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Charting directions for economic development in Myanmar:

A computable general equilibrium (CGE) approach on high quality education in labour-growth strategy

Abstract

Since 2011, Myanmar has progressively liberalized its international trade and investment policies, resulting in both opportunities and challenges. The rising inequality between urban and non-urban areas, and within urban areas, has become a growing concern for policy makers, in addition to the existing pervasive poverty issue. This research attempts to investigate how Myanmar economy can affect if the labour supply increased in its infancy stage of development and what policies Myanmar needs to integrate along with its trade and investment liberalization policies to ensure the flow of economic benefits towards Myanmar households and industries. To highlight our research concern, this paper explores to what extent an improvement in the education policy can stimulate effective labour supply in Myanmar's economic development. It applies the concept of Computable General Equilibrium (CGE) and the ORANIG model to test a sample of 57 sectors under 15 industries using the GEMPack software.

The results obtained confirm that by integrating Fritzen's proposed "egalitarian, high-quality educational systems" into Myanmar's trade and investment liberalization policies to supply effective labour, new employment opportunities would increase by 8.8659%: 5.3424% for the unskilled labour group and 3.5235% for the skilled labour group. Although it was expected that the labour price for skilled labour would be high, the result showed the potential to decrease the labour price, which meant that the price gap between skilled and unskilled labour would be narrowed. If we justify the macroeconomic indicators, it is apparent that the current account deficit problem, the competition failure problem as well as the unemployment problems would decline because there would be an increase in value-added production, effective labor input, increased employment, export and local demand, accompanied by a decrease in the output price, the purchasers' price and the price for the primary factor composite. In addition, producers would be encouraged to participate in the supply chain network and to invest for future potential; thus, new SMEs would emerge, together with employment opportunities.

For the rural concentrated agriculture industry, the value-added vegetable oil and fat sector, crop sector, and cereal and grain sector have the highest potential in terms of employment, production and competitive output prices. These three sectors would increase labour demand by 37.0368%. There are also 12 urban concentrated sectors and two regional concentrated industries which would establish stronger market competitiveness, offer more employment opportunities and production efficiency, and increase production and exports. However, there would still be some constraints in the economy such as the rising prices of land and capital, which cannot be solved by trade and investment policies and the education policy alone. Due to the existence of such constraints, some industries would be unable to establish market competitiveness in the short-term, although these industries would offer massive employment opportunities, increase production and more rural concentrating. This limitation would influence on the factor income of the households who are engaging in these industries.

As a consequence, the inequality gap between industries and households would remain in some areas. The planning intention is that Myanmar's next five-year short-term plan will strengthen the country's economic and investment base to reduce poverty and inequality while accelerating its regional and international integration endeavors. To ensure Myanmar is on the right track of growth with equity by stressing education and labour-absorbing growth in the long-term, Myanmar policy makers need to have intervention policies that control both the rising land and capital price as well as the inflation rate. By doing so, an additional 12 urban sectors, 3 regional sectors, 8 rural sectors and 1 supporting industry have massive potential for growth and thus, Myanmar would follow East Asia's "growth with equity" pattern of stressing education and labour-absorbing growth in the long-term.

Charting directions for economic development in Myanmar:

A computable general equilibrium (CGE) approach on high quality education in labour-growth strategy

Shwe Zin KO¹, Zhaoyong Zhang², Pierre Horwitz³, Hadrian Djajadikerta⁴

Introduction

2011 was a significant turning point for Myanmar as its political stance shifted to one of democracy. Since then, Myanmar has returned as a player on both the regional and international stages and has become the focus of many countries. Myanmar opens its doors to the world by actively engaging in regional and international negotiations and by practicing market economic policy with a series of liberalization measures. While the country has received many economic and development opportunities, it has been facing many challenges. Among these challenges, the most significant ones are rising disparities between urban and non-urban areas, an increasing inflation rate, intensified import competitiveness and the failure of Myanmar's small and medium enterprises (SMEs) in import competition. These are in addition to the existing pervasive poverty issue. Accordingly, an increased unemployment rate and underemployment rate are threatening sustainable economic development in Myanmar. Previous successive governments tended to develop the agricultural based economy along with the expansion of the manufacturing sector which aimed to reduce poverty across the country by halve from 32% to 16% between 2005 and 2015 (The UNDP country programme for Myanmar [2013-2015], 2012).

However, this target was unlikely to be achieved by the end of 2015⁵ and thus, domestic policy debate about the implementation of Myanmar's poverty reduction in the long-term, inclusive of growth, is particularly active in relation to the country's economic development trend. It is necessary to modify policies to overcome the current poverty and inequality challenges in Myanmar's infancy stage of development. In this regard, the shortage of skilled labour both in urban and non-urban areas is one of the major challenges in Myanmar's economy. When Myanmar has significant employment opportunities in the next five years in which trade and investment liberalization measures are to be implemented more aggressively, the shortage of skilled labour can hinder the development progress. In such a situation, Myanmar would face more political difficulties in order to balance economic policies and other development policies which require mutual collaboration and implementation. To address the research concern, this paper tries to estimate to what extent an improvement in the educational policy can stimulate Myanmar's economic development by asking the research question: Are there any increased gains for Myanmar's industries and households if the education level of the labour supply improved?

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⁵ The poverty rate was still high at 25.6% in 2014 (The UNDP country programme for Myanmar [2013-2015], 2012).

Research background

Geopolitically, Myanmar is located between two nations with emerging markets: India and China. Myanmar's 135 national races are living in 7 states, 7 regions and 1 administrative territory across the country (Fig. A, Annex I). Among 135 national races of Myanmar, the Bamar (Burman) is the majority ethnic group, residing in river valleys and coastal regions which are identified as major economic areas. Most of the other indigenous minority populations are living in the upland and border areas where agricultural and natural resource activities are conducted (Fig. B, Annex I). After the political changes in 2011, Myanmar laid down its long-term vision to become "a developed nation integrated into the global community by 2030" under the National Comprehensive Development Plan (NCDP) (2011-2031) (The President's Office, 2014). In conjunction with this long-term development plan, Myanmar has adopted four macroeconomic policies⁶ and five-year short-term plans. During the first five-year plan, trade and investment liberalization policy reforms were very important players to create employment opportunities and economic structural change. However, the poverty reduction target was not achieved in that period.

