INTERNATIONAL MONETARY FUND

Estimating Potential Output in Niger

Guy Morel Kossivi Amouzou Agbe (AFR)

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Estimating Potential Output in Niger

Prepared by Guy Morel Kossivi Amouzou Agbe (AFR)

Authorized for distribution by Antonio David.
April 2025

ABSTRACT: Potential growth in Niger is estimated at around 6 percent with a structurally significant contribution of labor and peaks of growth associated with higher investment in physical capital. Growth in Niger is, however, constrained by weak productivity, limited structural transformation, and inadequate economic diversification, with downside risks stemming mainly from regional insecurity and adverse climate shocks. Key factors that could boost economic growth in Niger include investment in human capital, the development of the extractive sector and agro-industrial value chains and the diffusion of digital technologies.

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Estimating Potential Output in Niger

Prepared by Guy Morel Kossivi Amouzou Agbe (AFR)[1]

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NIGER

SELECTED ISSUES

December 17, 2024

Approved By
The African Department

Prepared By Guy Morel Kossivi Amouzou Agbe (AFR)

CONTENTS

ESTIMATING POTENTIAL OUTPUT IN NIGER[1]

Economic growth in Niger is essentially driven by the agriculture and services sectors, with favorable prospects for the industry sector due to the start of oil exports in 2024. Potential growth is estimated at around 6 percent with a structurally significant contribution of labor and peaks of growth associated with higher investment in physical capital. However, growth is constrained by weak productivity, limited structural transformation, and inadequate economic diversification. Key factors that could boost economic growth in Niger include investment in human capital, the development of the extractive sector and agro-industrial value chains and the diffusion of digital technologies. However, downside risks to real and potential growth stems mainly from regional insecurity and adverse climate shocks, highlighting the need for effective climate, disaster and security risks management.

A. Motivation and Background

1. Potential growth is a critical determinant of a wide range of macroeconomic and development outcomes. Potential output and output gap estimates are frequently used to calibrate macroeconomic policies. Indeed, sound macroeconomic policies on growth cannot be taken without being grounded in a firm understanding of potential growth (Celik et al., 2023). The importance of estimating potential output lies in its ability to provide policymakers with a benchmark for evaluating economic performance and identifying areas of underutilization. Estimating potential output in Niger helps policymakers identify both conjunctural and structural factors limiting growth, calibrate macroeconomic policies, and design reforms aimed at enhancing resilience and long-term development.

2. Estimating potential output in developing countries is quite challenging. Estimates of potential output and the output gap are both generally difficult to produce as they are non-observable (Alichi et al., 2018). In developing countries such as Niger, estimating potential output and the output gap is further complicated due to challenges stemming from data limitations and frequent shocks.

3. This SIP accounts for data limitations and employs several methodologies including a number of univariate statistical filters and a production function model to estimate and analyze potential output in Niger. The paper is organized as follows. Section B analyzes historical sectoral growth trends and contributions to growth in Niger; Section C presents the potential output and output gap estimates; Section D elaborates on the downside risks to potential growth in Niger and Section E identifies policy recommendations and concludes.

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B. Sectoral Growth Trends and Contributions to Growth

4. Economic activity in Niger is generally concentrated in a few primary agricultural products and relies excessively on extractive industries in particular uranium, oil, and gold. This poorly diversified economic structure exposes the country to volatile growth patterns and external shocks, including fluctuations in commodity prices and climate-related risks.

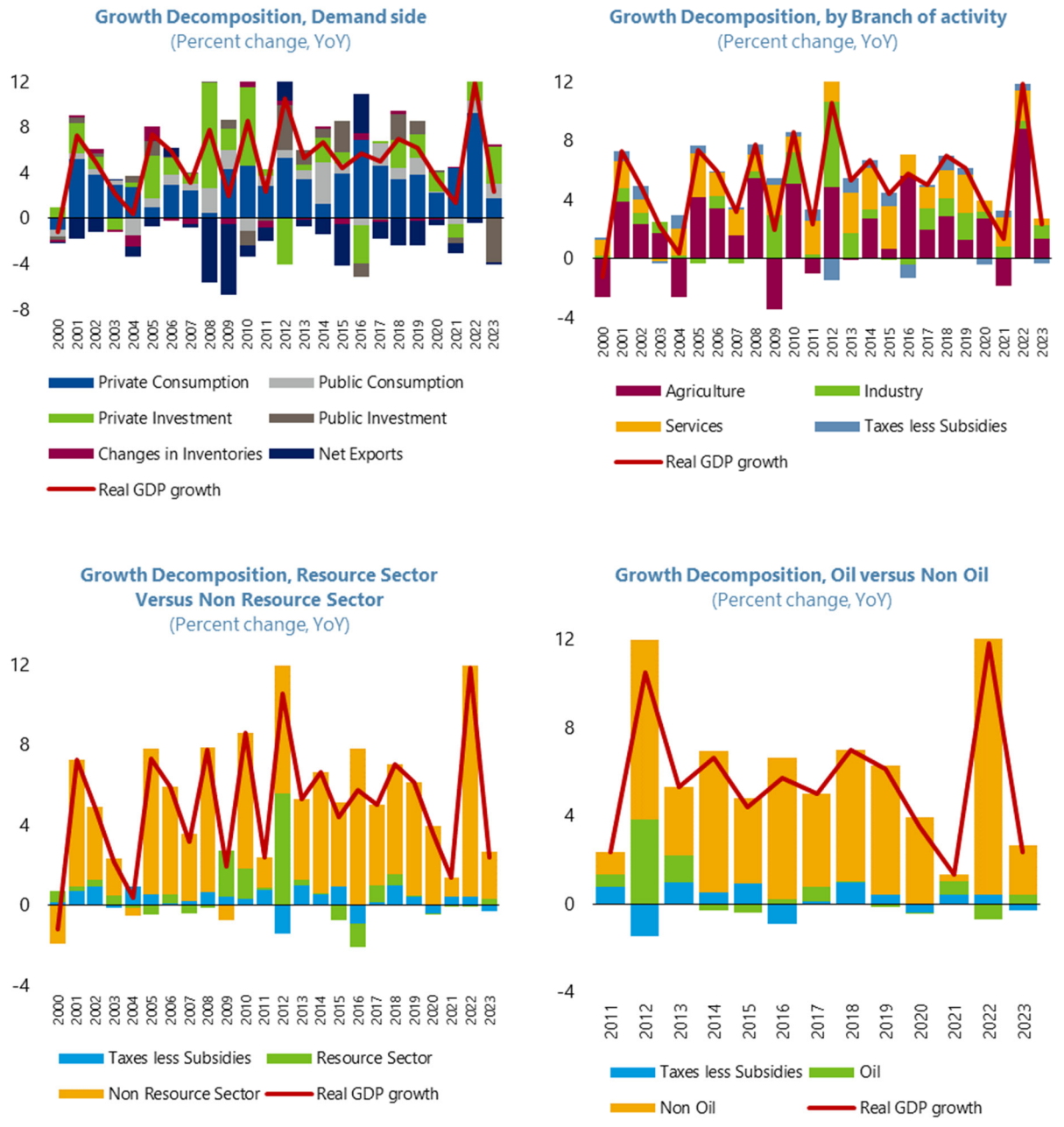
5. Sectoral growth trends in Niger reveal an economy heavily dependent on subsistence and rainfed agriculture, while increasingly shaped by services and extractive industries. Agriculture remains the backbone of Niger's economy, employing about 80 percent of the population and contributing approximately to 40 percent of GDP. Despite its pivotal role, the sector presents persistently low productivity levels. This is largely due to the dominance of subsistence farming practices, which are heavily reliant on rainfall, making agricultural output highly susceptible to climatic shocks such as droughts. Moreover, the sector is also confronted with significant infrastructure gaps and limited access to capital and inputs. Recently, efforts have been initiated to develop irrigation infrastructures and expand irrigated surfaces (from 18,000 hectares to 39,700 hectares by 2027) to improve productivity and strengthen the sector's resilience.

