Print ISSN: 2288-4637 / Online ISSN 2288-4645
doi:10.13106/jafeb.2021.vol8.no2.0771

Long-Term Growth Model in Myanmar Based on the Growth Trajectory of Vietnam*

Injae JEON[1], Yooncheong CHO[2]

Received: November 05, 2020 Revised: January 05, 2021 Accepted: January 15, 2021

Abstract

The purpose of this study is to identify major drivers of Myanmar's long-term economic growth and draw implications to implement development policies. This study investigated Myanmar, as the country is the most recently opened economy in Southeast Asia. This study conducted simulation analysis based on scenarios by applying World Bank's Long-Term Growth Model, Penn World Table 9.1, and World Development Indicator data. This study makes extensive use of LTGM and the LTGM-TFP extension to improve the validity of models for data calibration. This study confirms the validity of the model with data calibration and specifies scenarios for simulation analyses by setting the growth trajectory of Vietnam due to common geographical, political, and economic conditions. Main findings include that Myanmar's economic growth rate will continue to fall below 3% in 2040 without proper improvement of growth drivers. The results of this study also provide that total factor productivity growth and female labor participation are key factors for Myanmar's long-term economic growth. This study advises policymakers in Myanmar to strengthen human capital, which is crucial for total factor productivity growth in Myanmar's context and directly affects economic growth. Further, labor market policies to promote female labor participation is important to sustain economic growth.

Keywords: Long-Term Growth, Productivity, Labor

JEL Classification Code: O47, J24, J18

1. Introduction

Sustainable economic growth is a logical way for a country to become productive. The real GDP (Gross Domestic Product) per capita in the United States has grown from $3,340 in 1870 to $33,330 in 2000, the second highest level in the world in 2000, and the average annual growth rate was only 1.8% during the period (Barro & Sala-i-Martin, 2004). This long-lasting economic growth is more important than a high economic growth rate itself. East Asian miracle economies such as Taiwan, Singapore, and South Korea were not made by recording the highest economic growth rates several times, but rather by sustaining a fairly high level of economic growth over the long term. Since the 2000s, the growth rates of the emerging market and developing economies have begun to outpace those of advanced economies.

As this trend is expected to continue in the future, some developing countries that sustain long-term economic growth will be those that succeed in leapfrogging. The World Bank developed the Long-Term Growth Model (LTGM), an Excel-based tool for simulation analysis to support policymakers to measure the impact of changes in growth drivers such as investment, savings, labor participation, and productivity on long-term economic growth. In addition, LTGM-TFP extension has been also developed to simulate the impact of major determinants on Total Factor Productivity (TFP) growth because it is crucial for sustaining economic growth.

The purpose of this study is to investigate the application of LTGM and LTGM-TFP extension to Myanmar, the most recently opened economy in Southeast Asia. This study

***Acknowledgements:**
This paper was modified and developed from the thesis of the first author.
[1]First Author. Senior Research Associate, Center for International Development, Korea Development Institute (KDI), Korea. Email: jeonsom@kdi.re.kr
[2]Corresponding Author. Professor, KDI School of Public Policy and Management, Korea [Postal Address: 263 Namsejongro, #337, Sejong, 30149, Korea] Email: ycho@kdischool.ac.kr

aims to identify the major drivers that have an impact on the long-term economic growth of Myanmar and to draw policy implications with limited fiscal space. By doing so, this study improves the validity of LTGM and LTGM-TFP extension through data calibration used in the models. In addition, this study specifies scenarios for simulation analyses by setting the growth trajectory of Vietnam as a benchmark for Myanmar's long-term growth due to common geographical, political, and economic conditions. Vietnam opened its market about 25 years ahead of Myanmar and has shown remarkable development performance through overall economic reforms.

Under the military regime that lasted for almost 50 years, from 1962 to 2011, Myanmar had fallen into the Least Developed Country (LDC) category. However, since transitioning to a civilian administration in 2011, Myanmar has undertaken wide-ranging economic, social, and governance reforms (Asian Development Bank, 2017). Thanks to these reform efforts and the lifting of international sanctions, Myanmar has achieved robust economic growth with 6.9% real GDP growth rate on average between 2011 and 2018. Myanmar is regarded as a country with great economic potential, but there are also concerns about its long-term growth. The lack of hard and soft infrastructure is pointed out as a significant impediment to Myanmar sustaining high economic growth over the long term, and political instability such as ethnic conflicts and the depletion of natural resources that contribute the most to exports are also major development challenges (ADB, 2017; ASEAN + 3 Macroeconomic Research Office, 2019). Under these constraints, more fundamental improvements are required for Myanmar to lay foundations for sustainable economic growth. This study simulates how Myanmar's economic growth rate changes over 2020–2040, if Myanmar reaches the level of major growth drivers in Vietnam such as investment rate, female labor participation rate, human capital growth, and TFP growth by 2030. Based on simulation results, policy implications are drawn for Myanmar's long-term economic growth.

This study contributes to measure the impact of each growth driver for economic long-term growth in Myanmar and draws implications to implement development policies. In addition, through data calibration, this study secures the validity of simulation analyses using the LTGM and the LTGM-TFP extension. Furthermore, the approach applying two models comprehensively could be a reference to policymakers and researchers in utilizing them.

