering the Future of Kazakhstan's Energy Sector](#)"

¹⁰ World Bank (2023) "Kazakhstan Energy Sector Strategic Engagement - Power System Analysis to Support Clean Energy Development Strategies for Kazakhstan."

buildings is delivered mostly by state-owned networks that rely at 80 percent on coal-based energy and were built before 1980.

11. Renewable energy capacity is being actively scaled up, including through investment incentives. In June 2024, the authorities set the goals of having renewable energy sources contribute 15 percent of Kazakhstan’s energy mix by 2030, and 50 percent by 2050, against 6 percent currently.¹¹ The strategy includes: a plan to auction off nearly 7 GW of renewable energy capacity by 2030, and an additional 1 GW financed through bilateral agreements; reforms to auction processes; and, changes to foreign exchange indexation and ceiling price increases to attract investment – in addition to existing incentives such as feed-in tariffs, tax breaks, and exemption from customs duties for equipment and machinery imported for the construction of renewable energy facilities.



C. Macroeconomic Impact of Climate Policy Scenarios

12. Risks to the economy from various climate transition scenarios are assessed using a multi-sector general equilibrium model. Specifically, the IMF-ENV model is used to assess the impact of national and global decarbonization policies.¹² The model addresses three scenarios:

- **The rest of the world achieves their 2030 NDC goals, but Kazakhstan does not implement any climate policy (NDC ROW-FFS scenario).** This scenario estimates the potentially large impact of the global green transition on Kazakhstan. An additional, sub-scenario (NDC ROW) combines this with the introduction of a fossil fuel subsidy reform in Kazakhstan, as in scenario 2 below.
- **Kazakhstan phases out fossil fuel subsidies by 2030 (FFS scenario),¹³ and the resulting public savings are recycled as follows:** 30 percent are transferred to households, and 70 percent are used to reduce the budget deficit.
- **On top of the two above scenarios combined, Kazakhstan reaches its conditional NDC target in 2030, i.e., a 25 percent reduction of its GHG emissions (CNDC scenario).** In

¹¹ For this, it is estimated that the share of solar and wind energy would need to escalate from 4 percent in 2022 to 72 percent by 2060 (CCDR).

¹² IMF-ENV is a Computable General Equilibrium (CGE) model developed in the IMF’s Research Department (see Annex for details).

¹³ In the baseline scenario fossil fuel subsidies represent around 6 percent of GDP in 2024 and decline only slowly to 5 percent by 2030.

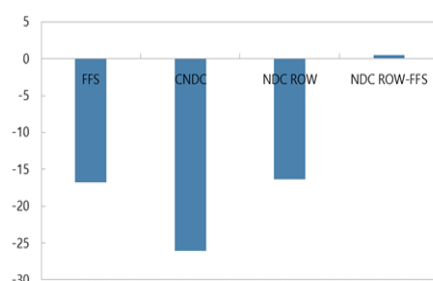
addition to public carbon tax revenues being recycled as in the FFS scenario, the target of 15 percent electricity generation from renewable sources by 2030 is attained.¹⁴

The scenario results below are compared against a business-as-usual (baseline) scenario that acts as a policy counterfactual scenario in which no energy and climate policies are undertaken by Kazakhstan or the rest of the world.

Figure 2. IMF-ENV Scenario Results

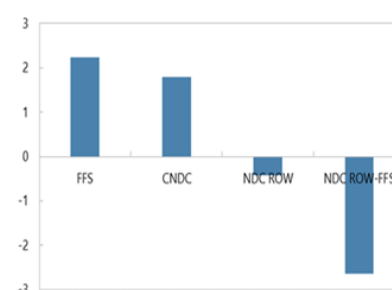
a) Total GHG emissions

(percent deviation from baseline in 2030)



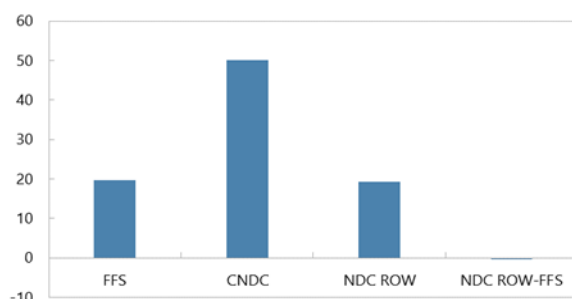
b) Impact on real GDP

(percent deviation from baseline in 2030)



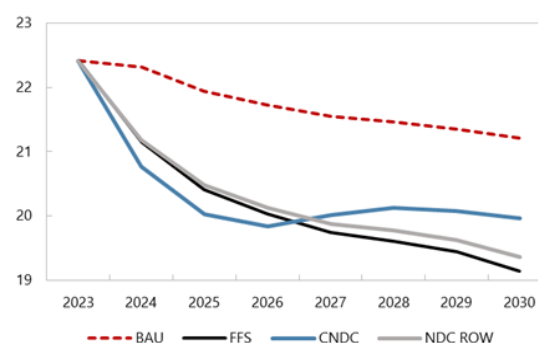
c) Electricity price

(percent deviation from baseline)

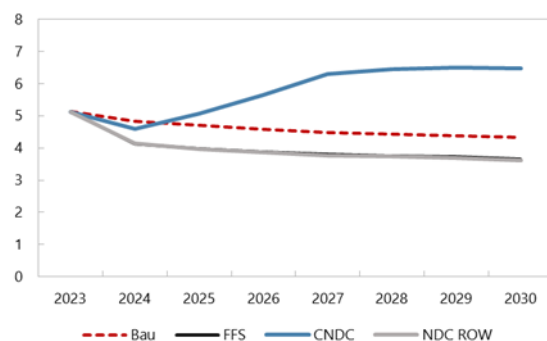


d) Share of energy expenditure

(percent of GDP)

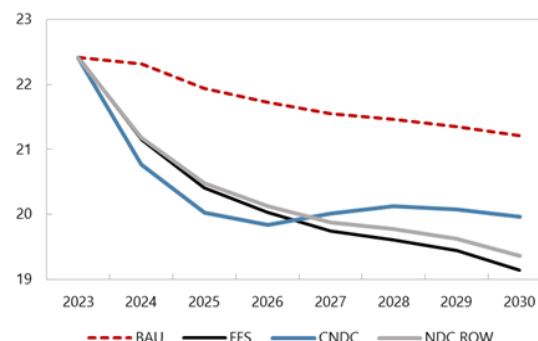


e) Share of imported energy relative to domestic energy demand



f) Government budget balance

(percent of GDP)



¹⁴ Investment in renewable energy is assumed to be primarily by the private sector, in line with the authorities' objective. The path for the energy mix until 2030 is from the World Bank's CDDR for a net-zero scenario by 2060.

