Economic Development

Prepared by

Dr. Gamal I. Hassan

Economic Development

Prepared by

Dr. Gamal I. Hassan

Chapter One

Characteristics of an underdeveloped

Chapter 1.

The main of goal from studying this chapter to understand the following topics

1- Meaning of the term underdeveloped.

2- Different criteria of underdevelopment.

3- General poverty.

4- Agriculture, the main occupation.

5- Underdeveloped natural resources.

6- Demographic Feature.

7- Unemployment and disguised unemployment.

8- Economic backwardness.

9- A dualistic Economy.

10- Lack of enterprise and initiative.

11- Insufficient capital Equipment.

12- Technological backwardness.

13- Foreign trade orientation.

Chapter One

Characteristics of an underdeveloped

Before we study the characteristics of an underdeveloped country, it is essential to understand the meaning of the term underdeveloped and the criteria of underdevelopment.

Meaning of the Term Underdeveloped

The term "underdeveloped" has been used in a variety of ways. "Undeveloped" and "underdeveloped" countries are often used as synonyms. But these two terms are easily distinguishable. An underdeveloped country is one which has no prospects of development. An underdeveloped country, on the other hand, is one which has no potentialities of development. The Antarctic, the Arctic and parts of the Sahara may be termed as undeveloped, while India, Pakistan, Uganda, Columbia, Panama, etc, may be called underdeveloped. "Poor" and "backward" are also used as synonyms for "underdeveloped". A poor country does not mean a young country. Poverty simply refers to the low level of per capital income of a country. It has nothing to do with the country's culture. "Backward countries" is a static term like the term underdeveloped. So the terms poor and underdeveloped are interchangeable. A more respectable term developing countries has also come to be used in economic literature. However, Bauer regards the expression underdeveloped, developing and less developed as clearly euphemisms. The terms underdeveloped and developing are especially inappropriate euphemisms: underdeveloped because it so clearly suggests that the condition it describes is abnormal, reprehensible and also perhaps readily rectifiable. The term developing because its use leads to such contradictions as reference to the stagnation or retrogression of the developing world. According to him poor or materially backward are the most appropriate expressions.[1] The World Bank uses the term developing Countries and divides them into low income and middle income countries. Middle income countries are further divided into lower-Middle income and upper- middle countries. Of late, a new term Third World[2] is being used. Ye shall be using all these terms interchangeably throughout the text.

Different Criteria of Underdevelopment

It is rather difficult to give a precise criterion of underdevelopment. Underdevelopment can be defined in many ways: by the incidence of poverty, ignorance. Or disease; by maldistribution of the national income; by administrative incompetence, by social disorganization.[3] There is thus not a single definition which is so comprehensive as to incorporate all the features of an underdeveloped country. Still some of the criteria of underdevelopment are discussed below:

1-The first criterion of underdevelopment is the ratio of population to land area. But it is very difficult to ascertain whether a high or a low ratio of population to area is an indicator of underdevelopment, there

---

[1] - P.T. Bauer Dissent on Development 1973.

[2]- The A; I can, the Asian and the Latin American member countries of the United Nation prefer to call themselves collectively as the Third World. They do so to distinguish themselves from the economically advanced capitalist countries of the "first world and the socialist countries of the second world.

[3]-Hugh I. Keenleyside Obstacles and Means in International Development" in Dynamics of development, (ed) G. Hambidge, p. 8.

are many underdeveloped countries in Africa and Latin America where there are empty spaces signifying a low ratio. While there are a number of other underdeveloped countries like India, China, Burma, Pakistan, Malaysia and many other South Asian countries which have a high ratio of population to area. This criterion is therefore, vague and superfluous.

2- Another indicator of underdevelopment is the ratio of industrial output to total output. It may also be explained as the ratio of industrial population to total population. According to this criterion, countries with a low ratio of industrial output to total output are considered underdeveloped. But this ratio tends to increase with the increase in the per capita income. Therefore, the degree of industrialization is often a consequence rather than a cause of economic prosperity in a country. In countries where agriculture is developed, tertiary or service industries tend to grow spontaneously because increasing disposable agricultural surplus creates demand for the products of the industrial sector. But when the disposable surplus agricultural income is used to subsidize uneconomic urban industry, the overall per capita income would tend to be lower.[4] Thus, this criterion is not a valid indicator of underdevelopment.

3- The third criterion of underdevelopment is the low ratio of capital to per head of population. Nurkse defines underdeveloped countries as those which compared with the advanced countries are under equipped with capital in relation to their population and natural

---

[4] - J Vines. The economics of Development in the Economics of underdevelopment

resources.[5] But dearth of capital is not a satisfactory criterion of underdevelopment for the following reasons: (a) Capital deficiency is not related to the absolute size of a country's stock of capital but to the ratio of capital to population or to some other factor. (b) the principle of Margins! Productivity tells that where the ratio of capital to other factors is low, the marginal productivity of capital is high. But it is difficult to infer from this that in underdeveloped countries marginal productivity of capital is high since capital is scarcity. or that a high marginal productivity of capital suggests a scarcity of capital it is possible that poor organisation, low skills, unfavourable weather, etc. May tend to keep of the marginal productivity of capital low in underdeveloped countries. (c) Moreover, if capital deficiency is taken as an indicator of underdevelopment, other socio- economic factors are neglected. As Nurkse himself says, Economic development has much to do with human endowments, social attitudes, political conditions and historical accidents. Capital is a necessary but not a sufficient condition of progress.

4- Another criterion indicates towards poverty as the main cause, of underdevelopment. Staley defines an underdeveloped country as one characterised by mass poverty which is chronic and not the result of some temporary misfortune and by obsolete methods of production and social organisation, which means that the poverty is not entirely due to poor natural resources and hence could

[5] - OP, cit., p. l

presumably be lessened by methods already proved in other countries.[6]

This definition points towards some of the important characteristics of underdeveloped countries. That underdeveloped countries have unexploited natural resources, scarcity of capital goods and equipment. Obsolete techniques of production and defects in socio- economic organisation, none can deny. But it does not lay emphasis on the basic criterion of underdevelopment, viz., low per capita income. As Barbara Ward says, perhaps the most satisfactory method of defining property is to discuss the question simply in terms of ber capita income- the average income available to citizens in the various countries.[7]

5- Thus one of the most commonly acceptable criteria of under develop- merit is the low per capita real income of underdeveloped countries as compared with the advanced countries. According to the United Nations experts, we use it (the term underdeveloped country) to mean countries in which per capita real income is low when compared with the per capita real incomes of the United States of America, Canada, Australia and Western Europe. But such definition which explains an underdeveloped country in terms of the low per capita level of income can by no means be considered adequate and satisfactory. For they focus attention only on one aspect of underdevelopment, viz., poverty. They do not analyse the

[6] - E. Staley, the future of underdevelopment countries, p. 13.

[7] - The rich and poor nations

causes of low consumption levels, of inhibited growth and of the development potential of an underdeveloped economy. Moreover, being underdeveloped in the technical sense means nothing in terms of the level of civilization, culture or spiritual values.[8] Serious difficulties also arise while measuring per capita national income in underdeveloped countries and their comparison with the per capita incomes of the advanced countries. The data on per capita national income are often inaccurate, misleading and unreliable due to the following reasons:

(a) There is a substantial non- monetized sector underdeveloped countries which makes the calculation of national income difficult. A great deal of what is produced in the subsistence sector is either exchanged for other goods or is kept for personal consumption. This tends to understate the national income.

(b) There is the lack of occupational specialization in such countries which makes the calculation of national income by distributive shares or by industrial origin difficult. Besides the crop, farmers often produce a variety of products like eggs, milk, articles of clothing, etc. That is never included in the national income estimates.

(c) In underdeveloped countries people are mostly illiterate and do not keep any accounts, and even if they do, they are reluctant to disclose their income correctly. In such a situation only rough estimates are possible.

---

[8] - B. Higgins , Economic development, P 7.

(d) National income estimates include only those goods and services which are commercially used. But in underdeveloped countries people living in rural areas and manufacturing articles of consumption from rudimentary goods are able to avoid many expenses. They build their own huts garments and other necessities. Thus in underdeveloped countries, relatively fewer goods are channelised through the market, and therefore are not included in the national income estimates.

(e) The computation of national income in terms of money under–estimates the real income. It does not include the real cost of producing an article, the effort or sacrifice of leisure forgone in the process of production. The income earned by two persons may be the same. But if one works for longer hours than the other, there is some justification in saying that the real income of the former is underestimated.

(f) National income estimates fail to measure adequately changes in output due to changes in the price level. Index numbers used to measure changes in the price level are simply rough approximations. Moreover the price levels vary in different countries. Consumers' wants and preferences also differ in each country. Therefore, the national income figures of different countries are often misleading data incomparable.

(g) International comparisons of national income are inaccurate due to exchange rate conversion of different currencies into a common currency, I.e., US dollars. The use of a single currency unit for computing the total output of goods and services underestimates the national incomes of underdeveloped countries as compared with the developed ones. The rates of exchange are primarily based on the prices of internationally traded goods. But there are many goods and services in underdeveloped countries that are never traded internationally and are also priced low. It is contended that approximately correct results can be obtained only when there exists equivalence between the prevailing exchange rates and the relationship of internal prices. The equivalence is unlikely to be achieved for most countries today in view of the prevalent use of exchange controls and quantitative restrictions on trade. This makes international comparisons national incomes misleading and superfluous.

(h) The calculation of per capita income in an underdeveloped country is likely to be understated or overstated due to unreliable and erroneous population figures. The census data are never accurate in such countries.

(i) Above all, difficulties arise in the definition of income, in the differences in concepts used for the computation of national income in various countries and calculating the contribution to national income of such governmental activities as irrigation and power projects, police and military services, etc.

Despite these limitations, per capita income is the most widely used indicator of the level of underdevelopment.

Characteristics of an underdeveloped country

In order to examine the problems of an underdeveloped country, it is useful to have in mind a general sketch of the economy of such a country. Though it is difficult to locate a representative underdeveloped country on the world map, yet it is possible to focus attention on some of its characteristics.

General poverty

An underdeveloped country is poverty- ridden. Poverty is reflected in low GNP per capita. According to the World Development Report, 1999-2000, 59.6 per cent of the world population in 1998 living in low_ income economies has GNP per capita of $ 760 or less; 25.4 per cent in middle income economies had $761 to $9,360; and 15.0 per cent in high-income economies had $ 9,361 or more. The extremely low GNP per capita of low- income economies reflects the extent of poverty in them.

Further, the World Bank Report pointed out vast income disparities among nations. Among the low- income countries were Nepal and Tanzania with GNP per capita of $210, Nigeria $300, Uganda $ 330, Bangladesh $350, Ghana $390, India $430, Pakistan $480, Zimbabwe $610, Indonesia $680 and China $750, Some of the middle- income group countries were Sri Lanka with GNP per capita of $810, Philippines $1,050, Kenya $1,310, Namibia $1,940, Russian Federatisuch2,300, South Africa $2880, and Malaysia $3,600. Of the high income countries, Luxembourg led with GNP per capita of $43,570, followed by

Switzerland $40,080, Norway $34,330, Denmark $33,260, Japan $32,380, Singapore 30,060, United States $29,340 and so on.

However, it is not relative poverty but absolute poverty that is more important in assessing such economies. Absolute poverty is measured not only by low income but also by malnutrition, poor health, clothing, shelter, and lack of education. Thus absolute poverty is reflected in low living standards of the people. In such countries, food is the major item of consumption and about 80 per cent of the income is spent on it as compared with 20 per cent in advanced countries. People mostly take cereals and other starches to the total absence of nutritional foods, such as meat, eggs, fish and dairy products. For instance, the per capita consumption of protein in LDCs is 52grams per day as compared with 105 grams in developed countries. The per capita fat consumption in LDCs is 83 grams daily as against 133 grams in developed countries. As a result, the average daily calorie intake per capita hardly exceeds 2,000 in underdeveloped countries.

The rest of the consumption of such countries consists mainly of a fetched hut and almost negligible clothing. People live in extremely insanitary conditions. More than 1,200 million people in the developing entries do not have safe drinking water and more than 1,400 million have no sanitary waste disposal. Of every 10 children born, two die with in a jar, another three die before the age of five, and only five survive to the age of 40 years. The reasons are poor nutrition, unsafe water, poor imitation, uninformed parents and lack of immunisation. Services like Education and health hardly flourish. Recent data reveal that there is a doctor for 2,083 persons in India, for 5,555 persons in Bangladesh, for 10,000 persons in Nepal, and for 870 persons in China, as against 410 persons for the developed countries. Most developed countries are expanding educational facilities rapidly. Still such efforts fall short of the manpower requirements of these economies. In many low- income countries about 70 per cent of the primary school age children go to school. At the secondary level, enrolment rates are lower than 20 per cent in these countries, while enrolment in higher education hardly comes up to 3 per cent. Moreover, the type of education being imparted to the majority of the school and college going children is ill- suited to the development needs of such countries. Thus the vast majority of the people in LDCs are ill- fed, ill- clothed, ill- housed and ill- educated. The number of people in absolute poverty in LDCs excluding China is estimated at about 1,000 million. Half of them live in South Asia, mainly in India and Bangladesh; a sixth live in East and Southeast Asia, mainly in Indonesia; another sixth in sub- Saharan Africa; and the rest in Latin America, North Africa and the Middle East. Poverty is, therefore, the basic malady of an underdeveloped country which b involved in misery- go- round. Prof. Cairncross is justified in saying that the underdeveloped countries are the slums of the world economy.[9]

Agriculture, the Main Occupation

In underdeveloped countries two- thirds or more of the people live in rural areas and their main occupation is agriculture. There are four

[9] - A.K. Cairncross, Factors in Economic Development, p 15.

times as many people occupied in agriculture in some underdeveloped countries as there are in advanced countries. In low-income countries like China, Kenya, Myanmar and Vietnam, more than 71 per cent of the population is engaged in agriculture while the percentage for the United States, Canada and West Germany are 3,3 and 4 respectively. This heavy concentration in agriculture is a symptom of poverty. Agriculture, as the main occupation, is mostly unproductive. It is carried on in an old fashion with absolute and outdated methods of production. The average land holdings are as low as 1 to 3 hectares which usually support 10 to 15 people per hectare. As a result, the yield from land is precariously low and the peasants continue to live at a bare subsistence level.

Such countries mainly specialize in the production of raw materials and foodstuffs, yet some also specialize in nonagricultural primary production, I.e., minerals. For example, Sri Lanka specializes in tea, rubber and coconut products; Malaysia in rubber, tin and palm oil; Indonesia in rubber, oil and tin; Pakistan in cotton; Bangladesh in jute; India in tea; and Brazil in coffee. An underdeveloped country is thus a primary sector economy. Besides the primary sector there is the underdeveloped secondary sector with a few simple, light and small consumer goods industries and an equally underdeveloped tertiary sector, I.e., transport, commerce, banking and insurance services. In some of the low-income countries such as Bangladesh, Ethiopia, Nepal, Uganda, Ghana and Tanzania the share of agriculture in GDP continues to be more than 40 per cent and the share of industry and manufacturing less than 20 per cent.

A Dualistic Economy

Almost all underdeveloped countries have a dualistic economy. One is the market economy, the other is the subsistence economy. One is in and near the towns, the other is in the rural areas. One is developed, the other is less developed. Centered in the towns, the market economy is ultra- modern with all the amenities of life, viz., the radio, the car, the bus, the train, the telephone, the picture house, the palatial buildings, the schools and the colleges. Here too government offices, the business houses, the banks and a few factories are visible. The subsistence economy is backward and is mainly agriculture- oriented.

Dualism is also characterised by the existence of an advanced industrial system and an indigenous backward agricultural system. The industrial sector uses, capitals intensive techniques and produces variety of capital goods and durable consumer goods. The rural sector is engaged in producing agricultural commodities with traditional techniques. Both perpetuate unemployment and disguised unemployment. There is also financial dualism consisting of the unorganized money market charging very high interest rates on loans and the unorganized money market with low interest rates and abundant credit facilities. This aggravates economic dualism between the traditional sector and the modern industrial sector.

In many underdeveloped countries, there are foreign-directed enclaves thus making a triplistic economy. They are highly capitalistic and are found in petroleum, mining and plantations. The native hired labour working in these plantations and mines spends a spends a considerable part of its, wages on imported consumer goods. The standard of living of the workers working there differs from that of their brethren living in the subsistence sector.

The dualistic or triplistic nature of the economy is not conducive to healthy economic progress. The primary sector inhibits the growth of the secondary and the tertiary sectors by putting a limit on their expansion and development.

Underdeveloped Natural Resources

The natural resources of an underdeveloped country are underdeveloped in the sense that they are either unutilized or underutilized or misutilized. A country may be deficient in natural resources, but it cannot be so in the absolute sense. Although a country may be poor in resources, it is just possible that in the future it may become rich in resources as a result of the discovery of presently unknown resources or because new uses may be found for the known resources. Thus instead of saying that underdeveloped countries are absolutely deficient in natural resources, it is more appropriate to say that they have not been successful in overcoming the scarcity of natural resources by appropriate changes in technology and social and economic organization. Generally speaking, they are not deficient in land, mineral, water, forest or power resources. Africa possesses considerable reserves of copper, tin, bauxite, and gold; Asia is rich in petroleum, iron, bauxite, manganese, mica and tin; and Latin America's reserves of petroleum, iron, zinc, and copper are immense. The forest wealth of Africa and South America still remains unpenetrated and unexplored. Thus underdeveloped countries do possess resources but they remain unutilized underutilized or misutilized due to various inhibitions such as their inaccessibility, lack of technical knowledge, non–availability of capital and the small extent of the market.

Demographic features

Underdeveloped countries differ greatly in demographic position and trends. Diversity exists in the size, density, age–structure and the rate of growth of population. But there appears to be one common feature, a rapidly increasing population which adds a substantial number to the total population every year. with their low per capita incomes and low rates of capital formation, it becomes difficult for such countries to support this additional number. And when output increases due to improved technology and capital formation, it is swallowed up by increased population. As a result, there is no marked improvement in the living standards of the masses. Warning about the increase in numbers, Keenleyside writes: "the womb is slower than the bomb but it may prove just as deadly. Suffocation rather than incineration may mark the end of the human story.[10]

Almost all the underdeveloped countries possess high population growth potential characterized by high birth–rate and high but declining death–rate. The advancement made by medical science has results in

---

[10] - H.L. Keenleyside, in Dynamics of Development, (ed) G, Hambidge, p. 9.

the discovery of marvelous drugs and the introduction of better methods of public health and sanitation which have reduced mortality and increased fertility Declining death-rates and increasing birth-rates give a very high natural growth rate of population. The average annual growth rate of population in developing countries is 2 per cent as compared with about 0.7 per cent in developed countries. This rapid increase in numbers aggravates the shortage of capital in such economies because large investments are required to be made to equip the growing labour force even with obsolete equipment.

An important consequence of high birth-rate is that a larger proportion of the total population is in younger age groups. The percentage of population under 15 years of age is about 40 in developing countries, compared with only 20 to 25 per cent in developed countries. Moreover,90 per cent of the dependents are children in LDCs whereas their percentage is only 66 in developed countries. A large percentage of children in the population entail a heavy burden on the economy which implies a large number of dependents who do not produce at all but do consume. with many dependents to support, it becomes difficult for the workers to save for purposes of investment in capital equipment. It is also a problem for them to provide their children with the education and bare necessities of life that are essential for the country's economic and social progress in the long run.

Underdeveloped countries have also a shorter life expectancy which means a smaller fraction of their population is available as an effective labour force. Average life expectancy at birth is roughly 51 years in low income countries whereas in the developed countries it is 75 years. Low life expectancy means that there are more children to support and few adults to provide for them which inhibits the rate of economic growth.

Lastly, in the majority of underdeveloped countries, the density of agricultural population is very high in relation to the area of cultivated land. In Egypt, in the inhabited area of the valley of the Nile, the density of population is 600 persons per sq. Km. Though in other underdeveloped countries it is much less, yet their density is increasing rapidly with the growth of population. The problem is becoming serious in the river deltas of Asia and Africa and in the density populated islands of Malaysia, Indonesia, and Sri Lanka. Shortage of land in relation to an excessively large agricultural population leads to overcrowding, over-cropping and soil exhaustion thereby impeding economic progress.

Unemployment and Disguised Unemployment

In underdeveloped countries there is vast open unemployment and disguised unemployment. The unemployment is spreading with urbanisation and the spread of education. But the industrial sector has failed to expand along with the growth of labour force thereby increasing urban unemployment. Then there are the educated unemployed who fail to get jobs due to structural rigidities and the lack of manpower planning. With the present average annual growth rate of 4.5 per cent in urban population, 20 per cent of the labour force in urban areas is unemployed.

But underemployment or disguised or concealed unemployment is a notable feature of underdeveloped countries. Such unemployment is not voluntary but involuntary. People are prepared to work but they are unable to find work throughout the year due to the lack of complementary factors. Such unemployment is found among rural landless and small farmers due to the seasonal nature, of farm operations and inefficient land and equipment to keep them fully employed. A person is said to be disguised unemployed if his contribution to output is less than what he can produce by working for normal hours per day. His marginal productivity is nil or negligible, and by withdrawing such labourers farm output can be increased. In the 1950s, economists estimated the number of disguised unemployed at 25 - 30 per cent of rural labour force. Now it is agreed that it doesn't exceed 5 per cent, even though precise estimates are not available

There are also other types of underemployed persons in such countries. A person is considered to be underemployed if he is forced by unemployment to take a job that he thinks is not adequate for his purpose, or not commensurate with his training , Further, there are those who work full time in terms of hours per day but earn very little to rise above the poverty level. They are hawkers, petty traders, workers in hotels and restaurants and in repair shops, etc., in urban areas. Open and disguised unemployed in urban and rural areas are estimated at 30-35 per cent of the labour force in LDCs.

Economic backwardness

In underdeveloped countries particular manifestations of economic backwardness are low labour efficiency, factor immobility limited specialization in occupation and in trade, economic ignorance, values and social structure that minimize the incentives for economic change.[11]

The basic cause of backwardness is to be found in low labour productivity as compared with the developed countries. This low labour efficiency results from general poverty which is reflected in low nutritional standards, I'll health, illiteracy and lack of training and occupational mobility, etc.

There is also occupational immobility of labour due to the joint family system and the caste system. Certain cultural and psychological factors are more dominant that wage rates in determining the supply of labour the joint family system makes people lethargic and stay–at–home. In many underdeveloped countries, certain occupations are reserved for members of some particular caste, religion, race, tribe or sex. In Latin America, cloth making falls within the exclusive jurisdiction of woman. In India, a janitor always belongs to a particular caste. According to Stephen Enke, underdeveloped countries have what might be termed "an uneconomic culture." Primarily, this means that traditional attitudes discourage the full utilization of human resources. More specifically. It means that men are less likely to strive for extra consumption in underdeveloped countries people are mostly illiterate.

[11] - Meier and Baldwin, op. Cit., p. 293.

