UNIT 7 DETERMINANTS OF GROWTH*

Structure

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7.0 OBJECTIVES

After going through this unit you should be able to :

- Explain the meaning of growth accounting;
- Discuss the influence of technology on growth;
- Analyse the concept of convergence and whether empirically growth rates of developing nations and developed nations are converging;
- Examine the role of institutions, human capital, geography and culture in determining economic growth; and
- Explain the ideas of path dependence and historical lock-ins.

7.2 GROWTH ACCOUNTING

Total Factor Productivity (TFP) or we may call it productivity is an important concept in the context of economic Growth of a nation particularly developing countries. Productivity contributes to industrial growth and to the competitiveness in international markets. It refers to the rate at which employment is generated from the employed resources. Increased productivity result in better utilisation of resources and reduces the cost and the prices of industrial products, which in turn, lead to a faster growth in demand in both domestic and international markets. Ever since Robert Solow) decomposed output growth into the contribution of input growth and a residual productivity term; the concept has gained popularity and is used as a benchmark to rank firms or countries. Such rankings get credibility once productivity is correlated with other indicators of success such as employment growth, export status, or

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technology adoption. Concept like low productivity is also found useful to predict exit of the firms in an economy, the ultimate performance standard. Its importance can also be gauged from the attention it receives as a criterion to evaluate policy interventions or firms' decisions. The concept has relevance and different meaning in different branches of economics. In industrial economics, for example, a large literature investigates the effect of R&D on productivity and the resulting impact on industry structure. In international economics, the efforts to evaluate the impact of trade liberalization range from estimating changes in price-cost margins to productivity changes. Fundamentally, the objective of productivity measurement is to identify changes in output that cannot be explained by changes in inputs.

Behind this concept most often stands the understanding that besides the traditional factors of production labour and capital there is something else that leads to the increase in production. Usually this 'thing' is associated with technological progress. The latter concept itself can be interpreted in various ways, but eventually it always implies that the combination of labour force, machines, human knowledge and skills, leads to changes in total income that are not expected by changes in capital or labour considered separately.

Growth (increase in GDP) of an economy is generally attributed to factors that can be clubbed under two broad headings: Capital and Labour. But you will find when you calculate it that Capital and Labour cannot account for all the growth and in fact there is a residual factor that comes into play and accounts for the increase in GDP. This factor is known as Total Factor Productivity. Let us try to understand it on the basis of an equation:

$$Y = A\, f(K,L)$$

Where Y is the output (GDP), K is the stock of physical capital invested and L is the labour (number of man-hours). The letter A stands for Total Factor Productivity.

Total Factor Productivity (TFP) as a concept is also important not only in the context of macro-economic aggregate measures of a country's performance in terms of per capita growth and productivity, but is of equal significance in measuring the determinants of productivity and competitiveness of firms. The hitherto more popular measure – labour productivity or value added per unit labour – suffers from the shortcoming that it does not reveal why the productivity has risen or vice-versa. Is it due to increased inputs of capital, or are there other causes? The TFP approach while analysing performance, attempts to go into the WHY of productivity changes and thus gives deeper insights into the underlying causes and sustainability of growth.

Productivity keeps on changing as production continues. It improves under favourable circumstances and deteriorates when unfavourable changes occur. The changes that lead to higher productivity of inputs are technological improvements, improvement in efficiency, increased education of labour, improvement in the quality of labour due to training, etc. Today, TFP is considered an important source of output growth worldwide

due to rapid progress in science and technology and various efficiency-enhancing measures.

In the equation given above a higher value of A means that the same inputs lead to more output and vice versa. It shows how efficiently that input is being used to further the interests of the economy and it is the productivity of the capital and labour investment. Total Factor Productivity is considered to be the actual determining factor in the growth of an economy as both capital and labour cannot continue to be invested indefinitely. Moreover the growth of economy, if depended solely on capital and labour would decline as soon as these investments in these inputs are reduced and vice-versa. Thus it is not a stable growth. Hence increased Total Factor Productivity is the only way that an economy can maintain a stable growth.

Also, the Law of Diminishing Marginal Returns, tells us that a sustained influx of Labour and Capital will not achieve long term growth as the value of the inputs get maximised; they onset to deliver lower returns over a period of time. Thus the only way growth can be ensured and sustained is to maximise the efficiency of these inputs and to work on improving the quality and quantity of returns for the same amount of inputs i.e. to increase Total Factor Productivity.

