

## The Role of Choice of Technique in Economic Development of Developing Countries

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### Introduction

Most of the development economists admit that the under-developed countries are economically backward because they are technologically backward. A higher level of technology is pre-condition for rapid economic development. Schumpeter emphasized the role of dynamic technology in the process of economic development and in the explanation of cyclical growth of capitalism. His emphasis on institutional factors or economic development may be welcomed by the developing countries which are trying to break the age old uneconomic tradition. Each long wave upswing is brought about by an innovation in the form of new product which leads to further innovations in the methods of production, new forms of business organization, and new sources of supply of raw materials and intermediate products and new markets. Technology has played a vital role and impact in supporting emerging economies to shift toward sustainable growth, with creative technologies that strengthen people's choices and well-being. Much of the development and modernization over the last several decades has been ascribed to technology. Technology is essential to the economic development as well as to other public welfare aspects. Instead of just attaching particular time intervals for one phase of technical transition alone, this is much more fitting to see this as a crystallization of mechanisms in the area of technology and growth over time; recognizing in part the evolving experience in industrialized economies as capability has grown; in part reflecting increasing intellectual perspectives.

In developing countries there is an important problem of choosing one of the most suitable techniques of production, so that producers may utilize the available resources in order to increase the growth rate of the economy. A given output may be achieved by producers by different methods of production. Some may use more

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labour and others may use more capital. The problem of choice of technique is thus, to select the best technological process in a given situation. In most of the developing countries where there is abundant labour, but scarce capital, the problem of choice of techniques arises. There two major factors determine the most suitable techniques of production in such economies. The choice of techniques to be adopted by a country is an important factor in the determination of capital-output ratio also. If the investment programming of a country be geared to labor intensive projects, a large output can be produced with a small supply of capital and the capital-ratio would be low. But such a proposition has been held to be theoretically untenable. The proposition that a less capital intensive project can entail a lower capital-output ratio and the productivity of labour was assumed independent of capital intensity. But capital-labour ratio and the productivity of labour are not independent variable but interdependent variables in relation to intensive it leads to an increase in the productivity of labour and so the capital-labour ratio is low but this may result in a lower productivity of capital leading to a high capital output ratio. On the other hand in capital intensive technique the capital labour ratio is high but this makes a unit of labour more productive resulting into larger output.

A significant question over which some dispute has arisen in economic discussion, is whether developing country should use the technology appropriate to its existing factor proportions, including especially its capital/labour ratio or whether it should anticipate the relative growth of capital and begin the use of capital intensive methods of production before its capital endowment is really suitable for this. In particular, the question is whether countries at early stages of development, with capital scarce and often with labour abundant should take advantage of the modern technology developed by advanced countries, where capital is abundant and labour scarce or whether they should take advantage of the modern technology developed by advanced countries, where labour is abundant and capital scarce or use production methods which are obsolete in countries abroad or whether they should devise their own ?

### **Innovation and Choice of Technique**

Technology consists of a series of techniques. The development of techniques is essentially a historical process in which one technique with one set of characteristics replaces another in the light of historical and economic circumstances of the time. Most of the technology used today has been developed in the western countries during the period of the last two centuries or so after the advent of the industrial revolution. This is often referred to as modern technology to distinguish it from the technology used in earlier period (traditional technology). In developing countries even today particularly in the field of agriculture and small-scale and cottage industries, it continues to be used.