6. Services dominated by transport and informal trade have emerged as a significant contributor to Niger's GDP growth (Figure 1). Over the last two decades, the contribution of the services sector has been positive and amounted to about 1.9 percent on average. The sector, however, remains underdeveloped and constrained by inadequate infrastructure, limited financial intermediation, insufficient formalization, weak institutional frameworks and regulatory inefficiencies.

7. Growth in the resource sector has been historically volatile with a notable peak in 2012 following the operationalization of the Soraz oil refinery in 2011. Growth volatility in the resource sector stems from price shocks and fluctuating production levels. The resource boom in 2012 is largely linked to the operationalization of the Soraz oil refinery in 2011 with the production of refined oil. The extractive sector, particularly uranium and oil, has gained further prominence with the operationalization of the Niger-Benin pipeline in 2024. This is expected to boost considerably growth in the near and medium term.

8. On the demand side, economic growth in Niger has historically been driven by private consumption and private investment. Public consumption and investment, while smaller in comparison, also contribute meaningfully to Niger's economic development. However, their impact on long-term growth is constrained by inefficiencies, including low revenue mobilization (see SIP #1), governance challenges (see SIP #2) and financial constraints.

Figure 1. Contributions to Real GDP Growth in Niger



Source: Nigerien authorities, IMF Staff calculations.

C. Potential Output and Output Gap Estimations

9. Several methodologies exist in the literature to estimate potential output and can be grouped into four main categories. Each of these methodologies offers distinct advantages, depending on the context and data availability, but also comes with its own set of limitations (see IMF Country Report No. 16/143 and Celik et al., 2023 for an in-depth discussion).

- **Univariate Statistical filters are simple but lack economic structure.** Univariate Statistical filters, including the Hodrick-Prescott filter (*HP filter*) and "Band pass" filters such as the Baxter and King filter *(BK filter)*, Christiano and Fitzgerald filter *(CF filter)* and the Butterworth filter *(BW filter)* require only a single input -typically the GDP series-, making them relatively simple to implement. Potential output is computed as a smoothed sequence over the actual output data. However, these filters lack economic structure and are subject to the endpoint problem.[2]

- **The production function approach offers valuable insights into the drivers of growth but is sensitive to parameter misspecification.** This method adopts a supply-side perspective, typically using a Cobb-Douglas production function to decompose aggregate output into its key components: capital, labor, and total factor productivity (TFP). Potential output is derived when each input is at its potential. The production function approach is however sensitive to the calibration of parameters used as well as the methodology employed to estimate the potential level of each input entering the production function.

- **Multivariate filters enhance the estimation of potential output by incorporating economic structure but requires more macroeconomic data.** These filters extend univariate methods by integrating relationships like the Phillips Curve and Okun's Law, utilizing data on inflation and unemployment to provide a more comprehensive analysis. These filters can produce robust real-time estimates that are less sensitive to the endpoint problem when they are complemented with expectations of growth and inflation, but they remain sensitive to the model specification and parametrization.

- **Dynamic Stochastic General Equilibrium (DSGE) models offers an interesting avenue but are data and time demanding.** DSGE models are appealing due to their strong theoretical foundation and rigorous framework. However, their implementation can be challenging, requiring significant time and data. Estimates from DSGE are also subject to model's specific assumptions and parameterizations.