Productivity is the main reason for economic growth. Some countries do better than others primarily because they are more productive. Also, the more productive a country is the better it is able to compete in the world markets as it can keep cost low while still producing a superior product. A high level of productivity also increases the standard of living of people in that country as they would get better outputs for the same inputs i.e. have better quality products at lower prices.

In order to conduct such an analysis, economists have built up a framework called growth accounting to obtain a different perspective on the sources of economic growth. Later we shall discuss that decomposing growth is essentially a growth accounting exercise. We start with a production function that tells us what output (Y_t) will be at some particular time t is a function of the economy's stock of capital (K_t), its labour force (L_t), and the economy's total factor productivity (A_t). If output changes, it can only be because of the change in the economy's capital stock, its labour force, or its level of total factor productivity. We are referring to the Cobb-Douglas form of the production function, which is:

$$Y_t = A_t f(K_t^{\alpha}, L_t^{1-\alpha}) \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

In this equation we can see that we would get higher output because of three reasons – if more number of man hours are put in (higher L), if the people have more equipment, etc to work with (higher K) or if capital and labour are used more productively (higher A). The equation at (1) shows that it assumes perfect competition and the constant returns to scale as depicted by the coefficients of K and L. If we decompose the growth in output into each of the three elements allotting $1/3^{rd}$ of the increase in growth to capital and $2/3^{rd}$ to labour (which is what is seen in the most developed countries), the equation then becomes

$$Y_t = A_t K_t^{1/3} L_t^{2/3} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Taking logs the growth in output (Y) is shown by the following equation

$$\ln Y = \ln A + 0.33 \ln K + 0.67 \ln L \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where lnY is the growth in output, lnK is the increase in capital, lnL is the increase in labour and lnA is the increase in Total Factor Productivity (all these are for a particular time period)

We can also use this equation to calculate growth in output per worker i.e. Labour Productivity (Y/L). This can be written as

$$Y/L = A\,(K/L)^{1/3} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

When we apply the growth in output formula to this equation, it becomes

$$\ln Y/L = \ln A + 0.33 \ln K/L \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where lnY/L is the growth in output per worker, $\delta(K/L)/(K/L)$ is the increase in the amount of capital per worker and $\delta A/A$ is the increase in Total Factor Productivity.

Thus equation (5) shows that the output per worker can rise because of two reasons - increase in Total Factor Productivity and increase in the amount of capital per worker.

So if we consider a real-world situation in which all three—the capital stock, the labour force, and total factor productivity are changing—then the proportional growth rate of output is as given in equation (3), which is the key. If we know the proportional growth rates of output, the capital stock, and the labour force, and if we know the diminishing-returns-to-scale parameter α in the production function, then we can use this growth-accounting equation to calculate the (not directly observed) rate of growth of total factor productivity A, and to decompose the growth of total output Y into (i) the contribution from the increasing capital stock K, (ii) the contribution from the increasing labour force L, and (iii) the contribution from higher total factor productivity A.

Since growth-accounting equation at (3) allows us to break down growth into components that can be attributed to the observable factors of the growth of the capital stock and of the labour force, and to a residual factor—often, in fact, called the Solow residual or a *measure of ignorance*—that is the portion of growth left unaccounted for by increases in the standard factors of production. Changes in the Solow residual or total factor productivity can come about for many reasons explained earlier. Economists often refer to total factor productivity as "technology," but if it is technology it is technology in the widest possible sense. Not just new ways of constructing buildings, newly-invented machines, and new sources of power affect total factor productivity, but changes in work organization, in the efficiency of government regulation, in the degree of monopoly in the economy, in the literacy and skills of the workforce, and in many other factors affect total factor productivity as well.

The approach that has been used here in the measurement of total factor productivity is the so-called growth accounting, which, although being simple with respect to the computation technique, leads to sufficiently illuminating results.

7.3 TECHNOLOGY AND GROWTH

In the growth models that you studied, particularly Harrod-Domar and the Solow model, the discussion was carried out in terms of how the output changed as a result of change in the level of input use. As more of labour and capital was used the output changed. We also discussed the important role of savings and investment. However, the production conditions do not stay the same. As technology improves, as technical progress takes place, inputs can be combined more efficiently. More output can be obtained from the use of the same level of input as before, or to produce the same amount of output as earlier, less use of input is needed. In this section we build upon the discussion in the previous section where we discussed growth accounting. In this section we discuss what we mean by technical progress and analyse how technology is an important determinant of economic growth.