Although currently used excessively in our daily lives, the term innovation continues to be vital in enhancing integrative performance. Invention is not simple to discover, it far wider than a change or improvement. It is therefore necessary to recognize the possibility that agencies and entities, every now and again, encounter circumstances that offer grounds for comprehensive improvements. Such situations require out of the box thinking, and the necessary transition can only be achieved by innovation. Innovation is also of vital importance for sustained growth and sustainable prosperity as well. In today's economy, innovation acts as a deciding driver not just for generating growth but also generation of employment. Innovation also leads to new enterprises and to competitive edge of existing enterprises. It is pertinent to mention that the pace of industrial, economic, financial and mechanical is directly related to the efforts made towards research and development, which literally acts as a well-founded measuring stick of the potential of a nation to innovate. Albeit, the expenditure on research and development in India has increased constantly in absolute terms but it still meager and less than one per cent of GDP. India, nevertheless, still does need to do more in this regard as a developing nation to reach the stage of development of developed countries. Innovation has proven to be the main force of progress worldwide. Innovation has made it possible to provide useful and relatively cheap products and services to satisfy every changing market demands. Global character clearly show how innovative solutions do not only contribute to encouraging the national economy

Innovations are both cost-reducing and demand increasing. In fact, both feed each other. Inventions and innovations during the initial period of the industrial revolution reduced the costs of production and also brought a whole breed of new consumer goods in the market. As more consumers sought purchase the new variety of goods, the pressure of demand increased and this encouraged the entrepreneurs to come forward with more new and improved products. Increased demand by consumers played an important role in the economic development of the developed countries by providing a continuously expanding market for the industrial goods. Therefore, the importance of demonstration effect in the economic development of the western countries has been duly acknowledged. The force of demonstration effect brought forth numerous demand- induced innovations and helped in the continuous up gradation of technology in these countries. This gave a boost to economic growth.

Creativity and innovations are important for the country's economic development and progress. Looking at the challenges that country is facing today, all the players in economy need a common innovation based solution to create and maintain a sustainable image in the globalized society. And internationally, consumer focused innovations, delivered by accelerated technological diffusion are increasingly becoming examples of creativity. Nations such China and South Korea serve as driving engine of how creativity affects development and prosperity with the latter perceptibly

strengthening its economic role by enhancing overseas technology inflows, building capacity to absorb these innovations, and growing R& D spending. A PwC study reports that India has the ability to raise its GDP to USD 10.4 trillion by and raising it per capita GDP from \$ 1490 to \$ 6800 by achieving a compound annual growth rate of 9% in GDP over consequent twenty years and raising its research and development (R &D) investment to 2.4% of GDP by 2032. Achievement of these targets requires innovation powered change in the economy. India is becoming an economic power and moving to become nucleus for innovation. Stimulated by demand created by economic reforms, curtailing legislation, the business firms are constantly improving the standard of their products and services and increasing their market presence increasingly.

Programme such as the Economic Times Power of Ideas partnered by Department of Science And Technology, Govt. Of India, IIMA's CIIE and supported by Facebook, aims to foster a vibrant creativity and entrepreneurship ecosystem. This platform aims to empower the citizens with inventive ideas, particularly for business purposes. The standard of living increase, the basis for a fast growing urban and industrial system is land and boundless, opportunities for progress unfold themselves. However, side by side, environmental pollution increases, anxiety and insecurity rises, and old crafts and craftsmanship declines Man becomes a machine and gradually loses his identity in a fast changing society. Despite these disadvantages of technology which are now coming more and more to the fore in the advanced industrialized countries of the world, the developing countries are putting in their best efforts for the promotion of technological innovations, because technology seems to be the only hope for economic development.

### **Appropriate Technology**

It is a rather very complex problem. Besides several economic features, much depends on socio-political forces to be operated in a given condition. The choice of techniques refers to the choice of capital intensity- the ratio of capital to labour or the amount of capital used per unit of labour. A developing country has a choice of alternatives between labour intensive and capital intensive techniques between light and heavy industries and between agriculture and industry.

The question of appropriate technology for the developing country like India has attracted increasing attention of the economists and planners during the recent years. This is due to the reason that massive importation of capital-intensive technology of the western countries into the backward countries during the past few decades has failed to yield the desired results. This importation of technology has largely resulted in the intensive development of small enclaves in some major cities and port towns but has created jobs and has left the rural areas and smaller towns virtually untouched so that there are increasing numbers of impoverished unemployed and underemployed.