10. Due to data limitations, we employed a wide range of statistical filters, including the HP filter, BK filter, the CF filter and the BW filter and a production function model (PF) to estimate potential GDP in Niger. The estimations have been computed using annual data as there is no quarterly data series for Niger and covers the period 1990-2023. Details of each methodology

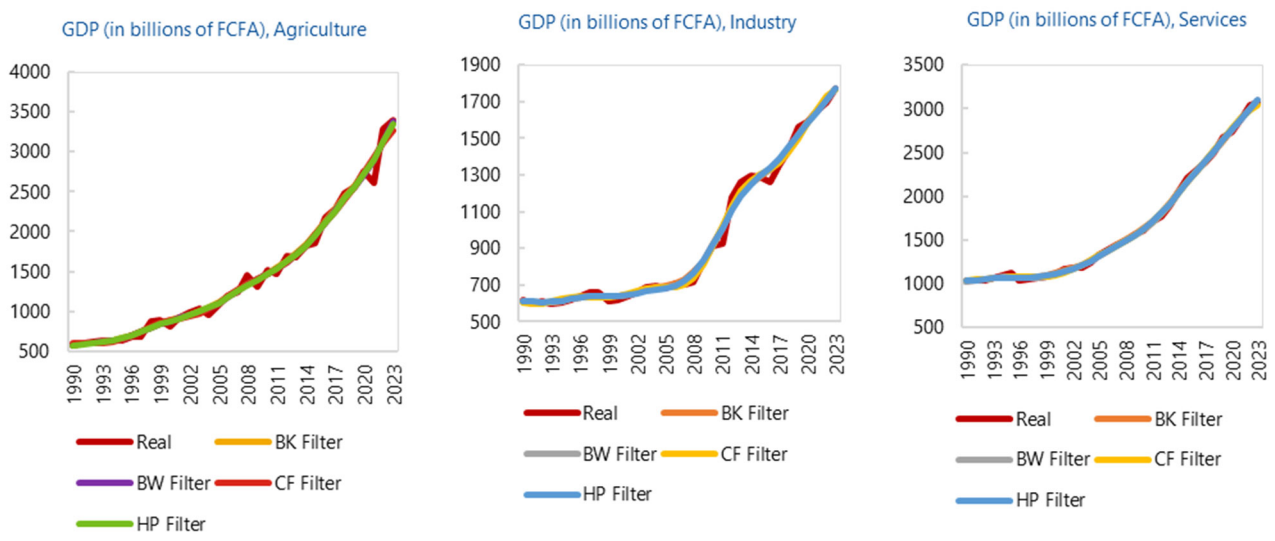
[2] The endpoint problem in statistical filters refers to the difficulty in accurately estimating potential GDP, at the beginning and end of a data series due to the absence of complementary data points beyond these endpoints.

are presented in Appendix A for the production function model and Appendix B for the statistical filters.

11. Sectoral estimates from the statistical filters show volatile growth patterns particularly in the agriculture and industry sectors (see Figure 2). All the different statistical filters employed yield similar results and show a steep rise in trend growth in both sectors in 2012. Growth patterns in the services sector appear less volatile compared to the agriculture and industry sectors. Fluctuations in the agriculture and industry sector generally arise from climate shocks and uncertainties in extractive activities.

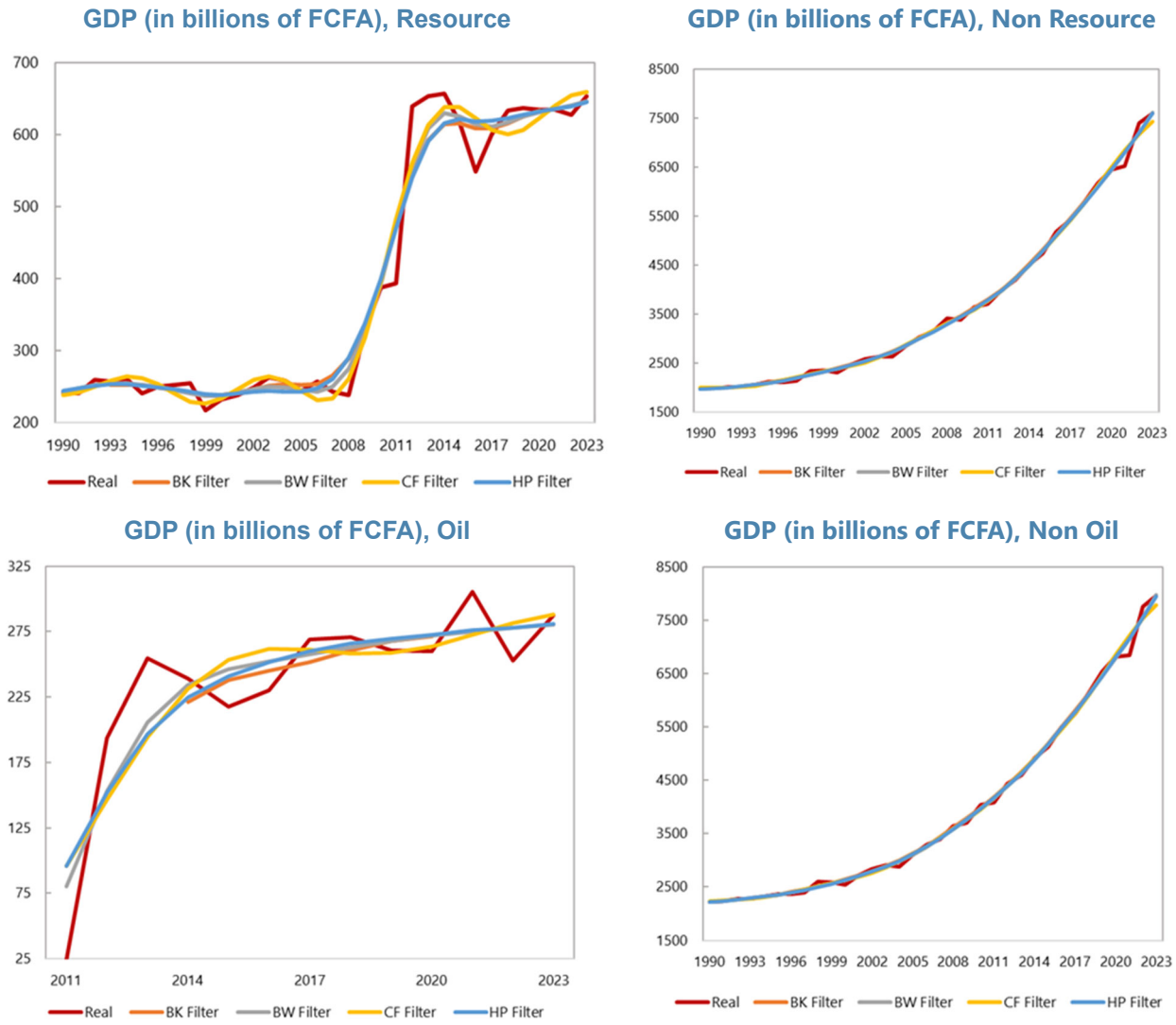
12. Growth in the resource sector experienced a significant boost with the launch of the Soraz refinery in 2011 but has since exhibited a deceleration in momentum. A strong rebound in the sector is expected in 2024 with the operationalization of the Niger-Benin oil pipeline and the start of crude oil exports. These swings in growth in the resource sector underscore the volatility and uncertainties of resource-driven growth patterns and the need for economic diversification.