2. Literature Review

After the introduction of the neoclassical growth model by Solow (1956), capital accumulation per capita has been considered crucial to increasing output per capita, although this does not guarantee sustainable economic growth. Barro and Sala-i-Martin (1990, 1991, 1992) and Mankiw, Romer, and Weil (1992) shows the validity of the neoclassical growth model, modifying the model or its assumption, and the relationship among savings, investments, and economic growth is empirically proved (Attanasio, Lucio, & Antonello, 2000; Hevia & Loayza, 2011; Young, 1995). Along with capital accumulation, demographic features of the labor market such as the working-age population and the labor force participation are also major factors affecting economic growth. Although more output with more labor input is natural, an important point is whether increasing labor input is possible. So, the working-age population and participation rate are associated with the acceleration of economic growth (ADB, 2011). Bloom, Canning, and Fink (2011) argued that favorable demographic factors are critical to economic growth in East Asia. Meanwhile, Lucas (1988) stressed the role of human capital and the quality of the labor force with its externality for sustainable economic growth. Human capital contributes to economic growth in that it increases labor productivity, brings about technological innovation, and also has a positive effect on the human capital of the next generation. Barro and Lee (2015) through panel regression sampling of 76 countries showed that an increase in average years of schooling positively impacts economic growth over the last decades. Productivity, referring to the amount of output compared to input, is also considered a significant growth driver because there is a limit to continuously increase inputs. Whereas the neoclassical growth model assumes exogenous productivity caused by technological advance, Romer (1990), Grossman and Helpman (1991a, 1991b), and Aghion and Howitt (1992) argued that research and development (R & D) and innovation, leading to technological advances, drives sustainable economic growth. Hall and Jones (1999) and Easterly and Levine (2001) empirically showed that economic growth has historically been driven by improved productivity rather than increasing inputs. As the importance of productivity has been further emphasized, numerous researchers have tried theoretically and empirically to find the determinants of productivity (Isaksson, 2007; Islam, 2008; Loko & Diouf, 2009; Syverson, 2011).

When it comes to LTGM, the model has been utilized for various World Bank group reports and working papers. Sinha (2017) explored the ways that Bangladesh can maintain high economic growth using LTGM and found that although Bangladesh has achieved robust economic growth in the last decade, sustaining that growth will be hard without TFP growth. Mijiyawa (2017) applied LTGM to Guinea to find what drivers can accelerate growth, and found that the most important driver for Guinea's long-term growth was TFP growth, as shown by Sinha (2017). In most other World Bank reports such as Systematic Country Diagnostic (SCD) for Seychelles (World Bank Group (WBG), 2017d), Georgia

(WBG, 2018a) and Zambia (WBG, 2018b), and Country Economic Monitor (CEM) for Malawi (WBG, 2017b) and Nepal (WBG, 2017e), LTGM has been utilized to forecast long-term GDP per capita growth under the change of growth drivers and to estimate required investment and TFP growth for targeted economic growth. In Armenia's SCD (WBG, 2017c), using a poverty extension version of LTGM, the World Bank simulated the impact of comprehensive policy reform package on poverty reduction. Jeong (2017) attempted to analyze South Korea's economic growth experience over the last six decades by using LTGM. The results show that although the engines of growth were balanced overall, the main driver was different in each period.

Some previous studies have conducted simulation analysis to support Myanmar's long-term economic growth. Taguchi and Lar (2015) used a macro-econometric model to simulate intensifying investment and improving TFP for optimal growth path in Myanmar. Meanwhile, using a Calibrated General Equilibrium (CGE) model, Roland-Holst and Park (2015) assessed the long-term benefits of economic reform and emphasized a favorable investment climate, including human capital development and regional economic integration. Compared to those studies, this study quantifies the future path of Myanmar's economic growth using LTGM, which directly shows the effect of growth drivers by overcoming limited information from developing countries. In addition, while previous studies were based mainly on data prior to Myanmar's market opening in 2011 when overall economic reform launched, this study utilizes data including the period after the market opening to increase reliability of the simulation analyses.

3. Comparing Growth Drivers between Myanmar and Vietnam

This study investigates how growth drivers have changed in two countries, Myanmar and Vietnam, over the last decades. Vietnam has launched economic reforms known as *Doi Moi* in 1986, and the performance of those reforms has been clearly shown since 1990. Vietnam has been developed from being primarily a closed and centrally planned economy to an open and market-oriented economy, and through long-term economic growth, it reached middle-income status in 2009 (WBG, 2017a).

3.1. Share of Capital Formation and Capital-to-Output Ratio

Myanmar's capital formation share has risen steadily to 22.7%, while that of Vietnam has increased to 31.9% in 2007 and then decreased to around 26.1%. As for capital-output ratio, that of Myanmar has risen since the late 2000s and was around 1.33 in 2017, while Vietnam's capital-output ratio has increased rapidly from 1.2 in 1990 to 2.4 in 2010 following investment expansion and slightly decreased to 2.23 in 2017.

3.2. Working-age Population and Labor Force Participation

The working-age population has been steadily increased since 1990 in both countries, and the total population growth rate also has shown a similar trend, although that of Vietnam has been higher during this period. The labor force participation rate has shown a different pattern. While Vietnam's labor force participation rate remains constant from 82.6% in 1990 to 82.7% in 2018, Myanmar's labor force participation rate gradually decreased from 78.4% in 1990 to 66.2% in 2018. This difference appears attributable to changes in the female labor participation rate. It has remained constant at around 80% during the period in Vietnam, but in Myanmar dropped steadily from 66.6% in 1990 to 51.7% in 2018.

3.3. Human Capital

When it comes to human capital, Vietnam has increased more rapidly than that of Myanmar during the sample period. The annual average growth rate was 2% in Vietnam, while it was only 0.9% in Myanmar. Due to these different growth rates, the gap in human capital between the two countries has been widening.

3.4. Total Factor Productivity

Myanmar's TFP growth rate exceeded that of Vietnam in the 2000s, but the trend was overturned after 2009. Considering that the TFP growth rate is calculated as a residual, which is unexplained with capital, and labor growth rate in GDP growth rate, Vietnam's low TFP growth rate from the late 1990s to 2010 means that factor accumulation played a relatively significant role in economic growth during the period. In the case of Myanmar, economic growth not explained by factor accumulation was achieved from the late 1990s to 2006, but after that TFP growth rate had continued to decline to –8.2% in 2011 when the market was opened. Since 2010, Vietnam's TFP growth rate has increased to 3.1% in 2016, while Myanmar remains around 0% in 2016.

In summary, Vietnam's investment rate has risen sharply during the last economic growth period, resulting in substantial capital accumulation. Myanmar's investment rate has risen steadily to a level slightly lower than that of Vietnam, but capital accumulation has not progressed much. The working-age population has increased during this period in both countries, but Vietnam's labor force participation rate has remained above 80%, while that of Myanmar has

decreased following the falling female participation rate. Meanwhile, the level of human capital has grown steadily in both Vietnam and Myanmar, but Vietnam has shown higher growth rates, so the gap has been widened between the two countries. Lastly, Vietnam's productivity has continued to rise since the late 2000s, reaching 2.7% in 2016, but Myanmar's has remained at around 0% since market opening.

