

# **Namibia - New Growth in New Age**

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## I. Introduction

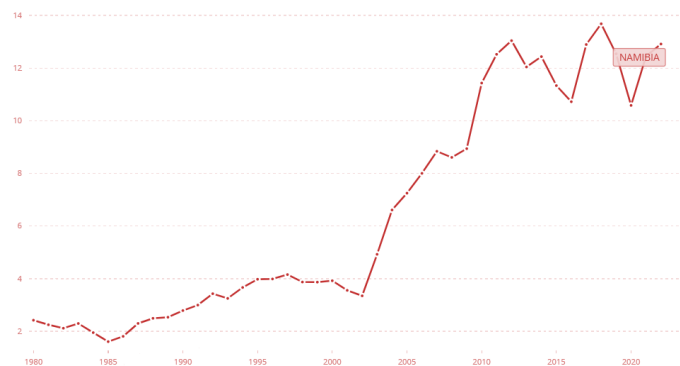
Namibia, a country in southwest Africa, is distinguished by the Namib Desert along its Atlantic Ocean coast. Namibia is an upper middle-income country, and therefore uses the US\$5.50 benchmark for extreme poverty. Despite being an upper middle-income, poverty and inequality levels in Namibia are very high. Namibia is known for its high-quality diamonds, some of the best in the world. The country also mines uranium, gold, and other minerals, playing a vital role in its economy.

Have you ever wondered what took the U.S. in the first place economically to become such a developed country nowadays? If you could go back in time to study the U.S. economy, where would you have begun with? And what would you have done differently to make the U.S. economy even more developed than it already is? That is the reason why we chose Namibia. The country became independent about 34 years ago (in March 1990) from South Africa, which provides enough periods for a robust study. We believe that it will be very interesting to determine what macroeconomic factors may have significant influences on a young country in a modern era where a lot of other countries have become independent well before 1990, meaning that they are well-advanced in terms of country development. Since independence, Namibia has maintained stability and has made significant progress in governance, although challenges such as economic disparities and unemployment remain. Specifically, in the political aspect, Namibia has maintained a stable political environment under the leadership of the South West Africa People's Organization (SWAPO), which has been the dominant political party since independence. Sam Nujoma, the country's first president, served three terms from 1990 to 2005. He was succeeded by Hifikepunye Pohamba and later by Hage Geingob, who continues to serve as president. Moreover, Namibia is known for its robust democratic institutions, including a

multi-party political system, regular elections, and a strong rule of law. The country has consistently been ranked high in Africa for governance and freedom indices. For the economic development aspect, the economy has diversified beyond its traditional reliance on mining (especially diamonds and uranium). Tourism, agriculture, and fishing have become significant contributors to the economy. Namibia also focuses on manufacturing and services such as food processing, beverage production, retail/ wholesale trade, telecommunication, IT services and so many more. Despite economic growth, the Namibian economy, like any others, faces challenges such as high unemployment rates, particularly among the youth, higher inflation, and lower “use of internet” rate compared to other countries.

In this research paper, we will be exploring some main macroeconomic factors that may be the key components that drive the country’s economy, such as inflation, unemployment rate, capital formation, technology, etc., and will test and explain how these factors affect Namibia's economy. In order to do so, we constructed a simple linear regression model with several independent variables such as inflation, unemployment rate, technology growth, and gross capital growth, and one dependent variable which, obviously, is the GDP growth. Thus, our hypothesis would be: the individual effect of macroeconomic factors on Namibia’s GDP growth. Using the regression model, we will be able to provide a statistical summary for each variable, then determine the statistical significance of each independent variable on the GDP growth.