Ignorant conservative, superstitious and fatalists. Poverty in such countries is abysmal, but it is considered to be God−given, something preordained. It is never attributed to personal lack of thrift and industry.

There is extensive prevalence of child labour and women's status and position in society are inferior to men. Dignity of labour is conspicuously absent. Government jobs. even of a clerical nature, have more prestige than manual work. People are ranked not according to their capacity to do a particular job but by age, sex, caste, clan and kinship. They are governed by customs and traditions. Individualistic spirit is absent. Exchange by barter is widespread and money economy is hardly understood. The value system minimizes the importance of economic incentives, material rewards, independence and rational calculation. It inhibits the development and acceptance of new ideas and objectives and fails to compare the cost and advantages of alternative methods to achieve objectives. In short, the cultural value system within many poor countries is not favourable to economic achievement and the people remain economically backward.[12]

Lack of Enterprise and initiative

Another characteristic feature of underdeveloped countries is the lack of entrepreneurial ability. Entrepreneurship is inhibited by the social system which denies opportunities for creative faculties. The force of custom, the rigidity of status and the distrust of new ideas and of the

---

[12] - Ibid., pp.298-99

exercise of intellectual curiosity, combine to create an atmosphere inimical to experiment and innovation. The small size of the market, lack of capital, absence of private property, absence of freedom of contract and of law and order hamper enterprise and initiative.

Besides, there exist a few entrepreneurs who are engaged in the manufacture of some consumer goods, and plantations and mines that tend to become monopolistic and quasi- monopolistic. They develop personal and political contacts with the government officials, enjoy a privileged position, and receive preferential treatment in finance taxation, exports, imports, etc. It is they who start new industries and thus found individual business empires which inhibit the growth of fresh entrepreneurship within the country.

The thin supply of entrepreneurs in such countries is also attributed to the lack of infrastructural facilities which add to the risk and uncertainty of new entrepreneurship. LDCs lack in properly developed means of transport communications, cheap and regular power supply, availability of sufficient raw materials, trained labour, well- developed capital and money markets, etc.

Further, entrepreneurship is hindered by technological back development underdeveloped countries. This reduces output per man and the products are of substandard quality. Such countries do not possess the necessary technical know- how and capital to evolve their own techniques which may be output- increasing and labour-absorbing. Mostly they have to depend upon imported capital- intensive techniques which do not fit in their factor endowments.

No wonder LDCs lack dynamic entrepreneurship which Schumpeter regarded as the focal point in the process of economic development

Insufficient capital equipment

Insufficiency of capital equipment is another general characteristic of such countries; underdeveloped countries are characterized as capital – poor or low saving and low- investing economies. There is not only an extremely small capital stock but the current rate of capital formation is also very low. In most underdeveloped countries gross investments is only 5-6 per cent of GNP whereas in advanced countries it is about 15-20 per cent. Such low rates of the growth of capital stock are hardly enough to provide a rapidly growing population at 2-2.5 per cent per annum. let alone invest in new capital projects. In fact, these countries find it difficult to cover even depreciation of capital and replace the existing capital equipment

The root cause of this capital deficiency is the problem of under saving or more precisely, that of under-investment in productive instruments capital of income being very low, people on the bare edge of subsistence cannot save much thereby leasing very little for further investment. There are extreme inequalities in the distribution of income in such countries. but this does not mean that the volume of savings available for capital formation is high. In fact large savings are possible only in the case of 3-5 per cent of the people at the top of the income pyramid. Moreover, the persons at the peak of the income pyramid are traders and landlords who have a tendency to invest in unproductive channels such as in gold, jewellery, precious stones, idle inventories, luxurious real estates and money markets abroad etc.

Another reason as to why the saving ratio does not rise with the increased level of incomes in the long run is the demonstration effect .In everybody there is a great urge to keep up with the joneses. That is, to imitate the standard of living of our prosperous neighbours. Similarly, there is a tendency on the part of the people of the underdeveloped countries to emulate the higher consumption standards of advanced countries .as a result of the demonstration effect, the rise in incomes is spent on increased expenditure on conspicuous consumption and thus savings are almost static or negligible. This demonstration effect is usually caused by foreign films, magazines and visits abroad.

This tendency to emulate the consumption patterns of advanced countries is to be found not only in the case of private individuals but also in the case of government. The governments in LDCs emulate social security programmes found in developed countries. viz mini mum wage legislation, health insurance, pension and provident fund schemes, etc ., but these measures put obstacles in the way of entrepreneurship and thus retard capital formation . It is not surprising writes Haberler. That poor and backward economies when they wake up and set their minds to develop in a hurry and catch up with mote developed economies are tempted to overspend and live beyond their means thus such countries suffer from chronic capital deficiency and the factors responsible for this are not only economic but also socio-political in nature

Technological backwardness

Underdeveloped countries are also in the backward state of technology .their technological backwardness is reflected ,firstly in high average cost of production despite low money wages secondly , in high labour output and capital output ratios as a rule , and on the average ,given constant factor prices thus reflecting a generally low productivity of labour and capital ; thirdly in the predominance of unskilled and untrained workers ; and lastly in the large amount of capital equipment required to produce a national output deficiency of capital hinders the process of scrapping off the old techniques and the installation of modern techniques. Illiteracy and absence of a skilled labour are the other major hurdles in the spread of techniques in the backward economy. Thus it may be pointed out that technological backwardness is not only the cause of economic backwardness, but it is also the result of it.

This technological backwardness is due to technological dualism which implies the use of different production functions in the advanced sector and the traditional sector of the economy. The existence of such dualism has accentuated the problem of structural or technological unemployment in the industrial sector and disguised unemployment in the rural sector. Underdeveloped countries are also characterised by structural disequilibrium at the factor level which leads to technological unemployment. This technological unemployment arises from mal- allocation of resources, the structure of demand and technological restraints.

Foreign trade orientation

Underdeveloped economies are generally foreign trade oriented .this orientation is reflected in exports of primary products and imports of consumer goods and machinery .the percentage share of fuels ,minerals, metals , and other primary products in the merchandise exports of the majority of LDCs , as revealed by the recent World Bank data is on the average about 80 per cent . for instance , the share of Ethiopia is 99 per cent , of Burma 97 per cent , of Uganda 99 per cent , of Indonesia 96 per cent , of Malaysia 80 per cent ,Algeria 100 per cent , and of Kenya 86 per cent

This too much dependence on exports of primary products leads to serious repercussions on their economies. Firstly the economy concentrates mainly on the production of primary exports to the comparative neglect of the other sectors of the economy. Secondly, the economy becomes particularly susceptible to fluctuations in the internation prices of the export commodities. A depression abroad brings down their demand and prices. As a result, the entire economy is adverse affected. lastly .too much dependence on a few export commodities 1 the utter neglect of other consumption goods has made these economic highly dependent on imports .imports generally consist of fue manufactured articles ,primary commodities , machinery and transport equipment , and even food. Coupled with these is the operation of the demonstration effect which tends to raise the propensity to import sti further.

Of late there has been a secular decline in the income terms of trac (capacity to import) of the underdeveloped countries so that they are faced with the balance of payments difficulties .an underdeveloped country ‘s weak export capacity relatively to its strong import needs reflected in its persistent external indebtedness. for instance, the grow inflow of public medium and long –term loans to Mexico was 72,2 million dollars and the repayment of principal was 7,502 million dollars in 1985

The foreign trade orientation also manifests itself through the flow foreign capital to underdeveloped countries it plays a dominant role developing and expanding the export sector .it also controls and manages those services which are ancillary to the export sector .In this way foreign capital has tended to monopolize its position in certain selected fields like minerals, plantations ,and petroleum in underdeveloped countries the multinational corporations MNCs from the developed countries have spread themselves in developing countries manufacturing export –oriented plantations petroleum and mining such a widespread hold of foreign capital drains their resources .the foreigners are interested only in maximizing their gains at the expense the developing countries .

Exercises

Question on chapter one

Characteristics of an underdeveloped country

Part A True – false questions

Circle whether the following statements are true (T) or false (F)

1- An undeveloped country is one which has no prospects of development.

2- An underdeveloped country is one which has no potentialities of development.

3- Poor and backward are also used as synonyms for undeveloped.

4- Poverty refers to the low level of per capita income of a country.

5- The ratio of population to land area is a superfluous criterion for definition of underdevelopment.

6- The ratio of industrial output to total output is a valid indicator of underdevelopment.

7- Capital indicator is a necessary but not a sufficient of progress.

8- Incidence poverty is one of the most commonly acceptable criteria of under develop- merit.

9- Underdeveloped countries have a relative poverty not absolute poverty.

10- Absolute poverty is measured only by low income.

11- In underdeveloped countries two – third or less of the people live in rural areas.

12- Agriculture is mostly unproductive; it is carried on in an old fashion.

13- The heavy concentration in agriculture is referred to poverty.

14- The subsistence economy is backward and is mainly agriculture-oriented.

15- In many underdeveloped countries, there are foreign directed enclaves thus making a triplistic economy.

16- The dualistic nature of the economy conducive to healthy economic progress.

17- An underdeveloped countries have been successful in overcoming the scarcity of natural resources.

18- Increasing in output is swallowed up by increased population.

19- Declining death rates and increasing birth rates give a very high natural growth rate of population.

20- Unemployed people are prepared to work but they are unable to find work throughout the year.

21- Disguised unemployed his marginal productivity is negligible.

22- The basic cause of backwardness is to be found in low labor productivity.

23- People are ranked according to their capacity to do a particular job.

24- The root cause of capital deficiency is the problem of under saving and under investment.

25- Absolute poverty is measured only by low income.

26- The underdeveloped countries are the slums of the world economy.

27- In underdevelopment countries most of the people live in rural areas.

28- The dualistic nature of the economy is a conducive to healthy economic progress.

29- In underdeveloped countries, the Economic growth can been swallowed up increased population.

30- I underdevelopment countries, the heavy concentration in agriculture is a symptom of poverty.

31- Underdeveloped countries are not been successful in overcoming the scarcity of natural resources.

32- The basic cause of backwardness is to be found in low labor productivity.

33- The demonstration effect means that the saving ratio does not rise with the increased level of income in the long run.

34- Almost all developed countries have a dualistic economy.

35- The subsistence economy (dualistic economy) is backward and is mainly agriculture – oriented.

36- The disguised unemployment is related to developed countries.

37- A person is said to be disguised unemployed if his contribution to output is less than what he can produce.

38- Marginal productivity, in case of disguised unemployment, is nil or negligible.

39- The basic cause of backwardness is to be found in high labor productivity compared with the developed countries.

40- Entrepreneurship is hindered by technological backwardness in underdeveloped countries.

41- In LCDs, the foreign trade orientation is reflected in exports consumer goods and machinery, and imports of primary product.

42- The foreign trade orientation manifests itself through the flow of foreign capital to LDCs.

43- The principal factor affecting the development of an economy is structural change.

44- The economic growth is related to a quantitative sustained increase in countries per capital output.

45- Economic development is related to qualitative changes in economic wants, goods, and institutions.

Part B : multiple – choice questions

Circle the appropriate answer:

1- ………………………..is one which has no prospects of development

A) An undeveloped country b) An underdeveloped country

c) A developing country d) Non of the above

2- …………………………..is one which has no potentialities of development

A) An undeveloped country b) An underdeveloped country

c) A developing country d) Non of the above

3- Underdeveloped countries have……………………….

a) unexploited natural resources

b) scarcity of capital goods and equipment

c) obsolete techniques of production

d) all of the above

4- Absolute poverty is measured not only by low income but also by:

a) malnutrition b) poor health

c) lack of education d) all of these

5- Absolute poverty if reflected in……………………………

a) low GNP per capita. b) low income per capita.

c) low living standards of the people d) all of the above

6- Absolute poverty is measured not only by low income but also by:

a) lack of technical Knowledge

b) lack of specialization of occupation.

c) small of extent market

d) all of the above

7- The increase in the number of deaths in underdeveloped countries is due to:

a) uniformed parents b) lack of immunization

c) poor nutrition d) all of the above

8-…………………………… saying that underdeveloped countries are the slums of the world economy

a) Prof. Cairncross b) Kreenleyside

c) Stephen enake d) Marx

9- The market economy is

a) In and near the towns b) in the rural areas

c) is developed d) a and c

e) b and c

10- The subsistence economy is

a) in and near the towns b) the rural area

c) is less developed d) a and c

e) b and c

11- A dualistic economy is characterized by the existence of

a) the market economy and the subsistence economy.

b) an advanced industrial system and an indigenous backward agriculture system.

c) a and b

d) a only

12- Dual economies are countries

a) with double capital and labor

b) with a modern manufacturing sector as well as traditional agriculture sector

c) that specialize in labor-intensive products more than capital-intensive products

d) with foreign –owned and domestically-owned capital.

13- In LDCs, the natural resource are:

a) Unutilized b) underutilized

c) Misutilized d) all of the above

e) non of the above

14- In LDCs, the underutilized natural resources due to:

a) lack of technical Knowledge b) the large extent of the market

c) b only d) A and b

15- LDCs are characterized as

a) capital-poor economy b) low-saving economy

c) low investing economy d) all of the above

16- The poorest region of the world is

a) the middle east b) sub-saharan Africa

c) Asia d) Latin America

17- Of the world's population, what portions lives in developing countries?

a) approximately 35% b) approximately 80%

c) nearly 10 billion people d) less than 1 billion people

18- In which of the following countries would you expect material lifestyles to be most like those in the United States?

a) Nigeria b) Japan c) India d) Mali

19- Which of the following could be considered critical questions in development economics?

a) How do the poorest 2/3 of the world live?

b) What are the major theories of economic development?

c) What factors affect labor skills in the third would?

d) all of the above are correct.

20- Which of the following characteristics are most likely found in developing countries?

a) high population growth rates

b) large number of people living in poverty

c) very traditional methods of agricultural production.

d) all of the above

e) none of the above

21- Which of the following could not be considered a major economic system?

a) capitalism

b) communism

c) socialism

d) physical quality of life index

e) none of the above

22- Economic development refers to

a) economic growth

b) economic growth plus changes in output distribution and economic structure

c) improvement in the well – being of the urban population.

d) sustainable increases in gross national product.

References

- Aigbokhaevbolo, O. (2011), **Application of game theory to business strategy in undeveloped countries**: a case for Nigeria, Hournal of Social Sciences, 26 (1) , 1-5

- Chelliah, R, J. (2012), **Fiscal policy in underdeveloped countries**: with special reference to india, Routledge.

- Luan, Z.: & Zhou, Z (2017) **The relationship between annual GDP growth and income inequality: developed and undeveloped countries**.

- Sagasti, F. R. (2007), " **underdevelopment, Science and Technology: The point of view of the Underdeveloped Countries**", Science Studies, 3 (1) , January, 47- 59. International library of critical writings in economics 231. 3.

- Widodo, B.S (2016, January, **the factors which influence the Quality of Education in Undeveloped Area** (Multi – cases study in 10 districts in Indonesia) in proceeding of international conference on teacher training and education (vol. 1. No 1)

Chapter Two

The Meaning and measurement of Economic Development

Chapter Two

The Meaning and Measurement of Economic Development

Scope of the Chapter

This chapter discusses the meaning, calculation, and basic indicators of economic growth and development; the classification of rich and poor countries; the price index problem; the distortion in comparing income per head between rich and poor countries adjustments to income figures for purchasing power; alternative measures and concepts of the level of economic development besides income per head; the problems of alternative measures, and the costs and benefits of economic development

Growth and Development

A major goal of poor countries is economic development or economic growth. The two terms are not identical. Growth may be necessary but not sufficient for development. Economic growth refers to increases in a country's production or income per capita. Production is usually measured by gross national product (GNP) or gross national income GND, used interchangeably, an economy's total output of goods and services. Economic development refers to economic growth accompanied by changes in output distribution and economic structure. These changes may include an improvement in the material well-being of the poorer half of the population; a decline in agriculture's share of GNP and a corresponding increase in the GNP share of industry and services; as increase in the education and skills of the labor force; and substantial technical advances originating within the country. As with children, growth involves a stress ci quantitative measures (height or GNP), whereas development draws attention to changes in capacities (such as physical coordination and learning ability, or the economy's ability to adapt to shifts in tastes and technology).

The pendulum has swung between growth and development. A major shift came near the end of the UN's first development decade (1960–70), which had stressed economic growth in poor countries. Because the benefits of growth did not often spread to the poorer half of the population, disillusionment with the decade's progress was widespread, even though economic growth exceeded the UN target. In 1969, Dudley Seers signaled this shift by asking the following questions about a country's development

What has been happening to poverty? What has been happening to unemployment? What has been happening to inequality? If all three of these have become less severe, then beyond doubt this has been a period of development for the country concerned, If one or two of these central problems have been growing worse, especially if all three have, it would be strange to call the result "development," even if per capita income has soared. (Seers 1969, 3–4)

At the U.N. Millennium Summit in September 2000, world leaders adopted the Millennium Development Goals (MDGs), setting "targets for reducing poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women (U.N. Development Program 2000). The project is directed by Columbia University's Jeffrey Sachs, with advice from senior representatives from U.N. agencies and an international Advisory Panel, with independent experts in relevant fields, supported by the research of thematically orientated task forces.

The MDGs, using 1990 as a benchmark, set targets for 2015. The targets include

1- Reducing the people suffering from hunger and living on less than a dollar a day from one of six billion (17 percent) to half that proportion.

2- Ensuring that all boys and girls complete primary school (at present, 113 million children do not attend school)

3- Promoting gender equality and empowering women by eliminating gender disparities in primary and secondary education by 2005, and at all levels by 2015 (at present, two-thirds of illiterates are women).

4- Reducing by two-thirds mortality among children under five years (presently 11 million children die before their fifth birthday, mainly from preventable illnesses).

5- Reducing the percentage of women dying in childbirth by three-fourths (now one in 48 die in childbirth, despite the fact that virtually all countries have safe programs for mothers).

6- halting and reversing the spread of HIV/AIDS, malaria, tuberculosis, and other diseases (at present, 40 million people live with HIV, including five million newly infected in 2001,despite the fact that Brazil, Senegal, Thailand, and Uganda show that the spread of HIV can be stemmed)

7- Ensuring environmental sustainability, by reversing the loss of environmental resources, reducing by half the proportion of people without access to safe drinking water by 2015, and achieving significant improvement in the lives of at least 100 million slum dwellers (now more than one billion people lack access to safe drinking water and more than two billion lack sanitation"; and

8- developing a global partnership or development, including an open, trading and financial system, a commitment to good governance, reducing the debt burden of developing countries, reducing the poverty of least developed countries, providing productive employment tor youth, providing access to affordable essential drugs in developing countries, and making available the benefits of new technologies, especially in telecommunications (U.N. development program 2002b)

During the first decade of the 21st century, world leaders discussed how to finance projects embodying these goals (a U.N, conference in Monterrey, Mexico, March 2002), interim progress reports, and final recommendations.

The United Nations points out development goals achieved in the past: eradicating smallpox(1977), reducing diarrhoeal deaths by half (during the 1990s), and cutting infant mortality rates (the annual number of deaths of infants under one year of age per 1,000 live births) to less than 120 (in all but 12 LDCs by 2000) (U.N. Development Program 2003:31). Thus, although most MDG goals appear daunting, we can expect some progress.

Timothy Besley and Robin Burgess (2003:3-22) estimate that in LDCs, the elasticity of poverty which respect to income per capita (percentage change in poverty/percentage change in income per capita) is-0.73, meaning that a doubling in average income will reduce poverty rates by 73 percent. The annual growth rate in per capita income needed to halve world poverty by 2015 is 3.9 percent. if you assume that world regions continue their 1960-90 growth, only the growths of East Asia and the Middle East will exceed the rates needed to have regional poverty by 2015.

However Africa's prospect is not as bright as that of the remaining LDCs. David Sahn and David Stifel (200323-52) use African demographic and health surveys to examine likely progress in achieving MDG goals, African countries are not on target to achieve any of the first six goals tested (numbers 5 and 6 include proxies), with rural areas, where most African reside, faring worse than cities. Still, the authors find increases in enrollment rates, declines in infant and child mortality and maternal death rates, and (although there is no MDG goal) improved living standards in the 1990s, the baseline for projecting linear and log-linear target paths.

The international community has especially focused upon Africa. The Economic Commission for Africa (1985.3) described Africa's economic situation in 1984 as the worst since the Great Depression, and Africa as "the very sick child of the international economy, ECA's 1983 25th anniversary projection of previous trends to 2008 envisioned the following nightmare of explosive population growth pressing on physical resources and social services:

The socio-economic conditions would be characterized by a degradation of the very essence of human dignity. The rural population, which would have to survive on intolerable toil, will face an almost disastrous situation of land scarcity whereby whole families would have to subsist on a mere hectare of land. Poverty would reach unimaginable dimensions, since rural incomes would become almost negligible relative to the cost of physical goods and services.

The conditions in the urban centers would also worsen with more shanty towns, more congested roads, more beggars and more delinquents. The level of the unemployed searching desperately for the means for survive would imply increase crime rates and misery. But, alongside the misery, there would continue to be those very few who unashamedly, would demonstrate an even higher degree of conspicuous consumption. These very few would continue to demand that the national department stores be filled with imports of luxury goods even if spare parts for essential production units cannot be procured for lack of foreign exchange. (Economic Commission for Africa (ECA) 1983:93-94)

Unfortunately, the projection of the ECA is proving correct. Africa's GDP per capita was lower in the I990s than it was at the end of the 1960s (World Bank 2000a:1). When expressed in purchasing-power parity dollars (discussed later), Africa's average GDP is the lowest in the world, even lower than South Asia's (India, Pakistan, Bangladesh, and Sri Lanka). Moreover, life expectancy in sub-Saharan Africa, reversing the global trend, has declined to the level of 1975, 46 years (inside front cover table) primarily because of the high adult prevalence of HIV/AIDS.

Africa's political milieus, authoritarian and predatory rule and widespread civil wars, militate against economic growth, Evidence from Africa reinforces cross-national findings, a refutation of Singapore's former prime minister Lee Kuas Yew's thesis (Sen1999:15, that democratizations is directly related to the level and rate of economic growth. In 1988, only 5 (Botswana, Gambia, Mauritius, Senegal, Zimbabwe) of 47 sub-Saharan countries were multiparty democracies (Bratton and van de Walle 1997:Ndulu and O'Connell 1999: 51). By 2004, the number of democracies had not increased much. Indeed, a majority of the democratically elected regimes in Africa contrive to hold elections to satisfy international norms of "preventability" and ignore political liberties, the rule of law, and separation of power (Nafziger and Auvinen 2003:114-31).

Claude Ake (1996:18, 42) writes: With independence African leaders were in no position to pursue development; they were too engrossed in the struggle for Survival...(indeed) instead of being a public force, the state in Africa tends to be privatized, that is, appropriated to the service of private interests by the dominant faction of the elite." Political elites extract immediate rents and transfers rather than providing incentives for economic growth Clientelism or patrimonialism, the dominant pattern in Africa, s a personalized relationship between patrons an clients, commanding unequal wealth, status, or influence, based on conditional loyalties and involving mutual benefits. In Nigeria's second republic

(1979-83), Richard Joseph (1987:8) labeled this phenomenon prebendalism, referring to "patterns of political behaviour which rest on the justifying principle that such offices should be competed for and then utilized for the personal benefit of officeholders as well as their reference or support group. Prebendalism connotes an intense struggle among communities for control of the state. Corruption is endemic to political life at all levels in Nigeria and may LDCs, Political leaders use funds at the disposal of the state for systematic corruption from petty survival venality at the lower echelons of government to Kleptocracy at the top.