4. Methodology

4.1. Model Description

This study comprehensively uses LTGM and the LTGM-TFP extension to improve the validity of models for data calibration.

4.1.1. LTGM

The LTGM is built on the neoclassical growth model introduced by Solow (1956) and Swan (1956). The three building blocks of the LTGM are the Cobb-Douglas production function, capital accumulation by investment, and demographic features of the labor market. To specify the growth drivers in the model, Pennings (2018) decomposed the function of GDP per capita growth as shown in equations (1) ~ (9). In the below functional form, Y_t is the aggregate output denotes GDP at period t, A_t is the total factor productivity, K_t is the capital stock, ht is human capital per worker, L_t is the number of workers, and β is the labor share.

$$Y_t = A_t K_t^{1-\beta} (h_t L_t)^{\beta} \tag{1}$$

The total number of workers can be decomposed as

$$L_t = \rho_t \omega_t N_t \tag{2}$$

where ρ_t is the participation rate, ω_t is the working-age population to total population ratio, and N_t is the total population. From equations (1) and (2), the output per capita equation can be realized. y_t^{pc} is the per capita term and y_t are per worker terms.

$$y_t^{pc} = \rho_t \omega_t y_t = A_t \rho_t \omega_t k_t^{1-\beta} h_t^{\beta} \tag{3}$$

Based on equation (3), the growth rate from t to t+1 is as follows.

$$1 + g_{y,t+1}^{pc} = \left(1 + g_{A,t+1}\right)\left(1 + g_{r,t+1}\right)\left(1 + g_{w,t+1}\right) \left(1 + g_{k,t+1}\right)^{1-b}\left(1 + g_{h,t+1}\right)^{b} \tag{4}$$

To decompose capital per worker growth (1 + $g_{k,\ t+1}$), the equation (5), referring to capital accumulation where I_t is inves1tment and δ is depreciation rate, can be rewritten as (6)

$$K_{t+1} = I_t + (1-\delta) K_t \tag{5}$$

$$\left[\frac{K_{t+1}}{L_{t+1}}\right]\left[\frac{L_{t+1}}{L_t}\right] = (1-\delta)\left[\frac{K_t}{L_t}\right] + \left[\frac{I_t}{L_t}\right] \tag{6}$$

From equation (6), substituting $\left[\frac{L_{t+1}}{L_t}\right] = \left(1 + g_{N,t+1}\right)$ $\left(1 + g_{\rho,t+1}\right)\left(1 + g_{\omega,t+1}\right)$ and dividing both sides by draw equation (7). In addition, the equation (7) can be rearranged as (8) to isolate the capital per worker growth rate.

$$\left(1 + g_{k,t+1}\right)\left(1 + g_{N,t+1}\right)\left(1 + g_{\rho,t+1}\right)\left(1 + g_{\omega,t+1}\right) = (1-\delta) + \frac{\left[\frac{I_t}{Y_t}\right]}{\left[\frac{K_t}{Y_t}\right]} \tag{7}$$

$$\left(1 + g_{k,t+1}\right) = \frac{(1-\delta) + \frac{\left[\frac{I_t}{Y_t}\right]}{\left[\frac{K_t}{Y_t}\right]}}{\left(1 + g_{N,t+1}\right)\left(1 + g_{\rho,t+1}\right)\left(1 + g_{\omega,t+1}\right)} \tag{8}$$

Combining equations (4) and (8), the final functional form (9) decomposing output per capita growth is drawn and is used to do simulation analysis in the model.

$$1 + g_{y,t+1}^{pc} = \left(1 + g_{A,t+1}\right)\left[\left(1 + g_{\rho,t+1}\right)\left(1 + g_{\omega,t+1}\right)\left(1 + g_{h,t+1}\right)\right]^{\beta} \left[\frac{(1-\delta) + \left[\frac{I_t}{Y_t}\right] / \left[\frac{K_t}{Y_t}\right]}{\left(1 + g_{N,t+1}\right)}\right]^{1-\beta} \tag{9}$$

4.1.2. LTGM-TFP Extension

The LTGM-TFP extension is built on the TFP determinant index and regression model by Kim and Loayza (2019). The TFP determinant index is composed of five subcomponent indices representing major determinants. Several indicators from different sources such as Barro and Lee (2013) and World Development Indicators (WDI), are used to construct the subcomponent indices (innovation index, education index, market efficiency index, infrastructure index, and governance index) through

a comprehensive literature review. Detailed information for the TFP determinant index is described in the Appendix. The LTGM-TFP extension utilizes coefficients derived from the following regression (10) to measure the effect of the TFP determinant index resulting in TFP growth. To do the regression, the five subcomponent indices are combined at the one TFP determinant index using Principal Component Analysis (PCA) because of their multicollinearity (Kim & Loayza, 2019).

$$\begin{aligned}\text{Annualized TFP growth}_{c,(t,t-5)} &= \beta_0 + \beta_1 \ln(TFP\,Index_{c,t-5}) \\ &+ \beta_2 \ln\left(TFP\,level\right)_{c,t-5} + \theta_c \\ &+ \delta_t + \varepsilon_{c,t} \qquad (10)\end{aligned}$$

In equation (10), the dependent variable is annualized TFP growth rate over five years, and independent variables are a time-lagged TFP determinant index, which is rescaled from 1 to 100 and a time-lagged TFP level with country-fixed effect θ_c and time-fixed effect δ_t. Log-transformation allows for a non-linear relationship between TFP growth and the index, and a time lag of five years is applied in consideration of reverse causality (Kim & Loayza (2019). Using coefficients drawn by regression and PCA, the LTGM-TFP extension allows policy makers to quantify the impact of the improved TFP determinant index and subcomponent indices on TFP growth in the long term.