Between 2011-2012 financial year (FY) and 2014-2015 FY, the FDI inflow was mainly due to the oil and gas sector, which occupied 40.20% of the total FDI, followed by the manufacturing sector (18.75%), the transport and communication sectors (21%), the real estate sector (10%), the hotels and tourism sector (4.5%), the agriculture sector (0.5%), the power sector (0.5%), the livestock and fisheries sector (0.34%), the mining sector (0.07%), and other sectors (4.14%) (Directorate of Investment and Company Administration, 2015). Apart from the natural resource exploitation projects, the FDI is highly concentrated in the Yangon Region and Mandalay Region. At the same time, almost 64% of registered citizen investment is also highly concentrated in these two regions. This situation is confirmed by Kudo and Kumagai (2012) who state that the Yangon and Mandalay regions are more than two times richer than the national average in Myanmar. They quantified that "Yangon Region and its neighbor and major agriculture raw materials supplier Ayeyarwaddy Region had an absolute poverty rate of 26.7%. Mandalay Region and its neighbor and major agriculture raw materials supplier Magway Region had a poverty rate at 27%" (2012, pp. 2, 4-5). Therefore, they recommended the government to focus development more in the Yangon and Mandalay regions to help neighboring regions. Besides these existing polar regions, there are another two potential polars in Myanmar: Nay Pyi Taw Administrative Territory and Shan State, which are located along the international trade route and border trade route⁷ and these areas already have major urban concentrated economic activities. These four regions account for 76.78% of the total FDI and citizen investment. In other words, these four regions occupy the major labour intensive industries that can be directly and significantly affected by the policy changes.

The population of these four regions is 20.5 million which constitutes 40% of the total population (Department of Population, 2015b). The GDP in these areas represented 42% of

⁶ Myanmar's macroeconomic policies are: "sustaining agriculture development towards industrialization and all round development; balanced and proportionate development among states and regions; inclusive growth for entire population; and Quality of statistics and statistical system" (Ministry of National Planning and Economic Development, 2014).

⁷ In the period of 2014-2015 FY, 90% of Myanmar's exports and imports were handling from Yangon Port (Myanmar Port Authority, 2015) and 80.75% of Myanmar's total border trade were through Shan State (Ministry of Commerce, 2015). Mandalay Region is located in the central part of Myanmar and thus, it is a crossroad for the majority of the trading and economic activities. Nay Pyi Taw is a newly established administrative territory located between Yangon Region and Mandalay Region.

total GDP in 2011-2012 FY (2011-2012 FY National Planning Law, 2012). Eight industries⁸ are highly concentrated in these four regions. Although there was significant growth in urban concentrated industries, Myanmar's urbanization rate was merely 30% in 2014⁹ and over 50% of the population was still employed in the agricultural sector (Department of Population, 2015a). The agricultural sector still accounted for 31% of GDP, while the industry and services sectors contributed 32% and 38% respectively to GDP as of 2014 (The World Bank Database). One of the major reasons for the low urbanization rate is the lack of people's assurance to engage in formal employment due to their educational qualifications and skills. In principle, Myanmar's education system is governed by Basic Education Law and University Education Law and the government has offered "free compulsory primary education for all" (Htay, 2013). Although Myanmar had an adult literacy rate (age 15 and above) of 89.5%¹⁰ in 2015, it was observed that there were still over one million children who were out of school and the repetition and drop-out rates in non-urban areas had remained high (Myanmar Quality Basic Education Programme, 2015).

In addition, Myanmar's education system has exhibited relatively low rates of secondary and tertiary gross enrollment ratios (49%) and the mean years of schooling was just 4 years in 2012 (Mizzima News, 2012). The completion rate of university was 17 times less completion in non-urban areas than urban areas. At the same time, the completion rates of high school and vocational school were 2.5 times and 4 times higher respectively in urban areas than non-urban areas. The completion rate of diploma was 23 times higher in urban areas in 2014 (Department of Population, 2015b). The survey of The Education Policy and Data Center (EPDC) (2008)¹¹ also highlighted that low income households were usually headed by a person with non-formal education and by persons with primary education. These statistics indicate that although Myanmar has a substantially high literacy rate, the existence of a labour group equipped with a high level of education and knowledge is moderately low. The majority of the unskilled and uneducated labour group is engaging in non-urban industries and, as a consequence, Myanmar has rather low economic diversification. Therefore, to achieve the goal of one of Myanmar's macroeconomic policies "balanced and proportionate development among states and regions" is still unrealistic during its first five-year short-term plan implementation phase.

The previous IHLCA survey in 2010 also revealed a much more widespread poverty rate in non-urban areas than in urban areas in Myanmar by measuring consumption gap¹², poverty gap ratio¹³, infant mortality rate¹⁴, child dependency ratio¹⁵, life expectancy¹⁶, and

⁸⁸ Livestock and fisheries industry (80.94%), manufacturing industry (81.22%), transport industry and communication industry (100%), hotel and tourism industry (87.01%), real estate industry (99.82%), industrial estate industry (98.02%) and other services (96.70%) respectively.

⁹ The urban population is 40% of total population in our study based on our assumption.

¹⁰ The average literacy rate for the ASEAN countries.

¹¹ (The Education Policy and Data Center (EPDC), 2008) found out that the household structure of Myanmar was similar to Burundi, Central African Republic, Lesotho, Moldova, Sao Tome, Sierra Leone, Swaziland and Vietnam. Non-formal attendance was higher at primary school-age, and a little less so at the secondary school-age.

¹² Myanmar has a large consumption gap between urban and rural, which is 525,929 Kyat at union level; 736,008 Kyat at urban; and 415,457 Kyat at rural (IHLCS, 2011).

¹³ The highest poverty gap ratio was found in Chin State and Rakhine State, which are isolated from major economic activities due to their geographical location, frequent outbreak of natural hazards and conflicts, and having very poor infrastructure (Ministry of National Planning and Economic Development, 2011).

¹⁴ Magway Region had the highest infant mortality and followed by, Ayeyarwaddy Region and Chin State.

¹⁵ Child dependency ratio was the highest in Chin State and followed by Kayah State and Kayah State.

¹⁶ Mon State had the highest life expectancy rate and followed by, Yangon Region and Mandalay Region.

unemployment rate¹⁷, amongst other things (Ministry of National Planning and Economic Development, 2011). Between 2005 and 2010 the poverty rate was still high, with an increase in the annual underemployment rate of 3.6% of the working population, which was around 29% in 1990 (Myanmar Statistical Information Service, 2015) and 37% in 2010 (Ministry of National Planning and Economic Development, 2007; The Asian Development Bank, 2014, p. 128). Myanmar's poverty rate was the third highest and the unemployment rate was the fourth highest amongst neighboring countries. Even though Myanmar has abundant natural resources, pervasive poverty is closely associated with economic concentration between urban and non-urban areas. Thus, narrowing this inequality gap is an urgent issue in Myanmar to ensure all of the Myanmar citizens achieve growth, which is one of Myanmar's macroeconomic policies for the long-term.

