**EXPANDING THE PRODUCTION
POSSIBILITY FRONTIER OF SRI LANKA:
A HISTORICAL ECONOMIC PERSPECTIVE
ON TECHNOLOGICAL PROGRESS**

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INTRODUCTION

The level of living conditions in a developed country such as the United States of America, Japan or the United Kingdom is not anymore a secret for any of the Sri Lankans living in this information age. Moreover, no one in the 21st Century would reject to have that level of comfort in his or her life. Therefore, the central question that gets to one's mind is that how they have achieved such development while we are struggling for it for decades even after independence. Alternatively, we can ask the same question, "*how did they achieve that much of development while we are not having*"? Answering this question is not an easy task. Even the shorted list of answers is so long, to name a few; effects of colonization, typical Sri Lankan culture, religion, corrupted political culture, bad institutions, and poor technological progress. Not to argue with the list, since it is not a complete one and the order can be different as one think. However, if we analyze it with world history, it suggests that the main culprit is the poor technological progress in the country during the past two centuries. Hence, the main objectives of this article are to answer the over raided question of "why Sri Lanka could not achieve the living conditions that the developed countries currently enjoying" and "how the future policy directions should be formulated to catch up the developed world" in a historical economic perspective.

PRODUCTION POSSIBILITY FRONTIER

To answer the questions, let us start with the Production Possibility (PP) of a country that shows the maximum output of a country can produce by fully utilizing the available resources with the existing technology. PP decides the level of living conditions of the people living in a country (assuming that the welfare of the people is measured by the amount of consumption of goods and services, as most economists do).

Production Possibility can be shown by a graph which is called the Production Possibility Frontier (PPF). An illustrative Production Possibility Frontier can be shown as Figure 1. We draw this graph assuming that all the production inputs of the country are fully utilized and the production technology is constant.

Figure 1 An Illustrative Production Possibility Frontier

PPF₁ curve of the above graph shows the maximum potential of the production of goods and services of the economy that decides the level of welfare of the people. Shifting it to the right (expanding) up to PPF₂ will increase the amount of production (thus consumption) of goods and services of the economy and vice versa. How can an economy shift its PPF to right? This could be achieved through increasing of the resource stock of the country, which is very rare in the global economic history, though few exceptions like Oman, Botswana, and Guinea where large deposits of crude oil or diamond reserves were discovered. Otherwise, it will be limited to the natural growth of the population as early economic growth theories explained.

INDUSTRIAL REVOLUTION

The second way of shifting the PPF to the right is the technological improvements. Technological improvements will shift the entire PPF right with the given level of production inputs so that there are no worries about finding new resources. This is what almost all the developed countries followed in the process of development up to the current level in their economic history. Industrial revolution (1760 – 1850) ignited the battle for the sustained economic growth of the countries like the United Kingdom, United States of America, Netherlands and so on. By closing the gap in Education, Capital and Productivity and thereby improving the technology, a few countries like Japan, Singapore, and South Korea later joined the club of developed nations and China is closing in with the same line. Technological improvements were the engine of the industrial revolution and growth of all these developed nations. Getting the technological improvement at the right time in the right place may have gone wrong in the Sri Lankan

development history due to many reasons that may add further to my shortlisted list of answers to the first question.

During the industrial revolution, many inventions were due to the technological improvements; put it as the steam engine, spinning and weaving machines, the iron, and steel refining machines, using coal instead of firewood and so on. Furthermore, several innovations simplified the production processes such as the production of pins and nails. Revolutionary technological improvements further invented the railway, steamships, and power-driven machinery which helped to expand the production possibilities of those countries. If the economic development of these countries augmented mainly by the technological improvements ignited by the industrial revolution, then the second question could raise is "why industrial revolution had taken place in these countries but not in Sri Lanka".

Cultural and political context that was conducive to the innovation in Western Europe helped the industrial revolution to take place in Europe, especially in the United Kingdom. Less than 5 percent (rich and educated) of the people in British could vote while the crown had still much power of the country. Parliament had the right to impose a tax on the rich as well as on the commoners and on land and on the goods or services. Tax on imports as a promotion of domestic industries was common. The British parliament had the power to take any property of the public for developmental activities against their wish. Moreover, a scientific culture had grown in Europe before the industrial revolution and upper class, as well as the working class people, were discussing, researching and implementing the scientific findings. Acceptable establishments for ensuring patent rights guaranteed the return for technological research and innovations. Importantly, by the time of the industrial revolution, the labor of these countries was more expensive than the capital. Therefore, these countries (especially the United Kingdom) found that investing more in capital development was more profitable than increasing the use of labor. Therefore, they employed cheaper technologies than expensive labor in their production processes.