Figure 2. Sectoral GDP Trends, by Branch of Activity



Source: Nigerien authorities, IMF Staff calculations.

Figures 3. Sectoral GDP Trends, Resource Versus Non-Resource Sector



Source: Nigerien authorities, IMF Staff calculations.

Potential Output and Output Gap

13. The output gap in Niger is estimated to have fluctuated between -4 percent and 4 percent between 1990 and 2023. The production function model and the statistical filters tend to yield similar results. Positive output gaps generally correlate with higher inflation where the country encounters capacity constraints leading to higher inflation.

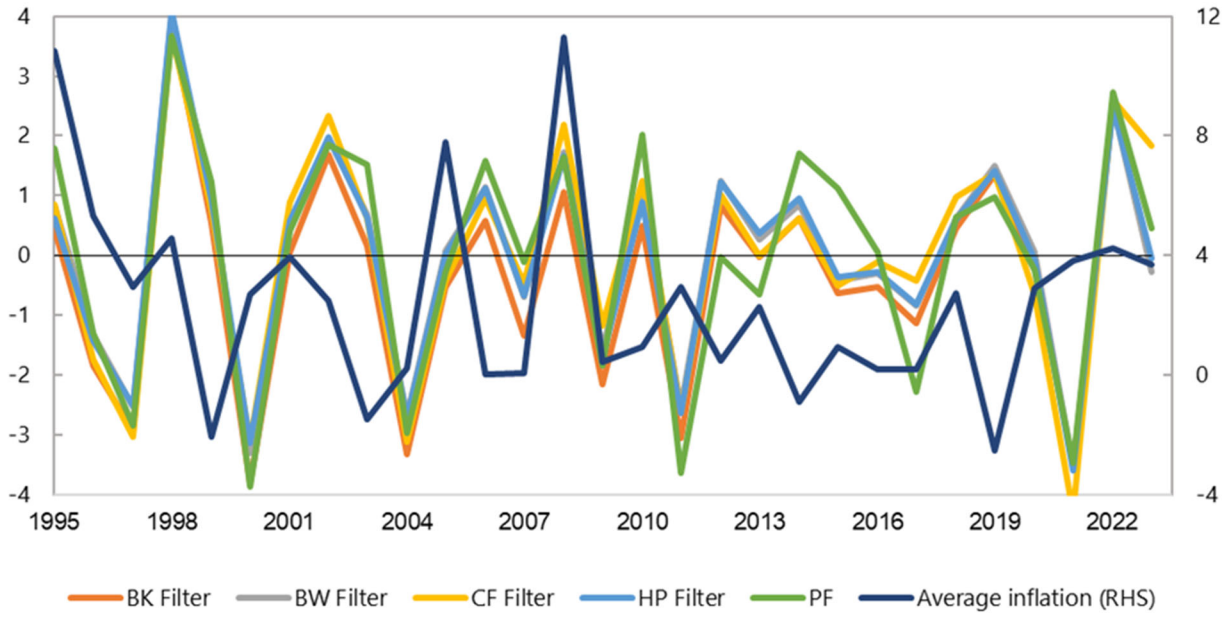
14. Niger has frequently operated below its potential, as evidenced by recurrent negative output gaps. Periods of significant underperformance align with external shocks, such as the global commodity price downturn in 2014–2016 and the COVID-19 pandemic, which disrupted trade and

reduced economic growth. Moreover, domestic shocks such as recurrent droughts and security challenges have also contributed to negative output gaps.

15. These recurrent negative output gaps also underscore the underutilization of Niger's labor force, particularly youth and women, and inefficiencies in capital allocation. Niger has a demographic growth rate of 3.8 percent per year and one of the highest fertility rates in the world (6.9 children per woman). While this rapid population growth poses challenges, it also presents an opportunity to harness a young and expanding workforce to drive economic growth. To capitalize on this potential, significant investments in education, healthcare, and infrastructure are crucial for addressing existing gaps and strengthening the country's capacity for sustainable development. Additionally, implementing structural reforms to improve governance and attract foreign direct investment (FDI) is essential to ensure efficient capital allocation.

