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Economic Growth and Total Factor Productivity in Afghanistan

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ABSTRACT

The political regimes in Afghanistan have changed frequently, which makes it impossible to implement a specific pattern of economic growth policy. As a result, the economy has fluctuated significantly over the past more decades, and similar scenarios have continued repeatedly, it becomes important to analyze the economic growth through Total Factor productivity (TFP) determinants by using the Ordinary Least Squares (OLS) method for measuring the effect of determinants of Total Factor productivity such as education, health, capital, trade openness, government expenditure, and foreign aid on economic growth, and the Engle-Granger cointegration test for establishing long-term relationship between the selected variables. This study analyzes 44 years from 1970 to 2020 (excluding the period 1994-2000), obtained from the UN database and World Development Indicators (WDI).

All variables stationary at I(1) were confirmed by the Augmented Dicky-Fuller (ADF) test. Dummy variables are introduced to assess the effect of political regime changes post-2002 on economic growth. Before 2002 the result showed a positive and significant relationship between Real GDP and capital although foreign aid and government expenditure were negative and significant also health, represented by the infant mortality rate, indicated a positive and significant effect, opposing economic theory. Education and trade openness found an insignificant association. After 2002 the results found insignificant relationships between real GDP and all independent variables without Foreign aid and government expenditure. The Engle-Granger cointegration test has confirmed the long-term relationship between variables. The findings

emphasize that capital, government expenditure, and foreign aid can contribute to sustained economic development.
Keywords: Afghanistan, Economic Growth, Total Factor Productivity, Ordinary Least Squares.

1. INTRODUCTION

Political regimes in Afghanistan have undergone numerous changes, leading to an absence of a consistent economic growth policy. Economic growth tends to rise during periods of political stability or substantial foreign aid inflows, resulting in enhanced economic performance. For instance, from 2002 to approximately 2020, Afghanistan experienced relative economic stability, leading to GDP growth attributed to improved fundamentals of macroeconomic, structural reforms, institutional development, and dynamics of private sector. Despite its strategic location in Central Asia, Afghanistan has faced prolonged conflicts and shocks, significantly impacting its overall economy. Over four decades of conflict and political shock, notably the civil conflict and the Russian invasion spanning over four decades have led to significant losses in the potential for agricultural and horticultural products—important drivers of economic growth—as well as a notable reduction in the potential for agricultural and horticultural products, which are a major source of economic growth. (Mohsen *et al*., 2021).

The country is one of the least developed and poorest countries in the world as a result of protracted clashes, including the Russian invasion, civil conflict, and political shocks. After 2001, however, Afghanistan's political and economic history entered a new chapter as a result of a 10% economic growth brought about by a flow in remittances and foreign aid, particularly from the United States. Around $50 billion was given to the Afghan economy during this time. (CIA, 2015).

A major concept in economics is economic growth, which is defined as an increase in both production and consumption of commodities and services. Its measurement, often in terms of Gross Domestic Product (GDP) or Gross National Product (GNP) growth, serves as a crucial indicator. The main goal of macroeconomic policy is to promote economic growth, which is measured by a number of financial indicators including GDP growth rate, Total Factor Productivity (TFP), and Human Development Index (HDI). (Nareen *et al.*, 2018).

Total Factor Productivity (TFP) is part of Gross Domestic Product (GDP) growth that cannot be associated with traditional inputs, like labor, capital, both physical and human, and raw material. Total Factor Productivity (TFP) is all about how efficiently economies use inputs. Total factor productivity is commonly measured as a residual, that is, the portion of GDP that remains after accounting for the direct contributions of capital and labor inputs in total GDP (Barro and Sala-i-Martin, 2h004).

There is complementarity between public infrastructure and private capital. So investment in public infrastructure enhances TFP growth (Kim and Loayza, 2019). Private capital becomes more productive due to public infrastructure. However, this variable may have an opposing effect on economic growth due to crowding out of private investment. Different studies have found different results. For instance, Aschauer (1989) found a significant association between infrastructure and TFP in the U.S. Moreover, Munnell (1992) finds complementarity between public infrastructure and private investment. Another significant factor of TFP, found in the literature, is institutions. Literature shows that institutions are deep determinants of TFP growth (North, 1990; Acemoglu, Johnson, and Robinson 2004).

The economy's structural footprint is an important determinant of TFP. Chanda and Dalgaard (2008) highlight that the economy's structural design is an important determinant of TFP while institutions play an important role in shaping structural design. The regulatory framework that is in place affects TFP through its effect on resource allocation Djankov, et al., (2002), Loayza and Serven (2010). Similarly, economic and political institutions positively affect TFP growth (Ulubasoglu and Doucouliagos, 2004). Financial development is another determinant of TFP growth with a positive significant effect (Fisman and Love, 2004).