You would have guessed by now that technical change has something to do with

improving the production process, and indeed so it is. We depict the change in technical level by looking at the production function. Let us suppose for simplicity that there is one single 'homogeneous' good in the economy. This good gets produced by using capital and labour. The simplest way to conceptualise technical progress is to understand that technical progress means that more output is produced using the same amount of inputs. If you visualise a production function, you can see that the production function shifting upward over time as technical progress takes place. Another way to look at technical change (improvement) is to say that the nature of the production function changed to a superior one, or that the same amount of output can be produced by using less of one or more factors than before.

The general way we have used to represent technical change as shifts in the production function (it may also be depicted as shifts in the position of each isoquant) can be expressed by bringing in time into the production function explicitiy. The production function now becomes:

$$Y = F(K, L, \boldsymbol{t})$$

The argument t is a production function shifter.

Although the above formulation is the most geileral way of depicting technical progress, there is another way of depicting technical change, where technical progress takes place through shifts in the production hilction even though the inputs used may not have increased. It is as though the factors of production were somehow augmented and they are able to produce more output than before.

To understand technical change, we have to bear in mind that there are several types of technical change. They have mostly to do with the capital-labour intensity, and by implication, on the relative shares of capital and labour in tile total product. This has repercussions on the remunerations of capital and labour,

that is, on the wage rate and rental of capital. If the capital labour ratio capital intensity) goes up, it is called **capital deepening.**

Now let us begin our study of the classification of technical change, Before doing so, let us recall our discussion of factor augmented technical progress. We introduce **a** related concept here. Technical change can be **embodied** or **disembodied.** Embodied technical change means that technical change assumes the form in the change in the type of factor of production, usually capital. In other words, embodied technical change is embodied in the form of new types of machines (a new process or new technology).

Disembodied technical progress, on the other hand, means that regardless of the type of machines, new or old, the same amount of factors can produce greater amounts of output, or the same amount of output can be produced using lesser quantities of inputs; in other words, the isoquant shifts inwards. The factor augmenting technical change that we studied in the previous section is a depiction of disembodied technical change. For most of this unit, we will have occasion to consider disembodied technical change. Only in the final section do we touch upon embodied technical change, and once you grasp the concept, you will find greater use of the concept in some of the later units. In embodied technical change, investment in new equipment or new skill is the essential vehicle of improvements in technique.

Another concept with regard to technical change is neutrality. Neutrality broadly means that technical change is neither labour saving nor capital saving.

Sir John Hicks looked at technical progress in terms of the effect of technical change on the ratio of marginal product of capital to that of labour. If after the technical change the ratio increases, in Hicks's terminology it is to be called labour saving. If the ratio stays the same it is neutral and if the ratio falls, it is called capital saving. We can now state the Hicksian classification of technical progress in the following way: A technical progress will shift the per-worker production function upward. This technical progress is said to be **labour-saving** if at any given value of capital-labour ratio, the ratio of marginal product of capital to the marginal product of labour has increased. Ifthis ratio decreases for a given value ofcapital -labour ratio, the technical progress is said to be **capital saving,** and if the ratio stays the same it is **Hicks neutral.**

Sir Roy Harrod put forward a classification of technical progress which was different from Hicks's classification. He defined as neutral a technical change one where the capital coefficient (capital-output ratio) does not change in the presence of a constant interest rate. Broadly, he suggested that if, when the interest rate is constant, the distribution of the total national product between capital and labour stays constant, then it is neutral technical progress. If we consider perfect competition and take interest rate as equal to the rental of capital and hence equal to the marginal product of capital, then Harrod-neutral technical progress is a statement about the relationship between capital-output ratio and the marginal product of capital. Robert Solow's classification of technical progress is

similar to Harrod's and Hicks's classification except in one respect. Hicks's classification compares points on different per-worker output curves at points of constant capital-labour ratio and Harrod's scheme compares points on different per-worker output curves at points of constant capital-output ratio. Solow's classification compares points on old and new per-worker production at points at which the labour-output ratio is constant. Thus Solow-neutrality is when at points where L/Y is constant that is, the relative shares of capital and labour remain constant. It can be shown that a Solow-neutral technical progress is capital augmenting.

