DEFINITION of 'Technical Progress Function'

An economic relation which seeks to explain changes in the level of economic output in terms of the level of technical progress. Rather than looking at [economic growth](http://www.investopedia.com/terms/e/economicgrowth.asp) as a form of efficiently allocating inputs, the technical progress function explains economic growth in terms of investment in technological progress.

# Technical Progress and Economic Development:

Technological advancement and economic growth are truly related to each other. The level of technology is also an important determinant of economic growth. The rapid rate of growth can be achieved through high level of technology. Schumpeter observed that innovation or technological progress is the only determinant of economic progress. But if the level of technology becomes constant the process of growth stops. Thus, it is the technological progress which keeps the economy moving. Inventions and innovations have been largely responsible for rapid economic growth in developed countries. The growth of net national income in developed countries cannot be claimed to have been due to capital alone. Kindleberger observed that major part of this increased productivity is due to technological changes. Robert Solow estimated that technological change accounted for about 2/3 of growth of the U.S. economy; after allowing for growth in the labour force and capital stock. Similarly, Karl Marx and Schumpeter have emphasized the significance if technical progress in their growth model formulations. In the words of Mansfield “Technological change is one of the most important determinants of the shape and evolution of the economy. Technological change has improved working conditions, permitted the reduction of working hours and provided the increased flow of products.” In fact, the technology can be regarded as primary source in economic development and the various technological changes contribute significantly in the development of underdeveloped countries.

**The contribution of technical progress to economic development has been summarized below:**

**(1) Intensive Utilization of Resources:**

Technical progress helps intensive utilization of the available resources. It leads to diversification of resource utilization. Increased and diversified output contributes to the growth of national income and economic development.

**(2) Use of Potential Resources:**

Technical advancement facilitates the discovery and utilization of potential resources of the country. Thus, technological progress helps the growth of substitute resources for imports. As a result, domestic production is increased with domestic resources themselves. For example, in India, oil could be exploited due to technical progress.

**(3) Helpful for Export Promotion:**

Technical advancement is very much helpful for export promotion. It facilitates diversification of output in under developed countries. As a result, these countries become capable of exporting non- conventional goods, such as engineering products and various other finished products. New technology helps to increase the level of output and therefore the capacity to export. Because of diversified output, dependence upon the developed ones is considerably reduced. Accordingly, terms of trade start improving in favour of the developing countries and these countries start getting fair compensation for their exports.

**(4) Contribution to Import Substitution:**

An underdeveloped country utilizes technological progress in the field of import substitution. As a result, lot of foreign exchange is saved for the import of essential raw materials and capital goods. Thus, the process of technological progress continues hand in hand with the process of capital formation within the country.

**(5) Growth of Infra-structure:**

Technological advancement helps the growth of infra-structure of the economy. They include the basic facilities like transport, Communication, power and irrigation. They play pioneer role for the development. Thus technical progress contributes to the growth of the economy by way of developing its infra-structure.

**(6) Increase in the Efficiency of Human Resources:**

Technical advancement helps to increase the efficiency of human resources. Labour is given training for the use of techniques of production. It improves their efficiency. Increase in the efficiency of workers, in turn, facilitates more innovative ideas of production. Cost of production and prices are reduced which are very much useful for developing countries.

**(7) Helpful Industrialisation:**

The growth of industrialisation depends upon the growth and application of new technology. Technological progress has been the chief determinant of industrial revolution in the European nations. In less developed countries, establishment of basic industries requires modern- technology. Technological progress has the direct bearing upon the process of industrialization. It helps the progress of all such parameters which are vital to the growth of industrialisation. Germany and Japan are good examples of technological progress in the world.

**(8) Change in Social and Economic Structure:**

It has been observed that technological progress has made remarkable change in the social and economic structure of underdeveloped countries. Man becomes curious to acquire new ideas so as to raise his income level and the level of living. The outlook of the man becomes more progressive. Contacts with the developed countries generates ‘Demonstration Effect’ which in turn help shedding conventions and rituals.

A new social order is established. More of efficient labour and capital are needed for the application of new technology. For its arrangement new economic institutions are established. All this brings about structural changes in the economy.

**(9) Increase in Capital Formation:**

Technical progress leads to the growth of output and productivity. As a result, per capita income is increased. On the one hand, consumption of the household rises, while, entrepreneurs start saving, generating more and more surplus. They are encouraged to make more and more investment in the economy. It helps to generate capital formation and the rate of growth automatically increases.

**(10) Availability of Foreign Capital:**

Generally underdeveloped countries face the problem of capital and domestic capital is already scarce. Thus, foreign-capital is invested in such developing countries generally on the condition that technological changes “are introduced in the process of production. In such a situation technology and external investment become the cause and effect for each other. New technology is also used in the new enterprises established with foreign collaboration. In this way, foreign capital is available with the underdeveloped countries which can be used for domestic technological advancement.

**(11) Agricultural Development:**

With the advancement of technology, agricultural sector is also developed. New agricultural strategies which include new high yielding varieties of seeds, fertilizer and other methods of production are sine qua non to technical advancement. As a result, there is tremendous increase in agricultural production. In India, green revolution in a good example of technological progress.