Given the uncertain performance of social and macroeconomic variables and the political regime's instability, the researcher is driven to empirically investigate how fluctuations in these factors impact economic growth through Total Factor Productivity (TFP) in Afghanistan. Similar research has been conducted in other developing countries such as Pakistan, Nepal, India, Iran, Bangladesh, and Turkey, shedding light on the broader implications of such fluctuations. The present research is the first attempt to find the social sector and macroeconomic factors affecting economic growth through TFP determinants along with the study of the effect of change in political

regimes on economic growth, by using a larger time series from several decades. Therefore, this study aims to explore the following research objectives:

1. To identify the role of change in the political regimes of Afghanistan on economic growth through TFP determinants over time and across different political regimes.
2. To analyze the factors that are responsible and significant for economic growth in Afghanistan through their impact on TFP.

The Specific hypotheses cover variations in TFP determinants and how can have a significant impact on Afghanistan's economic growth across political regimes such as education, health, foreign aid, trade openness, government expenditure, and capital. The significance of this research looks at how to increase economic growth through determinants of TFP because it is the closest indicator of economic performance and avoids reducing it through the key social and macroeconomic variables, the study also has an impact on the Afghanistan economy if the results are well taken by government policymakers, and also useful for researchers. To the best of my academic knowledge, the limitations of this research can be as follows: lack of references on economic studies related to Afghanistan's economy in the field of total factor productivity and lack of time series data for a long period for some major social and macroeconomic variables. The following is the outline for the paper: Section 2 evaluates pertinent literature. The research methods and data are covered in Section 3. The primary findings and discussion from the econometric study are presented in Section 4. Lastly, Conclusions.

2. LITERATURE REVIEW

2.1 Economic Growth Theories

Discusses the evolution of theories of economic growth, starting from classical theory to neo-classical and Keynesian theories. Highlights the contributions of Irving Fisher, Adam Smith, Ricardo, Keynes, and Friedman. Discusses macroeconomic variables and the roles of fiscal and monetary policies in achieving macroeconomic goals.

2.2 Development of Exogenous Growth Theories

Exogenous growth theories, as opposed to endogenous growth theories, emphasize external factors such as technological progress or exogenous shocks as the primary drivers of long-term economic growth. While endogenous growth theories focus on factors generated within the economic system itself, exogenous growth theories posit that growth is primarily influenced by factors outside the economic system.

One of the first exogenous growth models is the Harrod-Domar model (1946), which was created separately in the 1930s by Roy Harrod and Evsey Domar. It highlights the role of investment as the primary determinant of economic growth. The model suggests the capital-output ratio and the savings rate affect the rate of economic growth. However, it claims that technological progress is exogenous and does not consider factors such as innovation or human capital accumulation (Hagemann, 2009)

Another well-known exogenous growth theory is the Solow-Swan growth model, which was developed in the 1950s by Robert Solow and Trevor Swan. This model highlights how long-term economic growth is mostly driven by external technological advancement. The Solow-Swan model assumes that technological advancement happens independently of economic variables, and it is frequently described as an ongoing rate of exogenous technological change (A).

Neoclassical growth theory, influenced by the work of Solow and others, emphasizes the role of exogenous factors such as capital accumulation and population growth in determining economic growth. This theory states that physical capital accumulation combined with diminishing returns to capital results in steady-state growth rates that are set by external variables like the population growth rate and savings rate.

Exogenous growth theories also include models that emphasize structural changes in the economy as drivers of growth. For example, theories of structural transformation highlight the role of shifts in production from traditional agriculture to modern manufacturing and services sectors as a driver of economic development. These models often consider exogenous factors such as changes in global demand, technological innovations, or policy shocks as catalysts for structural change.

Overall, exogenous growth theories have played a significant role in shaping our understanding of the determinants of economic growth, particularly in highlighting the importance of exogenous factors such as technological progress, investment, and structural changes. Long-term economic development is still mostly driven by exogenous factors, even if endogenous growth theories have gained popularity in recent decades.

- The evolution from Solow-Swan's exogenous growth theory to the emergence of endogenous growth theories.

- Lucas (1988), Jones and Manuelli (1990), Grossman and Helpman (1991), Romer (1986 & 1990), and Rebelo (1991) provided theoretical and empirical contributions.

- Endogenous growth theories introduce human capital, knowledge, and R&D, making growth rates endogenous to economic models.

2.3 Total Factor Productivity and Economic Growth

TFP growth reflects improvements in the efficiency with which inputs are transformed into output. Technological advancements, better production techniques, and organizational innovations can enhance productivity and enable firms to produce more output with the same level of inputs. As firms become more efficient, overall output levels increase, leading to economic growth.

TFP growth is closely associated with innovation and technological progress. Innovations in products, processes, and technologies let firms develop both goods and services more efficiently, which improves productivity levels. Technological advancements also create new opportunities for firms to introduce new products, expand into new markets, and create value, contributing to economic growth.

TFP growth can generate positive spillover effects throughout the economy, contributing to broader economic development. For example, technological innovations in one industry can spill over to other industries through knowledge diffusion, supply chain linkages, and labor mobility. These spillovers can lead to productivity gains across the economy, stimulating further economic growth.

Overall, TFP growth plays a principal role in leading long-term economic growth by enhancing productivity, fostering innovation, facilitating resource reallocation, and generating positive spillover effects throughout the economy. Understanding the determinants of TFP growth and implementing policies to promote innovation, research and development, education, and efficient resource allocation are critical for sustaining economic growth and improving living standards over time.