7.4 CONVERGENCE

In this section we take a look at whether the growth rates and income levels of developing nations are converging to those of developed nations. The convergence hypothesis claims that the poorer economies' per capita incomes tend to grow faster than those of richer countries. The convergence hypothesis is also known as the 'catching up' hypothesis. The hypothesis is claimed on basis of the structure and results of the Solow growth, which you studied in unit 5. In this model, economic growth is driven by the accumulation of physical capital until this optimum level of capital per worker, which is the "steady state", is reached, where output, consumption and capital are constant. The model predicts more rapid growth when the level of physical capital per capita is low; this is sometimes referred to as "catch up" growth. As a result, all economies should eventually converge in terms of per capita income. Let us view the facts from history.

At the dawn of the industrial era, around the middle of the eighteenth century, average real living standards in the richest countries were no more than about three times as great as those of the poorest. However since the last two centuries, a huge gap has emerged in the living standards as well as the rate of growth in developed nations, and the developing nations. Today, the ratio of average real living standards of the rich countries to that of the poor approaches 100 to 1. Economist Lant Pritchett has called this phenomenon of the developed countries as a whole enjoying a far higher rate of growth than developing nations over the last two centuries as The Great Divergence.

The two centuries of exponential increase in productivity and incomes in early industrialising countries, and comparative stagnation in most other countries, led to the "Great Divergence." Some countries experienced almost no gains during this long period. Other countries were among those with the highest incomes throughout this period. Much later, incomes in many other countries where a majority of the world's people live began to rise; and then to start closing the gap, albeit often in fits and starts, and frustratingly slowly, by the turn of the twenty-first century. Yet many people, particularly in the least-developed countries, still have seen almost no improvements in living standards. Japan was the first non-Western country to begin to catch up. China and India, where more than one-third of the world's people live, began a period of high growth rates and entered the

catch-up process by the early 1980s, (in the case of China) and early 1990s (in the case of India).

How did the enormous change happen? And why did the benefits go for so long only to people in a small part of the world? Why are some countries still making little progress? And how have many countries finally started to reconverge, in some cases dramatically? Initially, some of these riches were gained through the process of colonialism. But as time went on, an increasing majority of the gains resulted from the productivity advances of the Industrial Revolution.

About 250 years ago, the Industrial Revolution started in England. Production rose through the progressive application of steam power, water power, and other technical advances. Countries that industrialised early—in West Europe and North America—began a transformation that would lead to unprecedented gains in living standards. There emerged a huge difference in the level of technology available in Europe and that in other parts of the world. Europe also saw rise in commerce and trade, other than manufacturing. The process of divergence was underway.

There was a decolonisation wave from the years after World War II to the mid-1970s. There was a massive historical and geopolitical change. Yet for decades following independence of many developing, formerly colonized countries, several observers found it puzzling that most developing countries made rather little progress on productivity and incomes.

If the growth experience of developing and developed countries was similar, there are (at least) two important reasons to expect that developing countries would be "catching up" by growing faster on average than developed countries. The first reason is due to technology transfer. Many companies and governments actively seek to absorb new technologies; in fact, development assistance often attempts to facilitate this goal, particularly in fields such as public health. Today's developing countries do not have to "reinvent the wheel". They do not need to go through the process of technological evolution that today's developed nation did. This should enable developing countries to "leapfrog" over some of the earlier stages of technological development, moving quickly to high-productivity techniques of production. As a result, they should be able to grow much faster than today's developed countries are growing now or were able to grow in the past, when they had to invent the technology as they went along and proceed step by step through the historical stages of innovation. Economic historian Alexander Gerschenkron called this process the advantage of backwardness. In fact, if we confine our attention to cases of successful development, the later a country begins its modern economic growth, the shorter the time needed to double output per worker. For example, Britain doubled its output per person in the first 60 years of its industrial development, and the United States did so in 45 years. South Korea once doubled per capita output in less than 12 years, and China has done so in 8 years. The second reason to expect convergence if conditions are similar is based on diminishing returns to

factor accumulation. Today's developed countries have high levels of physical and human capital; in a production function analysis, this would explain their high levels of output per person. But in traditional neoclassical analysis, the marginal product of capital and the profitability of investments would be lower in developed countries where capital intensity is higher, provided that the law of diminishing returns applied. That is, the impact of additional capital on output would be expected to be smaller in a developed country that already had a lot of capital in relation to the size of its workforce than in a developing country where capital was scarce. As a result, we would expect higher investment rates in developing countries, either through domestic sources or through attracting foreign investment With higher investment rates, capital would grow more quickly in developing countries until approximately equal levels of capital and (other things being equal) output per worker were achieved. However, , in practice, this does not always happen or happen quickly.