The figure to the right illustrates the GDP of the country in billions of U.S. dollars. Starting in 1990 after becoming independent, the country's GDP was at \$2.97 billion, and steadily



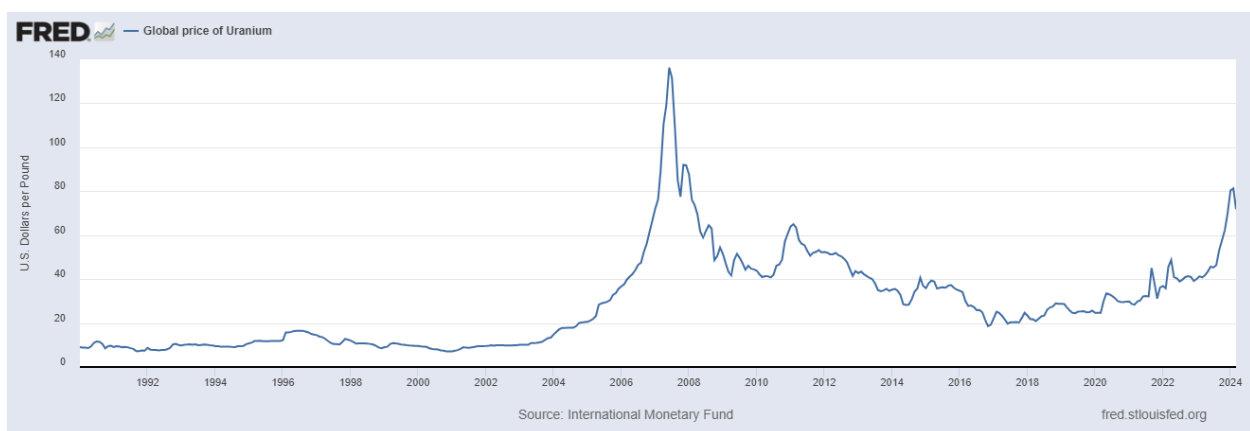
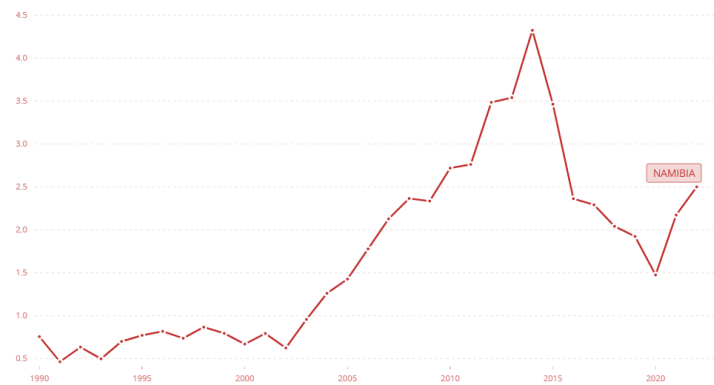
increased over time for the next 10 years. There is one significant mark in 2002, that was when the GDP started to grow exponentially from \$3.35 billion to \$13.04 billion in 10 years. That is about a 30% increase annually over a 10-year period compared to about 5% of the U.S. GDP growth during the same period (from \$5.32 trillion to \$10.93 trillion). This makes perfect economic sense since Namibia's economy relies heavily on uranium and diamond at the beginning. Uranium price peaked in June 2007 at \$136.22/ lb.

In light of recent economic theory, it is evident that younger or developing nations often exhibit more robust growth when they possess substantial capital assets. This principle is particularly applicable to Namibia, a nation that attained independence merely three decades ago, in 1990. Since its transition to autonomy, Namibia has encountered unique opportunities for economic expansion, significantly influenced by the burgeoning global market for uranium—an essential resource in which the country is notably rich. The rising prices of uranium in international markets have catalyzed the development of Namibia's mining sector, a cornerstone of its economic infrastructure. This surge in a critical commodity not only boosts immediate fiscal revenues but also facilitates broader economic growth by enhancing the nation's capital asset base. Consequently, Namibia stands on the cusp of accelerated economic development, poised to capitalize on its geological bounty amidst favorable market conditions.

## II. Literature review.

Contributing to the GDP growth, there are several macroeconomic factors that affect the growth such as capital formation , technology, labor market dynamics, productivity, etc. Before we get to that, Namibia is known for uranium and diamond mining; as a result, the country's economy depends heavily on uranium's and diamond's prices.