- TFP measured as a residual in the Solow-Swan model, representing the unexplained portion of economic growth.

-TFP is a Solow Residual that is used for analyzing the growth of the economy into its components. It is computed using the Growth Accounting Method (GAM).

- Review of TFP studies in various countries, including Singapore, Hong Kong, and major Asian economies, assessing their contributions to economic growth.

In the neoclassical perspective, total factor productivity (TFP) is often treated as an exogenous factor driven solely by technological progress. This implies that government policies have limited influence on the steady state of an economy. However, new growth theories challenge this notion, emphasizing endogenous factors such as education, research, and development. In Afghanistan, where challenges like low government expenditure on education and limited investment in research and development persist, the impact of these endogenous factors on TFP remains uncertain.

Furthermore, macroeconomic factors that promote productivity growth include stable exchange rates, low inflation, and well-managed public finances. These factors impact confidence and resource allocation efficiency. However, empirical studies on how these macroeconomic variables specifically affect TFP in Afghanistan are lacking, leaving room for exploration in understanding the relationship between macroeconomic conditions and TFP in the country.

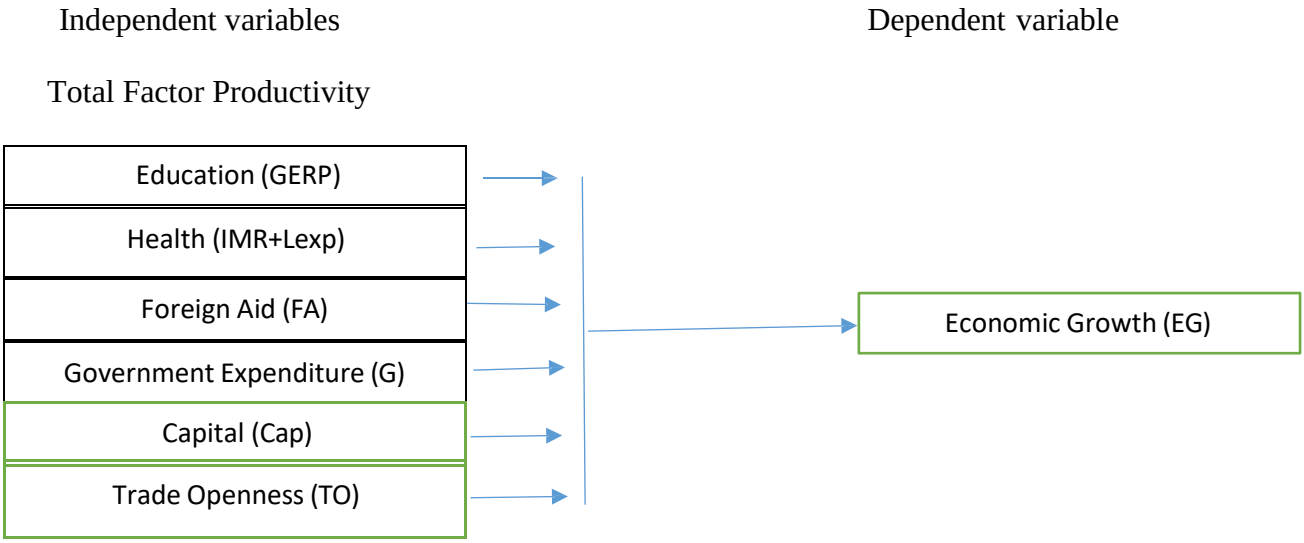
The Solow-initiated growth accounting approach divides economic growth into input-related components and a residual that reflects progress in technology. This approach provides a useful framework for analyzing the determinants of growth. Yet, the literature also acknowledges that the residual, often attributed to TFP, may not be a mere measure of ignorance but captures

organizational and technologically-induced efficiencies. Determining the factors that contribute to this residual is crucial to understanding the essence of the growth process, especially considering the specific challenges that Afghanistan faces.

2.4 Conceptual Framework

The researcher was inspired to conduct an empirical investigation into how these macroeconomic and social variables impact economic growth through Total Factor Productivity (TFP) in Afghanistan's economy, so after this theoretical framework's topic, which, to the best of the scholar's knowledge, identifies us causes of economic growth through determinants of TFP growth.

Figure 2.1:



Source: Developed by scholar

2.3 Empirical Studies

Xu et al. (2008) examined the factors that contributed to China's growth in the economy, emphasizing the knowledge-sharing potential of human capital as well as trade openness and foreign direct investment. The research, which used extensive panel data from 29 provinces between 1994 and 2006, indicated that trade openness, foreign direct investment, and human capital all significantly influenced total factor productivity. However, their significance differed according to the provinces' technological levels.

Uwakaeme (2015) investigated economic growth in Nigeria from 1980 to 2012, utilizing Johansen Co-integration and Granger Causality tests. The study identified a positive and significant long-run relationship between GDP and selected economic indicators, including foreign direct investment, industrial productivity index, and stock market capitalization. Trade openness exhibited a positive impact, albeit less impressive, while inflation and excessive government fiscal deficit had significant negative relationships with economic growth.