The dominance of Myanmar's labour pattern reflects the propensity of small and medium enterprises (SMEs) and Myanmar's exports. The ADB estimates that 63% of Myanmar SMEs countrywide are engaged in the food and beverages production sector, which mainly use agricultural inputs, unskilled labour and less advanced technology. Furthermore, a low level of competitive advantage¹⁸ and the influence of conventional unregistered business practices¹⁹ meant that 27% of Myanmar's exports were still from primary industries during the 2014-2015 FY, which grew by a mere 7% between 2010-2011 FY and 2014-2015 FY. At the same time, exports of manufacturing products significantly increased from 33% to 52% within the same periods. On the other hand, the importation of capital goods for investment and industrial raw materials increased at a rate of 47% and 34% respectively in the same period. (Ministry of Commerce, 2015). It is clear from this data that the development of agricultural value adding has been slower than the expansion of the manufacturing industry. In addition, the manufacturing industry seems to have relied more on imported raw materials to satisfy its input requirement and thus inhibited the achievement of one of Myanmar's macroeconomic policies: "sustaining agriculture development towards industrialization and all round development" in the long-term (The United Nations Sustainable Development, 2015).

The reliance on imported materials and goods has had a significant influence on Myanmar's current account. When Myanmar started implementing its policy reforms, the country's trade volume significantly increased from 8 billion USD in the 2010-2011 FY to 29 billion USD in the 2014-2015 FY. At the same time, the country began to experience a trade deficit issue in 2012-2013 FY, despite the revenue from customs duties and the tariff increasing by 609%²⁰ and 275%²¹ respectively between 2010-2011 FY and 2013-2014 FY (Central Statistical Organization, 2015). The ADB estimated in 2015 that the current account deficit of Myanmar would be -6.8% in 2015 and -5.0% in 2016. Along with the trade deficit, the foreign exchange rate also dramatically increased from 1,016 Myanmar Kyat (MMK) per 1 USD as at 12th November, 2014 to 1,216 MMK as at 28th March, 2016 (The Central Bank of Myanmar, 2016). Such currency depreciation led to the higher inflation rate of 5.7% in 2014.

¹⁷ The unemployment rate was the highest in Rakhine State (10.4%), Kayin State (7.5%) and Chin State (5.4%).

¹⁸ Myanmar SMEs lack competitive advantage in the ASEAN (Association of Southeast Asian Nations) region in terms of design, technology, price, quality, quantity and distribution channels due to the influx of imported commodities (Chipchase et al., 2014).

¹⁹ Only registered SMEs can engage in formal international trade and supply chain networks with foreign investors. Myanmar had 620,000 unregistered businesses in 2014 (Abe & Dutta, 2014; Chipchase et al., 2014).

²⁰ Customs duty increased from 5.96 billion Kyat in 2010-2011 FY to 36.3 billion Kyat in 2013-2014 FY (Central Statistical Organization, 2015).

²¹ Tariff revenue includes commodities and services tax, commercial tax, state lottery, stamp duties and income taxes. It was increased from 1,210 billion Kyat in 2010-2011 FY to 3,338 billion Kyat in 2013-2014 (Central Statistical Organization, 2015).

The ADB estimated that the inflation rate would continue to increase to 8.4% in 2015 and 6.6% in 2016 (The Asian Development Bank, 2013, 2015). The consumer price index (CPI) also dramatically increased from 1,627.33 in 2010 to 2,073.42 in 2015 (KNOEMA, 2009).

The United Nations Conference on Trade and Development (2006) warned that the effect of trade and investment policy liberalization on domestic investment and growth due to payment difficulties and increased capital flows could cause currency appreciation and a decline in the trade performance of domestic producers. In the case of Myanmar, trade and investment liberalization has led to higher imports of capital goods and industrial raw materials; therefore, the Myanmar currency has depreciated rather than appreciated due to capital inflows. While this situation could be beneficial for exporters, the producers who use imported materials for their production have suffered from currency depreciation. When this situation is combined with low level of SMEs' efficiencies, domestic producers and consumers might have to bear a greater burden and inequality gap than previously. In parallel with the poverty reduction debate, it has also been claimed that Myanmar's unskilled labour force, low level of SMEs' competitiveness, and increasing policy reforms have brought about financial and macroeconomic instabilities that can hinder the progress of sustainable economic development (Eleven media group, 2015). Thus, Myanmar policy makers need to make proper adjustments to policies to overcome these challenges in its infancy stage of development.

Literature review

To address the research question, a combination of endogenous growth theory, the proposed factors of Fritzen (2002) "egalitarian, high-quality educational systems", and East Asian countries' growth with equity pattern of "labour-intensive growth strategy" were used. An endogenous growth theory was used because of its ability to explain the spillover effects on the economy from an indefinite investment in human capital, which cannot be explained in neo-classical growth models. The endogenous growth theory argues that economic growth is primarily generated from within a system as a direct result of internal processes (endogenous) and not external forces (exogenous) (Romer, 1994). Under this theory, investment in human capital, innovation, and knowledge are significant contributors to economic growth. The theory focuses on positive externalities and spillover effects of a knowledge-based economy which will lead to economic development. The endogenous growth theory principally asserts the importance of policy measures to enhance a nation's human capital by developing new forms of technology and efficient and effective means of production on the long run growth rate of an economy (Romer, 1994).

The endogenous growth theory is further supported with models in which agents optimally determined by consumption and saving, by imperfect markets, and by optimizing the resources allocation to research and development leading to technological progress (Barro & Xaiver, 2004; Carroll, 2016; Grossman & Krueger, 1991; Lucas, 1988; Ortigueira & Santos, 1997; Romer, 1994; Sergio, 1991). Aghion and Howitt (1998, p. 327) cited the emphasis of Lucas (1988) in his study about "human capital accumulation as an alternative source of sustained growth, i.e. alternative to technological change, by distinguishing skill acquisition from education and from learning by doing". Neycheva (2013, p. 323) highlighted an important feature of the endogenous growth theory in their study that the returns to capital at the aggregate level could be constant or even increasing in the model. This rising marginal productivity in the economy driven by human capital was essential for the growth process". In addition, the research focuses on Fritzens' (2002) proposal to improve high-quality educational systems for the development of labour-intensive growth strategy, which came out after the success stories

of East Asian countries. This proposal was based on the experiences of new industrial countries like South Korea, Taiwan and developed industrial countries like France, Germany, United Kingdom and United States. The evidences showed that “the growth they had achieved was sourced from population growth, supported by human resources especially qualified labour and technology abilities to achieve growth objectives and economic development” (Todaro, 2000, p. 59). Such strategy could contribute to encourage high quality production, to employment creation and to lessen income inequality in Myanmar’s economic growth.