It is true that the small entrepreneurial class in developing countries is a deviant class. Economic and social climate is inimical to the entrepreneurs; economic development gets a serious setback. Innovations take the form of improved techniques of production or the expanded plant and equipment, labour productivity may considerable increase in developed countries. But in capital-poor and labour abundant economy the adoption of less labour-intensive technique may aggravate the problem of unemployment. Since innovational investment depends on high profit (often risky) expectation and capital using technology, developing economy may not find such investment always feasible and profitable for capital formation.

India is facing the problem of excessive pressure of population on land; it would be unwise to concentrate on the technology that displaces biological sources of energy since this is likely to create large scale unemployment of labour. Therefore, even though the use of machines like tractors, threshers, harvester combines may be defended on grounds of private profitability of the farmer concerned, it cannot be defended on grounds of social benefits. Does this mean that the use of traditional technique which is primarily based on the use of ploughs and animal labour is justified? or is there some alternative appropriate technology ?. Therefore there is need of some alternative technology in the context of the over-populated economies. These countries need to increase it considerably to meet the requirements of a rising population and generate adequate surpluses to support the programmes of industrialization. For labour surplus economies like India that technique would be appropriate which increases the agricultural output as well as the demand for labour simultaneously. In certain sectors and industries capital-intensive techniques are most appropriate; in certain other sectors and industries labour-intensive techniques are most appropriate. Therefore, a wise policy from the point of view of the developing countries would be to use a judicious mix of the two. Certain large scale industries require the use of the capital intensive techniques while certain complementary activities and agriculture call for the use of labour intensive techniques.

The appropriate technology is one that changes with the time, people accept its latest and improved version and that suits the new conditions. It should neither be based on traditional technology, nor on rejected modern technology. The efforts should be made towards the choosing the simplest of such alternative techniques, the sturdiest of available capital equipment, the small type of the plant consistent with technical efficiency the technology that makes the best use of the plentiful factors of production.

### **Technique, Employment and Output Conflict**

Each country passes through a long historical process for its technological development from simple to complex techniques, from traditional to modern techniques, from those satisfying local needs to those producing for distant markets

and from those using domestic resources to those demanding foreign capital. The successful completion of these phases would mean rapid economic development and the evolution of new technology would require the increasing scientific knowledge, heavy capital investment followed by skilled labour, entrepreneurial skill and willingness of the people to adopt the new products and processes for mass production.

A crucial question over which some dispute persists in economic theory of development is whether a developing country should use the technology appropriate to its existing factor proportions, including especially its capital-labour ratio or whether it should anticipate the relative growth of capital and begin the use of capital intensive methods of production before its capital endowment is really suitable for this. This particular question is whether countries at early stages of development, with capital scarce and often with the labour abundant countries, where capital is abundant should take advantage of the modern technology developed by advanced countries, where capital is abundant and labour scarce or use production methods which are obsolete in countries abroad. In developing country there is an important problem of choosing one of the most suitable techniques of production, so that producers may utilize the available resources in order to increase the growth rate of the economy.

There is conflict between employment and output due to selection of a particular technique of production. The conflict arises not in the utilization of existing equipment but in the choice of new techniques. The techniques of production which are labour intensive may have higher capital output ratio than techniques which are more capital intensive. It can be illustrated with an example. Let us suppose a fixed amount of capital to be invested of Rs. 5000. One technique of production could employ 50 units of labour, but the capital output ratio is 4. This would give an output of 1250 with the employment of 50 labourers. A second technique of production employs 25 labourers but its capital output ratio is 5. This provides the production of 1000 units of output with employment 25 labourers. Thus, if employment opportunities are to be generated, then the labour intensive technique should be adopted which has lower capital-output ratio.

The technological development is hence an essential condition for the rapid economic development of a country. The technological status that contributes much to the economic development in the developed economies cannot be achieved in developing economies with their present resources. Moreover, most of such economies are characterized by lack of education and research facilities, skilled labour and entrepreneurial ability. Their levels of savings, income, investment and consumption are extremely low and they have small markets.

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