The two figures below demonstrate Namibia's capital formation in billions of U.S. dollars and uranium's prices overtime. Capital formation, also referred to as capital accumulation, is the rise in a nation's stock of real capital, or assets like infrastructure, buildings, machinery, and tools. It is essential to a country's capacity to generate products and services, making it a major force behind economic expansion. We can see a similar trend in capital formation, and the country's GDP signaling that Namibia was ready for an economic expansion. Moreover, there is another similar behavior in uranium's price and Namibia's GDP suggesting a high correlation between the two macroeconomic components. You will see later in this paper that capital formation (described as "gross\_cap\_growth" in the regression model) is the only significant factor that drives the economy.

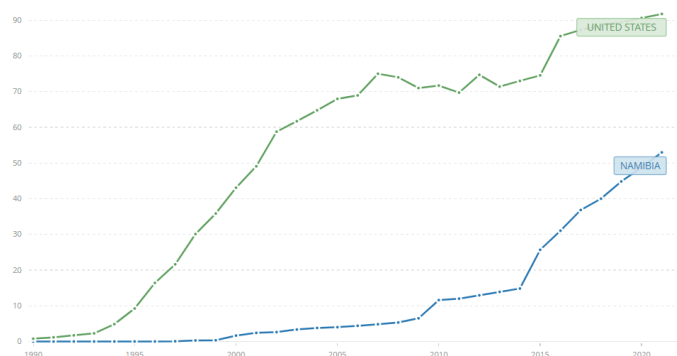


Another factor that generally affects an economy is population growth. This can have positive or negative effects on an economy. While providing larger workforce, market expansion,

and entrepreneurship, population growth creates resource constraint, infrastructure overload, unemployment and environment impact. Namibia is a developing country, higher population growth may not be a good indicator since they might already have limited infrastructure and resources, making it harder to accommodate growth without significant international aid or investment. Statistically, Namibia's population growth was at 6.1% in 1990 compared to U.S. population growth of 1.1% in that same year; however, the rate went down to 3.3% the next year, and gradually reached 1.2% (lowest since independence) in 2004. If you look at the graph above, this was when the economy was booming. Thus, there may be a strong relationship between population growth and GDP growth (just maybe).

Another key factor that I want to introduce is technology (denoted as “individual using the internet” or “internet\_chng” in the regression model). Technology plays a critical role in driving economic growth, shaping how economies develop, operate, and expand. The impact of technology on economic growth can be profound and multifaceted, offering both direct and indirect benefits such as: increasing productivity, innovation/development, labor market dynamics, global connectivity, resource management, etc. The graph below shows us exactly how the U.S. got to where it is nowadays thanks to technology (measured by “individual use of the internet” per total population). The two countries, Namibia and the United States, started out at 0% (population using the internet) in 1990. Then the trend went in two different directions, where Namibia's percentage of population

using the internet remained flat the next two decades. While not the most ideal metric for technological growth, we feel it



serves as a good enough proxy when faced with our limited data.

Not only those, but also many other macroeconomic factors that we included in our regression model such as life expectancy (life\_exp\_pc), foreign direct investment (for\_dir\_pc), pupils in primary education (student\_pc), unemployment rate (unemp\_chng), savings rate change (saving\_pc) and uranium price change (uran\_pc).

To reveal the connections between our exogenous factors and the endogenous GDP growth rate, a simple OLS model was constructed. This was done after refactoring all of the gross factors into growth factors, and differencing them to discover the change over time. The model takes on the form below:

$$\begin{aligned}\text{GDP per capita growth} = & \beta_0 + \beta_1 \text{Population Growth} + \beta_2 \text{Gross Capital Formation Growth} \\ & + \beta_3 \text{Life Expectancy Change} + \beta_4 \text{Foreign Direct Investment Change} \\ & + \beta_5 \text{Student Population Change} + \beta_6 \text{Unemployment Change} \\ & + \beta_7 \text{Internet Usage Change} + \beta_8 \text{Savings Rate Change} \\ & + \beta_9 \text{Uranium Price Change} + \epsilon\end{aligned}$$

where:

- $\beta_0$  is the intercept of the model.
- $\beta_1$  through  $\beta_9$  are the coefficients that measure the impact of each independent variable on the dependent variable, GDP per capita growth.
- Population Growth, Gross Capital Formation Growth, Life Expectancy Change, Foreign Direct Investment Change, Student Population Change, Unemployment Change, Internet Usage Change, Savings Rate Change, and Uranium Price Change are the independent variables considered in the model.
- $\epsilon$  represents the error term, accounting for the variation in GDP per capita growth not explained by the model.