4.2. Data Calibration

Penn World Table 9.1 (PWT 9.1, Feenstra, Inklaar, & Timmer, 2015) and WDI data are mainly used to do simulation analysis in this study. Specifically, real GDP at constant 2011 national prices, capital stock at constant 2011 national prices, human capital index based on years of schooling, and returns to education and share of gross capital formation are sourced from PWT 9.1. Total population size, working-age population, and labor force participation rate are sourced from WDI. Meanwhile, labor share is sourced from the Asian Productivity Organization (APO, 2017) database because PWT 9.1 and WDI do not include them for Myanmar and Vietnam. This study does not use original capital stock data provided in PWT 9.1, but reconstructs the capital stock with the initial capital stock and average deprecation rate using the Perpetual Inventory Method (PIM). The reason is that in many developing countries, the growth rates over the last period drawn by the LTGM with original capital stock shows low conformity to the real value. It seems to stem from insufficient historical asset composition data in developing countries because the original capital stock in the PWT 9.1 is constructed using different depreciation rates and user costs for each type of asset (Inklaar & Woltier, 2019; Feenstra, Inklaar, & Timmer, 2015). On the other hand, with the reconstructed capital stock, the conformity becomes quite reasonable. Figure 1 and 2 show the GDP per capita growth rates of Myanmar and Vietnam. PWT 9.1 and APO data (2017) are applied for Figure 1 and 2.

The actual per capita GDP growth rate is a bar in Figure 1 and 2, and a straight line represents growth rate drawn by the model using reconstructed capital stock, while a dashed line is illustrated by the model using original capital stock. The growth rate of Myanmar based on the model with original capital stock shows less than 2% in 2016, while the actual growth rate is over 5%. In Vietnam, the actual annual average growth rate (AAGR) is 5.1% during this period, but the AAGR based on the model with original capital stock is 3.5%. On the other hand, the straight lines show significantly improved conformity to actual growth rates in all the countries.

Meanwhile, the LTGM-TFP extension utilizes the coefficients from the regression results based on 98 countries across the world (Kim & Loayza, 2019). In the sample, several Asian countries, including Myanmar and Vietnam, are ruled out due to lack of TFP-level data in PWT 9.0. However, considering the research topic, this study attempts to include six Asian countries (Bangladesh, Cambodia, Myanmar,

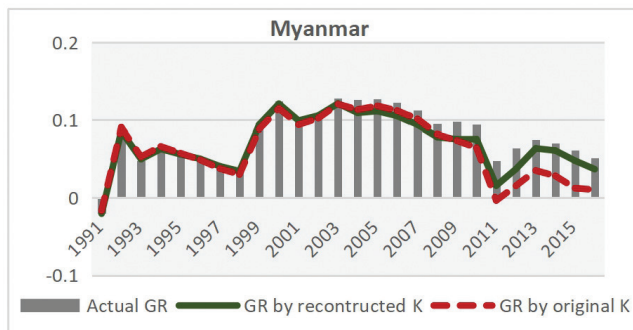

Figure 1: GDP per Capita Growth Rate of Myanmar

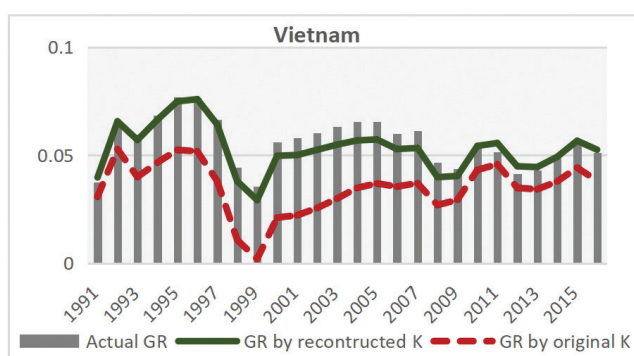

Figure 2: GDP per Capita Growth Rate of Vietnam

Table 1: Regression Analyses Based on Different Samples

Dependent Variable	Annualized TFP growth$_{c,(t-\alpha,t)}$	
Num. of countries	104	
Num. of observations	507	923
Time lag (α)	5	3
	Coefficient (Standard Error)	
ln (Index$_{c,t-\alpha}$)	0.062 (0.020)***	0.049(0.016)***
ln (TFP level)$_{c,t-\alpha}$	–0.103(0.014)***	–0.106(0.012)***
Constant	–0.215(0.069)***	–0.170(0.054)***
	R^2	
Within	0.2613	0.2006
Between	0.2428	0.2191
Overall	0.1249	0.0959

Note: ***p < 0.01; **p < 0.05.

Nepal, Pakistan, and Vietnam) to reflect the context of the two countries and regional characteristics in the coefficients. So, the total sample is 104 countries. Table 1 shows the comparison of the regression results based on increased sample sizes compared to a previous study (Kim & Loayza, 2019) and time lags to check robustness. A previous study by Kim and Loayza (2019) used 98 countries, while this study applied 104 countries that include Myanmar and Vietnam. The sign and significance of coefficients are consistent, so the six Asian countries' added sample is used in this study.

4.3. Scenarios

4.3.1. Initial Values

It is necessary to set up an initial value for each variable in 2019 to conduct simulation analyses based on scenarios for 2019–2040. First, capital-to-output ratio is 1.38, which is extrapolated on the basis of the prior period 1990–2017, and the investment rate is 23.0%, a 5-year average for 2013–2017 because the investment rate has been stabilized from 2013. The values of demographic factors during the analysis period are sourced from WDI, which are the International Labor Organization's (ILO) estimates. The human capital growth rate is 0.9%, a 10-year average for 2008–2017 using PWT 9.1. TFP growth rate, considering the TFP growth trend since 2013, is 0.0% on the assumption that the level of TFP would be maintained.

Based on the APO database, the labor share of Myanmar increased significantly from 32.2% in 2015 to 51.5% in 2016, so it would be inadequate to simply use the value of 2016 for long-term growth scenarios. In the labor share comparison in 2016 among Myanmar, 3-year average of Myanmar, the means of CLMV countries, Lower Middle-Income countries in the East Asia and Pacific (LMI in EAP) region, and Lower Middle-Income countries (LMI) obtained from PWT 9.1 and APO database, although the average labor share of all the LMI countries is close to 50%, those of LMI countries in the EAP region, CLMV countries are less than 40%. In addition, considering the labor share of Vietnam is still 36.4% in 2016, this study assumes the level of labor share for the long-term growth scenario of Myanmar is 39.5%, which is the mean of LMI countries in the EAP region.