Given either or both of these conditions, technology transfer and more rapid capital accumulation, incomes would tend toward convergence in the long run as the faster-growing developing countries would be catching up with the slower-growing developed countries. Although it is unlikely that incomes would eventually turn out to be identical, they would at least tend to converge, conditional upon that is accounting for any systematic differences in key variables such as population growth rates and savings rates. As we have just seen, the evidence shows that divergence occurred for two centuries from the start of the industrial revolution. However, the most recent data demonstrate that, on average, (re-)convergence is now underway.

The encouraging convergence trend is not inevitable. Potentially, the trend could be reversed by new technological divides, climate change impacts in some areas, policies that are bad or serve narrow interest groups, and disasters of widespread armed conflict. Least-developed countries could remain stuck for other reasons. Further, these trends in convergence reflect country averages – they do not adjust for inequality or the presence of extreme poverty.

At the heart of the Solow model is the prediction of convergence, but convergence is of more than one type. The strongest prediction is called unconditional convergence. Suppose we postulate that nations, in the long run, have no tendency to display differences in the rates of technical progress, savings, population growth, and capital depreciation. In that case, the Solow model predicts that in all nations, capital per unit of labour will converge to a common value regardless of the initial state of each of these economies, as measured by their starting levels of per capita income (or equivalently, their per capita capital stock).

The exogenous parameters of the model are assumed to be equal, but the initial level of the capital stock or per capita income is not. The claim of convergence is then based on the Solow model: its content is that in the presence of similar

parameters governing the evolution of the economy, history in the sense of different initial conditions does not matter.

Empirically, the assertion of unconditional convergence is even stronger. At the back of our minds we base such convergence on certain assumptions regarding the similarity of parameters across countries. However, there is no guarantee that these assumptions hold in reality, so if we were to find convergence, it would be a striking finding, not a trivial one.

Provided that all the parameters of the Solow model are constant across countries, convergence across countries is an implication of that model. Consider the obvious weak link in the prediction of unconditional convergence: the assumption that across all countries, the level of technical knowledge (and its change), the rate of savings, the rate of population growth, and the rate of depreciation are all the same. This notion certainly flies in he face of the facts: countries differ in many, if not all, these features. Although this has no effect on the Solow prediction that countries must converge to their steady states, the steady states can now be different from country to country, so that there is no need for two countries to converge to each other. This weaker hypothesis leads to the notion of conditional convergence.

In the literature on economic growth, the term 'convergence" is sometimes used in two senses. In the first sense, convergence is taken to mean a reduction in the dispersion of levels of income among nations. This is called σ (sigma) convergence. The other sense is called β (beta) convergence. Beta convergence means poor economies grow faster than richer countries. Conditional β convergence takes place when economies experience β convergence, but conditional on other variables being constant. Unconditional β convergence is said to occur when the growth rate of an economy declines as it approaches its steady state.

Check Your Progress 1

1. Explain the meaning of growth accounting.

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2. What do you understand by total factor productivity?

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3. Explain Hicks-neutral and Harrod-neutral technical progress

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4. Explain the concepts of:

(1) Unconditional and conditional convergence and

(2) Sigma and beta-convergence.

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7.5 OTHER DETERMINANTS OF GROWTH

In the earlier sections, we have looked at some factors that determine growth, like accumulation, improvements in total factor productivity, technology and technological advance. Here we would like to look at some other factors. Some factors like human capital were considered in unit 6 on endogenous growth theory. Some other important factors like impact of international trade and finance on growth will be taken up for discussion in the subsequent course on development economics.

Most of the economic determinants of growth, like factors of production, accumulation, technology, productivity growth, and so on, have been viewed by some economists as proximate causes. However, these economic determinants may themselves be influenced and impacted by underlying basic causes, some of which may be non-economic. In this section we study some of these.

7.5.1 Institutions

In recent times institutional economics has assumed considerable importance in the analysis of developing nations.. Recently, the analysis of exchange using tools of microeconomics has been sought to be supplemented by institutional analysis. Even in the study of economic growth, the study of institutions has assumed importance. . We have studied several theories of growth. We saw recently there has emerged a group of theories that see growth as determined by processes that are endogenous. There are differences in factors and endowments among nations, and this is supposed to explain the differences in economic growth of nations. Some economists have suggested that the factors which are supposed to cause economic growth, which are endogenous, are themselves not the causes of, or

explanations of growth. They are actually the characteristics or features of growth. The main reason for differences in growth performance is differences in the structure of institutions in various countries. Institutions and differences in them can account for large differences in the performance of countries.