In the era of globalization, while the least developed or developing countries like Myanmar tend to choose an export-led growth model, it is evident that trade and investment policies play a significant role, because these can contribute not only to economic growth, full employment, strong market competitiveness of local SMEs and better living standards, but also to sustainable development, in harmony with other public policies (International Trade Centre, 2015; Turvey, 1970). Helpman and Krugman (1989) and De Matteis (2004) found a fundamental link between exports and economic growth. Wacziarg and Welch (2003) confirmed that an ordinary country grew at a set 1.5% per annum higher rate in its liberalized phase than its protected phase. Ravallion (2005), Srinivasen (2001), and Bruno, Ravallion, and Squire (1998) advised policy makers not to worry about rising inequality because it was a more-or-less unavoidable by-product of rapid economic growth during the process of reducing the incidence of absolute poverty. However, when the import policy is liberalized, the export-led model could have a policy conflict with other public policies, especially when the trade deficit problem becomes persistent over a long time (Root, 1993). Thus, Root reinforced that such policy conflict could create a barrier in narrowing inequalities and poverty reduction and lessen market competitiveness of SMEs. Letiche (2006) claimed that the speed and depth of growth of poverty reduction would significantly vary on a range of policy measures regulated and implemented by the government. The views of Root and Letiche are more likely to reveal Myanmar’s current situation, which should be guided by the proper policy ranges.

Macroeconomic stability is essential in economic growth because it is strongly associated with high-level investment and trade liberalization (Ames et al, 2001; Panagariva, 2004; Ashok, 2007). Having weak financial institutions, Myanmar has been facing a trade deficit issue during the trade and investment liberalization phase and this has led to macroeconomic instabilities. Such a situation can increase the unemployment rate, decrease domestic demand and lessen competitiveness. As a consequence, it can prevent industries from sustainable expansion and decrease trade performance (The United Nations Conference on Trade and Development, 2006). Trade deficit issues in consecutive years can also create a shortage in government revenue which can be spent on health, public administration, environment and social welfare. Accordingly, income inequality can be widened and the governance mechanism weakened. Based on these findings, we believe that macroeconomic stability in Myanmar’s economy is crucial for sustainable economic growth.

At the micro or industry level, maximizing productivity is essential, not only to have better use of the factors of production —human capital, physical capital, and technology but also to raise living standards of households and improve overall macroeconomic performance (The World Bank, 2015, p. Chapter 7). There is a major cause related to a shortage of human capital that prohibits the achievement of maximum productivity under trade liberalization. When imports of raw materials and other industrial goods become cheaper, the producers would benefit from cheaper marginal costs of production for domestic products that can compete with imported products in the markets (Root, 1993). That competition potential can happen in reality when firms have additional factors of production such as skilled labour. With

labour efficiency and effective resource allocation, firms can maximize productivity and profit (Goto, 1990). In other words, maximum national production potential cannot be attained if there is a high level of underemployment of labour and capital or any other factor of production. Alternately, the firms' growing demands on labour and the capital depend on the prices of factor supplies (land, labour, capital, and technology). Reciprocally, the demand prices of commodities are also a precondition of national welfare and thus, productivity is directly related to job creation and consumer demand (Offe, 2010, p. 47). At the same time, trade and investment liberalization measures in Myanmar can increase consumer choice and satisfaction through increased substitution (Goto, 1990, p. 82). When households have better factor income from employment, they can maximize their utilities and welfare by choosing a variety of goods and services, either local or imported, depending on which is cheaper. Thus, international trade problems and domestic labour problems are closely interrelated (Goto, 1990, p. 5). Inefficiency at the microeconomic level and ineffective management of economic aggregation at the macroeconomic level result in resources being misallocated, unemployed or underemployed which can intensify in the future in Myanmar.

To achieve maximum productivity in SMEs, Atkinson and Meager (1994) suggested that the policy support should provide the existing and new SMEs to employ skilled labour because they might have disadvantages in attracting skilled labour. They stated that when SMEs attracted skilled labour which was limited in the labour market, there would be a sharp increase in the labour price. Such a high labour price would have a significant impact on SMEs to alter their decision to employ cheaper labour with a low level of skill who could not use scarce resources effectively. Generally, SMEs, even SMEs from developed countries like the U.K., would be unwilling to support skilled training to unskilled workers because they could not control employees leaving their jobs (Brown, Hamilton, & Medoff, 1990). On the other hand, large firms provide trainings to improve employees' skills (North, Smallbone, & Leigh, 1994, pp. 269-270) and accordingly, the gap, including turnover rates, between large firms and SMEs would grow larger (Blackburn, 1990; Curran & Stanworth, 1981; Scott, Roberts, Holroyd, & Sawbridge, 1989). Similar to other countries' experiences, Myanmar has been facing such a development gap.

In fact, the skill and performance of workers highly impact on SMEs. Bartlett (1994) study showed evidence of the relationship between investment in human capital by Italian and Spanish firms in 1994 and improvement in business performance. Anwar and Nguyen (2011) had also found that horizontal linkages with export-oriented foreign firms led to significant positive export spillovers for Vietnamese firms when both were located in the same region. Acemoglu and Zilibotti (2001) also stated that multinational corporations (MNCs) would make technologies available to their various least developed countries' (LDCs') subsidiaries depending on the relative availability of skilled workers. When SMEs have a critically low level of capacity and readiness in one country, they might face serious issues trying to cooperate with foreign firms (International Trade Centre, 2015). The most distinctive examples were the cases of Tanzania and Thailand because a new method for producing cans was not widely adopted because of workers' insufficient skill to work with this method. Therefore, this showed that skilled employment in host country was important because foreign firms had to bring and adopt overseas technologies to local suppliers (Fransman, 1985; Teitel, 1984). Haishun and Parikh (2007) stated that it was necessary to establish a certain level of development in the host country so that an outward-looking policy and an established comparative advantage would affect economic growth.