According to PWT 9.1, Myanmar's depreciation rate was 10.2% in 2017. Taking the development stage of Myanmar into account, the depreciation rate seems to be higher than in other countries. Korea's average depreciation rate falls within a range from 2.6% to 4.8% during its period of high economic growth (1960–2000). Vietnam has a value of 2.5% to 8% during 1990–2017, and the 20-year average value (1998–2017) is 4.6%. The depreciation rates of Lao PDR and Cambodia, which are frequently compared to Myanmar due to their similar geographical and economic backgrounds, are recorded at 6% and 5.5% in 2017. So, rather than applying the depreciation rate in 2017 to a long-term growth scenario for Myanmar, this paper uses the 20-year average value (1998–2017) of 7.8%, considering the depreciation rate will be adjusted in the future.

Meanwhile, as for initial values of TFP determinant index and subcomponent indices in Myanmar, the TFP determinant index of Vietnam is greater than that of Myanmar, and in terms of subcomponent indices, Vietnam is also comprehensively better than Myanmar. The subcomponent indices in order of gap between the two countries are education, governance, infrastructure, market efficiency, and innovation. Vietnam shows 1.33 greater than Myanmar in education, while in innovation Vietnam is only 0.1 greater than Myanmar. This small gap in innovation is reasonable, considering innovation seems not to significantly affect the TFP level of developing countries over the last decades (Isaksson, 2007).

4.3.2. Constructed Scenarios

To predict Myanmar's long-term growth by 2040, this study constructed five scenarios to investigate differences of major growth drivers between Myanmar and Vietnam. All the scenarios, except Scenario 4 (TFP), assume growth drivers will be improved linearly by 2030 and remain constant over the next ten years. In case of Scenario 4 (TFP), the LTGM-TFP extension is used to draw expected TFP growth rate, and the TFP growth rate is applied to the LTGM to quantify the impact of TFP growth on long-term economic growth. The LTGM-TFP extension assumes that the TFP determinant index of Myanmar reaches the level of Vietnam by 2030, and it keeps increasing following this upward trend.

The proposed scenarios involve assumptions. First, investment scenario assumes the investment rate of Myanmar rising to 26.7%, which is the 10-year average investment rate of Vietnam by 2030, and other growth drivers remain at initial values. Female participation scenario assumes that the level of Myanmar's female participation rate rises up to 79.2%, which is the level of Vietnam in 2018 by 2030 and other growth drivers remain at initial values. Human capital scenario assumes that the human capital growth rate of Myanmar reaches 2% by 2030, and that other growth drivers remain at initial values. Total factor productivity scenario assumes that the expected TFP growth rate drawn by the LTGM-TFP extension and other growth drivers remain at their initial values. Combined scenario assumes that other four scenarios proceed simultaneously.

5. Results

5.1. Baseline and Investment Scenario

Figure 3 shows the simulation results based on the baseline and investment scenarios. In terms of the baseline scenario, assuming initial values remain constant, the per capita GDP growth rate will continue to fall, reaching 3.4% by 2030 and 2.1% by 2040. On the other hand, the investment scenario shows that increasing investment rate mitigates the downward trend, showing a 4.3% growth rate in 2030 and 3.1% in 2040. AAGR based on the investment scenario during the analysis period is 4.2%, while AAGR based on the baseline scenario is 3.6%.

5.2. Female Participation and Human Capital Scenario

The female participation scenario in Figure 4 shows that labor market polices targeting promotion of female labor force participation can have a significant impact on

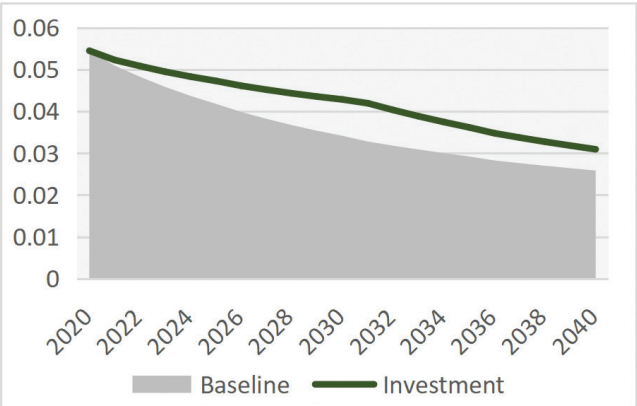

Figure 3: GDP per Capita Growth Rate Based on Baseline and Investment Scenarios

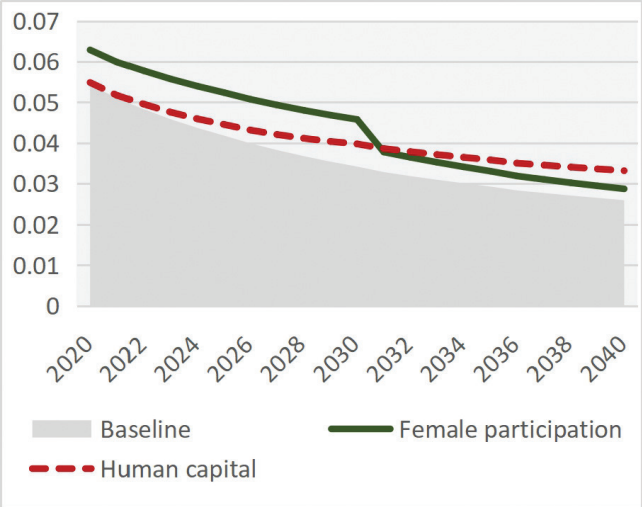

Figure 4: GDP per Capita Growth Rate Based on Baseline, Female Participation, and Human Capital Scenarios

Myanmar's long-term growth. AAGR based on female participation scenario during 2020–2030 is 5.3%. However, the gap in growth rate between the baseline and female participation scenarios reduces sharply in 2031, when female participation rate stops increasing because it reaches the level of Vietnam. Meanwhile, human capital growth does not show a marked increase in the growth rate, but this is enough to mitigate the downward trend. The growth rate based on the human capital scenario is 4% in 2030 and 3.3% in 2040, and AAGR is 4% during the analysis period.