Two-way causation links the increase in civil wars in Africa to its dismal growth record (Nafziger, Stewart, and Vayrynen 2000; Nafziger and Auvinen 2003:41-42; Collier 2000) (negative per-capita growth, 1974-90, and barely positive in the 1990s)(World Bank 1996a:77; World Bank 1996f:18).Indeed, Stewart, Huang, and Wang (2000:7)indicate that Africa had by far the greatest number of deaths (direct and indirect) from wars, 1960 to 1995, as a proportion of the 1995 population: 1.5 percent compared to 0.5 percent in the Middle East, 0.3 percent in Asia, and 0.1 percent in Latin America.

Nigeria is a clear example of ECA's foreboding, By the late 1970s, Nigeria, fueled by oil wealth had surpassed South Africa as Africa's nominal GDP leader, and was classified as a middle income country in 1978-80 (World Bank 1980i: 110-11; World Bank 1982i: 110 -11, 122-23). The contrast between the 1960s to 1970s and the first decade of the 21st century is remarkable. To be sure, visitors in the central cities notice that the urban elite (perhaps 10 percent of the population) is prosperous, with automobiles, cell phones, and refrigerators. Moreover, some villages have electricity (though erratic) and piped water, virtually unavailable in 1965.

But these pockets of prosperity hide Nigeria's massive income disparities. The World Bank (2003i:236-37) ranks Nigeria as having the 15th highest Gini index of income inequality in the world (113 countries ranked), with the highest 10 percent of income earners enjoying 40.5 percent of income, whereas the lowest 10 percent claims only 1.6 percent. Also 91 percent of the population, the highest among 90 countries listed, lives below the international poverty line of $2 a day (in 1993 prices).

From 1965 to 2004, Nigeria's average material well-being fell. This decline included that of average nutritional levels (the proportion of the population undernourished rose, substantially), average consumer spending, access to health care, and infrastructure (transport and communications degraded from inadequate maintenance). The shares of Nigeria's shrinking middle class have plummeted. Many middle-level professionals, teachers, and civil servants were marginalized in 2004; in 1965, they had perquisites of automobile loans and housing.

Alienation in 2004 may even be more widespread than in 1965, just before the civil war, the impoverished people of the oil delta area have protested the high unemployment and lack of public goods and social services amid the wealth of foreign companies and their domestic collaborators, Ethnic and sectarian strife is rampant. The federal government consistently lacks accountability for hundreds of millions of dollars collected from petroleum exports and revenues. To get a picture of present-day Africa, you can multiply Nigeria's ills several times (Nigeria, whose poverty and corruption may be representative of much of Africa, has one-sixth to one seventh of the population of Africa).

In Nigeria, Ethiopia, and Zambia, neither growth nor development took place in the last quarter of the 20th century. In Kenya and Malawi, growth took place without much development. In most of Asia and parts of Latin America, both growth and development took place (inside front cover table).

Economic development can refer not only to the rate of change in economic well-being but also to its level. Between 1870 and 1998, Japan had a rapid rate of economic development. Its real (inflation-adjusted) growth rate in GNP per capita was about 2.6 percent yearly, and there was substantial technical innovation, improved income distribution, and a decline in the share of the labor force in agriculture. In addition, Japan has a high level of economic development- its 2003 nominal per capita GN1,$34,510, placed it among the four richest countries in the world (inside front cover table). Other measures indicate most Japanese are well fed and housed, in good health, and well educated. Only a relative few are poor. This book will use both meaning of economic development.

Classification of countries

When the serious study of development economics began in the late 1940s and early 1950s, it was common to think of rich and poor countries as separated by a wide gulf. The rich included Western Europe, the United States, Canada, Australia, New Zealand, and Japan; the poor included Asia, Africa, and Latin America

The boundary between rich and poor countries overly simple then, has become even more blurred during the first decade of the 21 st century. Today, an increasing number of the high-and upper-middle-income countries are non –Western, and the fastest-growing countries are not necessarily the ones with the higher per capita GNP, Those countries considered to be poor in 1950 grew at about the same rate as rich countries during the subsequent three decades. A few of the poor countries in 1950 – such as Taiwan, Singapore, south Korea, Malaysia, Thailand, and Mexico- grew so much more rapidly than some higher-income countries in 1950 (Argentina, Uruguay, Venezuela, and New Zealand, for example) that the GNI per capita of the countries of the world now forms a continuum rather than a dichotomy.

Several GNP per capita rankings shifted substantially between 1950 and 2003. Among present-day Asian, African, Latin American LDCs listed in both GNP per capita ranking for 1950 in a world Bank study (Morawetz 1977:77-79) and for 2003 from sources in the inside front cover table, Venezuela fell from first to thirteenth, Uruguay from second to sixth, Peru from 11th to 22nd Bolivia from 31st to 56th, being overpassed by war-affected Japan, Taiwan (which rose from thirty-fifth to first), and South Korea, which vaulted from forty-fifth to second. In Africa, Morocco, engaged in conflict with Algeria over the Spanish Sahara and with local labor unions over social policy, declined from 17th to 32nd;

Zambia, with rapidly falling relative world copper export prices after the mid-1970s, fell from 22nd to 77th; and Ghana, with chronic cedi overvaluation and low farm prices that discouraged export expansion until the 1980s, dropped from a two way tie for 15th and 16th to 59th. During this period, Taiwan and South Korea, then 43rd and 46th, respectively, but since graduating to the high-income category, leapfrogged Ghana as did Malaysia, Turkey, Colombia, and Indonesia, as well as Thailand, which rose from 49th to 14th.

The classification of development used by the World Bank (2003h and inside back cover) divides countries into four groups on the basis of per capita GNI. In 2003, these categories were roughly low-income countries ($1,000 or less), lower-middle-income countries($1,001-3,000), upper-middle-income countries($3,000-9,000), and high-income countries ($9,000 or more) Each year, the boundary between categories rises with inflation, but few countries shifted categories between 1974 and 2003.

Sometimes the high-income countries are designated as developed countries (DCs) or the North, and middle and low-income countries as developing, underdeveloped, or less-developed countries (LDCs), or the South. Underdeveloped was the term commonly used in the 1950s and 1960s, but it has since lost favor. Perhaps all countries are underdeveloped relative to their maximum potential. However, the term underdeveloped, like less developed, has declined in use recently, not because it is inaccurate, but because officials in international agencies consider it offensive. And the term developing countries appears to be a euphemism when applied to parts of sub-Saharan Africa that grew (and developed) very little, if at all, from the 1970s through the first decade of the 21st century. Nevertheless, this book uses the latter term, as it is widely understood within the world community to refer to countries with low and middle GNP o GNI per capita.

The 134 Asian, African, and Latin American members of the UN Conference on Trade and Development (UNCTAD); often are referred to as the third world, a term originating in the early post-World War ll decade. By refusing to ally themselves with either the United States or the Soviet Union, nonaligned nations forged a third political unit in the United Nations Today, the term has lost its original meaning, no longer connoting nonalignment but distinguishing the low-and middle-income economies of the developing world from the first world, the high-income capitalist countries, where capital and land are owned by private entities; and the second world socialist, or centrally directed countries, where the government owns the means of production.

Contrary to Western usage, the second world described its economic system as socialism rather than communism. In Marxian terminology, communism refers to a later stage of development when distribution is according to needs, money is absent, and the state withers away. With the collapse of the Soviet Union in 1991, and the transition of the formerly socialist economies of Russia, East-Central Europe, and Central Asia toward a capitalist or mixed economy, only Cuba and North Korea are still socialist. Even Sweden, a social democracy, with an emphasis on taxes and transfers to redistribute income, and France, with indicative planning, which states government expectations, aspirations, and intentions but not authorization are classified in the first world.

The term second world is rarely used now, especially since 1989 –91, when Eastern Europe, the former Soviet Union, Mongolia, China, and Vietnam have been moving, albeit haltingly, toward the end of transition, with the Communist Party's loss of monopoly political power, the private sector accounting for the majority of GDP, and the market becoming the "dominant coordinator of economic activities (Svejnar2002:25 and Kornai 1999). By the mid–to late 1990s, virtually all formerly socialist economies in Europe had passed their inflection point, the lowest point, for real GDP since 1989.

This generally rising trend following an early abrupt five–year or so decline still meant that real GDP per capita, 1989 to 2001, had fallen about one third in Russia, more than one half in Ukraine, and 10 to 40 percent in the rest of the former Soviet Union. By 2001, only four formerly socialist European nations had attained their1989 real GDP by 2001: Poland, which reached its 1989 level in the mid–1990s، and Slovenia, Hungary, and Slovakia, achieving 1989 levels in the late 1990s. Unemployment rose to 16 percent of the labor force in Poland, 10 percent in Russia, and 7–19 percent in the rest of East–Central Europe in 2000 (Svejnar 2002:9–11) Some states of the former Soviet Union are not likely to attain their 1989 real GDP until near the end of the first (or even the second) decade of the 21st century. With the widespread overestimation of the pre–1989 output of the former

European and Soviet socialist countries, and the collapse of their output just after 1989, these countries are now included among developing mostly middle-income) countries.

Branko Milanovic and Shlomo Yitzhaki (2001), in decomposing a global income distribution, ask, Does the World Have a Middle Class?" between the first and third worlds, and answer "No Their division gives new meaning to the concept of a tripartite world. The first world, richer or equal to real GDP per capita in Italy (PPP$8,000 or more in I999) represents 16 percent of the world's population, and the third world, with income equal or less than Brazil's (PPP$3,470, about equal to the official poverty line in Western Europe), comprises 78 percent of the world. Only 8 percent is left for the world's middle class! This three part grouping. Leaving very little overlap captures more than 90 percent of global inequality.

The South Commission, chaired by the late Julius K. Nyerere, an articulate spokesperson for the poor who was head of government in Tanzania from 1961 to 1985, declares that "The primary bond that links the countries and peoples of the South is their desire to escape from poverty and underdevelopment and secure a better life for their citizens (South Commission 1990:1). Yet economic interests still vary substantially between and within the following types of developing countries (1) the 26 economies in transition" (East-Central Europe and the former Soviet Union, all low and middle-income countries except high income Slovenia), recognized as separate by the South Commission (ibid., pp. 3-4); (2) the eight members of the Organization of Petroleum Exporting Countries, or OPEC (not including high-income Kuwait and the United Arab Emirates); (3) the 48 poorest countries, designated as least developed countries, seven listed and starred in the cover table; and (4) 106 other developing countries.

The label economies of transition" (implying a passage to the market) may be a euphemism of the DCs Those citizens experiencing falling standards of living in the 1990s and first decade of the 21st century fear destitution before they arrive at the promised land of long run equilibrium. Indeed, by 1995, in Russia, Ukraine, Lithuania, Poland, Hungary, Romania, Bulgaria, and Slovakia, the former ruling communist Party (reincarnated as a socialist or social democratic party and opposed to central planning) had won a parliamentary plurality back from transient ruling parties or cliques committed to rapid economic reform and liberalization. Still, indicates, todays economics structure is very different from that of the early 1990s.

Among OPEC members, high- and upper-middle income economies are Kuwait, Libya, Saudi Arabia, Venezuela, the United Arab Emirates, and Gabon. Iran dropped from upper-middle-income status after the oil output disruptions during the 1979 Iranian revolution and the 1980-88 Iran- Iraq war, and Iraq also fell from the same status after the war with Iran, the U.N imposed trade ban in the 1990s, and the U.S. led invasion of 2003 (Alnasrawi 2000-92 estimates that Iraq's GDP fell 82 percent from 1980 to 1998) Indonesia, fluctuating between low-income and lower middle-income status, and low-income Nigeria, each with populations of more than 90 million, lack substantial surpluses, spending most foreign exchange on basic import requirements, such as machinery, equipment, food, and raw materials

in 1971, the United Nations designated 25 countries with a low per capita income, low share of manufacturing in gross product, and low adult literacy rates as least developed. A number of countries asked to be so designated, hoping to obtain economic assistance, especially from the United Nations. Since then, the United Nations has added other criteria to this list of marginalized economies, including low levels of human development (on indicators such as life expectancy, per capita calorie supplies, and primary and secondary school enrollment rates), natural handicaps (such as a small population, severe climatic risks, landlockedness, and geographical isolation), and low economic diversification. The list of countries has grown to 48 (including Afghanistan, Angola, Bangladesh, Burkina Faso, Burundi, Cambodia، Congo Kinshasa, Ethiopia, Haiti, Liberia, Malawi, Mali, Mozambique, Myanmar or Burma, Nepal, Niger, Rwanda, Somalia, Sudan, Tanzania, Uganda, Yemen, and Zambia) overlapping greatly with low–income countries. Most least developed countries, however, are small Most U.N. supporters of this program feared that DCs would treat the proposal seriously only if the number of countries were clearly limited. Thus, populous countries, such as India, Pakistan, Vietnams and Nigeria (and even Kenya) were not included (Simonis 1991:230–35; Blackwell 1986:40–41; for criticism, see Selwyn 1974:35–42).

The four Asian tigers, South Korea, Taiwan (China Taipei), Singapore, and Hong Kong (the largest investor in and a major recipient of investment from China, and a part of China since 1997) are included among the newly industrializing countries (NICs). The four, which have been growing rapidly despite stumbling temporarily in the 997-98 Asian financial crisis, are industrially diversified and high-income countries. Nine less advanced economies, Mexico, Brazil, Malaysia, Turkey, Argentina, India, China, Portugal, and South Africa, among others, are sometimes included among NICs (Sewell, Tucker, and contributors 1988,204).

China, a lower-middle country on a GNI per capita basis, has a GNI PPP of $5,625 billion, second to the $10,110 billion of the United States in 2002, and ahead of Japan's $3315 billon (World Bank 2004h:252-253). GNI an indicator of potential military and diplomatic strength. If China's total growth continues to exceed that of the United States, China may surpass the United States by the second to third decade of the 21st century.

LDC debtors, such as Argentina, Brazil, Bangladesh, Kenya, and Côte d'lvoire, have been interested in the expansion of official loan facilities, especially to finance oil imports. Their attempts to improve financing were directed at OPEC countries. Nevertheless, OPEC countries have maintained an alliance with oil-importing, developing countries on a broad range of economic and political issues in international forums. Many OPEC countries and oil-importing LDCs shared a concern with debit relief and rescheduling economic adjustment, and macroeconomic stabilization. Additionally، most OPEC countries, despite their high per-capita GNP, face problems common to most of the developing world-high illiteracy, high infant mortality, and dependence on imported technology. The NICs (both four and nine), which rely heavily on manufactured exports, have been more interested is reduced DC trade barriers against manufacturers than in the reduced DC agricultural subsidies and primary commodity stabilization sought by Uganda, Malawi, Sri Lanka, and Honduras.

Still in 1974 to 1975s, NICs (none then among high-income countries) and OPEC countries joined with other developing economies in the successful adoption by the U.N. General Assembly of a declaration on principles and programs to reduce the adverse impact of the international economic order on LDC development. This order includes all economic relations and institutions, both formal and informal that link people living in different nations. These economic institutions include international agencies that lend capital, provide short-term credit, and administer international trade rules. Economic relations include bilateral and multilateral trade, aid, banking service, Currency rates, capital movements, and technological transfers. Amid the tepid response by DCs, LDCs have changed their strategies, eschewing comprehensive strategies on the world order but continually pressing for concessions on various fronts, including lobbying for reduced DC tariffs and subsidies in the World Trade Organization (WTO, which administers international trade rules seeking debt reductions for highly-indebted poor countries, and tying U.N. millennium development goals to aid to decrease poverty and illiteracy.

Problems with Using GNP to Make Comparisons over Time

Economists use national-income data to compare a given country's GNP or GNI over time. The inside front cover table shows the economic growth of 63 of123 countries, 1973 to 1998. For example, Malaysia's growth in GDP per capita was 4.16 percent yearly. On the basis of a simple calculation, you might state. This means that Malaysia's GNP capita in 1998 was 277 percent (10416) of what it was in 1973." Yet a statement such as this, based on official growth figures, is subject to serious question as to accuracy.

Students know that the GNP price deflator affects government and World Bank figures for GNP and its growth. Whether the price deflator is 112.5, 125, 150, or another figure depends on which weighted price index is used. A number of countries، especially in Africa and Eastern Europe, have not changed the quantity weighting of commodity prices since before 1972, despite substantial output structural change. Economic development changes prices with shifts in supply and demand. A newly modernizing country may find that a good, such as steel, which is of little importance in the output mix in the premodern era, looms large during the process of modernization. Whether the country uses early or late (sometimes premodern or modern) weights in devising a price index makes a substantial difference in determining how large the price deflator will be is adjusting GNP growth.

Let us save Malaysia to illustrate the price-index problem. In showing how Malaysia calculates its GNP price deflator assume that Malaysia produces only two goods, electronic calculators and rubber boots.

Suppose Malaysia produces 20 million electronic calculators at R400 apiece (with R the Malaysian currency ringgit) and 200 million pairs of rubber boots at R100 per ton in 1973, and 100 million calculators at R100 apiece and 400 million pairs of rubber boots at R200 per ton in 1998. The output of boots grew steadily as prices doubled, whereas the output of calculators increased fivefold and prices were cut substantially, as the industry benefited from large-scale economies and a rapidly improving technology.

Malaysia may use the Laspeyres price index, applying base-period or 1973 (not late-year or 1998) quantities to weight price. The aggregate price index

$$P = \frac{\sum P_n q_0}{\sum P_0 q_0} \qquad (2-1)$$

where p is the price of the commodity produced, q the quantity of the commodity produced, 0 the base year (here 1973), and n the given year (1998)

$$\frac{(20m.calculators\ x\ R100) + (200\ m.units\ of\ boots\ x\ R200)}{(20\text{m. calculators x R 400}) + (200\text{ m units of boots x R100})}$$

$$= \frac{R42{,}000\ million}{\text{R28,000 million}} = 1.5$$

Many countries compute real growth by using current price weights, similar to the Paasche price index, which applies terminal-year (1998) outputs for weighting prices, so that piece index

$$P = \frac{\sum P_n q_n}{\sum P_0 q_n} \qquad (2-٢)$$

In Malysia, then

$$P = \frac{(100 \text{ m. calculators x R100}) + (400 \text{ m. units of boots x R 200})}{(100 \text{ m. calculators x R400}) + (400 \text{ m. units of boots x R 100})}$$

$$\frac{R90.000\ million}{R80.000\ million} = 1.125$$

In Malaysia, the GNP price deflator using the Laspeyres index, 1.5, exceeds that using the Paasche index, 1.125. To the extent that industries with more rapid growth، such as the electronic calculator industry, show relatively less rapid increases (or here even reductions) in price, a Laspeyres index, which uses base−period weights, will show higher values than Paasche−type indexes, which use weights from a current period. The Laspeyres index is biased upward and the Paasche index biased down−ward. Although the Fisher ideal index, a geometric average of the Laspeyres and Paasche indices, removes bias, it is not used much because of its complexity

National−income statisticians may not find adequate price weights for wonder drugs and other new goods recently discovered. In Viagra and the Wealth of Nations" Paul Krugman asks (1998.24), How do we compare today's price for a good not available at any price in 1973−the Internet, fax machine, microwave oven, video−cassette player, automatic teller machine, music file transfer, or a drug to cure cancer, male impotence (Viagra), baldness, and Alzheimer's What was the cost of a substitute for Viagra or electronic mail in 1973? Any imputation falls short of capturing the real improvements in today's living standards from a wider choice of goods and services

Problems in Comparing Developed and Developing Countries GNP

International agencies generally do not collect primary data themselves. These agencies almost always base their statistical publications on data gathered by national statistical agencies that often use different concepts and methods of data collection. The United Nations has not yet successfully standardized these concepts and methodologies (Srinivasan 1994 3–27). But aside from these problems, there are ocher incomparabilities, especially between the GNPs of rich and poor countries.

According to the cover table, per capita GNI or GNP varies greatly between countries. For example, compare the GNP per capita of India and the United States The 2003 U.S. GNP per capita of $37,610 is more than 70 times that of India's $530. Could an Indian actually survive for one year on less than the weekly income of an average American? In reality, income differences between developed and developing countries are very much overstated.

One difference is that developed countries are located in predominantly temperate zones, and LDCs are primarily is the tropics. In temperate areas such as the northern United States, heating, insulation, and warmer clothing merely offset the disadvantages of cold weather and add to GNP without increasing satisfaction.

Apart from this discrepancy, the major sources of error and imprecision in comparing GNP figures for developed and developing countries are as follows:

1- GNP is understated for developing countries, because a greater proportion of their goods and services are produced within the home by family members for their own use rather than for sale in the marketplace, Much of the productive activity of the peasant is considered an integral part of family and village life, not an economic transaction. The economic contribution of the housewife, who grinds the flour, bakes the bread, and cares for the clothes may not be measured in GNP in poor countries, but the same services when purchased are included in a rich country's GNP. In addition, subsistence farmer investments in soil improvements and the cultivation of virgin land are invariably understated in national income accounts. Although a shift from subsistence to commercial production may be slow enough to be dismissed in a country's GNP for three to five years, it is an important distortion for longer run or intercountry comparisons. Heston (1994:39) estimates that, in 1975 in LDCs, the mean share of the subsistence sector in GDP was 15 percent but does not estimate GDP's corresponding margin of error for GDP.

In some ways, distortions in income differences between the poor country and rich country are analogous to those between the United States in the 19th and 20th centuries. Although estimates indicate U.S. real per capita income for 1870 was one-eleventh what it was in 1998, adjustments would indicate a figure closer to one-fifth. Great-great-great-grandfather grew his fruits and vegetables, raised dairy cattle for milk and sheep for wool, and gathered and chopped fire-wood. Great-great-great grandmother processed the food, prepared the meals، and sewed quilts and clothes for the family. But few of these activities added to national product. Today, their great-great-great-grandchild purchases milk, fruits, and vegetables at the supermarket, buys meals at restaurants, and pays heating bills- all items that contribute to national product. Moreover, our great-great-great-grandparents grain output, wen estimated, was valued at farm-gate price, excluding the family's food processing Statistics show U.S. cereal product consumption increased by 24 percent from 1889 to 1919, although it decreased 335 percent if you impute the value of economic processes at home, such as milling grinding, and baking (Usher 1968:15; Kuznets 1971:10-14). Analogously, most food consumed by the poor in low income economies is value at the farm price, because most grow their own food or buy food at farm prices. Thus, part of today's increased GNP Per capita (over that of our great-great-great grandparents) occurs because a larger percentage of consumption enters the market and is measured in national income.