Macroeconomic determinants of economic growth has been investigated by Ismaila and Imoughele (2015) in Nigeria, employing time series data between 1986 and 2012. ADF tests, Johansen's co-integration test, and Ordinary Least Squares (OLS) were among the methods used. Six co-integrating equations that established a long-term relationship between the variables were shown by the results. The three main factors that determine Nigeria's economic output are total expenditure by the government, foreign direct investment, and gross fixed capital formation.

Khan et al. (2020) investigated the influence of TFP to economic growth in Pakistan from 1978 to 2019, utilizing the Johansen and Jusilies Co-integration technique. The growth equation, estimated through a growth accounting approach, included labor force, physical capital, human capital, and trade openness as control variables. Both in the short and long terms, the study found a long-term association between TFP and economic growth.

Malik et al. (2021) investigated the potential association and importance of variables influencing Total Factor Productivity (TFP) in India between 1980 and 2016. Utilizing a two-stage methodology, the research measured variations in TFP through growth accounting approach and determined variables using the Autoregressive Distributed Lags (ARDL) model. The findings showed that financial development and inflation had a statistically significant effect on TFP. While exports, government size, and natural disasters had statistically negative effects on TFP, foreign direct investment, imports, and capital formation had positive but insignificant effects.

Elsharif and Babiker (2021) analyzed the effects of macroeconomic variables on Saudi Arabia's Gross Domestic Product (GDP) from 1993 to 2019. Employing the ARDL model and Bounds testing, the study found positive significant effects of budget deficit, oil price, and money supply on GDP, while other variables had no significant effects.

Karimi et al. (2021) investigated the determinants of Afghanistan's economic growth utilizing OLS regression and Co-integration analysis. The research emphasized the crucial function of domestic investment, exports, and imports in promoting economic growth, whereas official development assistance / foreign aid played an insignificant role. The long-term association between the variables was confirmed by the Johansen Co-integration test, highlighting the significance of both foreign aid and domestic investment in affecting economic growth.

Mohsen et al. (2021) examined the effects of macroeconomic variables on GDP growth in Afghanistan from 2002 to 2019, using the bounds co-integration approach and ARDL model. Short-term results showed positive impacts of the exchange rate and foreign direct investment (FDI) on GDP growth. Inflation had mixed effects, and the net export ratio to GDP showed a negative impact on GDP growth.

Koçak et al. (2021) evaluated how China's utilization of natural resources was impacted by structural change, modernization, globalization, and total factor productivity between 1970 and 2017. The findings showed that total factor productivity, urbanization, industrialization, and income growth all had a negative impact on the sustainability of natural resources. Global integration contributed positively to resource sustainability, while institutional development showed no statistically significant relationship.

Memon et al. (2021) examined how macroeconomic indicators affected Pakistan's economic growth between 1991 and 2020. Employing ADF and Johansen Co-integration tests, the OLS model indicated that government expenditure, household consumption, and net exports had positive and significant influences on economic growth, while inflation had a significant negative impact.

Rahimi (2021) examined the impact of fiscal policy on economic growth in Afghanistan from 2003 to 2019, using the ARDL model. The results indicated a positive and significant effect of government expenditure on economic growth. Long-run relationships were established between government expenditure and GDP growth.

Fitriady et al. (2022) analyzed the impact of macroeconomic variables on real economic growth in Indonesia, using panel data regression from 32 provinces. The human development index (HDI)

had a positive and significant effect, foreign direct investment (FDI) had a positive and significant effect also, while poverty had a negative and insignificant effect. The Gross Regional Domestic Product (GRDP) was positively but not significantly impacted through domestic investment.

Ahmed and Sabawi (2022) highlighted the impact of economic changes on overall economic growth in Iraq from 1995 to 2020, using the Bounds co-integration approach, Dickey-Fuller, Phillips-Perron, and ARD methods. The research findings indicate a negative relationship between the long-term GDP and net foreign operations, inflation rate, and broad money supply. In the short term, direct relationships were observed between net foreign operations, broad money supply, and GDP.

Siddique (2022) explored the determinants of TFP in Pakistan, analyzing annual data from 1990 to 2019 through a growth accounting framework. Results indicated positive correlations between TFP growth and openness, inflation, capital intensity, institutions, innovation, and credit-to-GDP ratio. Conversely, IMF programs, education, and infrastructure showed negative relationships with TFP. The study emphasized the importance of enhancing TFP for sustained GDP growth.

The study addresses the gap in the literature by exploring the impact of political changes on economic growth, specifically through the lens of TFP. Previous works primarily focused on explaining TFP and its determinants' effect on economic growth, neglecting the influence of political regime changes. This study aims to fill this gap by investigating how political changes affect economic growth while also taking into consideration Afghanistan's particular historical economic conditions.

3. DATA AND METHODOLOGY OF RESEARCH

3.1 Data

Time series data is collected from secondary sources to achieve research objectives. The data covers the years 1970 to 2020, except 7 years (1994 to 2000) because of political shocks and internal conflicts. The sources from which data is taken are the World Development Indicators (WDI) and the UN database. Covering variables such as GDP, exports, imports, government spending, labor force, education, health, and foreign aid. The model's representation of the health variable is the infant mortality rate.