Therefore, these countries promoted technology than expected to generate a considerable profit for their users. Therefore, research and development of the country were mainly targeted on the contemporary needs and the issues of the industry. High wage rates of these countries further directed the labor reducing inventions by increasing the capital stock. However, high capital-intensive productions induced higher wages, finally increasing the wages of the workers, which is termed as a spiral of progress in Economics. How this happened can be explained with the following process. Increasing the capital, increased the capital per worker which increased the output per worker (termed as productivity of labor), which increased the wages of the workers. Increasing wages increased the buying capacity of the workers inducing higher demand (which is termed as Aggregate Demand in Economics) of the economy. Which in turn encouraged the

industrialists to increase the total production of the economy through new technologies with the least cost (which is termed as Aggregate Supply). This process continued until these economies reach up to the present level.

WHY SRI LANKA FAILED

The third question that automatically comes to our mind is that “why it did not happen it in Sri Lanka”. According to the historical accounts, when Prince Wijaya landed in Sri Lanka, a *Yakkini*, (probably a girl belongs to the *Yakka* clan) named “Kuweni”, the first wife of Prince Wijaya was weaving cotton, whereas the United Kingdom started transforming cotton production to the factory type and mechanizing the process in the mid-18th century. As we cannot differentiate the industrial revolution and the cotton industry, the fate of the cotton industry of India explains completely the technological collapses in the developing countries including Sri Lanka.

India, which was a great emperor before the 19th century, was one of the best-developed countries with the largest manufacturing industry, mostly cotton and related products. However, in the mid-19th century, India fully and formally became a colony of the United Kingdom. This colonization destroyed much of her industries without replacing them with the innovations. India became a net importer losing its place as a major exporter to the world. Therefore, the fate of India and many of the other colonies like Sri Lanka, suffered partly due to the western colonization and their bad policies after the colonization. Industrial manufacturing of the Western Countries was cheap due to their higher productivity obtained through technological improvements. However, the wages in this part of the world were low and productivity also was low due to higher labor intensity. The new technology developed by the industrial revolution was not suitable for countries like India and China as they were endowed with abandoned cheap labor whereas the innovations were on expensive capital-intensive production technologies. On the other hand, the colonial governments were not providing adequate consideration on the need for mechanization of the primary industries such as palm oil technology in Africa. Therefore, the countries like Sri Lanka was continuing on the same traditional production methodologies that were employing lots of labor. Therefore, not much change in technology was made in this part of the world with the industrial revolution. On the other hand, steamships and the railways made transportation cheap and cheaper transportation made western industrial products cheap in the local markets in India as well as in many of their colonies. These countries faced difficulty in competing with the western products (even with cotton products), eventually revert to their labor-intensive agricultural production, and gradually becoming the exporters of these primary products to the West as cheaper industrial inputs.

By the time of the invasion of Westerners, Sri Lanka was also a country that had technologically progressed comparably similar to India through the agricultural development. Much of the technology either developed or received from the other countries were mainly for the agricultural sector. The country had an advanced irrigation system which stays alive up to present day, many hospitals were run by the well-known kings for Ayurveda medicine indicating that the country had an advanced medical system, and production of agricultural tools and some weaponries were also much developed. The construction sector was highly developed such that the country is still having several skyscraping stupas and palaces constructed in ancient time.

However, with the colonization, Westerners promoted the plantation agriculture (especially, Tea, Rubber and Coconut) in Sri Lanka with the western technologies and imported labor from India. Three major exports - Tea, Rubber and Coconut - were exported as raw products without any processing. Railways were introduced by the British, but the railing was done by the British engineers and no local inputs were incorporated. Tea factories and their machinery were set up, but again there were no local people employed or trained for technical work. Buildings and bridge construction works also went on the same line. Moreover, all the inputs for all these developments were imported from Western countries and no locally made parts incorporated or promoted. Therefore, the industrialization process did not assist in the development of local industries and technologies. Traditional agricultural system and irrigation system were not promoted and gradually decayed.

SIGNS OF PROGRESS

Nevertheless, few important industries that were started and Sri Lankans were trained for these industries with the dawn of the 2nd World War. For example, steel rolling (1937), plywood (1941), leather (1941), acetic acid (1942), paper (1942), glass (1944) and ceramics (1944). But the technology and much of the inputs (especially machines and their components) were still imported from western countries. These technologies were primarily developed for Western countries with high wages and scarcity of labor. Whereas, wages in Sri Lanka was very low and labor was abandoned. On one hand, the industrial policy of the successive governments was to increase the use of technology, on the other hand, the objective of the economy was to increase the employability. This mismatch in the capital market and the labor market was not much helpful for the technological advancements and industrial development of the country.