2- GNP may be understated for developing countries, where household size is substantially larger than that in developed countries, resulting in household scale economies. Although it is not accurate to say that "two can live as cheaply as one, it is true that two can live more cheaply together than separately. India's average household size is 5.2 compared to the U.S.s 2.6; moreover, & larger percentage of the average Indian household consists of children, who consume much less food than adults If we adjust India's income to an equivalent adult, equivalent-household (EAEH) income based on household size and children percentage, India's per capita income is roughly 10 percent higher (Firebaugh 2003:46-69, who provides EAEH adjustment. The EAEH adjustment in Africa is more than 10 percent, as its population growth rate and average household size are larger than India's.

3- GNP may be overstated for developed countries, because a number of items included in their national incomes are intermediate goods, reflecting the costs of producing or guarding income. The Western executive's business suits and commuting costs should probably be considered means of increasing production rather than final consumer goods and services, just as expenditures on smog eradication and water purification that add to national income are really costs of urbanization and economic growth. Furthermore, part of defense spending is a cost of guarding higher incomes, and not for national power and prestige.

4- The exchange rate used to convert GNP in local currency units into U.S. dollars, if market clearing, is based on the relative prices of internationally traded goods (and not on purchasing power-see later). However, GNP is understated for developing countries because many of their cheap, labor-intensive, unstandardized goods and services have no impact on the exchange rate, as they are not traded. Many of the necessities of life are very low priced in dollar terms. In 2003, for example, rice the staple in the diet of an Indian villager cost 10 rupees (about 20 U.S. cents) per capita per day. Also, services is India tend to be inexpressive. Thus, 2003 annual salaries for elementary teachers were about one-tenth as high as those in the United States a case that surely overstates differences in the quality of instruction. Which indicates that recently trade in services has increased with enhanced globalization, which will reduce somewhat the scope for this distortion in the future.

5- GNP is overstated for countries (usually developing countries) where the price of foreign exchange is less than a market clearing price, This overstatement can result from import barriers, restrictions on access to foreign currency, export subsidies, or state trading, Suppose that in 2003 India's central bank had allowed the exchange rate to reach its free market rate, Rs, 85 = $1,rather than she official rate of Rs. 44.20 = $1. Then the GNP per capita figure of Rs. 23,430 would have been $276 (23,430 divided by 85) rather than $530 (23,430 divided by 44.20). On balance, other adjustments outweigh this effect, so that income differences between rich and poor countries tend to be overstated.

Comparison-Resistant Services

Comparison-resistant services, like health care, education, and government administration, which comprise more than 10 percent of most countries expenditure, distort cross-national, but not necessarily DC-LDC, GNP comparisons. People do not buy a clearly defined quantity of university education, crime prevention, health maintenance, and forest management as they do food and clothing. The usual ways of measuring service output are unsatisfactory: by labor input cost or to use productivity differences for a standardized service (for example, a tonsillectomy) as representative of general differences (for example, in medicine) (Kravis 1984:1-57; Summers and Heston 1991:330-31)

However, because health care and basic education are labor intensive, a poor economy needs less money than a rich economy to provide the same services (Sen 1999:48)

Purchasing-Power Parity (PPP)

The next sections, on green national accounting, examine alternatives to GNP at existing exchange rates as a measure to compare economic welfare.

Earlier we pointed out that exchange rates omit nontraded goods, and that the relative prices of nontraded goods to traded goods are lower in developing that in developed countries. The international (Comparison Project (ICP) of the UN. Statistical Office and the University of Pennsylvania converts a country's GNP in its own currency into purchasing power parity (or international) dollars (PPPS) by measuring the country's purchasing power relative to all other countries rather than using the exchange rate. Penn researchers Robert Summers and Alan Heston compute the price level of GNP (P) as the ratio of the purchasing power parity (PPP) exchange rate to the actual (or market) exchange rate, where both exchange rate are measured as the domestics currency price of the U.S. dollar (GDP or gross domestic product, sometime used, is income earned within a country's boundaries instead of gross national product, income accruing to a country's residents).

The PPP exchange rare is that at which the goods and services comprising gross domestic product cost the same in both countries. If people around the world consumed a single commodity, such as rice, constructing PPP exchange rates would be simple. Analogously, the London Economist assumes only one good, the Big Mac ،calculating the Big Mac PPP, the exchange rate at which this McDonald's hamburger costs the same in all countries.

In 2003,a Big Mac price of Real 4.55 in Brazil and $2.71 in the United States meant a PPP of Real 1.68 = $1 compared to the actual exchange rate of Real 3.07 =$1, so that P was 55 percent and the Real (Brazil's currency) was undervalued by almost ٤٥percent, indicating hamburgers were cheap in Brazil. Similarly, the South Korean Big Mac price of Wan 3537 indicates a PPP of Wan 1296 = $1 compared to an exchange rate of Wan 1258 = $1, with P of 1.03 percent. In 2003, the U.S dollar was strong, with only a few currencies, such as the Swiss franc, overvalued; the Big Mac price of Sfr5.86 corresponds to a PPP of Sfr2.21,compared to the actual rate of Sfr 1.30, with P 170 so that the Swiss franc was overvalued by 70 percent (Economist ٢٠٠٣b:68; Economist 2003 e) in the real world, although the purchasing power of rupees, the Indian currency, Rs. 9.40 = $1, the exchange rate is Rs. 50.71= $1, so that India's P is 18.8 percent of that of the United States. The nominal GNP per capita for 2001, $460, divided by P, 18.8 percent, equals PPP$2,450 or real GNP per capita.

The Penn economists use a series of simultaneous equations to. solve the PPP for 81 (60 in the mid-1980s and 34 in the 1970s) benchmark and quasi-benchmark countries and world average prices for 400 to 700 commodities and services, specified in detail for quantity and quality. The averaging, which uses a specialized multiple regression, is designed to consider the fact that not every country prices every item. If a country fails to price an item (for example, the rental of an apartment in a 20-year-old multistoried building, of 120 square meters, with central heating, and one bathroom), researchers calculate the cost of making appropriate quality adjustments to a substitute items that is directly observable. Indeed, the Penn researchers describe their basic procedure as the potato is a potato rule. "A potato with given physical characteristics was treated not only as the same produce but also as the same quantity ،whether it was purchased in the country or in the city, in January or in June, by the piece or by the bushel, and whether it was purchased at a retail market or consumed out of own production (Kravis, Heston, and Sumnmers 1983:31). For 57 non benchmark countries, the countries, the economist use a shortcut estimating equation in which PPP is a function of nominal GNP per capita, steel production per capita, telephone use, motor vehicles, and other variables (Summers and Heston 1991:327-68and CD).

The World Bank-Penn estimates indicate a P of 29.0 percent for sub - Saharan Africa, 19.6 percent for South Asia, 22.3 percent for East Asia and the Pacific, ٣٨.٢percent for the Middle East and North Africa, 50.3 percent for Latin America and the Caribbean, 28.0 percent for East and Central Europe and Central Asia, and96. ٥percent for the high - income economies. The figure for sub-Saharan Africa means that its purchasing power adjusted (IS) GNP per capita, $1,620, is 3.447 (1/290) times its

GNP converted into U.S. dollars at the existing exchange rate, $470 (World Bank 200 3h:235)

How much must an average income earner in India have to earn in U.S. dollars to attain the same living standard (that is, same basket of goods) in the United States that the earner does in India? How does this dollar amount compare with the average income earned in the United States؟

P (or the price level of GNP), 18.4 percent for India, indicates that U.S. per-capita GNP is not 70 times but 13 (70 x .184) times that of India. (The percentage of GNP to GDP is from the CD from Summers and Heston 1991:327-68.) The U.S. per-capita expenditure on food is almost 11 times what it is in India, but this is only six times with adjustment in purchasing power. For staples such as bread, rice ،and cereals, U.S. per-capita consumption is twice that of India but only 1.5 times as much with the adjustment (Kravis 1984:1-57; Summers and Heston 1988-:1- ٢٥،Summers and Heston 1984:207-262, Kravis 1986:3-26, Kravis, Heston, and Summers 1978b, Kravis, Heston, and Summers, 1978a:215-242, Kravis, Heston, and Summers 1993, Summers and Heston 1991:327-368). Or, as Princeton's Angus Deaton (2003) indicates, Rs 442 would convert to $10 at the official exchange rate but to 544 at the "food exchange rate.

Yet these comparisons do not provide answers to these two questions, You need sleterine che dollar price of India's basket of goods and services (wheat cakes ،mangos, papayas, rice, sitars, brass tables, and so forth) in the United States and then compare this figure to the dollar price of U.S, average income Although We cannot indicate the ratio of the dollar price of GNP per capita in the United States to that in India, the ratio is clearly less than 28. If Indians need to replicate their goods ، and cannot substitute wheat bread for wheat cakes, oranges for mangos, potatoes for rice, violins for sitars, or wooden for brass tables, the ratio might be very low; indeed, it might cost the U.S. pet-capita income to replicate these goods in the United States. How detailed the goods are specified determines how high the ratio is and how well off India appears.

Put the shoe on the other foot. How much must an average income earner in the United States earn in rupees to secure the same living standard in India that the person acquires in the United States? The rupee price of an average U.S. basket of goods (including milkshakes, hamburgers, computers, automobiles, rock-and-roll compact disks, and so forth) would be substantially more than 28 times the average Indian basket. The U.S. consumption basket would be more costly relative to the Indian baskets the more Americans refuse, for example, to consume yogurt and vegetables instead of milkshakes and hamburgers.

Dan Usher (1968) suggests that you can compare income per capita more directly if you calculate the geometric averages of (1) the ratio of the U.S. to Indian output of per capita goods and services in relative prices in dollars, and (2} the ratio of the U.S. to Indian output of per capita goods and services in relative prices in rupees. We might expect this geometric average to correspond roughly to ICP results. Both analyses ،however, assume no substitution in consumption resulting from changes in prices.

A majority of the 138 countries with PPP adjustments are either nonbenchmark countries (and thus based on an estimating equation) or quasi-benchmark countries, with substantial missing variables for commodities or services. The problems are even more serious when you require a reliable time series. The quality of data for former socialist countries is especially suspect. T.N. Srinivasan (1994:241) contends that Summers and Heston "use problematic procedure of extrapolation from data for a few years and countries to many more. "Both nominal GNP and its PPP are subject to a margin of error.

PPP, based on calculating detailed prices for a large number of commodities, represents the product of substantial time and effort. Nevertheless GNP PPP is relatively easy to interpret, and in recent years, readily available, as Ps and PPPs are assumed relatively stable from year to year (World Bank 2003h:245).

By and large, the greater the difference in per capita income between two countries, the greater the correction for purchasing power. Worldwide income inequality is reduced considerably when the gross product in developing countries is adjusted for purchasing power.

In this book, we use PPP national-income data when they are available, because they more accurately reveal relative material well-being.

Measurement Errors for GNP or GDP adjusted for Purchasing power

What are the confidence intervals for gross product PPPs? (Whether we use GDP or GDP is not an issue, as the cross-national correlation of GDP and GNP is close to perfection (with r = 1.0) for the world, according to Firebaugh 2003:34, 100). The Penn researchers assign letter grades from "A" to "D" for the quality of GDP estimates for each country 1960 to 1989. The margin of error is: A =±9 percent (18 nations), B+ =±12 percent (7 nations), B =±15 percent, C+ =±18 percent (1 nation), C =±21 percent (34 nations), C- =±24 percent, D+ =±27 percent (11 nations), and D =±30 percent (38 nations), (Firebaugh 2003:111-112,232; Summers, Heston, Aten, and Nuxoll 1994; Summers and Heston 1991: appendix 2). For China, a special case, comprising one fifth of the world's population, the error is =±50 percent (Firebaugh 2003:111). Although there is no reliability grade for World Bank data after 1989, we can assume confidence intervals similar to earlier data.

This margin of error may shock many readers. Kravis and Lipsey (1990: abstract) contend that the margin of error for the worst GDP PPP estimates is still a small rang of error compared to that stemming from the use of exchange rates to convert own-currency to common currency measures of output. Because nations are relatively consistent in procedures used over time, then the direction of bias is likely to be consistent over time, meaning that the margin of error for growth rates is much smaller (Firebaugh 2003: 109-110, 232-232).

Derek Blades (1980:71−72) estimates that, given the errors of population growth and price weights used to aggregate output indicators, the confidence interval for the economic growth of LDCs may be as much as 2 to 3 percent. For Africa, Blades suggests an estimated growth of 0 percent in GNP per capita yearly, 1973 to 1998 (inside front cover table), together with a confidence interval of 3 percent, means an estimated growth rate that is likely to be between −3 percent and 3 percent.

Additionally, there may be problems in estimates of sectorial aggregate output that distort GNP figure. In many LDCs, production estimates for domestic food crops, often the largest sector in the economy, are based on informal estimates agricultural officers make about whether output increased or decreased. Here even small errors may be of major importance. Assume GNP in 2003 is $10,000 million. If GNP in 2004 is $10,300 million, with a 5 percent margin, much from agriculture, the range is between $9785 million (a 2.15 percent decrease in GNP) and $10,815 million (an 8.15 percent increase)

A Better Measure of Economic Development?

But even with the more precise U.N Penn figures, using income as a measure of development is a weak tool, and efforts have been made to replace GNP per capita with a more reliable measure usually an index of several economic and social variables.

THE PHYSICAL QUALITY OF LIFE INDEX (PQLI)

One alternative measure of welfare is the PQLI, which combines three indicators – infant mortality rate, life expectancy (at age one, to not overlap with infant mortality ،and adult literacy rate, the ability to read and write in any language (in percentage). The first two variables represent the effects of nutrition, public health, income, and the general environment. Life expectancy is positively correlated with GNP per capita through the impact of GNP on indicators the poor and public spending, especially on health care: indeed, GNP adds no extra explanation to those of poverty and public health expenditure (Sen 199944; Anand and Ravallion 1993), Infant mortality reflects the availability of clean water, the condition of the home environment, and the mother's health. Literacy is a measure of well-being as well as a requirement for a country's economic development (Mclaughlin et al. 1979:129-133).

Critics of this measure stress a close correlation between the three PQLI indicators and the composite index and GNP per capita, Nevertheless, figures on PQLI (between the most unfavorable performance in 1950, valued at 0, and the most favorable figure, 100, expected by the year 2000) reveal exceptions to the correlation (see inside front cover table). For instance, China's life expectancy and infant mortality rates, matching those of the United States in 1940, were achieved at a per-capita Income of $490. By contrast, a relatively high per capita does not necessarily reflect widespread well-being, as in the case of affluent oil countries such as Saudi Arabia and Oman.

However, PQLI indicators are of limited use in distinguishing levels of development beyond middle-income countries. All three PQLI variables -life expectancy, literacy, and infant mortality-are highly related to per-capita income until nutrition, health, and education reach certain high levels, then the value of the variables levels off. These indicators have asymptotic limits reflecting biological and physical maxima (Hicks and Streeten 1979:$72-$75). Thus, except for city-states Hong Kong and Singapore and affluent oil exporters Kuwait and the United Arab Emirates, all high-income countries have infant mortality rates below 10 per 1000, literacy rates of 9 percent or above (except for Portugal's and Singapore's 92 percent, Israel's 95 percent, and Greece's 97 percent), and a life expectancy of 75-80 years (except or South Korea with 7 years).

There are difficulties with PQLI not encountered with standard per-capita GNP data. Scaling and weighting a composite index, as with PQLI, present a problem, because rescaling raw data to a 0-1 range is somewhat arbitrary and there is no clear conceptual rationale for giving the core indicators equal weights. Moreover, 87 of 117 LDCs with PQLI figures have not compiled reliable data on life expectancy since 1980 and 60 LDCs lack data on adult literacy since 1980 (Srinivasan 1994b:238-243; Srinivasan 1994c:1-2). In addition, as scholars changed their estimates of the most favorable figure for components by 2000, the maxima and scaling for PQLI indicators have had to be changed, Furthermore, economists question the meaning of the PQLI growth rate, called the disparity reduction rate, not only because of the unreliable time-series data but also because most high-income countries ate pressing near the practical maximum (99 to 100 percent for adult literacy, for example) for some indicators, giving little scope for growth.

THE HUMAN DEVELOPMENT INDEX (HDI)

The UN Development Program (UNDP) defines human development as "a process of enraging people's choices. The most critical ones are to lead a long and healthy life ،to be educated and enjoy a decent standard of living" (U.N. Development Program 1990:10) .In the face of widespread assessment that the 1980s was a "lost decade" for developing countries, UNDP has argued that human development disparities between DCs and LDCs are much less than disparities in income per capita, and that human development narrowed considerably between DCs and LDCs while income gaps were widening (U.N. Development Program 1991:16-18). In its effort to measure human development, UNDP has constructed another alternative measure of welfare, the Human Developments index.

The HDI summarizes a great deal of social performance in a single composite index combining three indicators-longevity (la proxy for health and nutrition), education ،and living standards. Educational attainment is a composite of two variables: a two-thirds weight based on the adult literacy rate (in percentage) and a one-third weight on the combined primary, seconders, and tertiary gross enrollment rate (in percentage). Longevity is measured by average life expectancy (in years) at birth, computed by assuming that babies born in a given year will experience the current death rate of each age cohort (the first years second years, third year, and so forth through the nth year) throughout their lifetime. The indicator for living standards is based on the logarithm of per capita GDP in PPP dollars.

Calculating the HDI, To construct a composite index, you determine the maximum and minimum values for each of the three variables- in 2000, life expectancy, from ٢٥to 85 years, education, adult literacy from 0 to 100, gross enrollment rate from 0 to 100%, and GDP per capita (PPP USS) from $100 to $40,000. You normalize the observed value for each of the three variables into a 0-1 scale. Then you express the performance in each dimension as a value between 0 and 1 by the following

formula:

Dimension index = actual value − minimum value/maximum value − minimum value

Let us compare the indexes and their calculation for India to those of the United States for 2000 (U.N. Development Program 2002:149-152).

Calculating the life expectancy index:

Maximum life expectancy = 85

India's life expectancy index = (63.3 −25)/(85 − 25)=38.3/60= 0.64

Minimum life expectancy = 25

U.S. life expectancy index

= (77.0 −25)/(85 − 25)=52/60= 0.87

Calculating the adult literacy index

Maximum adult literacy rate =100

India's adult literacy index

=57.3/100 = 0.573

Minimum adult literacy rate =0

U.S. adult literacy index =100/100 =1.000

Calculating the combined primary, secondary, and tertiary gross enrollment rate:

Maximum combined primary, secondary, and tertiary gross enrollment rate = 100

India's combined primary, secondary, and tertiary gross enrollment rate

=55/100 = 0.55

Minimum combined primary, secondary, and tertiary gross enrollment rate = 0

U.S. combined primary, secondary, and tertiary gross enrollment rate

= 95/100 = 0.95

Calculating the education index:

India's education index 2/3 (adult literacy index) + 1/3 (gross

U.S. education index 2/3 (adult literacy index) + 1/3 (gross enrollment index) = $2/3(0.573)$ + $1/3(0.55)$ = $0.382 + 0.1833 = 0.5653$, which U.N. Development Program rounds off to 0.57

enrollment index) = $2/3(1.000) + 1/3(0.95) = 0.6667 + 0.3167/3$ = $0.0.9834$, rounded off to 0.98

Calculating the GDP index

Logarithm of the maximum GDP per Capita (PPP US$) $40,000 = 4.6021$

India's GDP index = $3.3725 - 2/4.6021 - 2 = 103725/2.6021 = 0.53$

Logarithm of the minimum GDP per Capita (PPP US$) $100 = 2.0000$

Logarithm of U.S. GDP per Capita (PPP US$) $34,142$ in $2000 = 4.53329$

Logarithm of India's GDP per capita (PPP US$) 2.358 in $2000 = 3.3725$

U.S. GDP index = $4.53329 - 2/4.6021 - 2 = 2.53329/2.6021 = 0.97$

Calculating the HDI:

Once you calculate the dimension indices – life expectancy, education, and GDP, determining HDI is straightforward:

HDI = $1/3$ (life expectancy index) $+1/3$ (education index) + $1/3$ (GDP index)

For India, HDI = 0.21 + 0.19 + 0.177 =.577

For the United States, HDI = 0.29 + 0.326 + 0.323 = 0.939

U.N development program (2002:149-152,253).

Some critics argue that development problems are essentially economic problems, a matter of stimulating economic growth. Richard Reichel (1991:57-67) finds that PPP per capita income explains a large proportion of other HDI components. The Proportion of variation explained, or R^2, is 0.783 for life expectancy and 0.535 for literacy rate. He concludes that we do not need to measure human development separately from average income. However, most development experts and international agencies reject Reichel's position, arguing that income measures still neglect many important aspect of the development process, leaving much of human development unexplained (see also Trabold-Nubler 1991:236-243).

One example of a substantial divergence between HDI and income ranking is that of South Africa, which ranked 107th in GNP per capita but only 129th among 173 countries in HDI (U.N. Development Program 2002:149-152) Despite the introduction of a universal adult ballot in South Africa in 1994, the country's social indicators still reflect the legacy of decades of a white-ruled apartheid (racially separate and discriminatory) economy. South Africa, with 0.695 HDI, is not explained well by its GDP per capita (ppp$9510), comparable to high-human-development economies Chile (0.833 HDI) and Poland (HDI 0.831). Rather South Africa's HDI, about the same as Algeria, with roughly half the PPP$ GDP per Capita, and Syria, with less than half average real GDP, may better reflect its welfare ranking.

In 1992, the purchasing power adjusted GDP per capita of black, Asian, and mixed-race South Africa was PPP$1,710, about the same as Senegal's PPP$1,680, and in excess of the PPP$1,116 for Africa as a whole. Yet this low income for 36.1 million nonwhite South Africans stands in stark contrast to that of 7.3 million white South Africans, PPP$14,920 income per capita, a figure higher than New Zealand's PPP$I3,970. Life expectancy, an indicator of health, was 62 in South Africa compared to 72 in Chile and Poland. But life expectancy was only 52 for black South Africans, 62 for Asians and mixed races, and 74 for whites, 54 for Africa generally, and 77 for DCs, whereas the adult literacy rate was 67 percent for nonwhites and 85 percent for whites (Nafziiger 1988: 18; Lecaillon, Paukert, Morrisson, and Germidis 1984-46; U.N. Development Program 1993:27, 136, U.N. Development Program 1994:14-17,98, 130-131). Racial differences in human capital and discrimination based on social interactions, networks (from racially segregate housing informal screening devices, self-reproducing educational disadvantages, and other socially based means persisted, resulting in no improvement in the relative status of majority black and mixed-race workers between 1992 and the late 1990s (Allanson, Arkins, and Hinks 2002,443-459)

HDI when disaggregated regionally can vary widely within a country. Kerala, a south Indian state with one of the lowest incomes per capita in the country but with a more favorable policy on female education and property ownership, communal medical care, and old-age pensions, surpasses the Indian average in the following categories a life expectancy at birth of 77 years compared to 63 years, an infant mortality rate of 16 compared to 67 per 1,000, an adult literacy rate of 91 percent compared to 57 percent, a female literacy rate of 94 percent compared to 54 percent, and an HDI of 0.68 compared to 0.59 (World Bank 2004h:-44-45; U.N. Development Program 2003:239; U.N. Development Program 1993/27, 136: U.N. Development Program 1994:14-17, 98, 130-131).