3.2 Methodology

The study aims to analyze the impact of various variables on economic growth through TFP determinants using Ordinary Least Squares (OLS) regression. In order to address the spurious regression issue, the study employs a unit root test, namely the Augmented Dickey-Fuller (ADF) test, to confirm the stationarity of the series, to examine the long-run relationship between selected variables the research utilized the Engel-Granger (1987) test, and considering the existence of a dummy variable representing the effect of political changes in 2002 when a new Republic Government was established in that time.

3.2.1 Economic Growth Estimation

This research attempts to define the determinants of economic growth through TFP determinants using Ordinary Least Squares (OLS) regression to examine the impact of macroeconomic, social variables, and political shock effect on the economic growth of Afghanistan, A model is constructed with dummy variables (Dum) to find the effect of change in the political regimes on the economic growth of Afghanistan from 2002 to 2020 (the main time of the study). This model aims to find final worthy form of the economic growth model as follow.

$$Log(RGDP/LF) = \beta_0 + \beta_1 \log(GCF/lf) + \beta_2 \log(OA) + \beta_3 \log G/GDP + \beta_4 GERP + \beta_5 IMR + \beta_6 TO + \beta_7 Dum + \beta_8 Dum * \log(GCF/lf) + \beta_9 Dum * \log(OA) + \beta_{10} Dum * G/GDP + \beta_{11} Dum * GERP + \beta_{12} Dum * IMR + \beta_{13} Dum * TO + u_t$$

Where,

GDP = Dependent/endogenous variable representing Gross Domestic Product per labor force (shown real economic growth)

GCF = independent variable representing Capital per labor force (GFCF, as a measure of capital)

OA = independent variable representing Official Development Assistance (Foreign Aid)

G = independent variable representing Government Expenditure, ratio of G to GDP

GERP = independent variable representing Education (gross school enrollment rate)

IMR = independent variable representing infant mortality rate (health)

TO = independent variable representing trade openness [(EX+IM)/GDP]

Dum = Dummy variables representing change of in the political regimes and also Dum*… representing multiply of into different variables.

u = Random Error Term

t = Time (Shows that the data is time series)

β (0, 1,…,13) = Parameters of the model and β_0 also the intercept of model

Log = Logarithm form of the variable

The above Equation is estimated as the economic growth for testing the role of selected social, political and macroeconomic variables on economic growth through TFP determinants of Afghanistan.

4. RESULTS AND DISCUSSION

4.1 Unit Root test

After applying the ADF test to verify stationarity, it was found that the variables were stationary after taking the first difference but non-stationarity at the level.

Table 4.1 Unit Root Results for the Chosen Variables in Level and I(1) Form

Variables	Test statistic				Test critical values at 1st difference and Intercept		
	Level and Intercept		1st difference and Intercept				
	t-Statistic	Prob.*	t-Statistic	Prob.*	1 %	5 %	10 %
LOG(GDP/LF)	-2.0289	0.2738	-3.7814	0.0061	-3.596	-2.9331	-2.6049
LOG(GCF/LF)	-1.0311	0.7334	-3.4649	0.00071	-3.596	-2.9331	-2.6048
LOG(OA_D)	-0.6652	0.8442	-3.5660	0.0009	-3.601	-2.9350	-2.6058
Govt Exp (G)	-3.2729	0.0848	-4.8962	0.0015	-4.192	-3.5207	-3.191

GERP	-1.0896	0.7112	-4.9134	0.0002	-3.596	-2.9331	-2.6048
IMR	0.7301	0.995	-3.0923	0.0005	-4.601	-3.9250	-3.1929
Lexp	-1.4553	0.8305	-5.344	0.0004	-4.189	-3.518	-3.1897
(EX+IM)/GDP	-3.4420	0.2283	-5.0789	0.000	-3.595	-2.5331	-2.3402
TFP	-2.7257	0.2332	-3.9208	0.0002	-4.198	-3.5236	-3.192

Source: Developed by scholar's Calculations based on dataset of UN database (Various Issues) and WDI (Various Issues). Automatic lag selection has been performed using SIC, with a maximum lag of 9. *The calculation analysis was performed by EViews software.*

4.2 Estimation of Economic Growth model

This stage involves reintegrating the TFP determinants into the economic growth equation so that Afghanistan's economic growth is determined through the variables that affect TFP growth, such as social and macroeconomic factors, as well as dummy variables that stand in for political regime shock and fluctuating. Moreover, the economic growth model incorporates determinants of TFP growth, such as education, health, foreign aid, government expenditure, trade openness, and capital, to estimate GDP per labor force. The dummy variable D_REP accounts for changes in political regimes, particularly after 2002.

The factors influencing economic growth, as measured by real GDP from 1970 to 2020, are displayed in Table 4.2. LOG(RGDP/LF): This is the real GDP to labor force (LF) ratio expressed as the natural logarithm. It is a dependent variable, usually applied as an assessment of economic growth that the research is attempting to explain or forecast.

D_REP is used to find the effect of change in the political regimes on the economic growth of Afghanistan from 2002 to 2020 (the main time of the study) it takes the value of 1 from 2002 to 2020 (presumably representing specific years) and 0 otherwise to show the shock that happened in 2002 when became new Republic Government at that time.