16. Niger has also faced temporary positive output gaps which generally coincides with resource booms, favorable international commodity prices and positive climate shocks. Periodic growth spurts in uranium and oil production have occasionally contributed to positive output gaps. Additionally, favorable agricultural seasons, particularly those supported by favorable rainfall patterns, tend to contribute to positive output gaps, as rainfed agriculture remains a key determinant for real GDP growth in Niger.

Figure 4. Output Gap Estimates
(In percent)

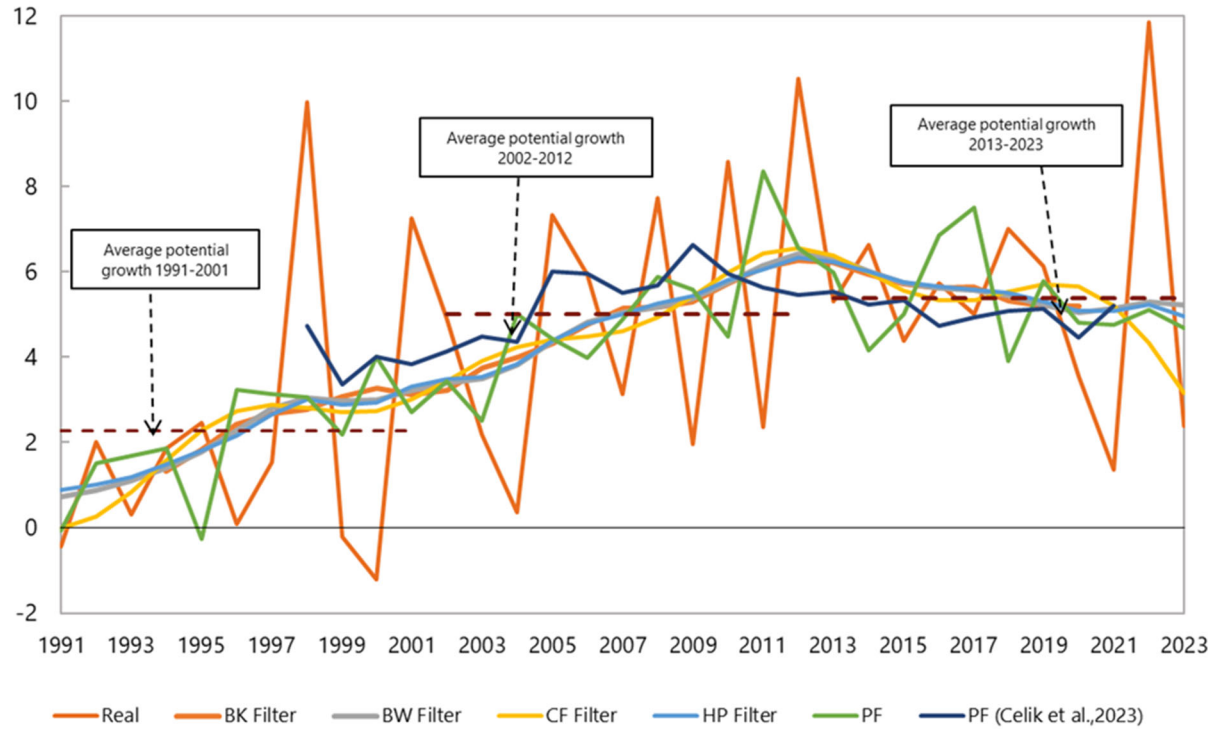


Source: PWT 10.01, Nigerien authorities, IMF Staff calculations.

Potential Growth Rates

17. Potential growth in Niger is estimated about 6 percent over the medium-term, exhibiting a steady but moderate expansion (Figure 5 and 6). Niger's average potential GDP growth rate is estimated to be 2.3 percent over the period 1991-2001, 5.0 percent over the period 2002-2012, and 5.4 percent over the period 2013-2023. These estimations generally align with those estimated by the World Bank when elaborating a global database of potential growth in 2023 (Celik et al., 2023, see data series PF (Celik et al., 2023)). The deceleration in the increase of potential growth from 2002-2012 to 2013-2023 reflects in general limited productivity improvements.

Figure 5. Potential Growth Rates
(In percent)



Source: PWT 10.01; Nigerien authorities; Celik et al., 2023; IMF Staff calculations.

Contributions to Potential Growth based on the Production function model

18. While labor has a structurally significant contribution, growth peaks are associated with physical capital accumulation (Figure 6). The average contribution of physical capital to potential GDP over the period 2011-2022 is estimated 2.5 percent with considerable peaks of 6.5 percent and 4.6 percent respectively in 2011 and 2017. These peaks correspond to increased

investment in infrastructure and extraction technologies in the extractive sector which are highly capital-intensive.

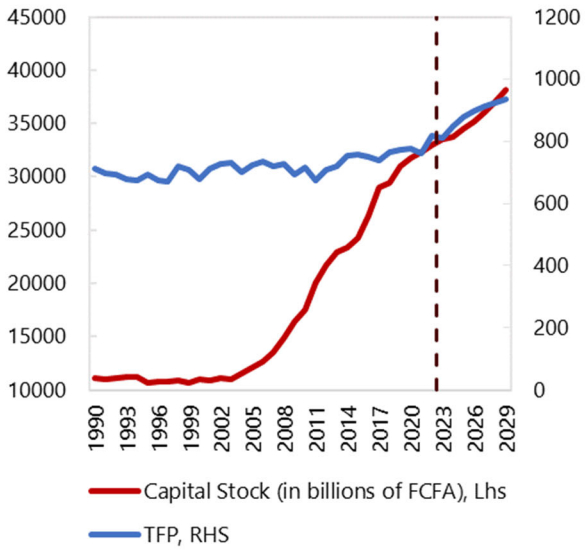
19. The physical capital stock, though pivotal for growth, is constrained by weak public investment efficiency and limited private sector participation. Niger faces challenges in optimizing public investments, often due to inefficiencies in the allocation and use of resources, as well as institutional weaknesses. Furthermore, private sector participation remains relatively low, with barriers such as inadequate infrastructure, limited access to financing, and a challenging business environment inhibiting investment. To accelerate capital accumulation and enhance potential growth, Niger must improve both public investment effectiveness and create a more conducive environment for private sector participation.