In 1994 in Chiapas State, the Zapatista army, representing Indian samllholders and Landless workers or campesinos, rebelled against Mexico's ruling party, which they believed was responsible for their poverty and distress. In the state, PPP$ GDP per capita was 43 percent below the national average and adult literacy 24 percent below the national average. During the first decade of the 21st century, Northeast Brazil lags behind Southern Brazil 71 to 54 years in life expectancy, 93 percent to 61 percent in adult literacy rate, and 40 percent in real GDP per capita, disparities larger than those in Mexico (World Bank 1993;238-304; U.N. Development Program 1993; 19,135-37, U.N. Development Program 1994:98-99, World Bank 2003h; Sen 1992;126-127; U.N. Development Program 2003:62-63).

HDI does not capture the adverse effect of gender disparities on social progress. In 1995, the U.N. Development Program measured the gender-related development index (GDI), or HDI adjusted for gender inequality GDI concentrates on the same variables as HDI but notes inequality in achievement between men and women, imposing a penalty for such inequality. The GDI is based on female shares of earned income, the life expectancy of women relative to men (allowing for the biological edge that women enjoy in living longer than men), and a weighted average of female literacy and schooling relative to those of males. However, (GDI does not include variables not easily measured such as women's participation in community life and decision making. their access to professional opportunities, consumption of resources within the family, dignity, and personal security. Because gender inequality exists in every country, the GDI is always lower than the HDL. The top-ranking countries in GDI are Australia, the Nordic countries of Norway, Sweden, and Finland, North America (Canada and the United States), Belgium, Iceland, Netherlands, and the United Kingdom. The bottom six places, in ascending order for GDI, include Sierre Leone, Niger, Burundi, Mozambique, Burkina Faso, and Ethiopia; Afghanistan, ranked lowest in 1995 but lacks 2000 data. In these countries, women face a double deprivation-low human development achievement and women's achievement lower than men (U.N. Development Program 1991:72-79; U.N. Development Program 2002:222-242;255-258).

Many who agree that human development needs separate attention are critical of HDL HDI has similar problems to those of PQLI-problems of scaling, and weighting a composite index, the lack of rationale for equal weights for the core indicators, and the lack at reliable data since 1980. Additionally, school enrollment figures are not internationally comparable, as school quality, dropout rates, and length of school year vary substantially among and within countries.

Before 1994, the U.N. Development Program shifted the goalposts for life expectancy, education, and real GDP per capita each year, not allowing economists to measure growth over time; thus, a country's HDI could fall with no change or even an increase in all components if maximum and minimum values rose over time. In 1994, however, the U.N. Development Program set goalposts for HDI components that are constant over time so that economists, when they acquire HDI indices retrospectively, can compute growth over time (Chamie 1994:131-146; Behrman and Rosenzweig 1994:147-171Srinivasan1994b:238-243; Srinivasan1994c:1-2; U.N. development Program 1994:90-96).

of human development is much richer and more multifarious than what we can capture in one index of indicator. Yet HDI is useful in focusing attention on qualitative aspects of development, and may influence countries with relatively low HDI scores to examine their policies regarding nutrition, health and education.

Weighted Indices for GNP Growth

Another reason why the growth rates of GNP can be a misleading indicator of development is because GNP growth is heavily weighted by the income shares of the rich. A given growth rate tor the rich has much more impact on total growth than the same growth rate for the poor. In India, a country with moderate income inequality, the upper 50 percent of income recipients receive about 70 percent ($350 billion) and the lower 50 percent about 25 percent ($150 billion) of the GNP of $500 billion. A growth of 10 percent ($35 billion) in income for the top half results in 7 percent total growth, but a 10-percent income growth for the bottom-half ($15 billon) is only 3-percent aggregate growth. Yet the 10-percent growth for the lower half does far more to reduce poverty than the same growth for the upper half.

We can illustrate the superior weight of the rich in output growth two ways: (1) as just explained, the same growth for the rich as the poor has much more effect on total growth; and (2) a given dollar increase in GNP raises the income of the poor by higher percentage than for the rich.

When GNP growth is the index of performance, it is assumed that a $35 billion additional income has the same effect on social welfare regardless of the recipients income class. But in India, you can increase GNP by $35 billion (a 7-percent overall growth on $500 billion) either through a 10-percent growth for the top 50 percent or a 23-percent increase for the bottom 50 percent.

One alternative to this measure of GNP growth is to give equal weight to a 1 percent increase in income for any member of society. In the previous example, the 10-percent income growth for the lower 50 percent, although a smaller absolute increase, would be given greater weight than the same rate for the upper 50 percent, because the former growth affects a poorer segment of the population. Another alternative is a poverty-weighted index in which a higher weight is given a 1 percent income growth for low-income groups than for high-income groups.

Table 1 shows the difference in annual growth in welfare based on three different weighting systems (1) GNP weights for each income quintile (top, second, third, fourth, and bottom 20 percent of the population): (2) equal weights for each quintiles and (3) poverty weights of 0.6 for the lowest 40 percent, 0.3 for the next 40 percent, and 0.1 for the top 20 percent. In Panama, Brazil, Mexico, and Venezuela, where income distribution worsened, performance is worse when measured by weighed indices than by GNP growth. In Colombia, EI Salvador, Sri Lanka, and Taiwan, where income distribution improved, the weighted indices are higher than GNP growth. In Korea, the Philippines, Yugoslavia, Peru, and India, where income distribution remained largely unchanged, weighted indices do not alter GNP growth greatly (Ahluwalia and Chenery 1974:38-421).

Is poverty-weighted growth superior to GNP-weighted growth in assessing development attainment? Maximizing poverty-weighted growth may generate too little saving as in Sri Lanka of the 1960s, as the rich have a higher propensity to save than the poor.

Although the different weighting systems reflect different value premises economists usually choose GNP weights because of convenience and easy interpretation. Given present data, it is easier to discuss poverty reduction by using both GNP per capita and income distribution data than to calculate poverty-weighted growth.

Table 1. Income Equality and Growth							
		1. Income growth			II. Annual income in welfare		
country	period	Upper 20 percent	Middle 40 percent	Lowest 40 percent	(A) GNP weights	(B) Equal weights	(C) poverty weights
Korea	1964-70	10.6	7.8	9.3	9.3	9.0	9.0
panama	1960-69	8.8	9.2	3.2	8.2	6.7	5.6
Brazil	1960-70	8.4	4.8	5.2	6.9	5.7	5.4
Mexico	1963-69	8.0	7.0	6.6	7.6	7.0	6.9
Taiwan	1953-61	4.5	9.1	12.1	6.8	9.4	10.4
Venezuela	1962-70	7.9	4.1	3.7	6.4	4.7	4.2
Colombia	1964-70	5. 6	7.3	7.0	6.2	6.8	7.0
El Salvador	1961-69	4.1	10.5	5.3	6.2	7.1	6.7
Philippine	1961-71	4.9	6.4	5.0	5.4	5.5	5.4
Peru	1961-71	4.7	7.5	3.2	5.4	5.2	4.6
Sri lanka	1963-70	3.1	6.2	8.3	5.0	6.4	7.2
Yugoslavia	1963-68	4.9	5.0	4.3	4.8	4.7	4.6
India	1954-64	5.1	3.9	3.9	4.5	4.1	4.0

Note: Equal weights imply a weight of 0.2 for the upper 20 percent, 0.4 for the middle 40 percent, and 0.4 for the lowest 40 percent, whereas poverty weights are calculated giving weights of 0.1,0.3 and 0.6, respectively

Source:
Ahluwalia and Chenery 1974:42.i.

"Basic-Needs" Attainment

Many economists are frustrated at the limited impact economic growth has had in reducing third-world poverty. These economists think that programs to raise productivity in developing countries are not adequate unless they focus directly on meeting the basic needs of the poorest 40-50 percent of the population the basic-needs approach. This direct attack is needed, it is argued, because of the continuing serious maldistribution of incomes; because consumers, lacking knowledge about health and nutrition, often make inefficient or unwise choices in this area; because public services must meet many basic needs, such as sanitation and water supplies, and because it is difficult to find investments and policies that uniformly increase the incomes of the poor

MEASUIRES

The basic needs approach shifts attention from maximizing output to minimizing Poverty. The stress is not only on how much is being produced bur also on what is being produced, in what ways, for whom, and with what impact.

Basic needs include adequate nutrition, primary education, health, sanitation water supply, and housing. What are possible indicators of these basic needs? Two economic consultants with the World Bank identify the following as a preliminary set of indicators (Hicks and Streeten 1979:567-580).

Food Calorie supply per head, or calorie supply as a percentage of requirements; protein

Education: Literacy rates, primary enrollment (as a percentage of the population aged 5-14)
Health: Lite expectancy at birth
Sanitation Infant mortality (per thousand births), percentage of the population with access to sanitation facilities
Water supply: infant mortality (per thousand births), percentage of the population with access to potable water.
Housing: None (as existing measures, such as people per room, do not satisfactorily indicate the quality of housing)
Each of these indicators (such as calorie supply) should be supplemented by data on distribution by income class.

Infant mortality is a good indication of the availability of sanitation and clean water facilities, as infants are susceptible to waterborne diseases. Furthermore, data of infant are mortality are generally more readily available than data on access to water.

GROWTH AND BASIC NEEDS

High basic-needs attainment is positively related to the rate of growth of per capita GNP, as increased life expectancy and literacy, together with reduced infant mortality, are associated with greater worker health and productivity. Furthermore, rapid output growth usually reduces poverty (Hicks 1979; 985-994). Thus, GNP per head remains an important figure. But we also must look at some indicators of the composition and beneficiaries of GNP. Basic-needs data supplement GNP data but do not replace them. And, as the earlier South African example indicates, we must go beyond national averages to get basic-needs measures by income class, ethnic group, region, and other subgroups.

Chapter Three

The Lewis theory of development

Chapter 3

The Lewis theory of development

The main of goal to studying this chapter to understand the following topics

1- The Lewis theory of development

2- Fei-ran is theory

3- The Marxian theory

- **Materialistic interpretation of history**
- **Surplus value**
- **Capital accumulation**

Chapter Three

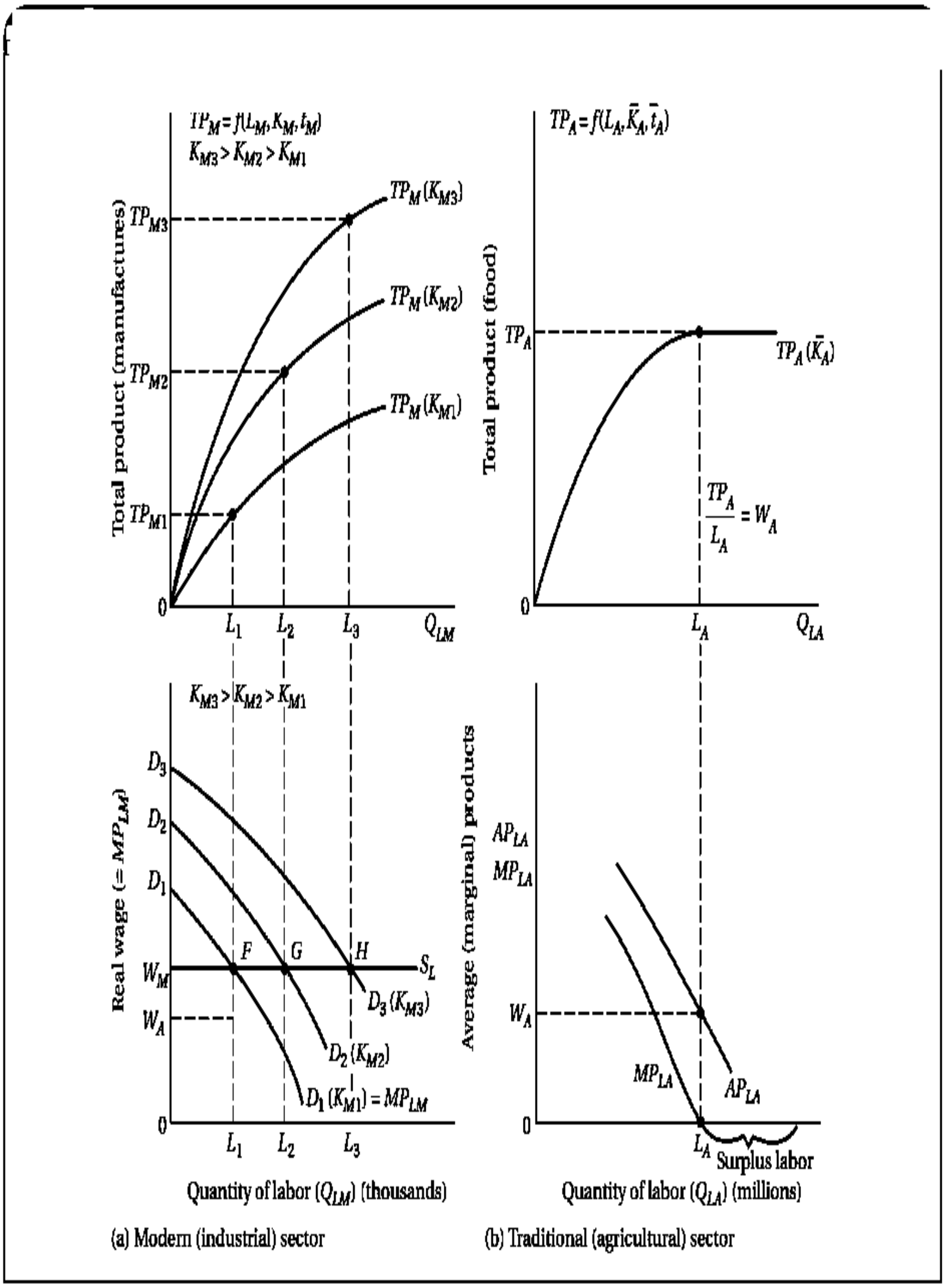
The Lewis theory of development

Basic model one of the best- known early theoretical models of development that focused on the structural transformation of a primarily subsistence economy was that formulated by Nobel Laureate W. Arthur Lewis in the mid-1950s and later modified, formalized and extended by John Fei and Gustav RLDCs Rains. The Lewis two sector model became the general theory of the development process in surplus labor third world nations during most of the 1960s and early 1970s. It still has many adherents today.

In the Lewis model, the underdeveloped economy consists of two sectors: a traditional, overpopulated rural subsistence sector characterized by zero marginal labor productivity - a situation that permits Lewis to classify this as surplus labor in the sense that it can be withdrawn from the agricultural sector without any loss of output- and a high productivity modern urban industrial sector into which labor from the subsistence sector is gradually transferred. The primary focus of the model is on both the process of labor transfer and the growth of output and employment in the modern sector (the modern sector could include modern agriculture, but we will call the sector industrial as a shorthand). Both labor transfer and modern sector employment growth are brought about by out- both labor transfer and modern- sector employment growth are brought about by output expansion in that sector. The speed with which this expansion occurs is determined by the rate of industrial investment and capital accumulation in the modern sector. Such investment is made possible by the excess of modern sector profits over wages on the assumption that capitalists reinvest all their profits. Finally the level of wages in the urban industrial sector is assumed to be constant and determined as a given premium over a fixed average subsistence level of wages in the traditional agricultural sector. (Lewis assumed that urban wages would have to be at least 30% higher than average rural income to induce workers to migrate from their home areas). At the constant urban wage, the supply curve of rural to the modern sector is considered to be perfectly elastic.

We can illustrate the Lewis model of modern sector growth in a two sector economy by using Figure1, consider first the traditional agricultural sector portrayed in the two right side diagrams of Figure 3.AB. The upper diagram shows how subsistence food production varies with increases in labor inputs. It is typical agricultural production function where the total output or product (TP_A) of food is determined by changes in the amount of the only variable input, labor (L_A), given a fixed quantity of capital, KA , and unchanging traditional technology, ta. In the lower right diagram, we have the average and marginal product of labor curves AP_{LA} and MP_{LA} which are derived from the total product curve shown immediately above. The quantity of agricultural labor (Q_{LA}) available is the same on both horizontal axes and is expressed in millions of workers, as Lewis is describing an underdeveloped economy where 80% to 90% of the population lives and works in rural areas.

Figure.1 The Lewis Model of Modern. Sector Growth in a Two-Sector Surplus Labor Economy



Lewis makes two assumptions about the traditional sector. First there is surplus labor in the sense that MP_{LA} is zero, and Second, all rural workers share equally in the output so that the rural wage is determined by the average and not the marginal product of labor (as will be the case in the modern sector). Assume that there L_A agricultural workers producing TP_A food, which is shared equally as W_A food per person (this is the average product which is equal to TP_A/L_A) the marginal product of these L_A worker is zero, as shown in the bottom diagram of Figure 3,1b; hence the surplus- labor assumption applied to all workers in excess of L_A (note the horizontal TP_A curve beyond L_A workers in the upper right diagram). The upper-left diagram of Figure 1 a portrays the total product (production function) curves for the modern industrial sector. Once again, output of, say manufactured goods (TP_M) is a function of a variable labor input, L_M. For a given capital stock K_M and technology t_M. On the horizontal axes, the quantity of labor employed to produce an output of, say, TP_{M1}, with capital stock KM1, is expressed in thousands of urban workers, L_1. In the Lewis model, the modern- sector capital stock is allowed to increase from K_{M2} to KM3 as a result of the reinvestment of profits by capitalist industrialists. This will cause the total product curves in figure 3.1a to shift upward from TP_M (K_{M1}) to TP_M (K_{M2}) to TP_M (K_{M3}). the process that will generate these capitalist profits for reinvestment and growth is illustrated in the lower-left diagram of figure 1a. here we have modern sector marginal labor product curves derived from the TP_M curves of the upper diagram. Under the assumption of perfectly competitive labor markets in the modern sector, these marginal product of labor curves are in fact the actual demand curves for labor. Here is how the system works.

W_A in the lower diagrams of figures. 1a and 1b represents the average level of real subsistence income in the traditional rural sector. W_M in figure. 1a is therefore the real wage in the modern capitalist sector. At this wage, the supply of rural labor is assumed to be unlimited or perfectly elastic, as shown by the horizontal labor supply curve $W_M S_L$. In other words, Lewis assumes that at urban wage W_M above rural average income W_A, modern sector employers can hire as many surplus rural workers as they want without fear of rising wages. (Note again that the quantity of labor in the rural sector, figure1 b, is expressed in millions whereas in the modern urban sector, figure. 1a units of labor are expressed in thousands) given a fixed supply of capital K_{M1} in the initial stage of modern- sector growth, the demand curve for labor is determined by labor's declining marginal product and is shown by the negatively sloped curve D_1 (K_{M1}) in the lower- left diagram. Because profit maximizing modern- sector employers are assumed to hire laborers to the point where their marginal physical product is equal to the real wage (I.e., the point F of intersection between the labor demand and supply curves) total modern- sector employment will be equal to L_1. Total modern sector output, TP_{M1}, would be given by the area bottomed by point OD_1FL_1. The share of this total output paid to workers in the form of wages would be equal, therefore, to the area of the rectangle OW_MFL_1. The balance of the output shown by the area W_MD_1F would be the total profits that accrue to the capitalists. Because

Lewis assumes that all of these profits are reinvested, the total capital stock in the modern sector will rise from KM1 to K_{M2} . This larger capital stock causes the total product cut of the modern sector to rise to TPM (K_{M2}), which in turn induces a rise in the marginal product demand curve for labor. This outward shift in the labor demand curve is shown by line D2 (K_{M2}) in the bottom half of Figure 3.1a

A new equilibrium modern sector employment level will be established at point G with L_2 workers now employed. Total output rises to TP_{M2} or OD_2GL_2 while total wage and profits increase to OW_MGL_2 and W_MD_2G, respectively. Once again, these larger (W_MD_2G) profits are reinvested increasing the total capital stock to K_{M3}, shifting the total product and labor demand curves to TP_M (K_{M3}) and to D3 (K_{M3}), respectively, and raising the level of modern sector employment to L_3.

The process of modern sector self-sustaining growth and employment expansion is assumed to continue until all surplus rural labor is absorbed in the new industrial sector. Thereafter, additional workers can be withdrawn from the agricultural sector only at a higher cost of lost food production because the declining labor-to-land ratio means that the marginal product of rural labor is no longer zero. Thus the labor supply curve becomes positively sloped as modern- sector wages and employment continue to grow. The structural transformation of the economy will have taken place, with the balance of economic activity shifting from traditional rural agriculture to modern urban industry.

A Critical Appraisal

The Lewis theory is applicable to overpopulated underdeveloped countries under certain set conditions. Its applicability is, therefore, circumscribed by its assumptions which are the bases of criticisms discussed below:

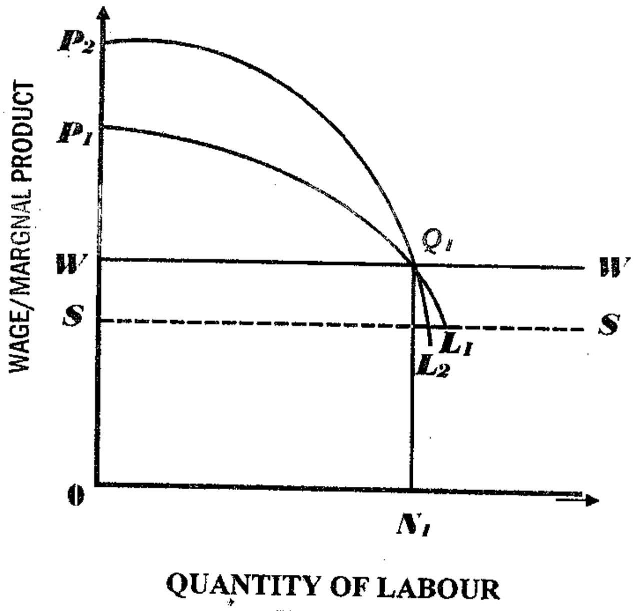


FIG. 16.2

1- Wage Rate not Constant in the Capitalist Sector.

The theory assumes a constant wage rate in the capitalist sector until the supply of labour is exhausted from the subsistence sector. This is unrealistic because the wage rate continues to rise over time in the industrial sector of an underdeveloped economy even when there is open unemployment in its rural sector.

2- Not Applicable if Capital Accumulation is labour saving. Lewis assumes that the capitalist surplus is reinvested in productive capital. But according to Reynolds,[13] if the productive capital happens to be labour saving, it would not absorb labour and the theory breaks down. this is shown in Fig.2 where the curve P_2L_2 has a greater negative slope than the curve P_1L_1, thereby showing labour-saving technique. With the shifting of the marginal productivity curve upwards from P_1L_1 to P_2L_2, the total output has risen substantially from $OP_1Q_1N_1$ to $OP_2Q_1N_1$. But the total wage bill OWQ_1N_1 and the labour employed ON_1 remain unchanged.