13. Key findings from the scenario analyses are as follows:¹⁵

- **Transition risks may incur GDP losses of up to 2.6 percent by 2030.** In the NDC ROW-FFS scenario, GHG emissions *rise* by 0.5 percent as decreasing export demand for oil and gas raises their domestic supply. The fiscal balance is not affected in this scenario.
- **The elimination of fossil fuel subsidies could raise GDP by 2.2 percent and cut GHG emissions by 16.8 percent by 2030** (Figure 2). The substitution of subsidies with targeted transfers to households and additional fiscal savings leads to a more efficient allocation of resources in the economy. Kazakhstan is able to achieve its *unconditional* NDC target by curbing energy consumption and increasing domestic savings.
- **Mitigation policies¹⁶ can help meet *conditional* NDC targets without substantial impact on growth** (in addition to the subsidy phaseout). These policies imply an ETS carbon price of US\$ 78/tCO₂ in 2030, which would erode part of the GDP gains from the elimination of fossil fuel subsidies – but GDP would still be 1.6 percent higher than in the baseline.

14. By itself, the removal of fossil fuel subsidies would reduce fossil fuel consumption but not eliminate it. In most scenarios, national expenditure on energy declines as electricity prices increase (by up to 50 percent relative to the baseline). However, the shares of fossil fuels in electricity generation remains similar to the baseline by 2030, indicating a negligible shift to renewable energy sources – except under the CNDC scenario for which, as noted, the energy mix is imposed in the model.

15. The above scenarios are complemented by analysis of the economic impact of increased carbon prices. The *Climate Policy Analysis Tool* (CPAT)¹⁷ is used to analyze a scenario under which the ETS carbon price reaches \$78/tCO₂ in 2030, using the same policy tools as in the IMF-ENV. CPAT is used to assess more detailed potential impacts of the scenario like distributional impact on households. Most assumptions are similar to those used in the ENV model above, except for the following:

- **All fiscal savings** (from FFS phaseout and ETS revenue) are recycled into public investment (70 percent) and targeted cash transfers to households (30 percent).
- **Cash transfers** to households target the lowest 40th percentile of the income distribution and actually reach 70 percent of households in this group.¹⁸

¹⁵ Scenario results are compared to the IMF's baseline macroeconomic projections as of October 2, 2024, which are taken as a counterfactual in which no energy and climate policies are undertaken.

¹⁶ The main policy tools here are ETS reforms that include reducing the emissions cap and reducing the number of government-issued allowances for regulated facilities.

¹⁷ [The IMF-World Bank Climate Policy Assessment Tool \(CPAT\): A model to help countries mitigate climate change](#). International Monetary Fund and World Bank, 2023.

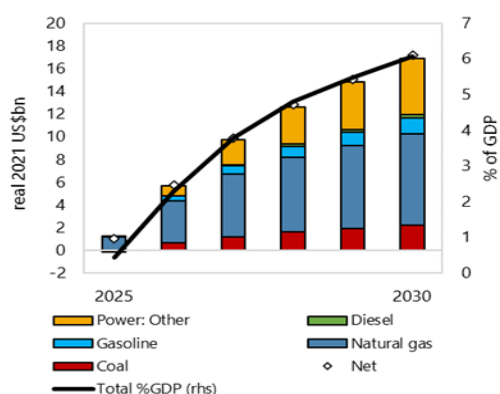
¹⁸ It is assumed that targeting is imperfect and that 10 percent of 'untargeted households' also receive transfers.

16. The CPAT model application indicates the following benefits from this policy approach:

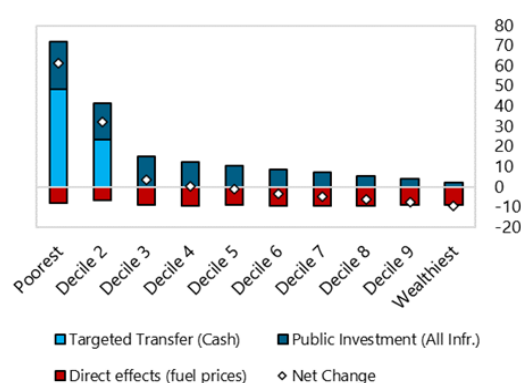
- **Fiscal revenues can increase by up to 6 percent of GDP** in 2030 (Figure 3).
- **Additional net welfare benefits** estimated (once monetized) to be equivalent to 3.6 percent of GDP, including due to transport and air pollution benefits.¹⁹
- **Redistribution benefits:** the two poorest household deciles increase their consumption by 61 and 32 percent, respectively, due to increasing public investment and targeted transfers. On the other hand, the wealthiest 6 deciles experience losses in consumption (e.g., 9 percent for the wealthiest decile) as higher fuel costs outweigh benefits from public investment.

Figure 3. CPAT Scenario Results

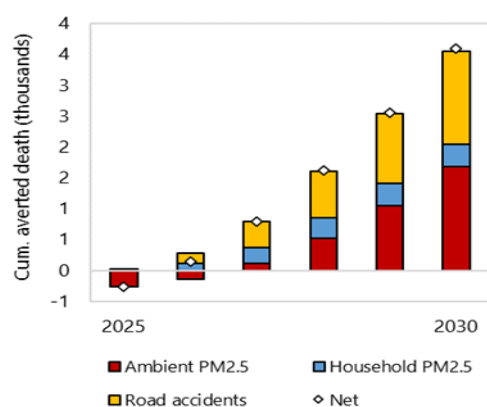
a) Fiscal revenues raised by fuel (left axis) and total as percentage of GDP (right axis)