The result between capital (GCF) per labor force (LF) and economic growth was found to be positive and significant, due to the first two decades the government was invested in the industrial and infrastructure sector before 2002. After 2002 the Capital variable is insignificant in this model,

due to there is an increase in the capital than at other times, therefore society was dependent on consumption materials also the government did not use the capital in the real economic sectors appropriately, such as the industrial sector and also presenting administrative corruption at the government level consequently the government did not exploit this opportunity efficiently.

the result of foreign aid found before 2002 negatively, due to the percentage of foreign aid before 2002 was lower as compared to after 2002, and during that period there was mostly civil conflict, war, political shock, and more insecurity in the history of Afghanistan, the government was spending more of this foreign aid in the security sector, when did not find any other sources for spending, as spending on wars and defense have an adverse effect on economic activities and livelihood than on economic growth therefore, the inverse relationship was found between real economic growth and foreign aid in the period before 2002. After 2002 foreign aid had a significant and positive relationship between Foreign aid and economic growth, the percentage of foreign aid was greater than in other periods and there was relative stability in economic activities and positive future expectations in the economy, therefore foreign aid had a significant effect on Afghanistan's economic growth after this period. At the same time, there was spending on the security sector but the ratio of foreign aid was greater than the cost of security.

On the other hand, there is a negative and significant association between the expenditures of the government and Afghanistan's economic growth previously 2002, because the government of Afghanistan was spending more on wars and security than other sectors, so this government spending had a negative impact on society and economic activities, therefore on economic growth. After 2002, there was a positive and significant impact between the spending of the government and Afghanistan's economic growth, as the state of Afghanistan received more revenues from foreign aid and foreign purchasing power as compared to other times in the economic history of Afghanistan, therefore positively affecting economic variables and thus economic growth.

The model indicates that education, as measured by the gross school enrollment rate (GERP), has an insignificant impact but an unexpected negative sign. Therefore Education is insignificant during the study of research due to political shock, wars, insecurity, the failure to utilize the outputs from education in a better way. the traditional culture was different compared to other countries, the people's lives depended on the traditional agricultural sector, some of the people did not like

to enroll the schools, especially in the villages, all these reasons the education was the insignificant effect on economic growth in the duration of the study.

Before 2002, the result of the infant mortality rate which represents health was positive and significant, opposing economic theory, therefore there was less population at that time in Afghanistan, as most of the population lived outside Afghanistan due to wars and insecurity, it led to a reduction in data. after 2002, there was an insignificant role in economic growth, the government focused on the health sector with an increase in health centers in various parts of the country, but the people who left their homes and migrated to other countries returned to their country most of them, thus the human capital has been increased in society, the infant mortality rate decreased, the important thing is that most people are dominated by cultural and traditional customs, so most newborns are born in their homes without returning to a hospital. Despite all that, health variable remains without affecting economic growth.

The trade openness (Exp+Imp/GDP) shows an insignificant effect in the study period, as the most main parts of trade openness are imports and exports. There is no doubt that Afghanistan imported most of the things that were consumption things and the least of technical materials and machines, but these equipment and machines were not exploited efficiently to Increase the overall productivity process and real economy. on the other hand, Afghanistan receives foreign aid in the form of money and foreign currency, they use this money in the activity of nominal economy and trade openness, therefore there is no effect on the real economy so, the main aim of this research is trying to find determinants that effect on the real economic growth, consequently there was insignificant effect in this model.

The values of R^2 and R^2 – adjusted are 98% and 97% respectively, which shows goodness of fit which demonstrates more than 98% variation in RGDP (economic growth) is described by these observed determinants, with the remaining variation being explained by other variables connected to the error term in the research model that does not replace it.

the extremely low Prob(F-statistic) = (0.000) indicates that the model as a whole is statistically significant. This means that at least one of the independent variables in the model is contributing significantly to explaining economic growth. In this case, the extremely low p-value (close to zero) associated with the F-statistic (153.97) indicates that the model as a whole is statistically

significant. This means that at least one of the independent variables in the model has a significant impact on economic growth. the Durbin-Watson statistic is approximately 1.396, which is significantly below 2. This shows that there may be variables driving economic growth that the model missing or that there may be positive autocorrelation in the residuals, suggesting that not any relevant data is being captured through the model.

The research estimates the economic growth function, which is the basis of this study, as follows:

LOG(RGDP/LF)= 2.065 -12.451D_REP + 1.197LOG(GCF/LF) -0.048LOG(OA_D*ER) -2.84E-08G/GDP +0.0007GERP + 0.0069IMR+ 8.71E-10 (EX+IM)/GDP + 0.214LOG(OA_D*ER)*D_REP -0.818LOG(GCF/LF)*D_REP + 2.92E-08D_REP*G/GDP - 0.006D_REP*(IMR) -1.00E-09D_REP*(EX+IM)/GDP