3- Skilled labour not a Temporary Bottleneck. Given an unlimited supply of labour, Lewis assumes the existence of unskilled labour for his theory. Skilled labour is regarded as a temporary bottleneck which can be removed by providing training facilities to unskilled labour. No doubt skilled labour is in Short supply in underdeveloped countries but skill-formation poses a serious problem as it takes a very long time to educate and train the multitude in such countries.

4- Lack of enterprise and initiative. The Lewis theory is based on the assumption that a capitalist class exists in underdeveloped countries. In fact, the entire process of growth depends on the existence of such a class which has the necessary skill to accumulate capital. In reality, such countries lack capitalists with necessary enterprise and initiative.

[13] - Lioyd G Reynolds, wages and Employment in a labour surplus Economy, A. F. R. September 1956.

5- Multiplier process does not operate in LDC. Again, the theory assumes that capital accumulation takes place when the capitalist class continues to reinvest profits. It, therefore, presupposes the operation of the investment multiplier which is not applicable to underdeveloped countries.[14] For if profits are reduced somehow or the prices of wage goods rise, the process of capital formation will stop before all the surplus labour is absorbed.

6- One sided theory. This is a one sided theory because Lewis does not consider the possibility of progress in the agricultural sector. As the industrial sector develops with the transfer of surplus labour, the demand for food and raw materials will rise which will, in turn, lead to growth of the agricultural sector.

7- Neglects total demand. Lewis does not study the problem of aggregate demand .he assumes that whatever is produced in the capitalist sector is either consumed by itself or is exported .He does not even analyse the possibility of the capitalist sector selling its products to the subsistence sector. In case , it so happens, the growth process may come to a half much earlier through unfavourable terms of trade or the subsistence sector adopting new techniques of production to meet the expanding raw material demand of the capitalist sector.

8- Mobility of Labour not so Easy. Higher capitalist wage will not lead to the movement of surplus labour from the subsistence sector to the capitalist sector. People are so intensely attached to their family and

[14] - See chapter on Keynesian theory of development.

land that they do not like to leave their kith and kin. Moreover, differences in language and custom, the problems of congestion housing and high cost of living in the capitalist sector stand in the way of mobility of labour to this sector. This is the main weakness of the theory.

9- Marginal productivity of labour not zero. Schultz does not agree that the marginal productivity of labour in overpopulated underdeveloped countries is zero or negligible. If it were so, the subsistence wage would also be zero. the fact is that every worker receives the subsistence wage, may be in kind, if not in cash. It is, therefore, difficult to find out the exact number of surplus labourers who are to move to the capitalist sector, their number hardly exceeding 5 per cent, as is now generally accepted.

10- Productivity falls with Migration of labour from the subsistence sector. Lewis assumes that when the surplus labour is withdrawn from the subsistence sector to the capitalist sector, the agricultural production remains unaffected in the subsistence sector. But the fact is that withdrawal of workers from the farms will reduce output. As pointed out by Schultz. "there is no evidence for any poor country anywhere that would suggest that a transfer of even some fraction, say, 5 per cent: of the existing labour-force out of agriculture, with other things equal, could be made without reducing its production.

11- Low income groups also save. It is not correct to say that only 10 per cent of the people with the largest income save. In fact, people, with low incomes also save due to social reasons and even small farmers save for capital accumulation in underdeveloped countries, whereas high income groups save less because they spend more under the influence of the demonstration effect.

12- Inflation not self a destructive. Lewis view that inflation for the purpose of capital formation is self a destructive is difficult to believe in the face of acute shortage of consumer goods. Production of consumer goods fails to increase rapidly due to structural rigidities. On the other hand, the marginal propensity to consume of the people is near unity, so that all increases in income lead to inflationary rise in prices.

Inefficient Tax administration, Lewis's contention that taxation will mop up increasing income cannot be accepted because the tax administration in underdeveloped countries is not so efficient and developed as to collect taxes sufficient enough for capital accumulation

Conclusion, despite these limitations, the Lewis theory has the merit of explaining in a very clear cut way the process of development. This two sector theory has great analytical value. It explains how low capital formation takes place in underdeveloped countries which have plethora of labour and scarcity of capital. His study of the problems of credit inflation; population growth technological progress, and international trade gives the theory a touch of realism.

FEI-RANIS THEORY

Introduction

John Fei and Gustav Ranis in an article entitled " A Theory of economic development " analyse " the transition process through which an underdeveloped economy hopes to move from a condition of stagnation to one of self-sustained growth. Their theory is an improvement over Lewis's theory of unlimited supplies of labour because Lewis failed to present a satisfactory analysis of the growth of the agricultural sector.

The analysis that follows is based on the original article and the subsequent modifications[15] made by the authors in their theory of the development of a dual economy.

The theory

The theory relates to an underdeveloped labour-surplus and resource- poor economy in which the vast majority of the population is engaged in agriculture amidst widespread unemployment and high rates of population growth. The agrarian economy is stagnant. People are engaged in traditional agricultural pursuits. Non- agricultural pursuits exist but they are characterised by a modest use of capital. There is also an active and dynamic industrial sector. Development consists of

[15] - John C.H. Fei and Gustav Ranks, A theory of economic development, AER, vol. 51, September 1961; development of labour Surplus Economy, 1964; and Agrarianism, Dualism and Economic development, in the theory and Design of Economic development (eds) I . Adelman and F. Thorbecke, 1966.

the reallocation of surplus agricultural workers, whose contributions to output is zero or negligible, to the industrial sector where they become productive at a wage equal to the institutional wage in agriculture.[16]

Assumptions

In presenting their theory of economic development Fei and Ranks make the following assumptions:

1- There is a dual economy divided into a traditional and stagnant agricultural sector and an active industrial sector.

2- The output of the agricultural sector is a function of land and labour alone

3- There is no accumulation of capital in agriculture except in the form of land reclamation.

4. Land is fixed in supply.

5. Agricultural activity is characterised by constant returns to scale with labour as a variable factor.

6- It is assumed that the marginal productivity of labour becomes zero at some point. If population exceeds the quantity at which the marginal productivity of labour becomes zero, labour can be transferred to the industrial sector without loss in agricultural output.

[16] - Before starting this model, students should first read the Lewis Model in the previous chapter.

7- The output of the industrial sector is a function of capital and labour alone. Land has no role as a factor of production.

8- Population growth is taken as an exogenous phenomenon.

9- The real wage in the industrial sector remains fixed and is equal to the initial level of real income in the agricultural sector. they call it the institutional wage.

10- Workers in either sector consume only agricultural products.

Given these assumptions, Fei and Ranks analyse the development of a labour-surplus economy into three phases. In the first phase, the disguised unemployed workers, who are not adding to agricultural output, are transferred to the industrial sector at the constant institutional wage. In the second phase, agricultural workers add to agricultural output but produce less than the institutional wage they get. Such workers are also shifted to the industrial sector. If migration of workers to the industrial sector continues, a point is eventually reached when farm workers produce output equal to the institutional wage. This begins the third phase which marks the end of the take-off and the beginning of the self-sustained growth when farm workers produce more than the institutional wage they get. In this phase, the surplus labour is exhausted and the agricultural sector becomes commercialised.

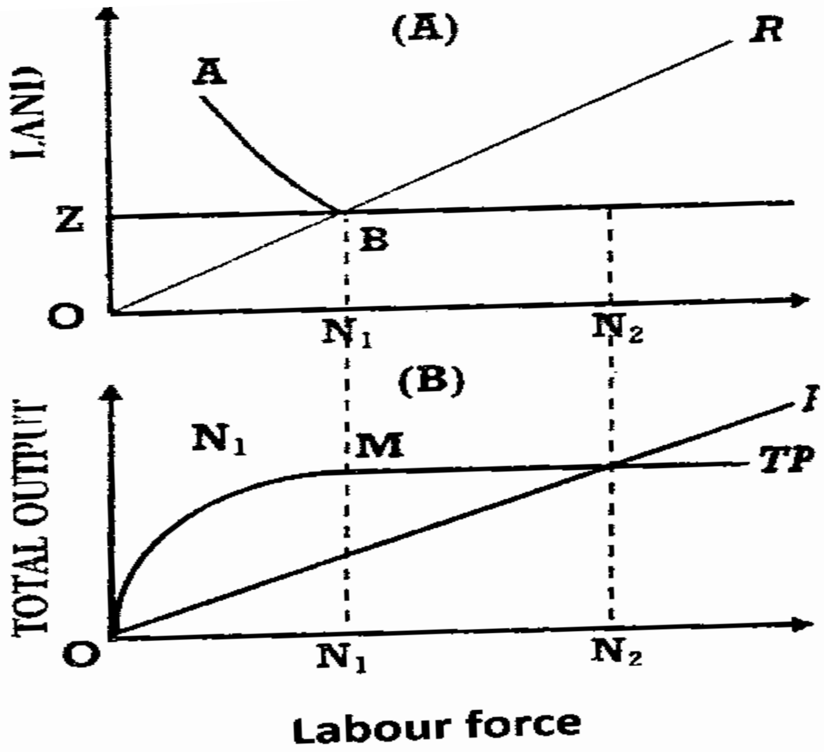


Figure. 1 (A&B)

Figure 1, (A) shows the functioning of the agricultural sector where agricultural goods are produced by the application of labour (L) and land (Z) labour is measured on the horizontal axis and land on the vertical axis. The ray OR shows the stage of production. The curve ABC is the production contour of agricultural goods. Assuming land to be fixed at OZ, labour ON_1 produces the maximum output. The total productivity of labour is represented by the TP curve in figure. 1(B). If more labour is employed beyond N1 with land OZ, productivity of labour becomes constant beyond point M on the TP curve. Assuming that ON_2 is the total Labour force engaged in agriculture, ON_1 is the non – redundant labour and N_1N_2 is the redundant labour force N_1N_2 number of workers do not make any positive contribution to output and their marginal physical productivity approaches zero beyond point M on the TP curve. Such workers are disguised unemployed

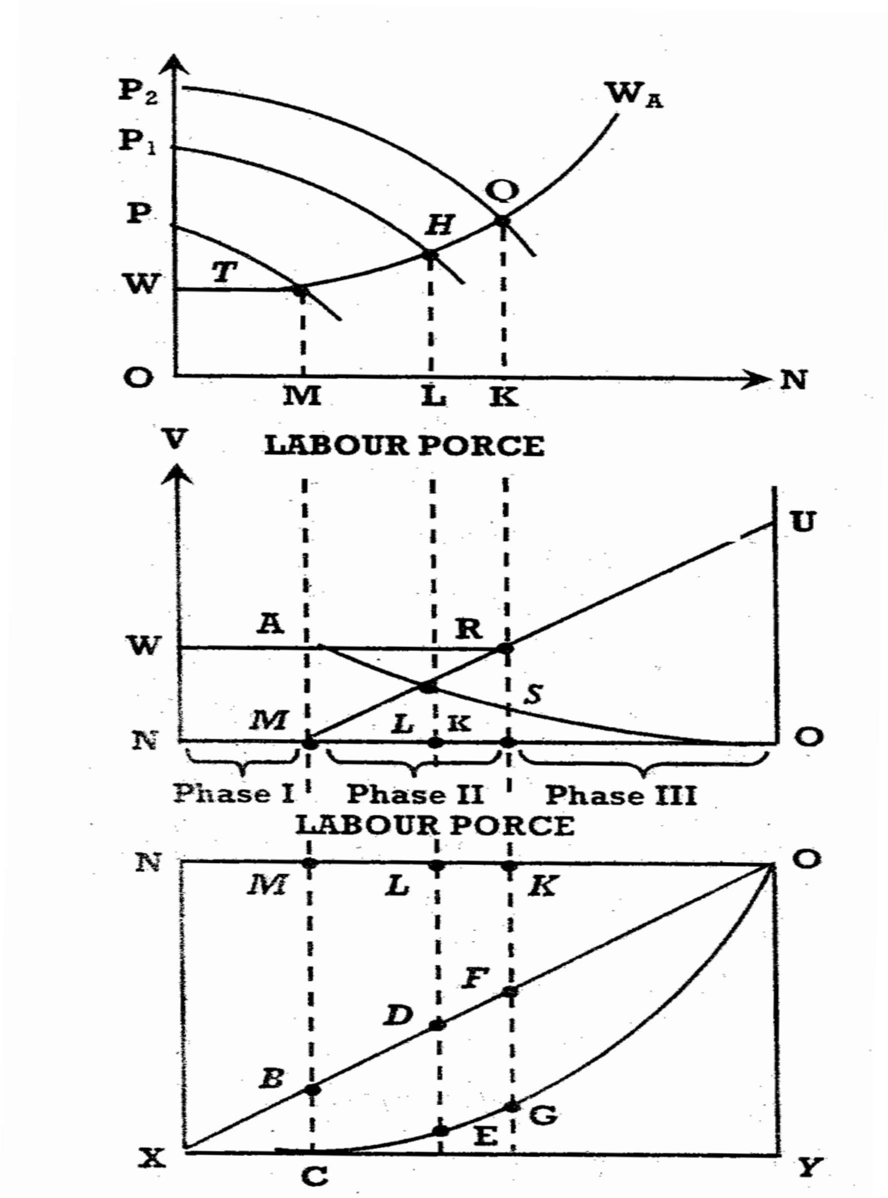


FIG. 2 (A,B&C)

Economic development takes place when these workers are shifted from the agricultural sector to the industrial sector in three phases. This is illustrated in Figure 2. (A), (B) and (C) where panel (A) (C) depicts the industrial sector and panels (B) and (Q,) the agricultural sector. Let us take panel (Q) where the labour force in the agricultural sector is measured from right to left on the downward output agricultural on and axis horizontal from O on the vertical axis OY. The OCX is the total physical productivity curve (TPP)[17] of the agricultural sector. The horizontal portion CX of the curve shows that the total productivity is constant in this region so that the marginal productivity of MN labour is zero. Thus MN labour is surplus and its withdrawal to the industrial sector will not affect agricultural output. If however, it is presumed that the entire labour force ON is engaged in the agricultural sector, it produces NX total agricultural output. Assuming that the entire output NX is consumed by the total labour force ON, the real wage is equal to NX/ON or the slope of the ray OX. This is the institutional wage.

The allocation process in three phases during the takeoff is depicted in panel (B) of the Figure.2 where the total labour force is measured from right to left on the horizontal axis ON and the average output on the vertical axis NV. The curve NMRU represents the marginal physical productivity of labour (MPP) in the agricultural sector. NW is the institutional wage at which the workers are employed in this sector.

In phase I, NM workers are disguised unemployed; their marginal physical productivity is zero, as shown by NM portion of the MPP curve in panel (B) or CX portion of the TPP curve of panel (C). This redundant labour force NM transferred to the industrial sector shown as OM in panel (A) at the same institutional wage OW (= NW).

[17] - It is the inverted OTP curve of figure 17.1 (B).

In phase II, the MPP of agricultural workers MK is positive in the range MR on the MPP curve NMRU but is less than the institutional portion (= NW) they get, as shown in panel (B). So they are also disguised unemployed to some extent and are shifted to the industrial sector. But the nominal wage in the industrial sector will not equal the institutional wage in this phase. This is because agricultural output declines with the transfer of labour to the industrial sector. As a result, there is a shortage of agricultural commodities leading to rise in their prices relative to industrial goods. This leads to the worsening of the terms for the industrial sector, thereby requiring a rise in the nominal wage in the industrial sector. The nominal wage rises above the institutional wage OW to LH and KQ. This is shown by the upward movement of the supply curve of labour from WT to H and Q, as ML and LK labour gradually shifts to the industrial sector in panel (A). The movement on the supply curve of labour WTW_1 from T upward is " the Lewis turning point."

When phase III begins agricultural workers start producing agricultural output equal to the institutional wage and ultimately more than the institutional wage they get. This marks the end of the takeoff and the beginning of the self-sustained growth. This is shown by the rising portion RU of the MPP curve in panel (B) which is higher than the institutional wage KR (= NW). Consequently, KO of labour will be shifted from the agricultural sector to the industrial sector at a rising nominal wage above KQ in panel (A) of the figure. This leads to the exhaustion of the surplus labour in the agricultural sector which becomes fully commercialised. according to Fei and Ranks, the exhaustion of the labour surplus must be interpreted primarily as a market phenomenon rather than as a physical shortage of manpower, it is indicated by an increase in the real wage at the source of supply.

Fei and Ranks point out that as agricultural workers are shifted to the industrial sector, there begins a surplus of agricultural commodities. This leads to the total agricultural surplus (or TAS) in the agricultural sector. The excess portion of total agricultural output over the consumption requirement of the agricultural labour force at the institutional wage is the TAS. The amount of TAS is a function of the number of workers shifted to the industrial sector in each phase of the development process. The TAS is measured in panel (C) of the figure by the vertical distance between the line OX and the TPP curve OCX. In phase I when NM Labour is transferred, the TAS is BC. In phase II as ML and LK workers are shifted to the industrial sector, DE and FG amounts of TAS arise. TAS may be viewed as agricultural resources released to the market through the re allocation of agricultural workers. Such resources can be shibhoned off by means of the investment activities of the landlord class and / or government tax policy and can be utilised in support of the new industrial arrivals."

There is also the average agricultural surplus (or AAS).The AAS is the total agricultural surplus available per head to workers allocated to the industrial sector it is as if each allocated workers, carries his own subsistence bundle along with him. The AAS curve is depicted as WASO curve in panel (B) of the figure. In phase I, the AAS curve coincides with the institutional wage curve WA. In phase II, when MK workers are transferred to the industrial sector, the AAS begins to fall from A to S in panel (B) while TAS is still rising from BC to DE to FG in panel (C).

In phase III, AAS decline more rapidly from S to O in panel (B) and TAS also declines as shown by the narrowing of the area from FG toward O in panel (C) below phase III of panel (B).the decline in both AAS and TAS is due to the rise in the MPP of agricultural workers by more than the institutional wage which ultimately leads to the transfer of the remaining surplus labour to the industrial sector.

Fei and Ranis call the boundary between phases I and II as the "shortage point" when shortages of agricultural goods begin as indicated by the fall of the AAS (the portion AS of WASO curve) below the minimum institutional wage (NW). Anthe boundary between phase II and III as the commercialisation point which signifies the beginning of equality between MPP and the institutional wage in agriculture. Thus the Lewis turning point coincides with the shortage point of Fei and Ranks, and the increase in industrial wage is speeder up at the commercialisation point.

They show that if agricultural productivity is increasing, the shortage point and the commercialisation point coincide. This is because with the increase in agricultural productivity the rise in MPP enables the output to rise to the level of the institutional wage more quickly. It may be viewed as the shifting of MRU curve Upward to the left in Figure. 2 (B). On the other hand, the AAS increases with the increase in total

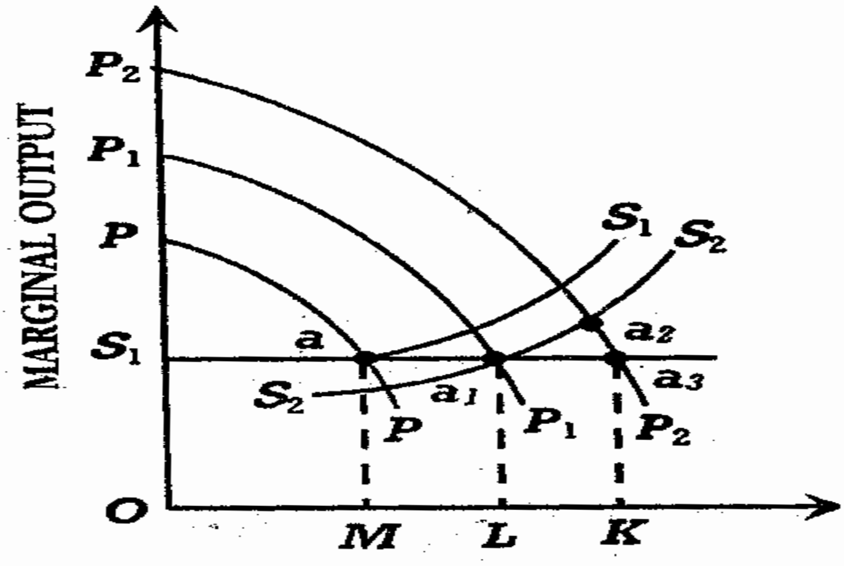


FIG. 3

physical productivity. This means that the ASO curve in Figure. 2 (B) shifts upward to the right. If the rise in productivity is sufficient, the MRU and ASO curve in Figure2 (B) will so shift upward that the shortage point A and commercialisation point R coincide and phase11 is eliminated. So far as the industrial sector is concerned, the increase in agricultural productivity productivity has the effect of raising industrial supply curve after the turning point the I point be viewed as the shifting of the WTW1 curve downward to the right below point T in Figure 2 (A). According to Fei and Ranks, significance of the equality between our turning point and the commercialisation point is that, after the turning point, the industrial supply curve of labour finally rises as we enter a world in which the agricultural sector is no longer dominated by non-market institutional force but assumes the characteristics of a commercialised capitalist system. In other words, the economic significance of the elimination of the second phase is that it enables the economy to move smoothly into self-sustained growth. Balanced Growth Fei and Ranks have further shown that their model satisfies the conditions of balanced growth during the take- off process. Balanced growth requires simultaneous investment in both the agricultural and industrial sector of the economy. This is illustrated in Figure 3. Where PP is the initial demand curve for labour and S_1S_1 the initial supply curve of labour. They intersect at a where OM labour force is employed in the industrial sector. At this level of employment, the industrial sector is getting a profit equal to the area S_1Pa. This profit is the total investment fund available to the economy during the take-off process. A part of this fund is allocated to the agricultural sector thereby raising agricultural productivity and shifting the supply curve of labour in the industrial sector downward to the right from S_1 S_1 to S_2 S_2. The remaining part of the investment fund is allocated to the industrial sector, thereby shifting the industrial demand curve upward to the right from PP to P1P1 .the S_2S_2 and P1P1 curves intersect at laying on the balanced growth path S_1 a3. At a1 the industrial sector absorbs ML labour force which has been released by the agricultural sector as a result of rise in agricultural productivity following the allocation of investment fund to it. In Fig.3 ML labour force absorbed in the industrial sector exactly equals the labour force ML released from the agricultural sector in Figure. 2 (B).

Thus as investment funds are continued to be allocated to both sectors through time, the economy will move on the balanced growth path. But there is every likelihood for the actual growth path to deviate from the balanced growth path from time to time. Such a deviation, however, will call into play countervailing equilibrating forces which tend to bring it back to the balanced growth path. The actual path is, in fact, likely to be oscillating around the balanced growth path " For example, if as a result of over investment in the industrial sector, the demand curve for labour shifts to P_2P_2 and intersects the supply curve of labour S_2S_2 at a_2 the actual growth path will be above the balanced growth path. This will lead to a shortage of agricultural goods, to a deterioration of the terms of trade of the industrial sector and to a rise in the wage rate in this sector. This will discourage investment in the industrial sector and encourage investment in the agricultural sector and thereby bring the actual path to the level of the balanced growth path a_3.