What are institutions? Douglass North, a Nobel Prize winner in economics defines institutions by referring to them, as "the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction." He suggests that institutions shape the constraints in interactions among people. These interactions may be economic, social or political. Economic institutions such as property rights and the degree of perfection of markets influence the structure of economic incentives in society. Economic institutions also determine how efficiently allocations will be allocated in society. Thus it is important to realise that not only are institutions important but also that they are endogenous.

One new strand in economic thought looks at changes in property rights and transaction costs having a great impact on economic development. This view is exemplified by the works of Ronald Coase and Douglass North. Another strand has sought to use the recent developments in information economics, like asymmetric information, imperfect information, moral hazard, adverse selection, signalling and screening, to understand how institutions affect development. They see institutions as filling in gaps in the economy created by missing and incomplete markets, presence of risk, and asymmetry of information. They have used this, for instance, to model agrarian institutions, for instance on these lines. This is seen in works of economists like George Akerlof and Joseph Stiglitz. Interestingly, all four economists have won the Nobel Prize.

The transaction costs school contends that as transaction costs change, institutions emerge to minimise these transaction costs. This is the basis of development. Transaction costs include costs of negotiation, monitoring, coordination, and enforcement of contracts. When transaction costs are high, allocation of property rights becomes crucial. Contracts come to be determined by property relations when transaction costs are high. In the development process there may emerge a trade-off between economies of scale and transaction costs. In simple face to face interaction transaction costs may be low but production costs are high because specialisation and division of labour is limited. The transactions cost school also believes that changes in relative prices cause institutional changes.

The information economics school cast their theories in more rigorous terms and explicitly bring in notions of equilibrium. In addition, institutional quality affects the amount and quality of investments in education and health, via the mediating impact of inequality. In countries with higher levels of education, institutions tend to be more democratic, with more constraints on elites. The causality between education and institutions could run in either direction, or both could be caused jointly by still other factors. It is important to understand why

and how a certain institution emerges, and what purpose it may be serving. Even an institution that appears to be negative may be serving some purpose. It is important to realise this to explain its persistence. The institution may not be optimal, indeed, may be dysfunctional and may still persist. It is necessary to observe if there are regularities in the evolution of institutions, as this gives rise to conventions.

7.5.2 Geography

At first glance, geography seems to have had a major influence on development. It is perhaps not a coincidence that many of the poorer nations are situated around and near the Equator. Very hot climate saps the energy to work, so workers' productivity is affected. Low productivity leads to low income, and many of low-productivity workers may not be able to afford adequate amount of nutritious food. Low nutrition levels can further diminish productivity.

Moreover, geography also influences economic development through the factor of location. Geographical factors may lead to industries and factors to be located, or not to be in productive regions. Similarly agriculture, urbanization and some other aspects of the economy can also be affected by geographical condition.

Economists have started paying greater attention to geographical factors.. First, in the very long run, very few economists doubt that physical geography, including climate, has had an important impact on economic history. Geography was once truly exogenous, even if human activity can now alter it, for better or worse. But the economic role played by geography, such as tropical climate, today is less clear. Some research suggests that when other factors, notably inequality and institutions, are taken into account, physical geography adds little to our understanding of current development levels. However, some evidence is mixed. For example, there is some evidence of an independent impact of malaria and indications that, in some circumstances, landlocked status may be an impediment to economic growth. Indeed, a direct link from geography to development outcomes is argued by some economists,

7.5.3 Culture

Cultural factors may also matter in influencing the degree of emphasis on education, postcolonial institutional quality, and the effectiveness of civil society, though the precise roles of culture are not clearly established in relation to the economic factors

The idea that culture is a determinant of national wealth is an old one. Sociologist Max Weber had argued that the rise of a "Protestant ethic," which celebrated hard work and the acquisition of wealth, led to an explosion of economic growth in northern Europe starting in the 16th century. More recently, economists have pondered over whether the rapid growth of such countries as Taiwan, Singapore, and South Korea can be explained by their adherence to "Asian values,"a term coined by *The Economist* magazine in 1980. Despite these examples, however, economists have generally not seen culture as a determinant

of development, contrary to anthropologists, sociologists, and historians. Economists do not wish to analyse culture as it is hard to quantify.