20. Investing in human capital would significantly raise potential growth in Niger. Low levels of human capital are major impediments to growth. Niger's labor force remains largely unskilled, and education outcomes lag behind regional peers. The human capital index in Niger is one of the lowest in the world with an average of 2 years of schooling for the population as a whole and stark regional and gender inequalities (IMF Country Report No 2023/029). Enhancing human capital through targeted education and vocational training programs is critical to addressing skill mismatches. A simple and mechanical simulation shows that an average annual 5 percent increase in the human capital index to close the gap relative to the WAEMU region by 2029, would result on average in a 2.3 percentage point gain in potential growth.

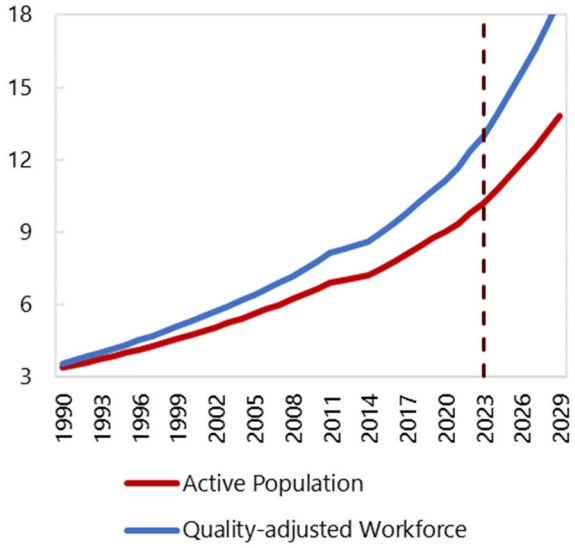
21. Total factor productivity growth reflects inefficiencies in resource use and the absence of significant technological adoption. TFP growth is estimated to contribute on average to 1 percent to potential growth over the period 2011-2023 reflecting low technology adoption. This weak total factor productivity growth is consistent with studies in low income and developing countries. Adegoke et al., (2023) have documented, for instance, that slow productivity growth has been widespread among LIDCs and SSA countries.