Besides, in an econometric study of transition economies, Esposito and Stehrer (2009) found results which were consistent with a positive relationship between the initial relative quantity of skilled labour and subsequent skill based technical change. Based on the experience of India, Datt and Ravallion (2015) stated the possibility of more demand in the experienced and higher educated labour group in the non-agriculture sectors in the post-reform period in one country. Based on the literature, the importance of human capital in achieving microeconomic and macroeconomic stabilities as well as firms' performance; thus, the role of policy intervention is very important to reduce poverty, to narrow the development gap among firms and households, to improve SME competitiveness, and to have maximum economic efficiency in Myanmar both in the pre- and post-reform period to ensure its sustainable economic development. Within contrast to the views of Ravallion (2005), Srinivasen (2001) and Bruno et al. (1998), Myanmar should be striving for minimal income disparity in its early stage of development so that this latecomer country would be able to rapidly its targeted developmental goals without failure and shortcomings.

The model development and simulation

The research model is based on the Frankle-Romer's AK model (1962) and the Romer's model (1987) in which an aggregate production function includes technology (A), capital (K) and labour (L).

$$Y = F(A, K, L)$$

In the model, technological knowledge is assumed a kind of capital goods because of having similarities such as "the ability to store over time when it cannot be used completely into a production process, the sacrifice of current resources in exchange for future benefits" (Aghion & Howitt, 1998, p. 26) and the capability to grow automatically with capital through research and development activities as well as other knowledge-creation activities. Thus, technology variable (A) is fixed because it can be combined with other factors of production to produce final goods under a Cobb-Douglas aggregate production (Equation 1).

$$Y = \bar{A} K^{\alpha} L^{1-\alpha}, \quad 0 < \alpha < 1 \dots\dots\dots(1)$$

Being a labour abundant country, the fixed technology variable is assumed to combine with labour as an effective labour input ($\bar{A}L$) to produce intermediate and final goods in Myanmar. The supply and demand of primary factors, intermediate inputs and other inputs are assumed to adjust spontaneously by the prices and quantities under the assumption of perfect market competition. Thus, the coefficients (α) and ($1 - \alpha$) are assumed to share equally in the capital and labour in Myanmar's national income (Equation 2).

$$Y = K^{\alpha} (\bar{A}L)^{1-\alpha} \dots\dots\dots(2)$$

Where:

$$\alpha + (1 - \alpha) = 1, \quad \alpha = 1 - \alpha$$

In this short-run model for Myanmar, the capital (K) is also set in its pre-determined level but the capital accumulation from the return on investment is allowed. Thus, the final output is determined by an effective labour ($\bar{A}L$) (Equation 3). However, the technology is fixed in our model and thus, the productivity is a function of labour efficiency (L).

$$Y_i = \bar{K} (\bar{A}L)^{\alpha} \dots\dots\dots(3)$$

The labour force (L) is equal to the aggregate flow of labour supply into the labour market. Each individual in the labour market has qualification depending on the allocation of

his or her time between work and schooling or work and learning by doing or on-the-job training (OJT) time. There are two types of labour forces in our model. The amount of skilled labour to work in the professional fields including researchers (L_s) and the amount of unskilled labour who are self-employed or work under the supervision of professional labours (L_u) (Equation 4).

$$L = L_s + L_u \dots\dots\dots(4)$$

The labour supply in the labour market includes new generation (c_1) and old generation (c_2) of individual workers (Aghion & Howitt, 1998, 341). The educational qualification of individuals in the past is accumulated to the current human capital with the discount rate because some skills need to be improved through learning by doing along with the improved technology and production lines. The assumption is that as Myanmar's education system is funded by public funding, the skilled labour joins the appropriate job and ends up their lifetime learning. Accordingly, their education knowledge can depreciate overtime (δ) and thus, the old skilled labour also need to be retrained to adopt new production technology (Equation 5).

$$L_s(c_1, c_2) = L_s(c_1) + \delta L_s(c_2) \dots\dots\dots(5)$$

Where:

δ = the discount factor

One way of narrowing the inequality gap is to support the investment in education and investment in human capital across industries countrywide because upgrading the quality of labour has been an urgent need in Myanmar. In order to do so, Myanmar policy makers should change the education policy from “free compulsory primary education for all” to “completion of free compulsory technical, vocational, school or tertiary education for all” or “supporting technical, vocational, school or tertiary education with reasonable tuition fees” for the new generation and should simultaneously provide training in different fields for the existing unskilled labour force. This research applied the matrix system based computable general equilibrium (CGE) analysis which is built on the concept of general equilibrium (GE) in which developmental assumptions are integrated under the equilibrium conditions of demand and supply of comprehensible economic agents, that is, intermediate users, investors, householders, government and exporters (Dixon, Parmenter, & Horridge, 1986; Ferguson et al., 2005). The reason for choosing GE analysis is its ability to close the gap between microeconomics and macroeconomics by merging some major branches of economic theory into one framework (Simpson, 1975) and by linking inter-industry relationships across industries through the competition in factor markets of land, labour, capital and technology (Wittwer & Horridge, 2007, p. 2). Under the assumption of equilibrium in demand and supply in the economy, the research framework and model for Myanmar was developed.

As described in the research background section, Myanmar has large proportion of unskilled and uneducated labour groups. It is also assumed that technology adoption by FDI into Myanmar's economy is still low level and accordingly and thus, the effect of technology is fixed in the model. In addition, capital and land are also fixed because these factors cannot be changed significantly in a short-run analysis. The size of the current capital and land stock in each industry is the result of investment decisions taken in the past (Baldry, 1980). Under the equilibrium condition with fixed technology, capital and land, it is possible to justify whether a rise in skilled labour supply would maximize the labour efficiency in production (Melotte & Moore, 1992), build market competitiveness of Myanmar industries (Chipchase et al., 2014) and increase and equalize the welfare of households (Fritzen, 2002). Although Behar (2010) argues that increasing the relative supply of skills is not an effective way to reduce wage

inequality after attaining a certain level of technology advancement in one country, this research's justification is suitable for Myanmar's situation because Myanmar still lags behind in advanced technology in its economic growth. The model follows Fritzen (2002)'s proposal on the need for "egalitarian, high-quality educational systems" to be added to the labour-intensive growth strategy of Myanmar as human capital to fulfil the skilled labour demand from industries and SMEs as well as the target of inclusive growth (Fig. 1).