5.3. Total Factor Productivity Scenario

Using LTGM-TFP extension, the potential TFP growth rate of Myanmar with the increase of TFP determinant index and subcomponent indices is drawn as shown in Figure 5. As TFP determinant is improved, the TFP growth rate continues to increase since 2019, peaks at 0.88% in 2028, and then slowly declines to 0.71% in 2040. AAGR is 0.74% over 2019–2040. Regarding the impact of each subcomponent index on TFP growth rate, the education index, which has the largest gap with Vietnam, leads to the highest AAGR of 0.42% over 2019–2040. Next to the education index, the governance index contributes to 0.21% AAGR in TFP, infrastructure index to 0.19% and market efficiency index to 0.16% over the same period. Similar gaps with the level of Vietnam in these three indices reflect the impacts on TFP growth. Meanwhile, the innovation index, which has the smallest gap with Vietnam, shows the least impact on TFP AAGR of 0.06% over the same period.

Figure 6 shows the expected per capita GDP growth rate by TFP growth drawn through LTGM-TFP extension.

The growth rate is 4.8% in 2030 and 4.0% in 2040. AAGR during the analysis period is 4.8%, which is 1.2 percentage point higher than that of the baseline scenario. This shows that the improvement of TFP has the greatest impact on Myanmar's long-term economic growth, although the differences of impacts among all the growth drivers are not that significant.

5.4. Combined Scenario

As shown in Figure 7, the combined scenario where all the above scenarios proceed at the same time shows the ideal long-term growth of Myanmar. Historically, the growth drivers of countries that have shown economic growth in the long-term have been improved simultaneously, so this scenario could be a realistic option under the positive assumption for Myanmar's economy. GMP per capita growth rate will peak at 7.6%in 2030 thanks to increases in female labor participation and investment, and from then it is stabilized. Though the rising trend stops, the growth rate is still maintained at over 5.5% by 2040, thanks to improved human capital growth and TFP growth. AAGR during the analysis period is 6.7%, which is 3.1% point higher than that of the baseline scenario. Following this scenario, Myanmar can keep high economic growth in the long term, and its real GDP per capita will exceed USD3,000 in 2028 and reach USD6,478 in 2040, so it would belong to the upper middle-income group.

GDP per capita growth rate will peak at 7.6%.

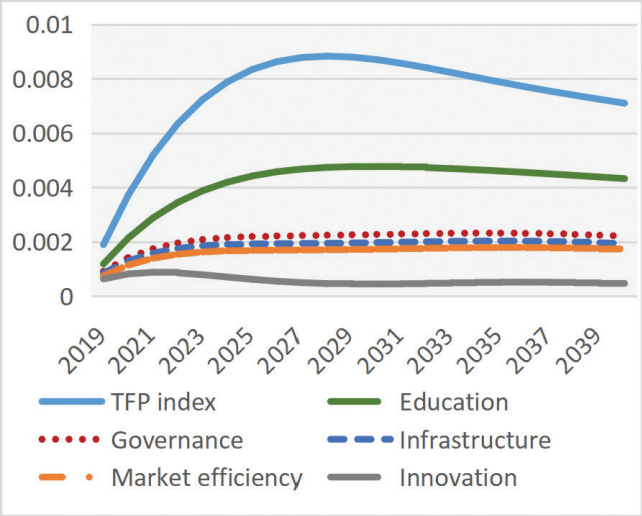

Figure 5: Simulation Results for TFP Growth Rate

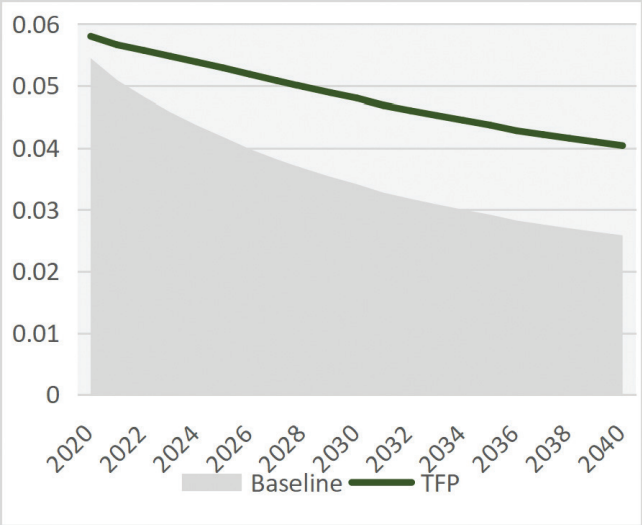

Figure 6: GDP per Capita Growth Rate Based on Baseline and TFP Scenarios

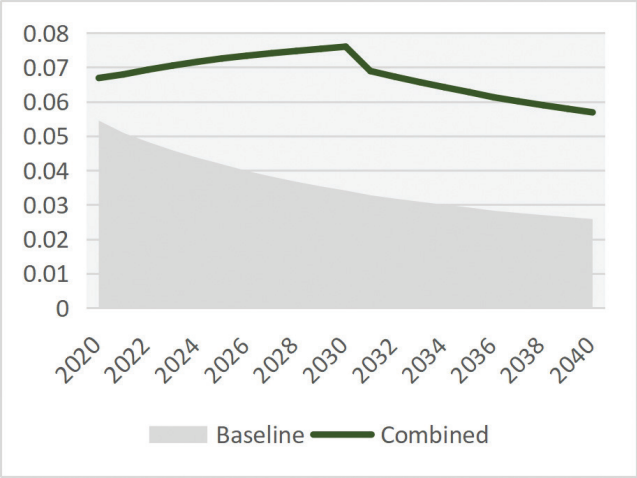

Figure 7: GDP per Capita Growth Rate Based on Baseline and Combined Scenarios

6. Conclusion

Since the launch of wide-ranging economic, social, and governance reforms in 2011, Myanmar has achieved robust economic growth. However, considering existing development challenges such as lack of hard and soft infrastructure and depletion of natural resources, Myanmar's sustainable growth will not be possible without constant reforms in the right direction. In order to draw policy implications for sustainable growth, using the World Bank's LTGM and LTGM-TFP extension, this study simulates the pattern of long-term economic growth based on scenarios assuming improvement of major growth drivers. This study benchmarks Vietnam, which has shown remarkable economic performance two decades ahead of Myanmar with a similar geographical, economic, and political background.