A Critical Appraisal

The Fei- Ranks model is an improvement over the Lewis model. The Lewis model ignores the development of the agricultural sector and concentrates exclusively on the industrial sector. The Fei-Ranis model shows the interaction between the two sectors in initiating and accelerating development. Moreover, its explanation of the Lewis turning point is more realistic. But the major merit of the theory is that it shows the importance of agricultural products in capital accumulation in underdeveloped countries.

Despite these merits, the model is not free from criticisms which are discussed below.

1- Supply of land not fixed. Fei and Ranks begin with the assumption that the supply of land is fixed during the development process. In the long run, the amount of land is not fixed, as the statistics of crop acreage in many Asian countries reveal. For instance, the index number of area under crops (base 1961-62) in India rose from 82 in 1950-51 ta- 107.3 in 1970- 71.

2- Institutional wage not above the MPP. institutional based on the assumption of a constant institutional wage which is above the MPP during phases 1 and 11 of the development process. There is no empirical evidence to support this assumption. In fact, in labour surplus underdeveloped countries, wages paid to the agricultural workers are much below their MPP.

3. Institutional wage not constant in the Agricultural sector. The theory assumes that the institutional wage remains constant in the first two phases even when agricultural productivity increases. This is highly unrealistic because with a general rise in agricultural productivity farm wages also tend to rise. For instance, the daily real wage rates (at 1966 prices) of agricultural workers for various farm operations in Punjab during the period of the green revolution (1967-72) increased by 41.7 per cent to 55.2 per cent.[18]

---

[18] - M.L. jhingan. Surpluses Pertaining since the Green Revolution and contribution to Industrialisation-- A study of Punjab, IJAE. Conference Number, July- September, 1979.

4- Closed model. According Fei and Ranks, the terms of trade move against the industrial sector in the second phase when agricultural output declines and prices of agricultural commodities rise. This analysis is based on the assumption of a closed economy where foreign trade does not exist. But this assumption is unrealistic because underdeveloped countries are not close but open economies which import agricultural commodities when shortages arise.

5. Commercialisation of agriculture Leads to inflation. According to the theory. When the agricultural sector enters the industrial bird phase, it becomes commercialised. But the economy is not likely to move smoothly into self-sustained growth inflationary pressures will start. When many workers shift to the industrial sector, the agricultural sector will experience shortage of labour. In the meantime, the institutional wage also equals the MPP of workers and the shortages of agricultural products arise. All these factors will tend to create inflationary pressures within the economy.

6. MPP not Zero. Fei and Ranis observe that " with a fixed amount of land, there will be some size of population which is large " enough to render MPP zero." But Schultz does not agree that in labour-surplus economies the MPP is zero. According to him if it were so the institutional Wage would also be zero. The fact is that every worker receives a minimum wage, may be in kind, if not in cash thus it is wrong to say that the MPP is zero in the agricultural sector.

Conclusion, however these limitations do not undermine the importance of the Fei–Ranis model for the economic development of labour surplus countries. It systematically analyses the development process from the takeoff to self–sustained growth, through the interaction of the agricultural and industrial sectors of an underdeveloped economy.

The Marxian theory

Introduction

Karl Marx, the celebrated , author of Das Kapital, is one of the few, celebrities in history who cast a spell on hundreds of millions of people by their doctrines, He has been epitomized as Marx the prophet and is ranked with Christ and Mohammad if we are to judge him by the number of his followers. As Schumpeter wrote, Marxism is a religion. To the orthodox Marxist, as any believer in a Faith, the opponent is not merely in error but in sin[19] Marx predicted the inevitable doom of capitalism and if was on this prediction that Communism has built its edifice. The Marxian analysis is the gravest and the most penetrating examination of the process of capitalist development. It had the greatest influence in shaping policies in the Soviet Union, China and other communist countries. Our purpose here is to examine the Marxian process of economic development and not the Marxist system as whole.

The Marxian theory

Marx contributed to the theory of economic development in three respects namely, in broad respect of providing an economic interpretation of history in the narrower, respect of specifying the motivating forces of capitalist development, and in the final respect of suggesting an alternative path of planned economic development

[19] - J.A. Schumpeter, Ten Great Economists , p 5 and footnote.

Materialistic interpretation of history. The materialistic interpretation of history attempts to show that all historical events are the result of a continuous economic struggle between different classes and groups in society. The main cause of this struggle is the conflict between the mode of production and the relations of production. The mode of production refers to a particular arrangement of production in a society that determines the entire social political and religious way of living. The relations of production relate to the class structure of a society uniquely characterised by the following components: (I) the organisation of labour in a scheme of division and cooperation. The skills of labour and the status of labour in the social context with respect to degrees of freedom or servitude; (ii) the geographical environment and the knowledge of the use of resources and materials; and (iii) technical means and processes and state of science generally.

According to Marx, every society's class structure consists of the propertied. And the non-propertied classes. Since the mode of production is subject to change, a stage conies in the evolution of a society when the forces of production come, into clash with the society's class structure. The existing property relations "turn into fetters" on the forces of production. Then comes the period of social revolution. This leads to the class struggle– the struggle between the haves and the have nots– which ultimately overthrows the whole social system.

Surplus value, Marx uses his theory of surplus value as the economic basis of the class struggle under capitalism and it is on the basis of his theory of surplus value that he builds the superstructure of his analysis of economic development. Class struggle is simply the outcome of accumulation of surplus value in the hands of a few capitalists. Capitalism, according to Marx, is divided into two great protagonists: the workers who sell their labour-power and the capitalists who own the means of production. Labour power is like any other commodity. The labourer sells his labour for what it is worth in the labour market, viz, for its value. And its value, like the value of any other commodity, is the amount of labour that it takes to produce labour power. In other words, the value of labour power is the value of the means of subsistence necessary for the maintenance of the labourer. Which is determined by the number of hours necessary for its production. According to Marx, the value of the commodities necessary for the subsistence of the labour is never equal to the value of the produce of that labour. If a labourer works for a ten hour day, but it takes him six hours labour to produce goods to cover his subsistence, he will be paid wages equal to six hours labour. The difference worth 4 hours labour goes into the capitalist's pocket in the form of net profits rent and interest. Marx calls this unpaid work "Surplus value" The extra labour that a labourer puts in and for which he receives nothing, Marx calls "surplus labour. "

Capital accumulation. According to Marx. It is surplus labour that leads to capital accumulation. This supererogatory labour simply Augments the capitalist's profits. The capitalist's main motive is to increase the surplus value which goes to swell his profits. He tries to maximize his profits in there ways (1) by prolonging the working day in order to increase the working hours of surplus labour. If the working hours are extended from ten to twelve. the surplus will automatically increase from four to six ;(2) by diminishing the number of hours required to produce the labourer's sustenance. If they were reduced, from six to four, the surplus would again rise from four to six. it also tantamounts to a reduction in the subsistence wage; (3) by ' the speeding up of labour', I.e., increasing the productivity of labour. This requires a technological change that helps in raising the total output and lowering the cost of production.

Of the three methods, according to Marx, increase in the productivity of labour is the likely choice of the capitalists, since the other two methods, of extending the working hours and reduction of wages, have limitations of their own.

So in order to make improvements in the productivity of labour, the capitalists save the surplus value, reinvest it in acquiring a large stock of capital and thus accumulate capital. "Accumulate, accumulate. that is Moses and the prophets, " and save, save, I.e reconvert the greatest possible portion of surplus value or surplus product into capital. There are the capitalist's methods.

Profit are determined by the amount of capital. As Marx says, Capital is dead labour that vampire like only lives by sucking living labour and lives the more, the more labour it sucks. To explain the origin of profit and to analyse the relation between wages and profits, Marx separates capital into constant capital and variable capital. Capital invested in stocks or raw materials or equipment which directly assists the productivity of labour, Marx calls constant capital (C) capital devoted to the purchase of labour power in the form of wages or direct subsistence, he terms variable capital (V). The surplus value is denoted by S. So the total value of product (W) = constant capital (C) + variable capital (V) + surplus value (S) or (C+V) +S.

It is on the basis of this division of the total output that Marx introduces his Department all Schema of Simple and Expanded Reproduction.

Marx divides the total output of the economy (W) into department 1 and department 2. The former is related to the production of capital goods and the latter to the consumer goods. The total output of each department is shown as

$$\begin{array}{r} W_1 = C_1 + V_1 + S_1 \\ + \ W_2 = C_2 + V_2 + S_2 \\ \hline W = C + V + S \end{array}$$

The Simple reproduction Scheme indicates a situation of stationary state in which all that is produced is consumed. Thus net investment is zero and there is no. Accumulation or surplus. Therefore, equality prevails in both the departments Hence the value of total constant capital in both the departments (C_1 + C_2) must equal the output of development 1

$(W_1 = C_1 + V_1 + S_1)$ that is

$$C_1 + C_2 = C_1 + V_1 + S_1$$

Or

$$C_2 + V_1 + S_1$$

(by eliminating the common factor C_1)

Similarly, the total consumption in both the departments $(V_1 + S_1 + V_2 + S_2)$ must equal the total output of department 2 $(C_2 + V_2 + S_2)$ that is

$$C_2 + V_2 + S_2 = V_1 + S_1 + V_2 + S_2$$

Or

$$C_2 + V_1 + S_1$$

(by eliminating the common factor $V_2 + S_2$)

This shows that the value of constant capital in department 2 must equal the value of commodities consumed by workers (V_1) and capitalists (S_1) in department 1.

It is in Marx's expanded reproduction scheme that accumulation takes place because the production of department 1 (capitalist sector) is greater than the demand for constant capital in both the departments that is

$$C_1 + V_1 + S_1 > C_1 + C_2$$
$$V_1 + S_1 > C_2$$

This shows that accumulation is taking place which is being invested in employing more labour (V_1) and the means of production (C_1) in

Department 1 than in Department 2 these, in turn, increase the surplus value (S_1)

In order to analyse the nature of capitalist accumulation, Marx establishes certain relationships between C, V, and S. The ratio of constant to variable capital (C/V) is termed as the organic composition of capital. The rate of surplus value is defined as S/V, the ratio of surplus value to variable capital or of exploitation. This leads Marx to point out that the rate of profit is not dependent solely on the rate of surplus value. The rate of profit (r) can change even though the rate of surplus value (S/V) remains constant, if a change occurs in the organic composition of capital (C/V). The influence of technical progress is to alter the organic composition of capital, generally in the direction of raising the ratio of constant to variable capital Hence the tendency of industrial progress is to lower the rate of profit r ---even though there is no decrease in the rate of surplus value.

One of the consequences of capital accumulation is the concentration of capital in gigantic enterprises. Competition among capitalists forces them to cheapen their products. This can be done by introducing labour-saving machines which increase labour productivity. Those capitalists who are unable to replace labour by machines are squeezed out and their enterprises are taken over by big capitalists.

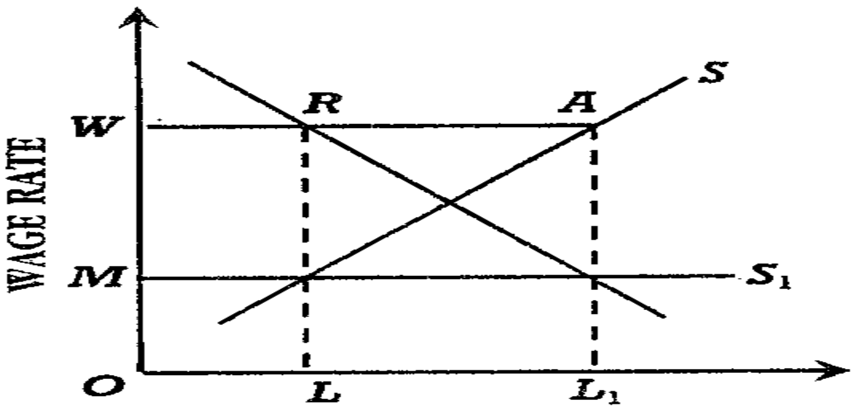


FIG. 1

Capital accumulation and concentration involve increase in constant capital and decline in variable capital. The rapid growth of constant capital as compared with variable capital leads to a relative decrease in the demand for labour. This process of supplanting labour by machines creates an industrial reserve army which increases as capitalism develops. The larger the industrial reserve army, the worse are the conditions of the employed workers, since the capitalist can dismiss dissatisfied and troublesome workers being able to replace them from the ranks of the reserve army. Capitalists are also able to. It down wages to a semi Starvation level and appropriate more and more surplus value. This is the law of the increasing misery of the masses under capitalism. this is shown in shown in Fig. 1 where the labour force is taken on horizontal axis and the wage rate on the vertical axis. D is the demand curve for labour and S is the supply curve of labour. At the wage rate W, there is an increase in the industrial reserved army equal to RA (=LL_1). As the industrial reserve army expands, capitalists start adopting labour-saving machines and reduce the wage rate to minimum subsistence level OM in order to have more surplus value.

But when the capitalist is replacing the workers by machines; he is killing the goose the laid the golden eggs. There is a continual reduction of the surplus value. Marx believes that technological progress tends to increase the organic composition of capital (C/V).since the rate of profit is inversely related to the organic composition of capital, the former tends to decline with accumulation. Marx explained this tendency of falling rate of profit in terms of the following equation:

$$R = \frac{S}{V+S} = \frac{S/V}{S/V+1}$$

The rate of profit (r) varies inversely with the organic composition of capital (C/V) and directly with the rate of surplus values (rate of exploitation) (S/V). Therefore, the rate of profit "r" rises with the rate of surplus value S/V and falls with the organic composition of capital C/V.

Capitalist Crisis, in order to counteract this tendency of declining rate of profit, the capitalists increases the degree of exploitation by reducing wages, lengthening the working day, and by "speed ups," etc. But since every capitalist is engaged in introducing new labour-saving and cost-reducing devices, the ratio of labour (and hence surplus value) to total output falls still further. The rate of profit declines all the more. Production is no longer profitable. Consumption dwindles as machines displace men and the industrial reserve army expands, Bankruptcies ensue. Every capitalist tries to dump goods in the market and in the process small firms disappear. A capitalist crisis has begun. The ultimate can of economic crisis, Marx point out, is the poverty and limited purchasing power of the masses. Economic crisis appears in the form of an overproduction of commodities, acute difficulties in finding markets, a fall in prices and a sharp curtailment of production. During the crisis, unemployment increases sharply, the wages of workers are further cut, credit facilities break down and small employers are ruined.

This does not continue forever. Revival soon starts. The low level of prices, cut in wages, elimination of speculative ventures and destruction of capital tend to raise the profit rate which eventually leads to new investments. As Marx wrote, " A crisis always forms the starting point of large new investments. Therefore, from the point of view of society as a whole, a crisis is, more or less, a new material basis for the next turnover cycle." But it leads to the same catastrophic conclusion: competition for labour; higher wages; labour – saving machinery; a reduction in surplus value: decline in profit rate; still greater competition and collapse. This succession from crisis to depression, followed by recovery and boom then again crisis is evidence of the cycle character of the development of capitalist production.

In each period of crisis stronger capitalists expropriate the weaker capitalists and along with it grows the indignation of the working class, " a class always increasing in number, and disciplined, united, organized by the very mechanism of the process of capitalist production itself. The monopoly of capital becomes a fetter upon the mode of production.... Centralization of the means of production and socialization of capitalist integument. This integument is burst asunder. The Knell of capitalist's private property sounds. The expropriators are expropriated. "This is the historical tendency of capitalist accumulation. In elaborating the general law of capitalist accumulation, Marx provides the economic explanation of the necessity and inevitability of the revolutionary transformation from capitalist to socialist society. Capitalism leads to the proletarian revolution whereby the dictatorship of the proletariat is established. Poverty will disappear. The state will wither away and each individual will contribute to national income according to his abilities and receive according to his needs! Socialism replaces capitalism.

A Critical Appraisal

Marx's theory of capitalist development has been accepted by his followers as a gospel truth while it has been severely criticised by his opponents for the following reasons:

1- **Surplus Value Unrealistic**. The whole Marxian analysis is built on the theory of surplus value. However, in the real world, we are concerned not with values but with real tangible prices. Thus Marx has created an abstract and unreal value world which has made it difficult and Cumbersome to understand the working of capitalism.

2- **Marx -- A False Prophet**. Marx has proved to be a false prophet. No doubt socialist societies have come into existence but their evolution has not been on the lines laid down by Marx. The countries which have toed the Marxian line of thinking have been curiously those in which capitalist development lagged behind. All the communist states had been poor and are even now so, as compared to the capitalist countries.

There is no increasing misery of labour in advanced capitalist societies as asserted by Marx. On the contrary, real wages of workers have continued to rise. The workers have tended to become more prosperous with capitalist development, And the middle class instead of disappear g has emerged as a dominant class. There have been also no signs often to withering away of the State in these countries.

3- **Technological progress Helpful in increasing Employment**. Marx led out that with increasing technological progress the industrial reserve army expands, but this is an exaggerated view, for the long run with of technological progress is to create more employment opportunities raising aggregate demand and income.

4- **Decreasing tendency of profits not correct**. According to Joan Muynard Keynes Marx's "explanation of the falling tendency of profits nothing at all." Marx contends that as development proceeds, increase in the organic composition of capital which bring down the in the profit rate. But Marx failed to visualize that technological innovations can be capital saving too, and that with a fall in capital-output ratios and increases in productivity and total output profits can rise along with wages.

5- **Marx could not understand flexibility in capitalism**; Marx also could not foresee the emergence of political democracy as the protector and the preserver of capitalism. Democracy as a political system has proved its resilience and adaptability to the changing times. the introduction of social security measures, anti-trust laws and the mixed economics have given a lie to the Marxian prediction that capitalism contains within itself the seeds of its own destruction.

6- **Cyclical theory wrong.** Marx emphasized that capital accumulation led to a reduction in the demand for consumption goods and fall in profits .but he failed to realise that with economic development the share of wages in aggregate income need not fall, nor the demand for consumer goods.

7- **Statue analysis. Marx's theory**, though it sought to explain a dynamic process, was, in the words of Schumpeter, " unsuited for it, its two main props being (a) labour theory of value, and (b) a modified version of subsistence theory of wages. Marx was analysing the problem of growth with the help of tools which were essentially suited to static economic analysis. "

Conclusion, despite these weaknesses, some of the Marxian tools pertaining to his theory of economic development have ever since become part and parcel of the theory of economic growth. Technological progress and innovations are the main stay of any theory of economic development. Similarly, capital accumulation is the fundamental idea behind economic growth. Profits are still regarded as both the hallmark of capitalist development and its Achilles heel. Marx showed that economic development does not follow a smooth course but comes about iii " fits and starts." Business cycles are inevitable. He pointed out that a state of under -consumption was the main cause of depression and that for stable growth a proper balance between investment and consumption was essential. He also indicated " that too low or too high wages in relation to total output can adversely affect investment and thus stifle economic growth. Industrial unemployment is also one of the major variables in his system. Thus, Marx was in a way Keynes' precursor.

The Marxian theory and underdeveloped countries

The Marxian theory is not applicable directly to underdeveloped countries. Marx did not think of the problems of such countries. A part from a few illusions remarkable for their determinant note with regard Western Asia or India no special attention is given to the problems of change in underdeveloped countries ".[20] Marx was mainly concerned with problems connected with the development of capitalism in the Western World. Colonies were regarded as one of the highest stages " in capitalist development. Foreign domination was regarded as the principal cause of economic backwardness of the colonies .the only obvious remedy was their political freedom.

Marx"s failure to recognize the existence of population pressures makes his theory inapplicable to overpopulated underdeveloped countries. But some of the variables of his analysis do exist in such economics. In underdeveloped countries till recently under the colonial rule, labour was being exploited for the benefit of the home country. There was the concentration of capital in the hands of a few capitalists; even now in almost all the underdeveloped countries that are also politically free, wages are near subsistence levels; the increasing misery of the masses is visible; a reserve army of the chronic and disguised

[20] - A.Bonne op, cit, P. 243

unemployed exist; the problem of under consumption is universal and the society is sharply divided between the two classes, the middle class being virtually non–existent.[21] The existence of such conditions can lead to class struggle and the establishment of the dictatorship of the proletariat. The recent political turmoil in some of the Latin American, African, the Middle and the Far Eastern countries have shown that the existence of Marxian conditions in backward countries act like nurseries where the communist seed grows soon. Ironically, however, it is Marx's perception of planned development expressed in his minor writings which presumably has had a greater impact on the actual economic development of countries such as Soviet Russia and mainland China. Marx's notion of planned development also seems to appeal to those backward countries which are in a great hurry to industrialize at the risk of excessive national belt– tightening.

As a matter of fact, it is Marx's Departmental Schema that is applicable to underdeveloped countries. Such a country is primarily a dualistic economy consisting of capitalist sector and a subsistence agriculture and small scale sector which may be said to represent Marx's two Departments. It is the capitalist sector which yields large economic surplus, while the subsistence sector yields a small surplus. Rapid economic development is possible by reorganising and expanding the capitalist sector (Department 1) and transforming the subsistence

---

[21]- Only the Marxian terminology is applicable. For under-consumption implies an abundance of unmarketable goods due to over-production in the Marxian analysis while in the case of underdeveloped countries it refers to low level of consumption due to low level of production . Similarly the existence of a surplus reserve army of workers in the Marxian theory is the result of the introduction of- labour saving devices , whereas in underdeveloped countries unemployment is disguised and rural , not industrial, the result of the growth in number rather, than the use-of industrial technology.

sector (Department 2) into the former so as to increase the economic surplus. This necessitates planning for industrialisation and increase in the supply of agricultural commodities to meet the expanding demand of the capitalist sector. As pointed out by Oscar Lange, it is the commodity character of agricultural production which determines the course and rate of industrialisation, along with the increased production of capital goods.

A number of underdeveloped countries like India, the Egypt, Burma and Ghana have followed the Marxian Departmental Schema in their development plans, these plans have emphasised the growth of Department 1 in relation to Department 2 . the basic strategy has been to increase investments in capital goods industries and services, and to increase the supply of consumer goods by increasing investment and production in agriculture and small scale sector. The primary aim has been to create larger employment opportunities, to increase purchasing power and fresh demand, to build a strong capital base and increase productive and technical capacities within the economy.

Exercises

Question on chapter three

Part A True – false questions

Circle whether the following statements are true (T) or false (F)

1- In the Lewis model, the capital stock is allowed to increase from the reinvestment of profits by capitalist industrialists

2- The economic basic of Marx' theory is surplus value

3- Marx believes that technological progress tends to decrease the organic composition of capital.

4- In Lewis model the level of wages in urban industrial is assumed to be constant

5- The Keynesian approach rejects the idea that saving determines investment and argues instead that the encouragement of investment will generate its own saving

6- The materialistic interpretation of history attempts to show that all historical events are the result of a continuous economic struggle between different classes and groups in society

7- In Marx theory the surplus value equal what is goes into the capitalist's pocket in the form of net profit.

8- The Marxian theory be became the general theory of the development process in surplus –labor third world nation.

9- Surplus labor, it can be withdrawn labor from agricultural sector without any loss of output.