Table 4.2: Estimation Results of Economic Growth

Input	Coefficients	Standard errors	t-Statistic	P-value
C	2.065	1.402	1.473	0.151
(D_REP, 2002-2020)	-12.451	4.433	-2.809	0.008
Log(GCF/LF)	1.197	0.205	5.845	0.000
Log(OA_D*ER)	-0.048	0.017	-2.803	0.0086
G/GDP	-2.84E-08	1.07E-08	-2.658	0.012
GERP	0.0007	0.0019	0.377	0.708
IMR	0.0069	0.0015	4.505	0.0001
(EX+IM)/GDP	8.71E-10	5.32E-10	1.636	0.1119
Log(OA_D*ER)*D_REP[#]	0.214	0.074	2.894	0.0069
Log(GCF/LF)*D_REP[#]	-0.818	0.445	-1.837	0.076
D_REP*G/GDP[#]	2.92E-08	1.07E-08	2.724	0.0105
D_REP*(IMR)[#]	-0.006	0.0034	-1.804	0.0808
D_REP*(EX+IM)/GDP[#]	-1.00E-09	5.42E-10	-1.848	0.0741
R-squared= 0.98		Prob(F-statistic)= 0.000		
Adjusted R-squared= 0.97				
F-statistic= 153.97				

Source: Developed by scholar's Calculations based on dataset of UN database (Various Issues) and World Development Indicators (Various Issues). The calculation analysis was performed by EViews. This (#) sign indicated that the value of these variable showed estimated time after 2002.

4.3 Engle-Granger Cointegration Test

All variables must be stationary at I(1) in order to use the Engle-Granger cointegration test. The Engle-Granger test is applied in this particular case. The unit root test utilizing the ADF test in the stationary and non-stationary section confirmed that all of the variables are stationary at the first difference. This suggests that in order to measure the long-term relationship between the variables chosen for the study, the Engel-Granger cointegration test for the economic growth model should be applied.

The Engle-Granger cointegration test consists of two steps. To estimate the cointegrating relationships, one variable is regressed on the other using ordinary least squares (OLS) regression in the Engle-Granger approach. This is the first step in the co-integration regression process. Next, the residuals are examined using a unit root test to determine whether the regression's residual (ε) is stationary. Testing tools such as the Augmented Dickey-Fuller (ADF) test are commonly used for this purpose. If the residuals are found to be stationary at the level, there can be a cointegrating relationship between the selected variables. The cointegrating relationship implies a long-term equilibrium or relationship between the variables (Lee and Lee, 2015).

4.3.1 Step one

It makes no difference in this regression whether the variable is the independent variable and which is the dependent variable. Instead, any one of these variables is studied in the research, either in addition to the independent variable or the dependent variable. In order to confirm whether there is cointegration in the long run, the research conducts cointegration regression until the study is confirmed by the test for stationary of residual series as follows:

LOG(RGDP/LF)= -1.318 +0.78LOG(GCF/LF) - 0.084LOG(OA_D*ER) + 1.37E-09G/GDP + 0.0089GERP + 0.00231IMR – 4.97E-10(EX+IM)/GDP

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Table 4.3 Estimation Results of Co-integration

Input	Coefficients	Standard errors	t-Statistic	P-value
Constant (C)	-1.318	0.748	-1.763	0.086
LOG(GCF/LF)	0.781	0.137	5.6689	0.000
LOG(OA_D*ER)	-0.084	0.0168	-5.0135	0.000
G/GDP	1.37E-09	7.35E-10	1.869	0.069
GERP	0.0089	0.00097	9.171	0.000
IMR	0.0023	0.00078	3.037	0.004
(EX+IM)/GDP	-4.97E-10	1.08E-10	-4.593	0.000
R-squared= 0.968		Prob(F-statistic)= 0.000000		
Adjusted R-squared= 0.963		Durbin-Watson stat= 1.413		
F-statistic= 190.749				

Source: Developed by scholar's Calculations based on dataset of UN database (Various Issues) and World Development Indicators (Various Issues). The calculation analysis was performed by EViews

4.3.2 Step Two

To verify the presence of cointegration between variables over an extended period, the study performs a unit root test utilizing the ADF test for residual stationarity. This process continues until the study verifies that the residual series is stationary as follows:

Table 4.4: ADF- Unit Root test on Residual

Variable	Test statistic				Test critical values		
	Level and Intercept	Prob.*	1st difference and Intercept	Prob.*	1 %	5 %	10 %
	-3.968924	0.0001			-2.621185	-1.948886	-1.611932

Source: Developed by Scholar

The result of Table 4.4 indicated that the P-value is less than 0.05, which is equal to 0.0001, this indicates that at the level, the residual series is stationary. A long-term, reliable relationship between the variables is suggested by the stationary residuals. The residual is stationary, indicating that the variables in the economic growth model are cointegrated, in contrast to the scenario where the null hypothesis (H_0) is rejected in preference for the alternative hypothesis (H_1 The presence of co-integration between all the variables already described in the economic growth model in this part is indicated through the residuals being stationary.

4.4 Discussion

The study also compares Afghanistan's economic growth rates over different decades, highlighting the highest growth rates observed in the last two decades (2001-2020). However, the 1990s marked a period of significant instability and economic downturn, often referred to as Afghanistan's "lost decade," characterized by negative TFP and GDP growth rates amidst political turmoil and poor macroeconomic management.