With the independence, Research and Development (R&D) activities were taken as a serious policy priority of many of the successive governments. Therefore, several institutions, such as the Ceylon Institute of Scientific and Industrial Research, Tea Research Institute, Rubber Research Institute, Department of Agriculture, and Industrial

Development Board were initiated. Almost all the successive governments from independence to date had identified the importance of the development of Science and Technology of the country and many measures had been taken to develop and promote them. However, with all the efforts, the country's economic system has only changed a little. Only a significant introduction to the composition of the country's manufacturing output was the garment industry, which is using much of its inputs by importing. Besides, the production technology of the garment industry is only a little varied from the production technology that is developed in the industrial revolution. The explanation for these poor developments of the technology in recent years can also be assigned to the mismatch of introduced technology (capital-intensive western technologies) and the realities of the labor market as explained in the previous sections. Furthermore, the less recognition of the innovations, inventors and the researchers of the country has also played a significant role in poor advancement of the technology. Many reputed inventions have been patented in foreign countries and brain drain is a fact of life in modern Sri Lanka. Even though the primary and secondary education in Sri Lanka is free and mandatory for all its citizens, access to government-provided tertiary education is very limited even though it is free for all. Moreover, expenditure on education, research, and development in Sri Lanka is even lower than many of the other developing countries. These developments suggest that Sri Lanka is still expecting to continue with its technological development at the current pace and will take more than one century to expand its Production Possibility Frontier to the level of the developed world.

WAY FOREWORD

Hence, it is very important for all the governments, policymakers as well as the national and international development agencies to take technological development of the country as the first priority of the country. This is not an easy task, but there are several similar examples in world history. One of the best examples is the Meiji Restoration (1868-1912) in Japan. Before Emperor Meiji crowned, Japan was a battle field for different clans coming from different regions of Japan ruining the whole economic system and society. Within a period of 45 years, Emperor Meiji was able to upturn the Japanese economy by modernizing all the activities of Japanese society. One of the major focus of the Meiji Emperor was to make Japan one of the advanced technological countries in the world. As it is today in Sri Lanka, it was a very difficult task as the society was segmented based on regional differences as well as the feudal culture established for more than 1000 years. However, he changed Japanese society from clothing to weapons. Changing technology was not that much easy in Japan where many things were different from the rest of the world. For example, they were using six hours of day time and six hours of the nighttime clock which made different durations per hour for day time and night time depending on the season. This made several difficulties in adopting new technologies developed in

other parts of the world. For example, it was very difficult to introduce the train system in Japan due to a time scheduling problem. But they changed the culture of Japanese people and adopted the world accepted 24 hours clock and developed the world's fastest train system which has the time accuracy to the second with zero fatal accidents. However, this required a well thought coordinated effort from all the sections of the country.

Education sector that played a very important role in the industrialization of all the developed countries needs to be modernized in such way that the recent technologies of the fourth industrial revolution can be delivered, absorbed and propagate from the kindergarten to the university level. Introduction of the technological stream in the A/L curriculum and start of the technological faculties in many of the public universities is a very positive sign in this direction. Award of the university status to the Technical Colleges will also help the country to improve the technological development. However, it is very important to allocate a reasonable amount of public expenditure for education, thereby, make the learning more relevant to the contemporary life of the public and address the issues and problems of the modern industries. The school education should be student-based, self-study mode of studying. It should not be focused on checking the memory power and writing ability of the students but developing the thinking and implementation ability of the students. Public and private universities should be directed for strengthening and introducing more technology-oriented degree programmes. Public expenditure on research and development (R&D) should be further improved while R&D expenditure from the private sector needs to be promoted by providing incentive programmes. The innovations and inventors should be highly recognized by the country, programmes on making aware of the public on this importance should be promoted. The professionals engaged in research activities should be promoted and they should be financially supported reasonably, such that brain drain from the country can be stopped.

Building up the quality institutions is also a primary requirement in the process of the technological development and growth of the economy. The fast track of achieving the development in the United States of America partly lies in the quality institutions she had developed within a shorter period. Institutions such as property rights, the judicial system, market mechanism, political system, and education should be strengthened.

CONCLUSION

Last but not the least, economic understanding of the problem of poor technological progress of the country- the mismatch between the capital market and the labor market – as the historical development explained, need to be understood. Therefore, technological improvements should be matched with the existing conditions. Moreover, the improvements in the technology should make more demand and return for the local

resources available in the country. Once the country is established with a sound technological base, gradually, the technology can be shifted towards the more capital-intensive products and projects. Which was the industrial development lesson learned by Japan in its development process? Development of an industrial culture within the Sri Lankan society is also very important in the technological advancement of the country. With all these, Sri Lanka will be able to expand; its Production Possibility Frontier up to the level that Sri Lanka can be called a “Developed Nation”.