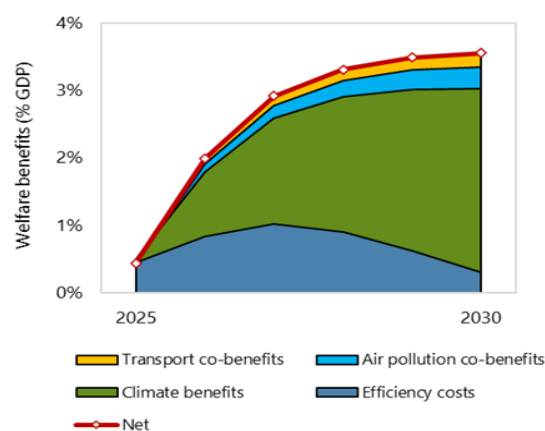
b) Impacts on households in 2030 (Percent total consumption by decile)



c) Co-benefits: averted air pollution & road accident deaths



d) Total monetized welfare benefits (percent of GDP)



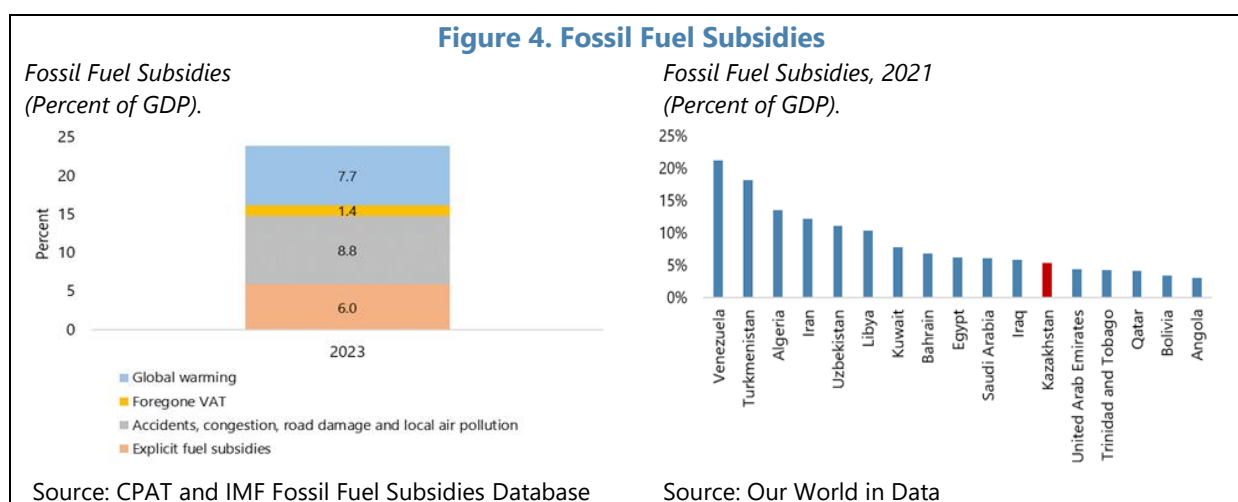
¹⁹ For instance, such benefits include an estimated 3,590 averted deaths from improved air quality and road safety.

D. Policy Considerations

17. Building on recent progress, climate-related reforms should accelerate to meet

Kazakhstan's objectives.²⁰ Under current policies, Kazakhstan's GHG emissions are projected to continue increasing in the years ahead, raising the risk that its NDC targets may not be met. More broadly, ambitious reforms are needed to promote diversification away from carbon-intensive sectors, starting with energy generation, and reach higher levels of sustainable economic growth in the longer term.

18. Phasing out fossil fuel subsidies and replacing them with targeted public transfers are key to transform the energy sector in an equitable way. Heavily subsidized energy prices hamper a reduction in GHG emissions and a shift in the energy mix toward renewable energy sources. Fossil fuel subsidies are currently estimated at about 6 percent of GDP, a comparatively high level, in addition to large social costs (Figure 4). This suggests that a gradual removal of these subsidies would provide substantial fiscal resources to support the transition to a greener model, in an equitable way, through public incentives and investment in renewables, targeted social programs, as well as potential reduction in other distortionary taxes.²¹



19. The ETS functioning and effectiveness can be improved in several ways. In addition to the removal of fossil fuel subsidies, greater ETS effectiveness would help raise the domestic price of carbon, including through emissions cap and quota allocations. While the government intends to reduce the emissions cap by at least 1.5 percent annually, this may not suffice to increase the ETS carbon price to a level that enables the country to reach its NDC. Rather than generous quota allocations, the ETS should rely on competitive auctions that better support price discovery.²² Also, the sectoral and GHG ETS coverage should be expanded, for example to include methane and products covered by the EU CBAM.

²⁰ Climate Action Tracker (2022): "[Kazakhstan Country Profile](#)"

²¹ "Paving the Way to More Resilient, Inclusive, and Greener Economies in the Caucasus and Central Asia," Departmental Paper No. 2023/004, IMF, 2023.

²² Kazakhstan aims to have 15 percent of carbon allowances traded in auctions in phase 3 of the ETS (2026-30).

20. Feebates and regulations also have a role to play to encourage shifts to greener energy. While carbon taxation and the ETS have broad-based and less distortive impacts when pricing strategies are efficient, complementary measures such as feebates and targeted regulations can also have important roles, such as to help address resistance from the public and energy-intensive industries. It is also crucial for regulations to evolve alongside rapidly changing technology to prevent firms from circumventing the rules of these regulations.²³

21. The need for further climate adaptation efforts is pressing. While the government's response to the recent catastrophic floods was prompt and effective, it remains important to enhance resilience to natural event risks going forward, including by strengthening the social safety net for vulnerable population groups (e.g., in most affected rural areas). Flood management infrastructure and early warning systems should also be improved to increase the country's preparedness to future climate-related events.