Applying the LTGM to simulate Myanmar's long-term growth, this study calibrates capital stock data sourced from PWT 9.1. The reason is that in many developing countries such as Myanmar and Vietnam, the growth rates over the last period drawn by the model with original capital stock show quite low conformity to the real value. With the reconstructed capital stock, the conformity becomes reasonable. In addition, this study calibrates regression coefficients utilized in the LTGM-TFP, including six Asian countries, to reflect the context of two countries and regional characteristics and confirm that the significance of new coefficients is consistent.

The results of simulation analysis show that Myanmar's economic growth rate continue to fall below 3% in 2040 without any improvement of growth drivers, but increasing investment rate and human capital growth rate are effective enough to mitigate the downward trend. Also, considering the low level of female participation rate in Myanmar, its improvement has a significant impact on economic growth until it reaches the target. The most influential factor for Myanmar's long-term economic growth is TFP growth, which leads to AAGR of 4.8% in Myanmar during 2020–2040. In addition, under the assumption that other growth drivers will be improved together, Myanmar will be able to achieve AAGR of 6.7% over the next 20 years and belong to the upper-middle-income group.

Meanwhile, regarding TFP growth, the increase of TFP determinant index leads to an average annual TFP growth rate of 0.74% over 2019–2040. Improving the education index has the most significant impact on TFP growth in Myanmar among five subcomponent indices. As education is directly related to human capital, so the impact on economic growth will be intensified. Meanwhile, the results also show improving governance, infrastructure, and market efficiency can lead to TFP growth rate of around 0.18% respectively during the same period.

According to the results of the analysis, this study advises policymakers in Myanmar to strengthen policies improving human capital in the first place. This will not only directly affect economic growth, but also contribute to TFP growth. In fact, in the Human Capital Index (HCI) formulated by the World Bank, Myanmar shows a lower level of HCI than the average levels of CLMV and ASEAN countries. Besides, according to the Enterprise Surveys conducted by the World Bank, the low education level of the labor force is mentioned as a second major factor that negatively affects business in Myanmar. In this regard, it is significant to enforce policies to enhance Technical Vocational Education and Training (TVET) as well as basic education, which is directly related to the productivity of workers. In addition, considering the low level of female participation rate in Myanmar, labor market policies to promote female labor participation would be important to economic growth by reaching its target. Specifically, polices are needed to support female participation in manufacturing and service sector jobs created in line with rapid industrialization and urbanization. Meanwhile, as the combined scenario ideally shows, Myanmar can sustain its high economic growth in the long term only when it improves growth drivers simultaneously. Therefore, policymakers are recommended to simultaneously implement development policies targeting major growth drivers including investment promotion. Moreover, in Myanmar, there are potential political risks that can negatively affect the overall economy, such as ethnic conflicts and the balance of power between the military and the civil government, so unceasing effort to improve governance is also required for sustainable growth.

There are some considerable limitations to this study. First, it may be controversial to benchmark Vietnam for simulation analysis. For example, Vietnam could keep implementing economic reforms while it was maintaining political stability, but Myanmar is at risk of political conflicts between the military and the civil government. Also, Vietnam has greatly expanded trade during the last few decades, and it has affected directly and indirectly the growth drivers, while it is not guaranteed that Myanmar could achieve such a trade expansion over the analysis period. Nevertheless, the reason why this study selected Vietnam as a benchmark is that targeting a specific country is beneficial to establish policy goals concretely, and considering its transition experience and regional characteristics, Vietnam is regarded as a relatively appropriate benchmark for Myanmar. Second, the TFP determinant index and subcomponent indices are constructed for countries across the world, so the indices may not be able to accurately represent the status of Vietnam and Myanmar. It would be necessary to create indices more focused on these two countries or Southeast Asian. Third, other analyses related to public-private capital, saving rate, and poverty rate that can be done through other versions of the LTGM are not used comprehensively. That is because, considering the economic and social status of Myanmar and Vietnam, those analyses do not provide meaningful policy implications, so they are omitted from this study.

Despite these limitations, the contribution of this study is to measure the impact of each growth driver for economic long-term growth in Myanmar and draw implications to implement development policies. In addition, through data calibration, this study secures the validity of simulation analyses using the LTGM and the LTGM-TFP extension. Furthermore, the approach applying two models comprehensively could be a reference to policymakers and researchers in utilizing them. Further study might also consider the roles of firms by addressing managerial aspects such as organizational commitment and job performance (Nguyen & Ngo, 2020) and innovation (Nguyen, 2020) in line with economic and policy issues (Dahliah, Kurniawan, & Putra, 2020) in Myanmar.

References

Aghion, P., & Howitt, P. (1992). A model of growth through creative destruction. *Econometrica*, *60*(2), 323–351.

ASEAN+3 Macroeconomic Research Office (2019). AMRO Annual consultation report-Myanmar. *Singapore: ASEAN+3 Macroeconomic Research Office*, 1–52.

Asian Development Bank. (2011). Asian Development Outlook 2011: South-south economic links. Manila. Retrieved from https://www.adb.org/sites/default/files/publication/28300/ado2011.pdf.

Asian Development Bank. (2017). *Country partnership strategy: Myanmar, 2017-2021 Building the foundations for inclusive growth*. Manila: Asian Development Bank.

Asian Productivity Organization (2017). APO. https://www.apo-tokyo.org.

Attanasio, O. P., Lucio P., & Antonello S. (2000). Saving, growth and investment: A macroeconomic analysis using a panel of countries. *The Review of Economics and Statistics*, *82*(2), 182–211.

Barro, R. J., & Lee, J. W. (2013). A new data set of educational attainment in the world, 1950-2010. *Journal of Development Economics*, *104*, 184-198.