Figure 6. Contributions to Potential Growth

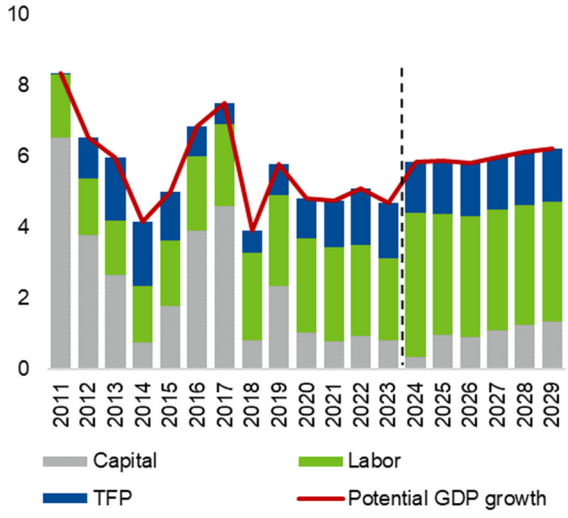
Capital Stock and TFP



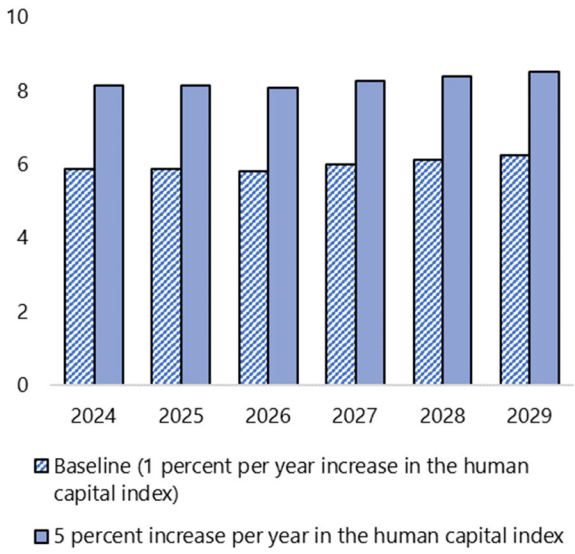
Labor Force in Millions



Potential Growth Decomposition, Factors of Production



Simulated Potential GDP Growth



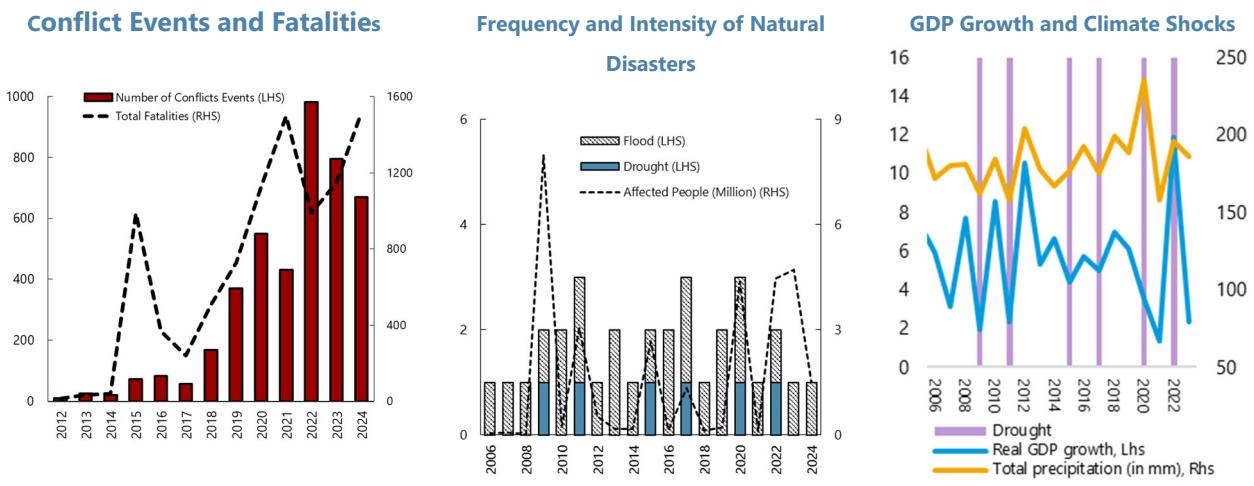
Source: PWT 10.01, Nigerien authorities, IMF Staff calculations.

D. Downside Risks to Growth

22. Niger's growth prospects are constrained by a range of downside risks, including climate shocks that threaten its economic stability and development trajectory. Natural disasters are frequent in Niger, with severe events—mainly droughts and floods— occurring approximately every two years. Between 2010 and 2023, disasters affected about 3 percent of the population annually and incurred a cumulated cost of at least US$271 million (1.4 percent of GDP), according to the Emergency Events Database (EM-DAT). In 2024, flooding combined with heavy rain affected more than 1.5 million people, claiming more than 300 lives, and damaging more than 158,000 houses. These climate shocks disproportionately impact agriculture, which is the backbone of the rural economy, leading to reduced yields, food insecurity, and heightened poverty levels. The heavy reliance on rain-fed farming exacerbates these challenges, making investments in climate-resilient agriculture and water management systems critical.

23. Geopolitical instability and security challenges in the Sahel region further exacerbate downside risks to Niger's growth. Niger faces security challenges from insurgent groups and cross-border conflicts, which disrupt trade routes, deter investment, and strain public finances due to rising defense and humanitarian assistance expenditures. This insecurity also undermines the government's capacity to implement structural reforms and build investor confidence, hampering sustainable growth. Over the past decade, the Sahel has experienced a surge in violent conflict and insecurity. Spillover effects from regional conflict and insecurity operate through a number of channels, including by dampening economic activity, often due to increased uncertainty, or trade disruptions.

Figure 7. Risk Factors to Growth in Niger



Source: EMDAT; ACLED; and IMF staff calculations. Data as of November 22, 2024

E. Policy Options and Conclusions

24. Addressing growth challenges in Niger requires a comprehensive reform agenda that tackles structural bottlenecks, promotes diversification, and builds resilience to shocks. Key drivers of economic growth include human capital development, the development of the extractive sector and agro-industrial value chains and diffusion of digital technologies. A consistent potential growth pathway will focus on several policies. These will include i) leveraging technology for private sector growth; ii) fostering financial inclusion and digital finance, iii) ensuring transparency and adequate governance of the resource sector; iv) strengthening climate resilience and disaster risk management and v) enhancing human capital development.

25. One critical pathway for growth is leveraging technology to foster private sector-led economic transformation. New technologies, such as agri-platforms and smart agriculture, offer opportunities to enhance agricultural productivity and link the sector to global value chains. However, transitioning from subsistence to commercial agriculture requires substantial investments in irrigation, logistics, and digital infrastructure. Targeting export markets where Niger has competitive advantages, such as horticultural products and livestock, can also drive economic diversification. Additionally, strengthening farmer organizations could help aggregate production, improve quality, and attract private investment.

26. Expanding digital finance and fostering financial inclusion is another promising strategy for accelerating growth and inclusion. Mobile financial services have the potential to provide rural and underserved populations with access to financial products. This ultimately helps to increase resilience and productivity. Despite the success of digital finance and its transformative potential in other West African countries, mobile money penetration and financial inclusion remains very low in Niger. Policies to digitalize government payments, improve financial literacy, and create a conducive regulatory environment are essential for scaling digital finance. These measures create opportunities for small and medium-sized enterprises to thrive and boost growth (see IMF Country Report No. 23/29).

27. Developing extractive industries responsibly is also essential. The extractive sector has significant potential to drive economic growth, but its development must be managed responsibly to ensure sustainability and inclusivity. Implementing transparent fiscal rules to manage oil revenues is crucial to avoid the "resource curse" and ensuring that windfalls are invested in human capital development and critical infrastructure.

28. Climate shocks and natural disasters remain significant risks to Niger's economic stability, making climate resilience and disaster risk management (DRM) a priority. Recurring droughts and floods cause substantial economic losses and exacerbate food insecurity. Strengthening climate resilience and DRM frameworks, including risk reduction investments, early warning systems, and disaster risk financing, is critical. Stepped up implementation of measures under the current IMF's Resilience and Sustainability Facility arrangement (RSF) will help build resilience to climate change.

29. Investing in human capital is essential for unlocking Niger's economic potential and addressing structural challenges. The education system requires significant improvement to enhance literacy rates, skill development, and labor productivity. Addressing gender disparities in education and employment is particularly important, as women face significant barriers to participation in the labor market. Initiatives to increase school attendance, delay early marriages, and expand vocational training for women could yield substantial economic benefits. Moreover, improving health services and reducing malnutrition would contribute to a healthier, more productive workforce capable of driving economic growth (see IMF Country Report No. 23/29).