22. In certain emissions-intensive sectors, tailored reforms are required. Specific plans are needed to mitigate emissions from coal-based activities which, due to the low cost of coal production, account for 55 percent of national emissions, 60 percent of electricity generation, and 99 percent of heat generation. Such plans should incorporate specific measures for heavily coal-dependent communities, including to support labor mobility. Similarly, specific measures may be needed in the aluminum sector, as aluminum is now covered by the first CBAM phase and 42 percent of Kazakhstan's aluminum exports are to the EU.²⁴

Table 1.2. Features of Alternative Mitigation Approaches

Alternative Mitigation Approaches	Potential for Exploiting Mitigation Opportunities	Use of Price/Market Mechanism	Efficiency across Mitigation Responses Induced by Policy	Energy Price Impacts and Acceptability	Price Predictability	Revenue Generation	Administrative Burden
Carbon Tax	Full, if applied comprehensively (in practice, may contain exemptions)	Yes	People and firms choose most efficient way of reducing emissions	Higher energy prices can be challenging politically	Yes (if trajectory is clearly specified)	Yes (though exemptions may limit revenue base)	Small (if building on existing fuel or royalty tax systems)
Emissions Trading Systems	Full, if applied comprehensively (in practice, often limited to powerful/large industries)	Yes	People and firms choose most efficient way of reducing emissions	Higher energy prices can be challenging politically	No (unless it includes price floors or similar mechanisms)	Maybe (if allowances are auctioned, but revenue base may be limited)	New capacity needed to monitor CO ₂ /trading markets
Feebates	Similar to regulations	Yes	People and firms choose most efficient approach within only one activity	Avoiding significant energy price increases may enhance acceptability	Yes (if trajectory is clearly specified)	No (recommended design is revenue neutral)	New capacity needed (for example, to apply fees/rebates to power generators)
Regulations	Can exploit some key opportunities but not all (for example, reductions in vehicle use)	No	No automatic mechanism	Avoiding significant energy price increases may enhance acceptability	No (implicit prices vary with technology costs, energy prices, and so forth)	No	New capacity needed (for example, to monitor and enforce emission rate standards for power generators)

Source: IMF staff.
Note: CO₂ = carbon dioxide.

Source: Fiscal Monitor, IMF, 2019.

²³ IMF (2019): "Fiscal Monitor: How to Mitigate Climate Change (October 2019)"

²⁴ World Bank (2023): "[Relative CBAM Exposure Index](#)"

23. Overall, Kazakhstan is relatively well positioned to address climate-related challenges, which should facilitate the implementation of decisive policies. It benefits from substantial space and can use available buffers and public resources (including from future carbon taxation) to support economic resilience and long-term growth, while cushioning the potential adverse impacts of economic greening and transformation.²⁵ As shown above, this will require implementing more decisive and multifaceted policies, including to incorporate climate change in macro-financial policy frameworks, increase public spending and fiscal management efficiency, and implement broader economic reforms to support private sector development and investment in a new sustainable growth model. Finally, deepening the public debate and stakeholder engagement will also be essential to help economic agents understand and prepare for the necessary reforms and economic transformations.

²⁵ Annex IV on Debt Sustainability Analysis in Article IV Staff Report 2024

Annex I. IMF-ENV Model Description

1. **IMF-ENV is a global recursive dynamic computable general equilibrium (CGE) model developed by the IMF's Research Department.**¹ It features a detailed description of energy production and consumption, and links greenhouse gas (GHG) emissions to specific economic activities. This makes the model well suited to analyze the macroeconomic and sector-specific effects of a variety of energy and climate mitigation policies at the national and global level. The model allows simulating mitigation policies such as carbon pricing and fossil fuel subsidies, energy demand and supply policies and regulations, improvements in energy efficiency and new green technologies, and how these affect GHG emissions, macroeconomic variables, sectoral output, employment and trade, among others. The core components of IMF-ENV— production, demand, trade, factor markets and inter-temporal linkages—are all relatively standard recursive dynamic multi-sector multi-region CGE model features.
2. **The model is built using a neo-classical framework, which optimizes consumption and production decisions by households and firms.** It follows the circular flow of the economy based on the activities of its key agents: firms, households, and markets. Firms purchase inputs (from other firms) and primary factors (from households) to produce goods and services. Households receive factor incomes and in turn demand the goods and services produced by firms. Markets determine equilibrium prices for factors, goods, and services. Finally, countries exchange goods and capital on international markets.
3. **Factors of production are almost perfectly mobile across sectors (capital excluded) but not across countries.** An important feature of IMF-ENV is that capital stocks have vintages such that firms' production and behavior are different in the short and long run.² This allows a more realistic adjustment of the capital stock in the short- and medium-run, as it increases the capital costs for expanding activities and reduces the productivity of capital that is tied to declining economic activities. Labor supply is determined by the working age population, labor participation and long-term unemployment rates. Labor adjusts endogenously to changes in real wages following a reduced-form wage supply curve that accounts for decisions on leisure and work (at both the intensive and extensive margin). The model also includes land and natural resources as production factors, which constrain the expansion of agricultural and mining activities.
4. **Production follows a series of nested constant-elasticity-of-substitution (CES) functions to capture the different substitution possibilities across all inputs. Household**

¹ The IMF-ENV model is based on the ENVISAGE model (van der Mensbrugghe, D. (2024) "[The Environmental Impact and Sustainability Applied General Equilibrium \(ENVISAGE\) Model, Version 10.4](#)" GTAP Technical Paper TP/24/xx.) originally developed and used at the World Bank and the OECD's in their ENV-Linkages Model (Château, J., R. Dellink and E. Lanzi (2014): "[An Overview of the OECD ENV-Linkages Model: Version 3](#)". OECD Environment Working Papers No. 65).

² There are two capital vintages: *new* capital stock (i.e., net-investment) is allocated without friction such that the return to *new* capital across sectors is the same for all sectors, on the opposite *old* (i.e., installed) capital is given and cannot be reallocated without high costs (i.e., a putty-clay specification).

demand is non homothetic, which emphasizes subsistence (minimum) consumption levels of essential commodities (mainly food).

5. International trade is modeled using the so-called Armington specification where demand for goods is differentiated by region of origin. This specification uses a full set of bilateral trade flows, prices and trade costs by commodity, which allows provide international linkages between regions, including supply chain features.

6. The model is recursive dynamic: it is solved as a sequence of comparative static equilibria where the factors of production are exogenous for each time period and linked between time periods with accumulation expressions. Agents, however, are not forward looking and investment levels are driven by savings, which in turn is a combination of household savings, the government budget balance and the current account balance.