Barro, R. J., & Lee, J. W. (2015). *Education matters: Global schooling gains from the 19th to the 21st Century*. Oxford, UK: Oxford University Press.

Barro, R. J., & Sala-i-Martin, X. (1990). Economic growth and convergence across the United States, *NBER Working Paper*, *No. 3419*, Retrieved from https://www.nber.org/papers/w3419.pdf.

Barro, R. J., & Sala-i-Martin, X. (1991). Convergence across states and regions. *Brookings Papers Economic Activity*, *1*, 107–182.

Barro, R. J., & Sala-i-Martin, X. (1992). Convergence. *Journal of Political Economy*, *100*(2), 223-251.

Barro, R. J., & Sala-i-Martin, X. (2004). *Economic growth* (2nd ed.). Cambridge, MA: The MIT Press.

Bloom, D. E., Canning, D., & Fink, G. (2011). Implications of population aging for economic growth. *NBER Working Paper*, *No. 16705*, 1–38, Retrieved from https://www.nber.org/papers/w16705.pdf

Dahliah, D., Kurniawan, A., & Putra, A. H. P. K. (2020). Analysis and strategy of economic development policy for SMEs in Indonesia. *Journal of Asian Finance, Economics and Business*, *7*(5), 103–110. https://doi.org/10.13106/jafeb.2020.vol7.no5.103

Easterly, W., & Levine, R. E. (2001). It's not factor accumulation: Stylized facts and growth models. *The World Bank Economic Review*, *15*(2), 177–219.

Feenstra, R. C., Inklaar, R., & Timmer, M. P. (2015). The next generation of the Penn World Table, *American Economic Review*, *105*(10), 3150–3182.

Grossman, G. M., & Helpman, E. (1991a), *Innovation and growth in the global economy*, Cambridge, MA: MIT Press.

Grossman, G. M., & Helpman, E. (1991b), Quality ladders in the theory of growth. *Review of Economic Studies*, *58*(1), 43–61.

Hall, R. E., & Jones, C. I. (1999). "Why do some countries produce so much more output per worker than others? *Quarterly Journal of Economics*, *114*(1), 83–116.

Hevia, C., & Loayza, N. (2011). Savings and growth in Egypt, *Policy Research Working Paper*, *WPS 5529.* Washington, DC: World Bank Group, 1–27.

Inklaar, R., & Woltier, P. (2019). What is new in PWT 9.1, GGDC Note.

Isaksson, A. (2007). Determinants of total factor productivity: A Literature Review. *UNIDO Working Paper 2.* United Nations Industrial Development Organization.

Islam, N. (2008). Determinants of productivity across countries: An exploratory analysis. *Journal of Developing Areas*, *42*(1), 201–242.

Jeong, H. (2017). Korea's growth experience and long-term growth model. *Policy Research Working Paper, WPS 8240.* Washington, DC: World Bank Group.

Kim, Y. E., & Loayza, N. (2019). Productivity growth: Patterns and determinants across the world. *Policy Research Working Paper*, *WPS 8852*, Washington, DC: World Bank Group.

Loko, B., & Diouf, M. A. (2009). Revisiting the determinants of productivity growth: What's new? *IMF Working Paper*, *9*(225), 1–29.

Lucas, R. E. Jr. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, *22*(1), 3–42.

Mankiw, G., Romer, D., & Weil, D. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, *107*(2), 407–437.

Mijiyawa, A. G. (2017). Economic growth in Guinea and How to accelerate it. *Policy Research Working Paper, WPS 8214*, Washington, DC: World Bank Group.

Nguyen, H. M., & Ngo, T. T. (2020). Psychological capital, organizational commitment and job performance: A case in Vietnam. *Journal of Asian Finance, Economics and Business*, *7*(5), 269–278. https://doi.org/10.13106/jafeb.2020.vol7.no5.269

Nguyen, T. N. (2020). The effect of bribery on firm innovation: An analysis of small and medium firms in Vietnam. *Journal of Asian Finance, Economics and Business*, *7*(5), 259–268. https://doi.org/10.13106/jafeb.2020.vol7.no5.269

Pennings, S. (2018). Long-term growth model v4.1 - Model description. *World Bank Internal Note*. Washington, DC: The World Bank.

Roland-Holst, D., & Park, C. (2015). *Myanmar: Long term scenarios for sustained macroeconomic growth*. Manila: Asian Development Bank.

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, *98*(5), 71–102.

Sinha, R. (2017). Long-term growth scenarios for Bangladesh. *Policy Research Working Paper*, *WPS 7952*, Washington, D.C: World Bank Group.

Solow, R. (1956). A contribution to the theory of growth. *Quarterly Journal of Economics*, *70*, 65–94.

Swan, T. (1956). Economic growth and capital accumulation. *Economic Record*, *32*, 334–361.

Syverson, C. (2011). What determines productivity? *Journal of Economic Literature*, *49*(2), 326–365.

Taguchi, H., & Lar, Ni. (2015). Long-term projection of Myanmar economy by macro econometric model. *MPRA Paper*, *No. 64412*, 1–28.

World Bank Group. (2017a). Country partnership framework for the Socialist Republic of Vietnam. Washington, DC: World Bank Group.

World Bank Group. (2017b). Malawi economic monitor: Land for inclusive development. Washington, DC: World Bank Group.

World Bank Group. (2017c). Systematic country diagnostic: Future Armenia: Connect, compete, prosper. Washington, DC: World Bank Group.

World Bank Group. (2017d). Systematic country diagnostic: The Republic of Seychelles. Washington, DC: World Bank Group.

World Bank Group. (2017e). Nepal country economic memorandum: Climbing higher: Toward a middle-income Nepal. Washington, DC: World Bank Group.

World Bank Group. (2018a). Systematic country diagnostic: Georgia: From reformer to performer. Washington, DC: World Bank Group.

World Bank Group. (2018b). Systematic country diagnostic: Republic of Zambia. Washington, DC: World Bank Group.

World Development Indicators (2019). Washington, D.C.: The World Bank.

Young, A. (1995). The tyranny of numbers: Confronting the statistical realities of the East Asian growth experience. *The Quarterly Journal of Economics*, *110*(3), 641–680.