If we have to show that culture is important for economic growth, we have to show first that culture has potentially important aspects that vary among countries and second, that these aspects of culture significantly impactt economic outcomes. Both these things are difficult to show as culture is hard to measure. Not only does culture have many different dimensions, but even when we restrict ourselves to a single aspect of culture, we often lack any objective (much less quantitative) measure and have to rely on the observers' subjective assessments. Similarly, in some cases there is direct evidence of culture's economic effects, whereas in other cases such effects can only be inferred.

We can just touch upon a few aspects of culture and how it influences economic growth. Some individual aspects of culture: openness to new ideas, belief in the value of hard work, saving for the future, and the degree to which people trust one another. Some broader characterizations of culture could be social capital, conventions and so on. These broader characterizations will be discussed on the subsequent course on development economics. Let us discuss some individual characteristics:

1. **Openness to new ideas**: Scholars who have examined the historical process of economic growth have of- ten stressed the importance of a society's openness to importing new ideas from abroad. Many of the technologies used in any particular country were invented in other countries, so a country that more readily adopted technologies from abroad would be more technologically advanced.
2. **Hard work**: Throughout human history, in every culture, almost all adults have had to work to survive. But cultures have differed in their view of that work: as a necessary evil or as an activity with an intrinsic value. We would expect that in cultures where work was viewed as good in and of itself, people would work harder and produce more output.
3. **Saving rate:** A country's economic growth is strongly affected by its saving rate. We also saw that there are large differences in saving rates among countries. If cultural differences among countries affected their saving rates, then these differences could in turn affect the level of economic growth.
4. **Trust:** Economic interactions often involve reliance on a person to keep his word. Without trust, economic activity would be reduced to a crude level, and huge resources would have to be devoted to making sure that people came through on their promises. Society would lose the advantages gained by creating complex organizations—for example, allowing people to specialize in specific tasks or exploiting gains from trade. Obviously, a society in which one could not rely on others to hold to their commit- ments would be poorer.

7.6 PATH DEPENDENCE

We have studied in an earlier section that one of the issues in economics of development is whether nations converge to a common growth rates. Statements

about convergence tend to include propositions about parameters like investment and saving and their relationship with growth. We saw in the previous section that institutions too have a profound impact on the development process. We can now ask, is history itself important? What if a country's history itself, coupled with people's expectations about the future, determines not only the institutional framework but also the parameters of the growth process like saving and investment? We are looking at the persistence of certain patterns over long periods and asking why is such persistence present? People often speak of 'historical forces'. The question is, how do we take these into account? One view is that the course of economic development is determined to a considerable degree on the earlier choices that were made, the basic *path* that was chosen. The development process is path dependent. Path Dependence theory postulates that when we consider the performance of an economy, its position at a certain point of time depends on the whole sequence of events. The whole path is important. We need to look at the entire history of the process.

Some economists have put forward the suggestion that certain inferior outcomes may have got locked-in by historical events. You have studied in the microeconomics course that equilibrium is usually the result of economic agents choosing actions and making decisions while acting rationally by maximizing some objective function. Such equilibria are optimal. However, in reality some inferior outcomes can sometimes emerge and, moreover, may persist. It is these situations that path dependence theory addresses. The question it asks is Why do these situations arise, and how? Moreover, why do they sometimes tend to continue? Why do rational decision- makers who are supposed to make optimal choices not take corrective measures? The interesting thing is that these inferior outcomes emerge even when superior alternatives exist and are available.

One way how this works is through complementarities and network externalities. We shall explain these concepts with some examples from technology. The common typing keyboard layout in typewriters and computers usually has the letters Q, W, E. R. T. Y.... on the top row and this is called a QWERTY-type keyboard. Now, the earliest typewriters were mechanical gadgets where, when a key was struck, a lever with the imprint of the letter would rise and strike the typewriter ribbon that, because it contained the fluid or the ink, the letter would form on the page. If two or three keys were hit with quick succession the lever would jam. The QWERTY keyboard was designed in such a way as to minimise the possibility of such jamming by placing the keys that were likely to be struck in quick succession in terms of spelling of words of the English language were placed far apart. Thus the QWERTY keyboard was designed to slow down speed. An alternative keyboard design introduced in 1932 was realised to be better at promoting speed when it was found that typists trained in the Dvorak system were regularly beating typists trained in the QWERTY system at speed typing tests. The question is, why do we then find the inefficient QWERTY-type layout in most keyboards? The answer is that the QWERTY layout had a historical advantage of emerging first. Given that firms and organisations hired typists