7. The IMF-ENV model compares a business-as-usual (baseline) scenario without energy and climate policies with a policy counterfactual scenario that does include these policies. The differences between both scenarios are used to simulate the impact of the policies on macroeconomic variables (e.g., GDP, sectoral production and employment, bilateral trade), energy variables (electricity generation mix, energy demand) and environmental outcomes (GHG emissions).

KAZAKHSTAN: OUTPUT AND FINANCIAL CYCLES

The financial cycle in Kazakhstan has a persistent and amplifying effect on the business cycle. This impact occurs primarily through consumption (credit to individuals) and construction (housing prices), and to a lesser extent through investment (long-term credit and corporate credit). During the COVID shock, the relationship between the financial and business cycles weakened, which is likely due to the increasing state footprint in the financial sector. The impact of the financial cycle highlights the importance of macroprudential policy in helping to preserve financial stability and in complementing macroeconomic policies.

A. Introduction

1. **This paper uses a multivariate filter approach to examine the role of financial cycle proxies in refining available estimates of the business cycle.**¹ The traditional HP filter is augmented to include a set of exogenous variables proxying the financial cycle, including various types of credit, interest rates, and headline and housing inflation (Appendix). Estimation is conducted via maximum likelihood, using the Kalman filter.²
2. **Assessing the extent to which the financial cycle impacts the business cycle is important for many reasons**, including to: (i) refine the assessment of the monetary and fiscal policy stances; (ii) support the role of macroprudential policy as an integral part of the countercyclical policy toolkit; (iii) gauge the strength of the interest channel of monetary policy transmission; and (iv) inform the calibration of macroprudential policy tools.
3. **The remainder of this paper is structured as follows:** section B discusses estimation results, and conclusions and policy recommendations follow in section C.

B. Empirical Results

4. **The financial cycle in Kazakhstan has a small but significant contribution to the business cycle.** Table 1 reports the estimates of the contemporaneous contributions ($\hat{\gamma}$) of different financial cycle proxies to the business cycle, the Wald statistics (w) for their significance, and the corresponding p-value ($\chi(1)$).³ Results are as follows:

- **Real lending rates contain limited information about the business cycle with credit to corporates containing more information than credit to individuals.** Results may be partly a reflection of the weight of inflation in the reaction function of the central bank over the sample

¹ This selected issues paper was prepared by Gregorio Impavido and it reflects the comments received from NBK and IMF staff.

² See Impavido, G. (2024), *Financial and business cycles: shall we dance?* IMF Working Paper No 2024/12 for technical details.

³ Other information reported includes the number of observations contained in the sample, their span, and the estimated autoregressive parameter ($\hat{\beta}$) of the business cycle. In what follows, variables highlighted in green are used as alternative best proxies (broadly following the Wald test results) for the financial cycle.

period: for instance, during 2021-23, the ex-ante real policy rate drifted into negative territory (especially in late 2022) while inflation surged above 20 percent. More likely, the results confirm that the interest rate channel of monetary policy is weak in Kazakhstan. As noted in Zhou (2022),⁴ there is a low pass through from the policy to the lending rates, and such pass through is stronger for credit to corporates than to individuals.

Table 1. Republic of Kazakhstan: Significance of Different Proxies for the Financial Cycle 1/

Variable	$\hat{\beta}$	$\hat{\gamma}$	w	$\chi(1)$	1/	N	Min	Max
Real Lending Rate to Individuals (HP filter, cycle)	0.672	0.012	0.050	0.823		98	1999q2	2023q3
Real Lending Rate to Individuals (annual)	0.672	0.009	0.034	0.853		98	1999q2	2023q3
Real Lending Rate to Corporates (HP filter, cycle)	0.672	-0.100	2.407	0.121	*	98	1999q2	2023q3
Real Lending Rate to Corporates (annual)	0.672	-0.112	3.332	0.068	**	98	1999q2	2023q3
CPI Inflation (QoQ, HP filter, cycle)	0.672	-0.217	3.249	0.071	**	98	1999q2	2023q3
CPI Inflation (QoQ)	0.672	-0.213	3.471	0.062	**	98	1999q2	2023q3
CPI Inflation (YoY, HP filter, cycle)	0.672	0.014	0.055	0.814		98	1999q2	2023q3
CPI Inflation (YoY)	0.672	0.006	0.016	0.899		98	1999q2	2023q3
House Prices Inflation (QoQ, HP filter, cycle)	0.701	0.063	1.426	0.232		70	2006q2	2023q3
House Prices Inflation (QoQ)	0.701	0.071	2.090	0.148	*	70	2006q2	2023q3
House Prices Inflation (YoY, HP filter, cycle)	0.702	0.074	10.199	0.001	***	67	2007q1	2023q3
House Prices Inflation (YoY)	0.702	0.058	9.089	0.003	***	67	2007q1	2023q3
Long Term Real Credit (QoQ, HP filter cycle)	0.672	0.042	1.680	0.195		98	1999q2	2023q3
Long Term Real Credit (QoQ)	0.672	0.046	2.276	0.131	*	98	1999q2	2023q3
Long Term Real Credit (YoY, HP filter cycle)	0.672	0.047	10.874	0.001	***	98	1999q2	2023q3
Long Term Real Credit (YoY)	0.672	0.043	10.744	0.001	***	98	1999q2	2023q3
Short Term Real Credit (QoQ, HP filter cycle)	0.672	0.014	0.409	0.522		98	1999q2	2023q3
Short Term Real Credit (QoQ)	0.672	0.016	0.611	0.434		98	1999q2	2023q3
Short Term Real Credit (YoY, HP filter cycle)	0.672	0.024	5.204	0.023	***	98	1999q2	2023q3
Short Term Real Credit (YoY)	0.672	0.024	6.205	0.013	***	98	1999q2	2023q3
Total Real Credit (QoQ, HP filter cycle)	0.672	0.046	1.992	0.158		98	1999q2	2023q3
Total Real Credit (QoQ)	0.672	0.052	2.776	0.096	**	98	1999q2	2023q3
Total Real Credit (YoY, HP filter cycle)	0.672	0.047	11.207	0.001	***	98	1999q2	2023q3
Total Real Credit (YoY)	0.672	0.044	11.601	0.001	***	98	1999q2	2023q3
Real Credit to Individuals (QoQ, HP filter, cycle)	0.672	0.087	9.949	0.002	***	98	1999q2	2023q3
Real Credit to Individuals (QoQ)	0.672	0.084	11.276	0.001	***	98	1999q2	2023q3
Real Credit to Individuals (YoY, HP filter, cycle)	0.672	0.044	12.829	0.000	***	98	1999q2	2023q3
Real Credit to Individuals (YoY)	0.672	0.035	11.660	0.001	***	98	1999q2	2023q3
Real Credit to NFCs (QoQ, HP filter, cycle)	0.672	0.020	0.444	0.505		98	1999q2	2023q3
Real Credit to NFCs (QoQ)	0.672	0.026	0.755	0.385		98	1999q2	2023q3
Real Credit to NFCs (YoY, HP filter, cycle)	0.672	0.037	6.012	0.014	***	98	1999q2	2023q3
Real Credit to NFCs (YoY)	0.672	0.037	7.208	0.007	***	98	1999q2	2023q3