## Definition of Brain Drain

**Brain drain** can be described as the process in which a country loses its most educated and talented workers to other countries through migration. This trend is considered a problem, because the most highly skilled and competent individuals leave the country, and contribute their expertise to the economy of other countries. The country they leave can suffer economic hardships because those who remain don't have the 'know-how' to make a difference.

**Brain drain** can also be defined as the loss of the academic and technological labor force through the moving of human capital to more favorable geographic, economic, or professional environments. More often than not, the movement occurs from developing countries to developed countries or areas.

Causes of Brain Drain

There are various causes of brain drain, but they differ depending on the country that's experiencing it. The main causes include seeking employment or higher paying jobs, political instability, and to seek a better quality of life. Causes of brain drain can categorized into push factors and pull factors.

The **push factors** are negative characteristics of the home country that forms the impetus for intelligent people migrating from *Lesser Developed Countries* (LDC). In addition to unemployment and political instability, some other push factors are the absence of research facilities, employment discrimination, economic underdevelopment, lack of freedom, and poor working conditions.

**Pull factors** are the positive characteristics of the developed country from which the migrant would like to benefit. Higher paying jobs and a better quality of life are examples of pull factors. Other pull factors include superior economic outlook, the prestige of foreign training, relatively stable political environment, a modernized educational system to allow for superior training, intellectual freedom, and rich cultures. These lists are not complete; there may be other factors, some of which can be specific to countries or even to individuals.

Effects of Brain Drain on the Home Country

When brain drain is prevalent in a developing country, there may be some negative repercussions that can affect the economy. These effects include but are not limited to:

* Loss of tax revenue
* Loss of potential future entrepreneurs
* A shortage of important, skilled workers
* The exodus may lead to loss of confidence in the economy, which will cause persons to desire to leave rather than stay
* Loss of innovative ideas
* Loss of the country's investment in education
* The loss of critical health and education services

Brain drain is usually described as a problem that needs to be solved. However, there are benefits that can be derived from the phenomena. When people move from LDC countries to developed countries, they learn new skills and expertise, which they can utilize to the advantage of the home economy once they return. Another benefit is remittances; the migrants send the money they earn back to the home country, which can help to stimulate the home country's economy.

**Why in Developing Countries Capital-intensive Technology is used?**

A pertinent question is why have the developing countries been using capital-intensive technology despite the fact that surplus labour prevails in them? There are two views about this. First, the alternative technology which though efficient but labour-intensive is generally not available. The available technology is the capital-intensive technology that was developed in the Western countries to suit their factor endowments. The Western technology is quite inappropriate for the developing countries which suffer from surplus of labour and shortage of capital.

Now, given the technology imported from the Western countries, there is not much possibility of substitution of capital for labour. In view of this, Schumacher and Singer advocate for the development of what has been called intermediate or appropriate technology. Appropriate technology for the developing countries is that which though efficient should be labour-intensive so that it conforms to their factor endowments.

According to Schumacher, the development of appropriate technologies does not imply the discovery of altogether new principles of science and technology. What is required is the application of basic principles of modem science and technology to evolve the appropriate production techniques.

These appropriate production techniques may be obtained by scaling down the advanced techniques by adapting them so as to make them more labour-intensive, or by scaling up handicrafts technique with the introduction of new tools and simple machines and thus improving economic efficiencies of these techniques while maintaining their labour-intensity.

On the other hand, several other scholars such as Ranis, Blaug, Layard and Woodhall, Little, Scott and Scitovsky are of the view that the slow growth of employment opportunities in the industrial sector is not due so much to the lack of flexibility in the production function but to the distortions in factor prices.

Due to the various concessions and subsidies provided in taxation structure by the Government such as liberal investment or development rebate, policy of low interest rate and over­valued foreign exchange rate have caused the price of capital to be very low relative to its scarcity. On the other hand, the prevailing wage rates are too high for a labour-surplus economy due to the strong bargaining power of the trade unions in the organised sector.

According to them, these distortions in factor prices induce the adoption of capital-intensive techniques in industries with the consequence that less labour is employed. In order to promote the use of more labour-intensive techniques, it is therefore imperative that all distortions in factor prices be corrected.

By emphasising the use of labour-intensive technology in developing countries, this strategy has brought into sharp focus the question of appropriate technological choices. In a labour-surplus economy the importance of the use of appropriate technology which is labour-absorptive and at the same time quite efficient can hardly be denied.

However, appropriate technologies for various manufacturing industries just do not exist and a good deal of more research and development (R & D) would have to be undertaken before appropriate techniques are evolved for several industries. Of course, to encourage the development and use of appropriate techniques the various factor price distortions ought to be removed.

Whereas, in view of the prevailing price situation, wage rates of industrial workers do not seem to be high, the effective price of capital is low. Therefore, the various concessions and rebates in taxes on various types of capital investment be drastically reduced and the lending rates of interest charged by banks and other financial institutions be raised so as to curb the tendency to substitute capital for labour.

As for technological choices in agriculture it may be noted that new high-yielding technology represented by a package of high-yielding varieties, fertilizers and pesticides is quite appropriate for a labour-surplus economy such as ours, for it not only raises yield per hectare substantially but is also labour-absorptive.