Conversely, improvements in stabilization policies, structural reforms, and private sector dynamism in the 2000s contributed to enhanced TFP and GDP growth rates in both Afghanistan and Pakistan. These findings align with existing literature on neighboring countries' growth experiences, emphasizing the pivotal role of political stability, governance, and resource utilization efficiency in driving economic growth.

Comparisons of study results with neighboring countries, such as Pakistan, reveal similar patterns of economic growth influenced by political instability, governance issues, and suboptimal resource utilization. Studies on Pakistan's economic woes during the 1990s mirror like Afghanistan's challenges, emphasizing the negative impact of political instability and inadequate governance on economic growth.

Conversely, improvements in stabilization policies, structural reforms, and private sector dynamism in the 2000s contributed to enhanced TFP and GDP growth rates in both Afghanistan and Pakistan. These findings align with existing literature on the country and neighboring countries' growth experiences, emphasizing the pivotal role of political stability, governance, and

resource utilization efficiency in driving economic growth, like Rahimi (2021), Mohsen et al. (2021), Memon et al. (2021), and Elsharif and Babiker (2021).

The results of cointegration may have an impact on long-term policy planning if the study variables are connected to policy or economic concerns. Making decisions sometimes requires an understanding of the steady relationship between variables, like the results of the study of Karimi et al. (2021), Khan et al. (2020), Ismaila and Imoughele (2015), Uwakaeme (2015)

In summary, the study's results corroborate findings from the literature on neighboring countries, highlighting common opportunities and challenges for economic progress in the region. These insights underscore the importance of addressing governance issues, implementing structural reforms, and optimizing resource utilization to foster sustained economic growth in Afghanistan and its neighboring nations.

5. CONCLUSION AND RECOMMENDATION

The research's principal objectives to assess the impact of political regimes changes on the economic growth of Afghanistan through the determinants of TFP, and explore factors influencing economic growth during the study period.

Commencing to scrutinize the role of Total Factor Productivity (TFP) determinants in Afghanistan's economic growth from 1970 to 2020 (excluding 1994-2001), the study ensured stationarity through the ADF test. It confirmed that all variables were in the ' first-difference stationary.

The economic growth model was used dummy variable to find the effect of changes in the political regimes of Afghanistan on economic growth in the duration of the main time of the study, from 2002 to 2020 as compared to other before years. This dummy variables show the shock that happened in 2002 when the new Republic Government became at that time. Before 2002 the result showed a positive and significant relationship between economic growth and capital although foreign aid and government expenditure were negative and significant relationship also health, represented by the infant mortality rate, indicated a positive and significant effect, contrary economic theory. Education and trade openness found an insignificant association. After 2002 the results showed insignificant relationships between dependent variable and all

exogenous/independent variables without Foreign aid and government expenditure. The result of R^2, R^2-Adj, F-Statistic, and p-value Statistic showed that the model of determinants of TFP and economic growth is in the acceptable standard range. Which is generally a desirable characteristic of a regression model. These statistics collectively suggest that both of the study models is a good fit for the selected data and provide meaningful insights into the association between the TFP determinants and economic growth.

The regression model exhibits a high R-squared value of approximately 0.98, indicating that 98% of the variation in economic growth is explained by the independent variables. Even after taking the complexity of the model into account, the adjusted R-squared value of 0.97 is still high, indicating significant explanatory power. The model's overall statistical significance is further confirmed through the extremely low p-value related to the F-statistic.

However, the Durbin-Watson statistic of approximately 1.396 suggests the presence of positive autocorrelation in the residuals, indicating potential shortcomings in capturing all relevant information or omitted variables affecting economic growth.

The acceptable standard range is taken by analysis results of the R^2, R^2-Adj, F-Statistic, and p-value statistic. Overall, the low Durbin-Watson statistic suggests that there may be autocorrelation in the residuals that requires further investigation and potential model refinement, even though the high R-squared and low p-value show that the model is statistically significant and explain a significant portion of economic growth

Engle-Granger tests affirmed cointegration, signifying long-term relationships among selected variables. The comprehension of economic dynamics and the direction of long-term policy planning for economic policymaking are greatly dependent on this long-term relationship.

Overall, the analysis highlights the complex interplay of social, political, and economic factors influencing TFP and economic growth in Afghanistan, underscoring the need for targeted investments, structural reforms, and efficient resource utilization to foster sustainable development.

In fact, the study recommends that encouraging further research to enhance understanding of TFP determinants in Afghanistan. Focusing on TFP as a significant contributor to Real Gross Domestic

Product (RGDP) and investigating its major sources to formulate effective macroeconomic policies. Prioritizing capital, foreign aid, and government expenditure in economic policies, emphasizing increased resource allocation and creating conducive environments for attracting capital and Foreign aid. Identifying and addressing literature gaps, considering the role of other TFP components in economic growth, and exploring fiscal and monetary policy instruments.

These recommendations aim to guide future research and inform policy decisions for fostering sustainable economic growth in Afghanistan. Lastly, future research should delve into the interplay between total factor productivity, infrastructure development, and industrialization, which remains unexplored in the current literature.

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