### III. Data

The data for our growth study was primarily sourced from The World Bank DataBank in their World Development database, as well as a small datapoint pulled from the St. Louis Federal Reserve database, FRED. The data spans the 30 years from 1991 to 2021. When deciding which indicators to include to understand the growth of a young nation, we wanted to make sure to include things that captured active investment, a growing labor force, foreign capital injections, passive savings, education, and a technological proxy. To include all for such a young nation became slightly challenging, as some of the more traditional economic measures were unavailable, so we had to get a little creative with proxies. With that being said, we chose gross capital formation, population, net foreign direct investment, gross domestic savings, pupils in primary education, unemployment estimates, life expectancy, and of course our endogenous GDP. Also, due to Namibia's mining-centric economic production, we also included changes in uranium prices, as an indicator for one of their largest exports. All currency related factors are denominated in current U.S. dollars, and any factor not already in percent change was log differenced to do so.

**Gross Capital Formation** consists of outlays on additions to the assets of an economy, plus net changes in the level of inventories. This includes things like land improvements, infrastructure construction and improvements, machinery and equipment purchases, as well as home construction, office construction, etc. This is a critical factor in deciding a country's growth estimates, especially within the context of a Solow growth model (Solow, 1956). This capital formation must exceed the depreciation rate to ensure that output can continue to grow.



**Population** is rather straightforward. It simply counts all the residents, regardless of legal status. The development indicator uses midyear estimates for this factor, which, as previously mentioned, are log differenced to estimate a population growth rate.

**Net foreign direct investments**, according to the database's definition, are “the net inflows of investment to acquire lasting management interest in an enterprise operating in an economy other than that of the investor.” This amount is gathered from the balance of payments as the sum of equity capital, reinvestment of earnings, long-term capital, and short-term capital. Especially in our modern international age, this is an important factor to include to understand the complete picture for a nation’s economy. As of now, Namibia has had a negative balance for their FDI but that may soon change. As recently as 2021, Namibia’s Minister of Industrialization and Trade has been working on revising the Namibia Investment Promotion Act which will make it easier for foreign actors to invest in the country (*Namibia - United States Department of State*, 2023).

**Gross domestic savings** is calculated as GDP minus expenditures. This is an important factor as it indicates how much the country is investing in future output. Without proper investment, similar to gross capital formation, a country’s output will fail to grow. Again, Robert Solow was the economist that empirically linked output growth and investment growth, which laid the basis of the modern understanding of economic growth that is used today. One special note about this datapoint, Namibia experienced a large recession, due in most part to the diamond market collapsing. They have shown recovery in recent years, but their growth rate during that period is almost -40%, a large outlier.

**Pupils in primary education** is the proxy we used to understand education levels within Namibia. Our original intent was to use the percentage of GDP spent on education, but that data had many gaps that we deemed too large to statistically overcome.

**Unemployment** has long been an indicator of economic health, and as such was important to include. The nationally reported unemployment data from Namibia was spotty and unreliable, so in its place we have used the International Labour Organization's modeled estimate.

**Life expectancy** measures the number of years a baby born in the given period will live if prevailing patterns of mortality were to stay the same. This factor quantitatively captures some things that may be otherwise more qualitative, such as levels of care, perceptions towards western medicine, etc.

**Uranium prices** were included because of their importance to the Namibian economy. For 2023, uranium made up 14.3% of Namibia's total exports totaling around \$787 million in U.S. dollars.

These factors were chosen to create a robust model that attempts to capture not only the general factors of economic growth, but ones tailored specifically to Namibia in this period of finding its economic footing. The table below details summary statistics for this period.