Sources: Authors' calculations.

1/ *** $0 < p \leq 0.05$, ** $0.05 < p \leq 0.10$, * $0.10 < p \leq 0.15$.

- **Headline inflation contains very limited information about the cycle.** Results likely imply that the Phillips curve in Kazakhstan is rather flat, confirming the results in Hajdenberg (2024)⁵ that inflation in Kazakhstan is mostly externally determined. The link between inflation and business cycle is also weak due to extensive subsidies and price controls and strong social mandates of SOEs to employ individuals. Indeed, unemployment barely moves during recessions.

⁴ Zhou, J. (2022) *Shocks and monetary policy transmission in Kazakhstan: empirical findings from an estimated DSGE model*. Selected Issues Paper for the 2021 Article IV consultation.

<https://www.elibrary.imf.org/view/journals/002/2022/114/article-A002-en.xml>

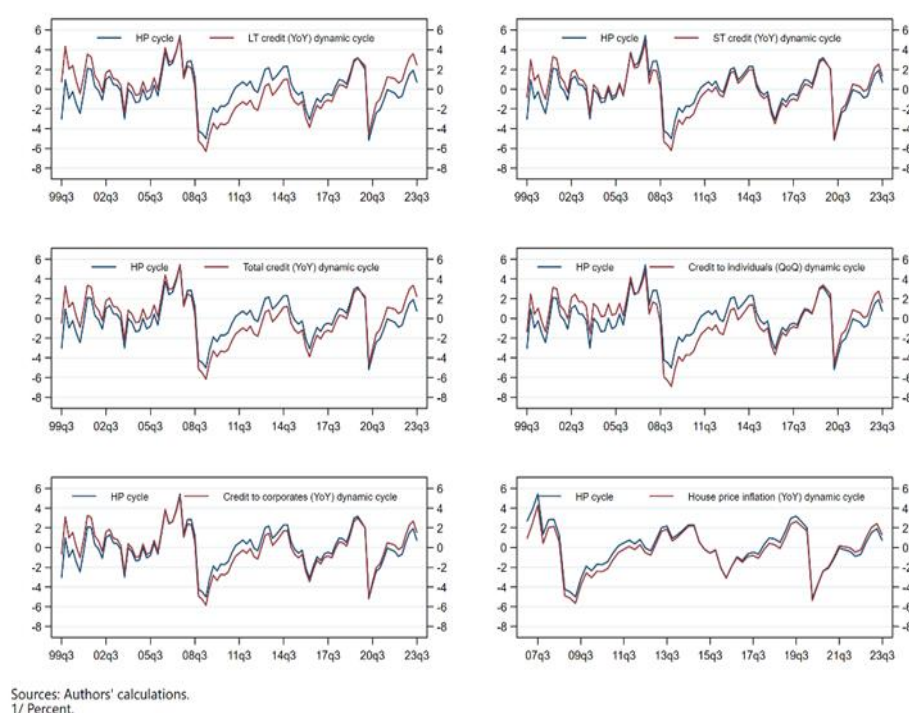
⁵ Hajdenberg, A. (2024) *Drivers of Inflation*. Selected Issues paper for the 2023 Art. IV Staff Report.

<https://www.imf.org/en/Publications/CR/Issues/2024/02/07/Republic-of-Kazakhstan-Selected-Issues-544623>

- **House price inflation has a strong contribution to the business cycle.** The significance of house prices for the business cycle is not surprising given the large share of construction in supply GDP.
- **Long term real credit has a stronger contribution to the business cycle than short term credit,** on average driving the behavior of total credit in explaining the business cycle.
- **Credit to individuals has a stronger contribution to the business cycle than credit to corporates.** This result suggests that the financial cycle impacts the business cycle more through consumption than investment. Indeed, Kazakhstan's large oil sector is largely financed from abroad through FDIs and the domestic banking sector primarily lends to households. In 2021, credit to individuals accounted for about 13 percent of GDP and 54 percent of bank credit portfolios. Its contribution has been increasing since 2022 due to a boom in loans to individuals while the share of credit to non-financial corporates has been decreasing.

5. The inclusion of proxies for the financial cycle yields notably different business cycle estimates. Figure 1 compares the static HP filter estimates of the cycle (in blue), excluding financial cycle proxies, with dynamic multivariate filter estimates (in red) including financial cycle proxies. Three distinct period can be identified:

Figure 1. Static and Multivariate Cycle Estimates 1/



- **1999-2007.** In the run up to the GFC, dynamic estimates are notably higher than static HP filter estimates. During this period, real GDP grew on average by about 10 percent per year, real

credit and house prices grew on average by about 39 percent per year (with real credit reaching an astonishing 67 percent annual growth rate in 2007q2).

- **2008-19.** During this period, dynamic estimates are notably lower than static HP filter estimates. This period is characterized by the GFC in 2008, a financial crisis in 2014, the floating of the Tenge and the adoption of inflation targeting in 2015, three recessions, a high level of nonperforming loans, and a slow process of cleaning up bank balance sheets. Real GDP grew on average by 4 percent per year, house prices by 5 percent per year, and real credit contracted on average by 2 percent per year.
- **2020-23.** During this period, dynamic estimates are notably higher than static HP filter estimates. This period is characterized by the COVID-19 global pandemic. Real GDP grew on average 2 percent per year, house prices by 14 percent, and real credit by 6 percent.