coming out of typing schools. Given that these typists were already trained in QWERTY-type keyboard, any *individual* firm would have found it very costly to invest in retraining its typists on the Dvorak system. There is now a clear divergence between individual costs and social gains. This occurs in this case because there are complementarities and network externalities. Externalities take the special form of network externalities because of the complementarities. Let us explain further what network externalities mean. You have already read in the section of market failure what externalities are. Network externalities mean that the cost or benefit of adopting a technology or product depends on how many people already adopted the same technology or product. Say you plan to buy a mobile phone, because among other uses, you think that sending and receiving SMS messages would be very useful. But if only two or three other people whom you know have a mobile, this feature is not going to be too useful. Surely, the more of your friends and acquaintances already have a mobile, the more useful it would be to you. This is an example of network externalities. This is very important in Information and Communication Technology(ICT) like e-mail.

So, to come back to the QWERTY example, we find that complementarities and network externalities create a situation where a suboptimal choice is made and it tends to persist. The important thing to realise is that if we were to look at the average cost (AC) curves (recall from your microeconomics course what these look like) of the Dvorak system and the QWERTY system, we will find that the Dvorak system, because it is more efficient, will have its curve downward sloping, and everywhere below the AC curve of the QWERTY system, which would of course be downward sloping because of scale economies. But for an individual firm which wants to make a switch from QWERTY to Dvorak, the relevant costs (in the two curves) to be compared are at different points corresponding to the horizontal axis, which measures the number of units (typists trained). On the QWERTY curve, the point is far too much to the right since QWERTY has been around for a long time and many typists with QWERTY type training are there. To switch to Dvorak system, we have to consider a point close to the origin on the horizontal axis, because it will be first typist for the individual firm .so this point, on the Dvorak curve will be too much to the left and be of higher average cost than the QWERTY point.

Although some economists and historians of technology do not agree that the QWERTY system is inefficient as compared to the Dvorak system, the basic idea should be clear. There are other such examples. In the 1980s, the format for videotapes chosen was the VHS although the Betamax system was demonstrably superior In computer software, although other operating systems may be available, and may even be superior or cheaper or both, because of complementarities and network externalities, Windows operating system has become the standard. Similarly in the case of microprocessors, although other chips like AMD and RISC chips are available, Intel chips have become the industry standard. The upshot of the discussion is that we find that because of complementarities and network externalities, there may be multiple equilibria.

Which equilibrium gets chosen—and it may be the inferior one, depends on the path chosen by history. When complementarities are present, there may occur historical lock-ins. the same idea can be understood in terms of widespread coordination failure where large-scale investment does not take place because other complementary investments are not forthcoming. Because of coordination failure, each investment is not made because other complementary investments are not made. Investments would be made if each investor expects others to invest. Coordination then depends on the expectations of investors. The problem of coordination can be solved to a great extent if linkages can be created among various sectors of such a developing economy

Check Your Progress 2

1. What are institutions? Discuss some ways in which institutions determine economic growth.

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2. How do geographical factors influence growth?

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3. How do individual aspects of culture impact economic growth?

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4. Explain the concepts of path dependence and historical lock-ins.

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7. 6 LET US SUM UP

This unit was the last unit in this Block, which dealt with economic growth. The first four units had focused on various theories and models of growth, while the current one extended the discussion of the previous four units and sought to identify the actual determinants of growth.

The unit began by discussing growth accounting. This allows us to break economic growth down into the proportion that is caused by individual factors of production like labour and capital, and the proportion that can be attributed to technological growth. Proceeding ahead, you learnt about the nature of technology. The unit explained what is meant by embodied and disembodied technical progress. You were also acquainted with neutral and non-neutral technical progress. The unit went on to discuss the idea of total factor productivity, and how productivity is related to efficiency.

Following this, the unit discussed the very important concept called convergence. In unit 2, you had learnt about development gap between rich countries and developing nations. This unit examined whether the developing countries are catching up with the rich ones. The unit explored the idea of whether faster rates of growth of developing countries as compared to the developed ones will lead to the convergence of growth rates. The unit discussed about the concept of relative and absolute convergence..

Finally, the unit briefly discussed certain other determinants of growth. These are largely non-economic in nature like institutions, geography, and culture,. The unit suggested that these are often underlying factors that may influence economic determinants of growth, and as such may be considered as indirect, albeit underlying determinants of economic growth.

7.7 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1. See section 7.2
2. See section 7.3
3. See section 7.3
4. See section 7.4

Check Your Progress 2

1. See sub-section 7.5.1
2. See sub-section 7.5.2
3. See sub-section 7.5.3
4. See Sub-section 7.6.4