Descriptive Statistics for Growth Model Variables										
Includes GDP growth, Population Growth, and more										
Statistic	GDP growth	Population Growth	Capital Formation Growth	Life Expectancy Change	Foreign Direct Investment Growth	Primary School Students Growth	Unemployment Change	Internet Use Change	Domestic Savings Growth	Uranium Price Change
mean	0.05	0.02	0.05	0.00	-0.07	0.01	0.00	0.29	-1.27	0.03923093
median	0.04	0.02	0.08	0.00	-0.02	0.02	0.00	0.11	-0.02	0.03967063
sd	0.12	0.01	0.21	0.02	10.19	0.01	0.07	0.42	12.45	0.26804583
min	-0.17	0.01	-0.38	-0.06	-39.64	-0.01	-0.15	0.00	-39.09	-0.43583221
max	0.39	0.03	0.43	0.02	37.78	0.05	0.13	1.56	39.15	NA

#### IV. Econometric Results, Interpretations, and Discussions

With these specifications, the following output was obtained:

Namibian Growth Model Regression Results			
	OLS		
	Est.	S.E.	p
(Intercept)	0.075	0.098	0.454
pop_growth	-1.973	4.597	0.672
gross_cap_growth	0.329**	0.107	0.006
life_exp_pc	0.208	1.834	0.911
for_dir_pc	-0.002	0.003	0.412
student_pc	-0.618	1.447	0.674
unemp_chng	-0.092	0.321	0.779
internet_chng	0.011	0.057	0.852
savings_pc	0.002	0.002	0.412
uran_pc	0.050	0.084	0.558
Num.Obs.	30		
R2	0.507		
R2 Adj.	0.285		
Log.Lik.	31.032		
+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001			

The big thing to note about the results is the lack of significance across the board, with the exception of capital growth. Initially this lends one to think that this is a poor model for

explaining output growth, but one notable difference is an R-squared value of 0.507. This indicates that our model explains 50.7% of the variation in GDP growth, which is a fairly good fit. One explanation for this lies in the single significant factor.

Namibia is still getting its footing when it comes to its growing economy, and one that is important beyond all else at that stage is growing their stores of capital. Physical capital is so important that for a long time human capital and technology was not even considered in growth models. For comparison, we also built a regression of the United States over the same period, with almost the same factors (students in primary was removed due to unavailability):

U.S. Growth Model Regression Results			
	OLS		
	Est.	S.E.	p
(Intercept)	0.036**	0.010	0.002
pop_growth	0.116	1.312	0.930
gross_cap_growth	0.314**	0.090	0.002
life_exp_pc	0.533	0.568	0.358
for_dir_pc	0.000	0.000	0.253
unemp_chng	-0.059**	0.021	0.010
internet_chng	0.012	0.014	0.416
savings_pc	-0.251*	0.106	0.027
Num.Obs.	30		
R2	0.839		

As noted, there are more significant factors, and a much improved R-squared value of 0.839. The hypothesis here is that the U.S., being much more established as one of the top developed nations, has a much different growth profile than that of a developing nation. As researcher primarily based in the U.S., these biases may have affected our choice of growth factors.

One of the factors in the Namibian regression that was close to being significant is the savings growth rate. An interesting note, there was originally a miscalculation during the data cleaning process, and the large deficit of 2016 was left out of the regression. When that was the case, the savings growth rate was significant at the 10% level. This leads us to think that the instability of this growing nation makes its GDP growth hard to predict. Statistical insignificance on a single case basis like this does not necessarily mean economic insignificance. When the 2016 recession is treated as a black swan event outlier, especially in the statistical context of only 30 data points, its atypical-ness does not reflect the usual economic behavior observed in the other periods.

## V. Recommendation

Based on our regression results and our interpretation of them, Namibia should focus on two things as they continue to stabilize into the future. As an exporter of physical goods such as uranium and diamonds, they should continue to focus on their capital formation. Not only is that the only significant statistic in our regression, but doubling down into what has already done them well is a good strategy. The second being to continue to increase their domestic savings. While not significant in the final regression, there is a positive correlation between savings growth and GDP growth. As they continue to grow into the future, they should turn their attention to match closer with the U.S. regression, which highlights unemployment, and, with negative correlation between savings and growth, warns of the consequences of oversaving.

Namibia is still only at the starting line, but has the natural resources and guidance to potentially become an economic powerhouse of the region.

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