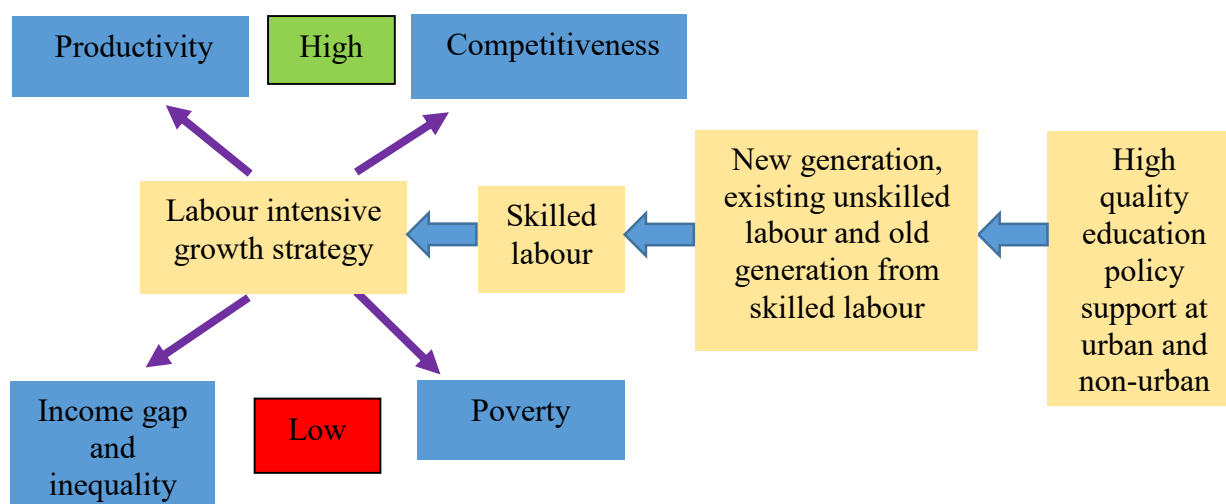


Figure 1: The concept of the importance of human capital in economic growth
 Source: Researcher's design based on the growth theory, Fritzen (2002)'s proposal on the need for "egalitarian, high-quality educational systems" and previous literature reviews

The ORANI-G applied general equilibrium model is used in this analysis. In specifying the skill and educational qualifications of Myanmar labour in this model, two definitions based on current education system have been developed. In general, Myanmar's basic education system consists of 11 years (Htay, 2013). After the upper secondary level, the students will have to join technical vocational school, degree college or university to learn specific skills. Thus, depending on their education qualifications, the skill and ability of Myanmar's two labour groups are different, especially to learn spillover effects from foreign firms (Anwar & Nguyen, 2011). More specifically, the workforce consists of:

- (1) Unskilled labour force: The lowest entry level 1 in an industry can be classified as the labour who have completed high school but no other formal skill training; or the labour who have not completed high school; or others who have not completed any school. At level 2, labour can be identified as those who have not completed high school or formal training but have relevant work experience. Level 1 and level 2 types are classified as unskilled labour and semi-skilled labour.
- (2) Skilled labour force: Level 3 and above is classified as the high-skilled, disciplined graduate labour force because these labour have completed either certificate training, or technical vocational school, or degree college or university, and are equipped with relevant experiences. The labour in this group includes professionals, managers, supervisors, technicians, researchers, experts and skilled labour.

In the model, the households are the suppliers of the factors (land, labour and capital) that are used in the production of goods and services. Depending on their ownership and educational qualifications, households engage in different industries to earn their factor income, which is limited. Referring to (Goto, 1990), trade and investment liberalization measures in Myanmar could maximize Myanmar households' choice and satisfaction²² through increased substitution of locally produced for imported goods²³ (Hosoe et al., 2010) depending on their factor income and which is cheaper. To further differentiate between subsistence (essential) goods and luxury goods under the Armington assumption, the Klein-Rubin utility function is included in the model (Horridge, 2014) because household purchasing power and preferences (tastes) depend on their income (Baldry, 1980). Based on the assumptions related to Myanmar's economic structure, factor resources, investment and production and agglomeration pattern, there are four major types of industries and four major types of households in Myanmar's economy as follows:

Table 1: The classification of types of industries and households in Myanmar's economy

Type	Sectors	Households
Urban concentrated industries	<ul style="list-style-type: none"> -Manufacturing industry -Livestock and fishery industry -Electricity, gas, steam and air conditioning supply industry - Wholesale and retail trade industry - Transportation and storage industry - Information and communication services industry -Financial and insurance industry -Real estate industry - Arts, entertainment and recreation industry 	Most of the urban households are relying on the industries which are related to the production of goods and services, and which are intended both for local markets and exports. Depending on their skill and occupations, the monthly income of households ranges between 90 USD and 1000 USD. The proportion between skilled and unskilled labour force is 40:60.
Rural concentrated industry	Agriculture industry	This type of household can be classified as conventional families who live in rural areas and earn their living from the agriculture industry from which they cannot have regular, reliable and stable income. This group can also be identified as a vulnerable household group. Some products from this industry such as paddy, maize, pulses and

²² Households' utility maximization function is known as Cobb-Douglas utility functions.

²³ The consumer choice to purchase locally produced goods and services or imported ones from abroad is known as an "Armington function" (Hosoe, Hashimoto, & Gasawa, 2010).

		fruits are exported to abroad. Apart from the income of owners and the skilled labour force, the income of the rest of the unskilled labour force is significantly low, which is calculated on the daily basic income ranging between 2 USD and 3.5 USD. The ratio of income between the skilled and unskilled labour force is 30:70.
Regional concentrated industries	<ul style="list-style-type: none"> -Forestry industry -Mining and quarrying industry -Construction industry 	This type of household can be classified as families living in remote areas where the forests or mines or construction projects are located. Myanmar exports a massive amount of forest products and mining products. While the maximum income of professionals, technicians and skilled labour force is around 60 USD per day, the income of the rest of the unskilled labour force is significantly low, which basically ranges between 7 USD and 15 USD per day. Thus, the income gap between the two labour groups is obviously large in regional industries. The ratio of the skilled to unskilled labour force is 40:60.
Support industries	<ul style="list-style-type: none"> -Water supply industry -Public administration, defense, social security, education, and health industry 	As the government is managing these industries, this type of household can be classified as government employees. Their monthly income ranges from 60 USD to 3000 USD per month depending on their positions. The average ratio between the skilled and unskilled labour force is 60:40.

Source: GTAP and the international standard industrial classification (ISIC) of all economic activities of the United Nations (2008) and CSO (2012)

Producers combine the input resources for the production of value-added goods and services. These resources include intermediate goods (including imported industrial raw materials), and primary factors (land, capital and labour), which are also limited (Melotte & Moore, 1992). The producers take technology acquisition, use their resources effectively and maximize their profits by building competitiveness and perceiving business opportunity. They decide their factor demand based on factor prices, supply prices, market demands and labour

efficiency²⁴. Sectoral output is a combination of the value-added and intermediate inputs through a constant elasticity of substitution (CES) production function between local products and imported products²⁵. After the production of gross domestic outputs, the domestic firms allocate their products either for the local market or for the export market or for both markets²⁶. The producers might determine the allocation of their goods based on the demand prices in the domestic market and export market. Alongside locally produced products and services, there will be the imported similar products and services in the local market due to trade liberalization. Therefore, market competition is important in the model.