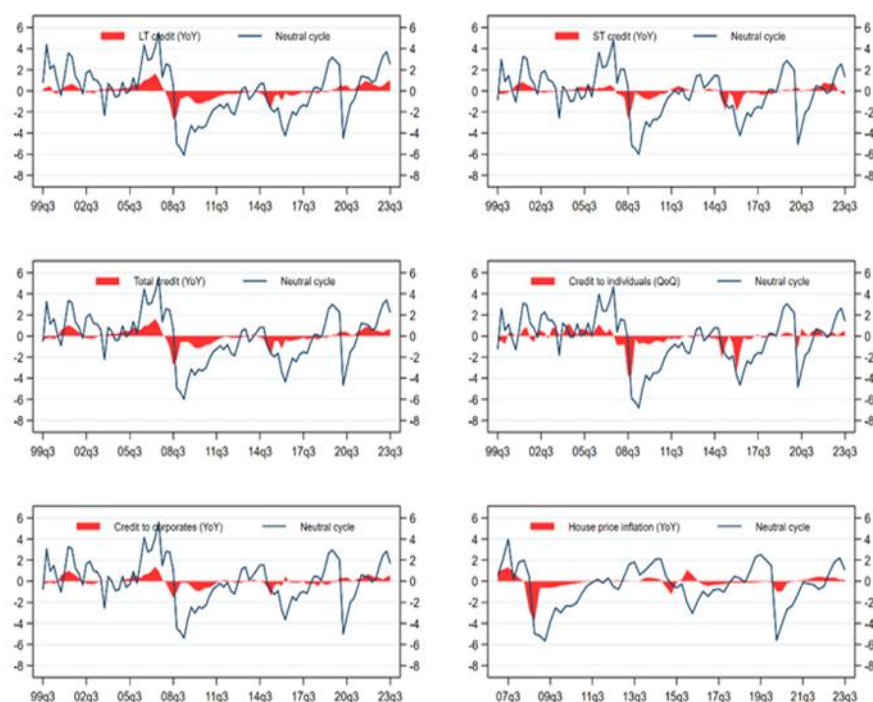
6. Static HP filter estimates fail to capture the amplifying impact of the financial cycle.

When financial cycle proxies are above their trend, the static HP filter fails to capture the extent to which the financial sector is supporting the economy and hence it yields negatively biased output gap and potential GDP estimates. Conversely, when financial cycle proxies are below their trend, the static HP filter fails to capture the extent to which the financial sector is holding back the economy and hence, it yields positively biased output gap estimates and negatively biased potential GDP estimates. Since dynamic estimates including financial cycle proxies capture the amplifying effect of the financial cycle, they better reflect trend economic growth.

7. The amplification effect of the financial cycle did not take place during and after the COVID-19 shock.

The financial cycle did not contribute to the economic recession in 2020, which was caused primarily by a supply/demand shock induced by measures such as school and workplace closures, restrictions on public gatherings, public transport closures, and stay-at-home requirements. Both cyclical and structural factors contributed to keeping financial cycle proxies above trend during this period. From a cyclical perspective (i) monetary policy remained loose, especially in 2022 and the first half of 2023; (ii) the authorities subsidized local currency deposits, the key source of local currency lending, limiting depositors' switch into FX deposits (which would have amplified exchange rate pressures); (iii) pension fund contributors were allowed to use cash balances to purchase houses, inflating house prices; and (iv) a large influx of Russian citizens also contributed to keeping house prices high following the invasion of Ukraine. From a structural perspective, the increasing state footprint in the economy and financial sector since the 2014 financial crisis progressively weakened the link between business and financial cycles.

8. The financial cycle is correlated with future levels of the business cycle. Figure 2 reports the contemporaneous contribution of different proxies for the financial cycle (red areas). The correlation with future levels of the business cycles is more apparent here than by simply comparing the static and multivariate estimates in Figure 1. While the financial cycle co-moves with the output gap on average, it tends to peak and recover before the business cycle. This is especially noticeable around the GFC and less so (if at all) during the COVID-19 recession which, as discussed above, was of a different nature.

Figure 2. Contemporaneous Contribution of the Financial Cycle 1/

Sources: Authors' calculations.
1/ Percent.

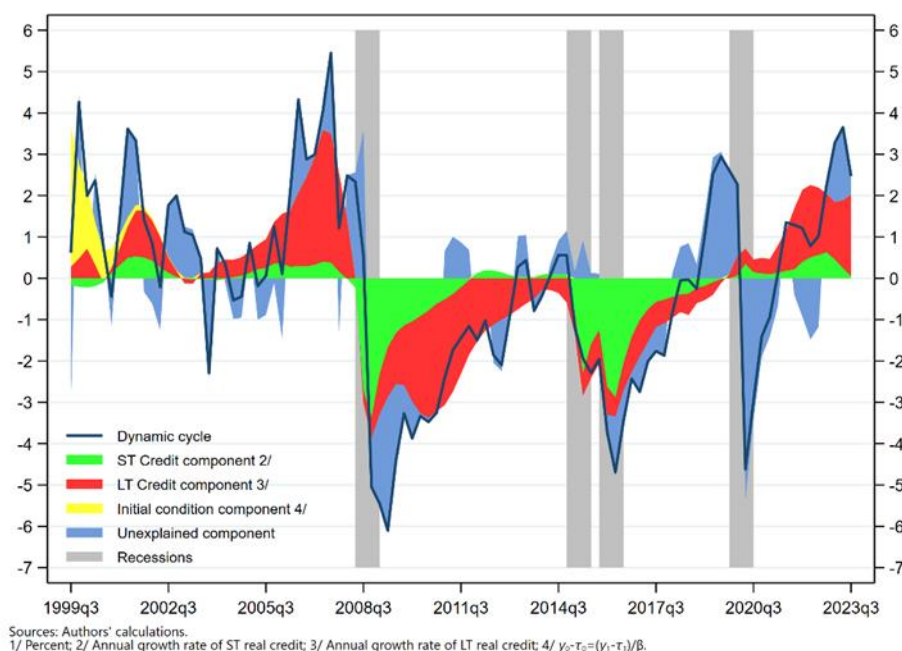
9. Historical contributions better capture the impact of the financial cycle on the business cycle. Due to the autoregressive component in the business cycle equation, estimates of the contemporaneous contribution of the financial cycle to the business cycle underestimate true contributions. Figure 3 reports the historical contributions of short-term and long-term credit to the business cycle.⁶ Several things can be observed:

- **The initial condition component is practically zero already around 2003**, confirming that shocks have a short-lived impact on GDP, as suggested by the low estimated autoregressive parameter in the business cycle equation reported in Table 1.
- **Long-term credit has the largest amplifying effect on the cycle during expansion and contractions periods.** Short-term credit appears to have the largest contribution during recessions, likely because this type of credit is written off earlier than long-term credit at the onset of a recession and banks can stop rolling it over earlier to improve their balance sheets.
- **The unexplained component is particularly large around the COVID-19 pandemic.** If anything, financial cycle proxies supported growth during the recession in 2020q2–q3 rather than amplifying the recession. In 2023, the historical contribution of long-term credit was

⁶ Equivalent figures can be constructed using different combination of available proxies.

around two percentage points of potential GDP while short-term credit had reverted to its mean.

Figure 3. Historical Contributions of Short and Long-Term Credit 1/



C. Conclusions and Policy Recommendations

10. The financial cycle in Kazakhstan has a small but significant contribution to the business cycle. The impact of the financial cycle on business fluctuations primarily occurs through consumption (credit to individuals) and construction (housing prices), rather than through investment (long-term credit and corporate credit).

11. Headline inflation contains very limited information about the business cycle. This weak relationship between the output gap and inflation (flat Phillips curve) may reflect the large state footprint in the economy, a rigid labor market (with unemployment barely moving between cyclical peaks and troughs), price controls, and subsidies. This confirms that inflation in Kazakhstan is primarily imported.

12. Real interest rates contain limited information about the business cycle. Rates on loans to individual contain no information about the cycle while rates on loans to corporates have a small significant impact. This suggests that the interest rate channel of monetary policy works primarily through credit to corporates and is not particularly strong.

13. The financial cycle in Kazakhstan has a persistent and amplifying effect on the business cycle. In the run up to recession periods, the static HP filter overestimates potential GDP as

it fails to capture the divergence of financial proxies from their trend. Consequently, output gaps are lower. Conversely, after financial busts, the static HP filter fails to capture the extent to which the financial sector is holding back the economy, yielding optimistic output gap estimates. It is worth noting that the amplification effect of the financial cycle proxies did not take place before or after the COVID-19 recession: during this period, the financial sector actually supported growth. Likely explanations for this include: (i) the relative loose monetary policy in 2022-23; (ii) the progressively increasing state footprint in the financial sector and growing reliance on subsidized credit; (iii) policy responses to the COVID shock that included subsidizing LC deposits and allowing pensioners to use their cash balances to buy houses; and (iv) increased housing demand from Russian citizens following the invasion of Ukraine.

14. The impact of the financial cycle suggests that macroprudential policy has a significant role in both preserving financial stability and complementing macroeconomic policies. This highlights the importance of preserving significant buffers in bank balance sheets and implementing any needed balance sheet repair swiftly. In addition, since the impact of the financial cycle on the economy appears similar in both expansion and contraction periods, macroprudential policy should be calibrated in a symmetric fashion in both periods. The recent enhancement of NBK's macroprudential policy mandate and toolkit, including greater clarity on the division of responsibilities across agencies, is welcome.

Appendix I. Data Used to Construct Financial Cycle Proxies

1. Table 2 reports the data used in this note, their availability, and sources. Our observed endogenous variable is the log of quarterly real GDP. Data used to construct financial cycle proxies include:

- **Headline inflation.** The one and four quarter difference of the log of the CPI index are used. It is expected to be positively correlated with the cycle and with its contribution being a function of the reaction function of the monetary authority.
- **Real interest rates.** The annual real rate banks apply to loans in Tenge to individuals and non-financial corporates are used as individuals are barred from borrowing in FX from banks and the volume of FX loans to corporates is small. Interest rate is expected to be negatively correlated with the cycle with its contribution depending on the reaction function of the monetary authority.
- **Short term real credit.** The one and four quarter difference in the log of the short-term banking sector loans deflated by the CPI are used. Short term credit is expected to be positively correlated with the cycle and primarily with real consumption.
- **Long term real credit.** The one and four quarter difference in the log of the long-term banking sector loans deflated by the CPI are used. This type of credit is expected to be positively correlated with the cycle and primarily with real investment.
- **Total real credit.** The one and four quarter difference in the log of the sum of short- and long-term banking sector loans deflated by the CPI are used. This type of credit is expected to be positively correlated with the business cycle.
- **Real credit to individuals.** The one and four quarter difference in the log of the banking sector loans extended to individuals deflated by the CPI are used. This type of credit is expected to be positively correlated with the business cycle and primarily with consumption.
- **Real credit to nonfinancial corporates.** The one and four quarter difference in the log of the banking sector loans extended deflated by the CPI are used. This type of credit is expected to be positively correlated with the business cycle and primarily with real investment.

House price inflation. The one and four quarters difference in the log of the housing price index are used. The house price inflation is expected to be positively correlated with the business cycle.

Table 1. Republic of Kazakhstan: Data and Sources

Variable	Min	Max	Source
Gross Domestic Product (SA, Mil.2005.KZT)	1999q1	2023q3	BNS
Credit			
Loans to the Economy - Medium & Long Term (EOP, NSA,Mil.KZT)	1996q1	2023q4	NBK
Loans to the Economy - Short Term (EOP, NSA,Mil.KZT)	1996q1	2023q4	NBK
Loans to individuals (EOP, NSA,Mil.KZT)	1996q1	2023q4	NBK
Loans to non-financial corporates (EOP, NSA,Mil.KZT)	1996q1	2023q4	NBK
Prices			
New Housing prices (NSA, Thou.KZT/Sq.m)	2006q1	2023q4	BNS
Consumer Price Index (SA, Dec. 2020 = 100)	1993q1	2023q4	NBK
Interest rates			
Loans to individuals (KZT, percent)	1997q1	2023q4	NBK
Loans to corporates (KZT, percent)	1997q1	2023q4	NBK