References

Adegoke, Y. O., Mbonigaba, J., and George, G., 2023, "Health and total factor productivity nexus in selected sub-Saharan African countries: quadratic and threshold modelling", BMJ open, 13(5).

Alichi, A., R. Al-Mashat, H. Avetisyan, J. Benes, O. Bizimana, A. Butavyan, R. Ford, N. Ghazaryan, V. Grigoryan, M. Harutyunyan, A. Hovhannisyan, E. Hovhannisyan, H. Karapetyan, M. Kharaishvili, D. Laxton, A. Liqokeli, K. Matikyan, G. Minasyan, S. Mkhatrishvili, A. Nurbekyan, A. Orlov, B. Pashinyan, G. Petrosyan, Y. Rezepina, A. Shirkhanyan, T. Sopromadze, L. Torosyan, E. Vardanyan, H. Wang, and J. Yao, 2018, "Estimates of Potential Output and the Neutral Rate for the U.S. Economy." IMF Working Paper No. 18/152.

Alichi, A., O. Bizimana, D. Laxton, K. Tanyeri, H. Wang, J. Yao, and F. Zhang, 2017, "Multivariate Filter Estimation of Potential Output for the United States," IMF Working Paper No. 17/106.

Barro, Robert J. and Jong-Wha Lee, 2013, "A new data set of educational attainment in the world, 1950-2010" Journal of Development Economics 104: 184–198.

Benes, J., K. Clinton, R. Garcia-Saltos, M. Johnson, D. Laxton, P. Manchev, and T. Matheson, 2010, "Estimating Potential Output with a Multivariate Filter," IMF Working Paper No. 10/285.

Blagrave, P., R. Garcia-Saltos, D. Laxton, and F. Zhang, 2015, "A Simple Multivariate Filter for Estimating Potential Output," IMF Working Paper No. 15/79.

Clinton, K., Freedman, C. Juillard, M. Kamenik, O. Laxton, D. and Wang, H, 2015, "Inflation-Forecast Targeting: Applying the Principle of Transparency," IMF Working Paper No. 15/132.

Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer, 2015, "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182. Available for download at: https://www.rug.nl/ggdc/docs/the_next_generation_of_the_penn_world_table2013.pdf

IMF, 2022, Selected Issues on Niger, IMF Country Report No. 23/29

IMF, 2016, “Potential growth and output in Albania”, IMF country report no. 16/143

Kılıç Çelik, Sinem, M. Ayhan Kose, Franziska Ohnsorge, and Franz Ulrich Ruch., 2023, "Potential Growth: A Global Database."

Laxton, D. and R. Tetlow, 1992, “A Simple Multivariate Filter for the Measurement of Potential Output,” Technical Report No. 59 (Ottawa: Bank of Canada).

Medina, L., 2010, “Potential Growth and Output Gap in Peru,” Staff Report for the 2010 Article IV Consultation, IMF Country Report No. 10/99, page. 57 (Washington: International Monetary Fund).

Psacharopoulos, George, 1994, “Returns to investment in education: A global update” World Development 22(9): 1325–1343.

Rasmane Ouedraogo and Diego Gomes, 2023, Macroeconomic Gains from Closing Gender Educational Gaps in Niger, IMF Country Report No 2023/029

Appendix I. Cobb-Douglas Production Function and Growth Accounting

The Cobb-Douglas production function is specified as follows:

$$Y_t = A_t K_t^{\alpha} (h_t L_t)^{1-\alpha} \text{ with } 0<\alpha<1$$

where Y_t refers to total output (GDP) at time *t*; A_t is the total factor productivity (TFP) at time *t* and is determined as the solow residual of total output, capital and labor; K_t is the capital stock at *t*; h_t is the index of human capital at time *t*; L_t is the labor input at time *t* and is assumed to be equal to the total active population as a proxy as detailed employement data on LICs are generally unvaliable; **α** is the elasticity of output with respect to capital assuming constant returns to scale.

The perpertual inventory equation for capital accumulation is as specified follows:

$$K_t = (1-\delta)K_{t-1} + I_t$$

where δ is the rate of depreciation of capital and I_t is the investment at time *t*. Using the Penn World Table version 10.01, δ and **1-α** are calibrated respectively to 0.05 and 0.545 as the avearge depreciation rate and labor share to GDP over the period 1990-2019. These values are also consistent with the existing litterature.

Total initial capital stock and dynamics in capital accumulation are derived using data from the Penn World Table version 10.01 as well as data on investments from the IMF's 2024 WEO October vintage and IMF's staff projections.

Potential output is derived by combining the actual stock of capital with average filtered series of different filters of TFP. Potential labor input is assumed to be equal to equal actual population active corrected by the human index capital from the Penn World Table version 10.01 database.

Appendix II. Overview of Univariate Statistical Filters

Univariate statistical filters decompose a series y_t into trend, cyclical, and noise components. The trend component is used as a proxy for potential output. Although they are all essentially weighted moving averages of the series y_t , they differ in their weights.

- The Hodrick-Prescott Filter minimizes the sum of squares of the deviations between the observed series (real GDP) and the trend (potential GDP), while penalizing variations in the trend.

- The Baxter-King Filter is a moving average of the data with symmetric weights on lags and leads. Therefore, it loses observations in the beginning and towards the end of the sample. It is particularly well-suited when the raw series follows a near-independent and identically distributed process.

- The Christiano and Fitzgerald (CF) filter is a one-sided moving average of the data with weights that minimize the distance between the approximated and the "ideal" filter. Since the filter is one-sided, it does not lose observations towards the end of the sample. It is most suitable for random-walk series.

The Butterworth (BW) filter—widely used in electrical engineering for signal extraction—isolates only low-frequency fluctuations, not high-frequency ones. It is viewed in macroeconomics as an alternative to the traditional linear filters such as the Hodrick-Prescott filter.