In the final stage, all of the composite goods in the market are assumed to be absorbed by the economic agents (intermediate users, householders, investors, government, and exporters) under the equilibrium condition in the model and the producers obtain sales income from it. In the model, prices adjust to clear the markets in both the product and factor markets and thus, supply price is equal to demand price. Therefore, no firm would enter or exit the economy in this model because none of the individual firms could earn excess profits or suffer excess losses in the equilibrium condition (Horridge, 2014; Hosoe et al., 2010). To create a link between industries, two connecting mechanisms are applied: substitutability of goods and services in consumption (domestic or imported) and flexibility of labour across industries (Hosoe et al., 2010) while wages is fixed. As a short-run analysis model, the effects of government spending, nominal exchange rate, and world prices in foreign currency terms are fixed. In the national expenditure side, real consumption, real aggregate investment, and real government consumption are fixed. At the disaggregated industries level, fixed national household expenditure between urban and non-urban is in proportion to labour income. Besides, the model assumes fixed national investment across industries, between urban and non-urban areas, to endogenously determine the rates of return. Population is also held constant.

Model simulation

In economic theory, firms' marginal cost (MC) is determined by the ratio of wage and marginal product of labour (MP_L). MP_L is the factor of capital labour ratio ($\frac{K}{L}$) and technology ($\frac{1}{A}$). As the effect of technology and capital are fixed in the model, Myanmar firms will achieve the profit maximization point when the labour productivity is efficient. Under the equilibrium assumption, marginal revenue is equal to marginal cost. The firms which employ many unskilled labour have higher marginal cost and lower productivity than firms employing skilled labour. Such firms will lose their market competitiveness and as a consequence, they might reduce their employees in the future which will impact on the households' factor income. Marginal product of labour will be more effective when firms either train their unskilled labour force or employ skilled labour. The model tries to increase the qualifications of the labour force into skilled labour by 5% by assuming that Myanmar upgrades its education policy and trains existing labour forces with necessary skills and qualifications in the trade and investment liberalization period. To estimate the changes, the year 2013 is fixed as an initial year by assuming that it is unaffected by the policy simulation, which could reflect the economic scenario of the previous three years and the recent years of Myanmar's market demand and

²⁴ Firms' decision on factor demands is based on the Cobb-Douglas substitution function.

²⁵ Sectoral output is a fixed coefficient (Leontief) where the substitution is not allowed between value added and intermediate inputs.

²⁶ Firms' decision on allocation of output is based on the assumption of a constant elasticity of transformation (CET) function.

supply. The changes in endogenous variable A (ΔA) will be estimated from the change either in exogenous variable B (ΔB), or in exogenous variable C (ΔC) or in both variables in some scenarios, by assuming “Ceteris Paribus”, that is, other things being equal or unchanged (Marshall, 1890). The result will be described by percentage change.

It is expected that the increase in qualified labour supply will increase the productivity (output) and competitiveness of Myanmar firms. The prices of products are expected to decline together with cheaper intermediate products. The price gap of skilled and unskilled labour is expected to narrow while employment opportunities are expected to increase. It is also expected that the model can explain the relationship between increased qualified labour forces and important macroeconomic indicators. Ultimately to the aim is to estimate how human capital accumulation through the improved education policy can affect urban and non-urban industries, whether only in the particular industries or evenly distributed across industries, so that policy implications towards long-run economic development can be determined.

To conduct the policy simulation by the ORANI-G AGE model, the main analytical tool used in this research was the GEMPACK software package²⁷. The analysis techniques in this program showed many important results such as simultaneous changes due to policy change. To reduce the linearization error, the 3-step Gragg’s solution was used because of its more accurate direction and one extra pass at the end than the midpoint method and Euler’s method. Accordingly, the 3-step Gragg calculation in this study calculated 4 passes and thus the data accuracy rate was 100% (Centre of Policy Studies, 2015b, p. Section 30.32). The study used the dataset for Myanmar prepared and developed by the Global Trade Analysis Project (2015) and the Centre of Policy Studies (2015a) in which coefficients and elasticities were calculated. These coefficients and elasticities such as sigma (σ) were used to calculate the effect of changes in relative factor prices on relative factor demands (Cahuc & Zylberberg, 2004; Hamermesh, 1993).

Preliminary results

The results showed that the research model could answer our research question. At **the macroeconomic level**, due to a 5% increase in the supply of skilled labour, **the government** would be able to collect substantial tax revenue because the contribution of aggregate tariff revenue and aggregate revenue from all indirect taxes would increase at a rate of 1.6325% and 30.4069% respectively. The most noteworthy tax payers would be producers and households because the changes in tax revenue from these economic agents would increase by 3.5991% and 16.0666%. Although there would be a surge in imported intermediate goods and consumer goods, the quantity increase in collective export volume (2.9419%) would be greater than the import growth (1.1685%) and accordingly, the GDP price index in terms of expenditure would also decrease by -0.0008% together with a decrease in the balance of trade to GDP by -0.0041%. However, we have to note that the terms of trade would fall slightly by -0.1614%, which means that the import price would be slightly higher than the export price and thus, real devaluation would occur by 0.0008%, which means that export prices would less expensive than import prices and which could add slight pressure on imports and inflation.

From **the consumers’** demand side, household expenditure would be significantly increased by 2.0093% because skilled labour would gain new employment opportunities, an

²⁷ GEMPACK (General Equilibrium Model Package) was developed by the mid-1990s (Horridge & Ken, 2011).

increase of 8.8659%: a 5.3424% increase from the unskilled labour group and a 3.5235% increase from the skilled labour group. Household purchasing power would grow considerably by 23.1562%, which means that overall household satisfaction would be higher than before policy stimulation. The households would shift their preference to luxury goods significantly along with more employment opportunities. Of which, somewhat of these goods would be from local sources because quality, price and design would be improved. The consumer price index would increase significantly by 0.8084%, which would cause the prices pressure on the factors of production for the producers. The price gap between skilled and unskilled labour would be narrowed.

From the **producers'** supply side, the aggregate primary factor use would also be greater than before, an increase of 1.9463%, because they need to respond to the increased domestic and export demands. As producers could hire more skilled labour than before the policy change, the effective price of labour would decrease greatly by -6.8407% and thus, the payment to labour would decrease significantly by -2.1827%. The average nominal wage would fall by -6.8407%, which means that producers could reduce their wage bill by employing skilled labour. However, producers would face an increase in average prices of capital rental (3.7659%), land rental (5.3107%) and other costs (1.6267%). Therefore, aggregate factor payment would rise by 1.7861%, which could lead to a decrease in an economy-wide rate of return by -0.4522%. In other words, the investment in some industries would not be profitable in the short-term. However, with the increased market demand, attractive demand prices and better labour force, investors would invest more for the future and thus, investment expenditure would increase significantly by 2.0093% in Myanmar. The registered Myanmar SMEs would be able to get spillover effects from the foreign investors as well as to involve in supply chain network with foreign firms because Myanmar has many FDI projects in different areas.

The research could also distinguish between urban and non-urban industries at **the micro level**. For **the rural concentrated agricultural industry**, the value-added vegetable oil and fat sector, crop nec sector, and cereal and grain sector have the highest potential in terms of employment, production and competitive output prices. These three sectors would increase the employment offer by 37.0368% and thus, these opportunities would be able to reduce the rural unemployment and underemployment rate significantly. Among **the urban concentrated and regional concentrated industries**, the following sectors would have future opportunities such as establishment of market competitiveness, offer employment opportunities and production efficiency, and increase production and export, which are outweighed the current challenges:

Table 2: The particular industries which could achieve significant improvement from effective labour supply

Urban concentrated sectors 1.Dairy products sector 2.Bovine meat sector 3.Textile sector 4.Wearing apparel sector 5.Leather sector 6.Machinery and equipment sector 7.Electronic equipment sector 8.Motor vehicles and parts sector 9.Metal nec sector 10.Transport equipment sector 11.Insurance sector 12. Business services sector	Regional concentrated sectors 1.Forestry industry 2.Coal sector
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However, there would still exist some constraints in the economy such as the rising prices of fixed endowments such as land and capital, and the prices of intermediate input such as fertilizer, which could not be solved by trade and investment policies and the education policy alone. Due to the existence of such constraints, some industries would be unable to establish market competitiveness in the short-term, although these industries would offer massive employment opportunities and increase production. These industries include most of the sectors under **the agriculture industry**. This limitation would influence the factor income of households who are engaging in these industries. As a consequence, the inequality gap between industries and households would remain in some areas and would still be hamper the planning intention of Myanmar's next five-year short-term plan "to strengthen the country's economic and investment base to reduce poverty and inequality while accelerating its regional and international integration endeavours". If Myanmar would stabilize the fixed endowment prices, it would helpful for the major areas of the agricultural supply chain with the highest poverty rate: Ayeyarwaddy Region and Magway Region.

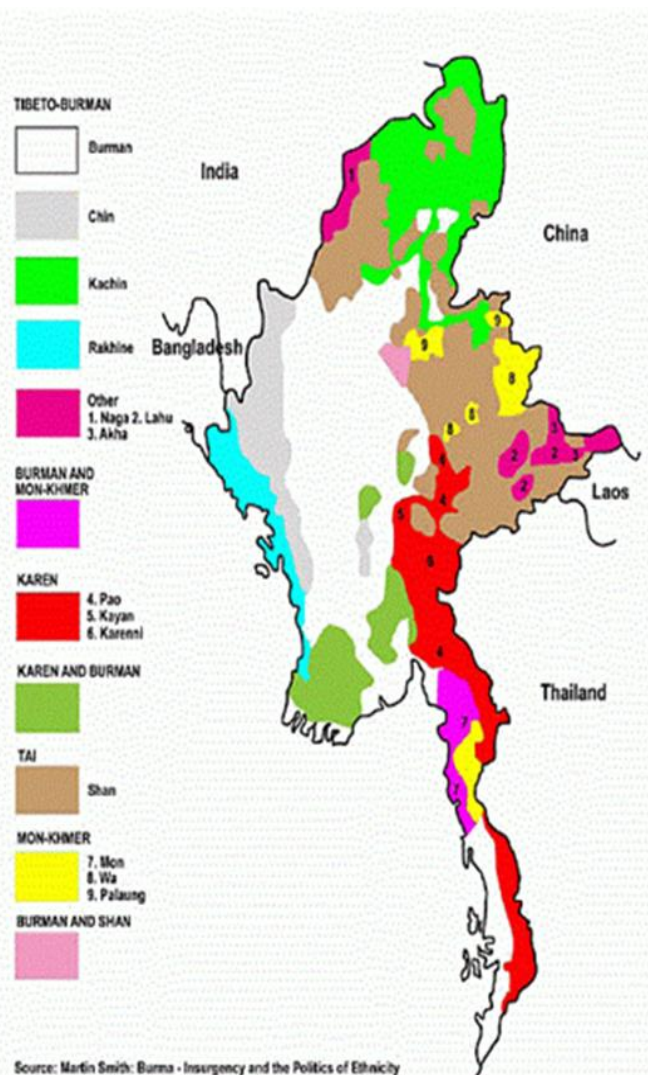
To ensure Myanmar is on the right track of growth with equity by stressing education and labour-absorbing growth in the long-term, Myanmar policy makers should intervene with policies that control rising land and capital prices, as well as with policies that control the inflation rate. This intervention would bring about fewer disparities between urban and non-urban areas. This would ensure that the following industries have considerable potential in terms of employment opportunities, narrowing inequalities between urban and non-urban areas, supply chain networks in national production as well as competitive economic performance:

Table 3: The potential industries which could achieve substantial improvement if the government supports other policy interventions in addition to high quality education policy

Urban concentrated sectors	Regional concentrated sectors	Rural concentrated sectors	Supporting sector
1.Petroleum and coal products sector 2.Electricity and gas sector 3.Financial sector 4.Wholesale and retail trade industry 5.Arts, entertainment and recreation industry 6.Information and communication industry 7.Raw milk sector 8.Animal products sector 9.Fisheries sector 10.Wool and silk sector 11.Transport and storage industry 12.Real estate industry	1. Mineral nec sector 2.Oil sector 3.Construction industry	1.Plant-based fibres sector 2.Sugar cane sector 3.Paddy sector 4.Oil seeds sector 5.Wheat sector 6.Grain nec sector 7.Crop nec sector 8.Fruit and nuts sector	1.Water supply industry



Figure A: Map of Myanmar's states and regions
Source: (Ephotopix.com, 2015)



Source: Martin Smith: Burma - Insurgency and the Politics of Ethnicity

Figure B: Map of major ethnic groups
Source: (The BibliOdyssey, 2008)

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