10- Lewis assumed that urban wages would have to be at least one – third higher than average rural income.

11- The supply curve of rural labor to the modern sector is considered to be perfectly inelastic

12- According to Lewis, the rural real wage is determined by the marginal product of labor

13- Acc. To Lewis, it is more realistic that wage rate is constant in the capitalist sector.

14- Lewis assumes that the capitalist surplus is reinvested in productive capital.

15- Lewis assumes the existence the investment multiplier in LDCs,

16- Lewis theory is considered one sided theory

17- Criticism of Lewis theory weakened its power

18- The mode of production relate to the class structure of a society.

19- Acc. To Marx, every society's class structure consists of the propertied and the non-propertied classes

20- Mode of production is subject to change

21- Class struggle- the struggle between the haves and haves nots.

22- Marx uses his theory of surplus value as the economic basis of the class struggle under capitalism

23- Acc. To Lewis, the surplus value is the extra labour that a labourer puts n and for which he receives nothing

24- Acc to Marx. It is surplus labour that leads to capital accumulation

25- Marx separates capital into constant capital and variable capital.

26- Acc to Marx, the rate of profit can change even though the rate of surplus value remains constant.

27- Acc. To Marx. Capital accumulation and concentration involve increase in constant and variable capital.

28- Marx believes that technological progress tends to increase the organic composition of capital.

Part B : multiple – choice questions

Circle the appropriate answer:

1- According to Lewis's model , the dual economy grows only when

a) the modern sector increases its output share relative to the traditional sector

b) agricultural sector uses modern equipment.

c) agricultural sector hires labor economically

d) modern manufacturing sector is labor – intensive.

2- Marx refers to the concept of organic composition of capital. Which of the following ratios stands for this capital? Constant capital = C; variable capital = V; Surplus value = S

a) C/(V+S) b) C/V c) C/ (C+V) d) (C+V)/V

3) In the Lewis model, what does the term surplus labor refer to?

a) an amount of labor that is so high that it deflates wages throughout the economy

b) labor that does not have at least a primary level education

c) labor that can be withdrawn from the low productivity agricultural sector without a decrease in the total production

d) labor that is exploited by the capitalist class

4- In the Lewis model, what will cause an expansion in modern sector employment?

a) Are investment of profits by capitalists that allows production to expand

b) interventions by the State to expand employment

c) An increase in technology

d) An increase in the surplus labor

5- Which one of the following is not correct about Lewis theory

a) supply of labour is perfectly elastic

b) marginal productivity of labour is zero

c) surplus labour in industrial

d) surplus labour in rural sector

6- A.cc to Lewis, there is surplus labor in the sense that MPLA is…………………………..

a) larger than zero

b) less than zero

c) zero

d) less than one

7- The organic composition of capital is

a) the ratio of surplus value to variable capital

b) the ratio of constant value to variable capital

c) all of the above

d) non of the above

8) Acc. To Marx, the relative decrease in the demand for labour due to:

a) the rapid growth of constant capital as compared with variable capital.

b) the rapid growth of constant variable capital as compared with constant capital.

c) the rapid growth in the wage rate

d) non of the above

References

- Carey, S ., Zaitchik, D., & Bascandziev, I . (2015) theories of development : **in dialog with Jean Piaget, developmental** review, 38, 36-54

- Crain, W. (2015) theories of development: **concepts and applications. Psychology press**

- McCowan , T (2015), theories of development, **education and international development an introduction**. 31-48

- Peet, R., & Hartwick , E (2015), theories of development: contentions, arguments, alternatives **Guilford Publications**

- Peet R., & Von Eschen , D . (2001), theories of development, **Canadian journal of sociology** , 26(2) , 243

Chapter Four

The Choice of techniques

Chapter 4

The Choice of techniques

The main of goal to studying this chapter to understand the following topics

1- The capital intensity of techniques in developing countries

2- The conflict between employment and output and employment and saving is the choice of techniques.

- **Aggregative implications of factor substitution**
- **Employment versus saving**

Chapter 4

The capital intensity of techniques in developing countries

If labour is more abundant and capital is scarcer in developing countries than in developed countries, we might expect to observe the use of more labour-intensive techniques of production in the industrial sector of developing countries, reflecting a lower price of labour relative to capital. Figure 1 shows this assuming the same production function in the two sets of countries, labelled 1, and holding everything else constant, the lower relative price of labour in the developing countries, given by the price line (or isocost curve), cb, gives a more labour-intensive choice of technique than in developed country, where the relative price of labour is given by the steeper line ad.

In the developed country, the capital-labour ratio is given by the ray from the origin, DC, while in the less-developed country the capital - labour ratio is given by the ray LDC: both rays pass through the point of tangency between the price line and production function - A and B respectively.

In practice, however, it is often the case that for the same outputs produced, the capital intensity of techniques is not very different between the two sets of countries and that the capital-labour ratio differs between developed and less-developed countries in the aggregate only to the extent that the composition of output differs; that is, because there are large sectors in developing countries' economies where very little capita is employed at all as in subsistence farming and petty service activities, in , the modern sectors of developing countries, however, techniques are much more capital- intensive than would be predicted on the basic of knowledge of factor endowments Given the supply of labour available, and given the rate of investment, the more capital- intensive the techniques, the less employment and the more unemployment there will be.

Unemployment is one of the major preoccupations in developing countries, and one of the senses in which the prevailing techniques of production might be regarded inappropriate.

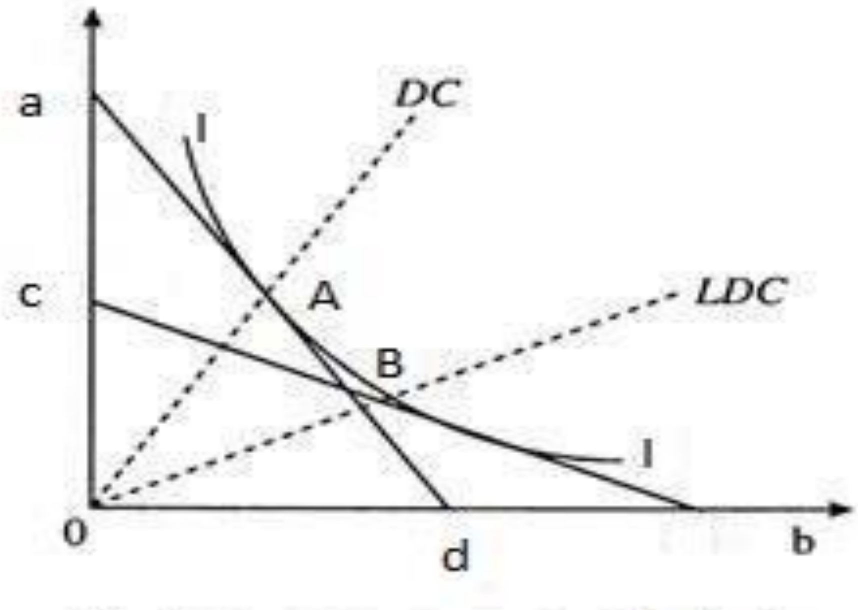


Fig 1·

But what accounts for this relative capital intensity of modern sector techniques, and would the developing countries be better off using more labour-intensive techniques? There are a number of reasons why technological choice sometimes appears to be little different in developing countries than in technologically advanced societies.

First for a large number of commodities there may not be a spectrum of techniques to choose from: that is, in practice the production function in Figure 1 may not be smooth and a country cannot move from A to B in accordance with differences in relative factor endowments and relative factor prices. We are talking here, of course, about techniques that are profitable; there may always be more labour-intensive techniques using both more labour and capital, but then the output would not be competitively saleable!? If there is not a spectrum of profitable techniques of production, and the coefficients of production are fixed. The production function is L-shaped (sometimes) called a Leontief production function after Sassily Leontief, the father of input-output analysis, which assumes no substitutability between capital and labour, Whether world technology is such that there is only one profitable technique or whether there are many but developing countries are denied access to them, is an empirical question that we shall consider later.

A second reason for the relative capital intensity of production in developing countries is that the market prices of factors of production frequently do not reflect relative abundance or scarce capital and encourage high wages in the modern manufacturing sector by the government paying high wages to its own employees. The old justification for using capital- intensive techniques, which governments used to believe in and still do to a great extent, was that they were necessary to maximise output and saving, and that more labour-intensive techniques would reduce the level of output and saving because of their, relative inefficiency and high wage bills. Later in the chapter we shall examine these contentions thoroughly but clearly the cheaper that capital is made by subsidies and the higher wages are above their shadow price, the more capital- intensive the techniques will tend to be

A third factor to bear in mind is that although labour may be abundant and its money price may be lower than in developed countries, it is not necessarily cheaper or less costly to employ, because its productivity may be lower. In other words, the so-called efficiency wage (that is, the wage rate divided by the productivity of labour), or wage costs per unit of output, may differ very little between the developing and developed countries. This means that the production function for the developing country in Figure 1 will lie outside the production function for the developed country in such a way that even if the relative money price of labour is lower in the developing country, it is profitable to choose a relatively capital-intensive technique. Figure2 shows this. The production function for the developing country is labelled 2 Even though labour is cheaper relative to capital in the developing country (slope of cb< slope of ad), none the less the most profitable capital-labour ratio will be the same in both countries (given by the ray from the origin. DC

= LDC). It is probably because abundant labour is not necessarily cheap. In a cost per unit of output sense. That accounts for the observation that in trade developing countries exports are sometimes as capital intensive as in developed countries, contrary to the prediction of certain trade theories. This apparent paradox (sometimes called the Leontief paradox) could be explained by the fact that it is the "efficiency" wage that matters, not the money wage, and while the money wage may be low in developing countries, the efficiency wage is relatively high.

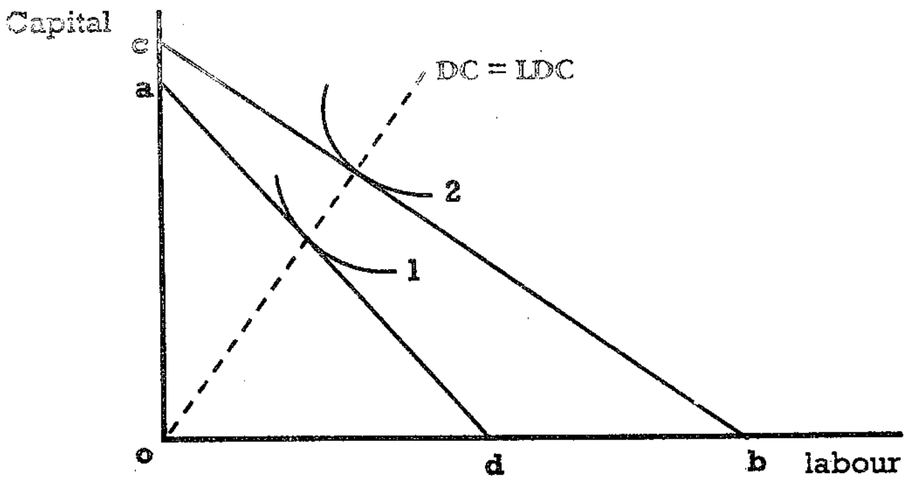


Figure 2

Fourthly, we may mention the fact that in certain instances capital intensity may be explained by a skill constraint. Typically, labour–intensive techniques require a great deal of skilled labour, compared with capital intensive techniques, which require a preponderance of semi– skilled labour to undertake routine tasks. In developing countries that are short of skilled manpower, capital may substitute for skills and constitute a rational response on the part of decision makers, whoever they may be.

But perhaps the overriding factor that accounts for the relative capital intensity of the modern sector of developing countries is the fact that many, if not most, of the techniques of production are imported from abroad with a heavy bias in the labour-saving direction. The techniques may either be employed by indigenous firms or as increasingly seems to be the case, by large foreign owned multinational corporations, which invest in the country and bring their technology with them. In this case the technology may be inappropriate not because there is not a spectrum of techniques or an inappropriate selection is made, but because the technology available is circumscribed by the global profit maximising motive s of the companies investing in the less developed country concerned. The labour- saving bias of the technology is tone explained by the labour-saving bias of technical progress in advanced countries where labour is relatively scarce and expensive. As we know labour saving bias on a production- function diagram is represented by a non-uniform inward shift in the production function, causing capital to be substituted for labour at the same ratio of relative factor prices.

If developed countries have designed labour saving technologies that, through the process of international investment, are now being widely used in developing countries, it might well be asked: why have developing countries not invented capital-saving technologies to economies on scarce capital? The answer is that if a country is to develop technology to save capital, it must have a capital goods industry, but typically the capital goods sector of developing countries is rudimentary or non–existent, With a large fraction of investment goods coming from abroad, and the relative unprofitable ability of production coupled with lack of know–how, there has been very little incentive for developing countries to establish their own capital goods industries.

Capital goods production is characterised by the ability to specialise, but to do this economically requires a large market a much larger market than for homogeneous consumer products that can reap economies of scale. Capital saving also comes from improvement in the efficiency of capital goods production itself, but without a capital goods sector there cannot be innovations and an important source of capital saving and technical progress in the economy as a whole is lost, it is widely recognised that a capital goods sector is essential for innovatory activity in the economy as a whole, and if developing countries are to reduce their dependence on imported technology from abroad, priority must be given to the establishment and nurture of an indigenous goods sector capital

The empirical evidence on multinational corporations and the choice of techniques is mixed Mall (1978) distinguishes three separate issues,

* Whether the technologies used by multinational s are adaptable to abundant labour and low wage conditions in developing countries
* Whether multinationals do adapt the technologies they transfer
* Whether multinationals adapt better or worse than local firms

Regarding the first question, the technologies used by multinationals are unlikely to be very flexible because the companies tend to predominate in modern industries where processes are complex, continuous and, by their very nature, capital intensive. Outside processing, however ancillary activities, such as the handling of materials and packaging, may be amenable to substitution. On the second issue, it is unlikely that multinationals will undertake major, expensive alterations to technology simply to suit local conditions, and there is not much evidence that they do so.

With regard to third matter, however, in comparison with local firms the experience of the multinationals seems to be very mixed. The problem here is that when making comparisons, like must be compared with like: that is, local and foreign firms must be compared in the same market, producing similar products with equal access to technology. Studies must therefore be treated with caution. It is easy to reach the conclusion that multinationals are more capital intensive than local firms if they operate in different industries producing different products. this in fact is often the case; being concentrated in activities that are intrinsically more capital intensive such as heavy industries and extractive industries.

We turn now, however, to the potential conflict between moving towards the use of more labour-intensive techniques of production and output on the one hand, and saving on the other.

The conflict between employment and output and employment and saving in the choice of techniques

Developing countries have three broad objectives: to raise the level of present consumption, to raise the level of future consumption (by saving now), and to raise the level of employment. In the choice of new techniques, a conflict between objectives may arise first, a technique that maximises employment may involve a sacrifice of output. Second, a technique that maximise employment may involve a sacrifice of saving. As we have mentioned already, certainty one of the justifications for the use of modern capital- intensive technology used to be that labour-intensive -techniques would reduce output and the investible surplus, we need to look at this matter theoretically and empirically. We shall argue that while in theory there may be a conflict, the assumptions upon which a potential conflict is based are either invalid or too extreme and that in practice developing countries could move towards the use of more labour-intensive techniques without sacrificing the level of present or future consumption. Some of the empirical evidence would seem to bear this out.

Exercises

Question on Chapter Four

The choice of techniques

Part A True – false questions

Circle whether the following statements are true (T) or false (F)

1- In developing countries, labor –intensive reflecting a lower price of labor relative to capital.

2- The capital intensity of techniques is different between the two sets of countries.

3- The capital – labor ratio is similar between developed and less-developed countries.

4- There is a negative relationship between the capital-intensive techniques and the employment.

5- There always are more labor-intensive techniques using labor only.

6- Wessily Leontief assumes no substitute between capital and labor

7- The higher wages are above their shado price, the more capital – intensive techniques will tend to be.

8- Wage costs per unit of output is similar between the developing and developed countries.

9- The production function for developing country will lie outside the production function for the developed country.

10- In developing countries, the money wage may be low; the efficiency wages is relatively high.

11- The capital – intensive technique require a great deal of skilled labor

12- Techniques that maximize employment have a lower flow of current output.

Part B : multiple – choice questions

Circle the appropriate answer:

1- The ………………….. capital intensive the techniques , the …………………Employment and the ……………….unemployment there will be

a) more. Less , more

b) less, more, more

c) more, less, less

d) more, more , more.

2- There may always be more labor- intensive techniques using

a) both labor and capital

b) labor only

c) capital only

d) skilled labor

3- The wage rate divided by the productivity of labor that is

a) the wage rate ratio

b) the efficiency wage

c) wage costs per unit output

d) a and b

e) b and c

4- In a developing country , a relatively capital- intensive technique will choose if the relative money price of labor is ……………………………

a) higher

b) lower

c) less than 1

d) zero

References

- Akubue, A (2000), "Appropriate technology for socioeconomic development in third world Bhattacharjee G (2014) choice of techniques".

- Leo Ledesma M . A , & Satchi M (2011(the choice of CES production techniques and balanced growth, (no 11. 13) **school of economics discussion papers.**

- Schiozawa, y. (2007), A New Construction of Ricardian Trade theory- A Many- country, May- commodity Case with intermediate goods and Choice of production Techniques -, **Evolutionary and institutional Economics** Review, 3(2), 141-187.

- Stewart, F. (2016, technology and underdevelopment, Springer.

Chapter Five

Building Technological Capability

Chapter Five

Building Technological Capability

Policy–makers in developing countries have often failed to appreciate the importance of successful technology transfer. Hence the need to emphasize the building of technological capability. This entails both the personal possession of skills and experience (human capital) and the social possession of advances in know how (through R&D). Technology transfer takes place through a variety of routes, formal and informal, and the experiences of the East Asian 'dragons' provide important exemplars.

Introduction

Technological –capability building may be viewed as a process of learning, enabling a developing country to adopt successfully technologies imported from abroad. It refers to a country's ability to select, assimilate, use, maintain, adapt, design, and even create technology – capabilities required for the development of products and processes in response to a changing economic environment (see Huq, 1996)

The main focus in the chapter is on manufacturing, a sector to which the building of technological capability in developing countries is clearly relevant, but the implications of the analysis have a wider relevance

The discussion starts with a comparison of the thinking of classical and neoclassical economics on technological devolvement and choice and the relevance of both sets of insights for development economics. This leads on to evaluation of the radical case made for 'intermediate technology', an idea that was advanced in the 1960s and carried a strong appeal as a way of helping the poor, especially the rural poor.

Successive sections hen deal with the economic evaluation of alternative technologies; the learning process involved in mastering technologies; the nature of technological capacities the justification for state financial support to the learning process; suitable forms of financial support; and the ways in which developing countries can pursue appropriate policies for supporting the development of technological capabilities within the rules and conventions of an open-world economy.

The various forms of technology transfer are listed in Box 18.2. There is also a box (18.3 illustrating briefly the acquisition of electronics technology by Korea, Taiwan, Singapore and Hong Kong, the four dragons of East Asia

Classical and neoclassical perspectives

The contributions from classical and neoclassical economists to theories of economic growth have already been discussed. Here we are focusing on their thoughts and ideas relevant to factor use and advancement of technology.

In his classic treatise An inquiry into the Nature and Causes of the Wealth of Nations (1776), **Adam Smith** (1723-1790) sought to account for the differences between countries in productive capability. In particular, he was enquiring why in the second half of the eighteenth century the people of Britain enjoyed a higher standard of living than people in other countries، He observed that a country's supply of the necessaries and conveniences of life' depended on two things; (a) the proportion of the people productively employed, and (b) important, the productivity of those so employed. Superior productivity of labour (i. e, output per person), according to Smith, could be explained by the way the workers were organized in production, the skill they possessed, and the effectiveness of the tools and equipment with which they worked. The extent of the division of labour, that is the degree of specialization, was considered the key factor in Smith's analysis of productivity differences the higher the degree of specialization, the greater the output per unit of labour. in speaking of specialization Smith had in mind industrial specialization, the division of labour amongst the separate trades and industries that operate within the economy. To illustrate, however, the implications of division of labour for productivity, he chose, as he put it, a rather trivial activity- pin-making-because in the case of this small-scale operation all the various specialized activities were conducted under the one roof, so that the operation and consequences of the principle of the division of labour were particularly evident to the observer. Smith recognized that interlinked, specialized activities were in fact conducted simultaneously in different locations, in different workshops, so that the fact of the division of labour by trades and industries, although an essential feature of the economy, was not so readily apparent as was division of labour on the pin-makers' shop floor (Smith, 1776, bk I, ch. 1).

Taking a long view, Smith envisaged economic growth as a continuing process occurring over time with increasing division of labour, technological progress, and accumulation of capital over time. This would yield progressively rising productivity and real income per head.

Karl Marx (t818-t883) continued the classical economics tradition, Like Adam Smith, he was keen to understand the sources and the process of economic growth, although he experiencing a significantly different industrial world from the one that had existed during Smith's time in the later part of the eighteenth century. Marx had witnessed the first half-century or so of the industrial revolution taking place during his lifetime, with machinery playing a much more prominent role than in Adam Smith's time, Still, just like Smith, he was keen to understand the factors that were responsible for contemporary levels of labour productivity and industrial capability.

As an economist, Marx was close to the classical tradition, analysing the role of machinery in the production process, the growth of mechanization and the factors that were helping in the application of science production. He observed:

The machine, which is the starting point of the industrial revolution, replaces the worker، who handles a single tool, by a mechanism operating with a number of similar tools set in motion by a single motive power… As soon as tools had been converted from being manual implements of man into the parts of a mechanical apparatus, of a machine, the motive mechanism also acquired an independent form, entirely emancipated from the restraints of human strength….(in time) large scale industry had to take over the machine itself....and produce machines by means of machines.

But just as a man requires lungs to breathe with, so he requires something that is the work of human hands in order to consume the forces of nature productively. A water-wheel is necessary to exploit the force of water, and a steam-engine to exploit the elasticity of steam...But the exploitation of these (natural) laws... necessitates costly and expensive apparatus...it is clear at the first glance that large-scale industry raises the productivity of labour to an extraordinary degree by incorporating into the production process both the immense forces nature and te results arrived at by natural science...(Max, 1867,ch,15)

So the great classical economists were keen to unravel the mystery of the growth of output and to understand how particular systems of production and the use of tools and machinery helped output per worker to increase. The essential message that emerged was clear:

economic growth was the result of continuous improvements in the 'productive powers of labour' (progressively increasing productivity), obtained through technological progress. in the latter part of the nineteenth century, with the advent of the "marginalist' or neoclassical' school of economic theorists who envisaged economic questions as issues of choice resolved by rational optimizing agents, attention was diverted from the dynamics of economic growth to static issues of utility maximization. The central concern of the new school was the formal conditions for optimal use of given resources in a static context, with an efficient equilibrium attained through substitution at the margin.

So the tools developed for analysing utility maximization in consumption are extended to model optimum input combination in production. The technique that maximizes output (given technology and resources) or minimizes costs (given factor prices) is represented as the optimal choice, as shown in Figure 1.

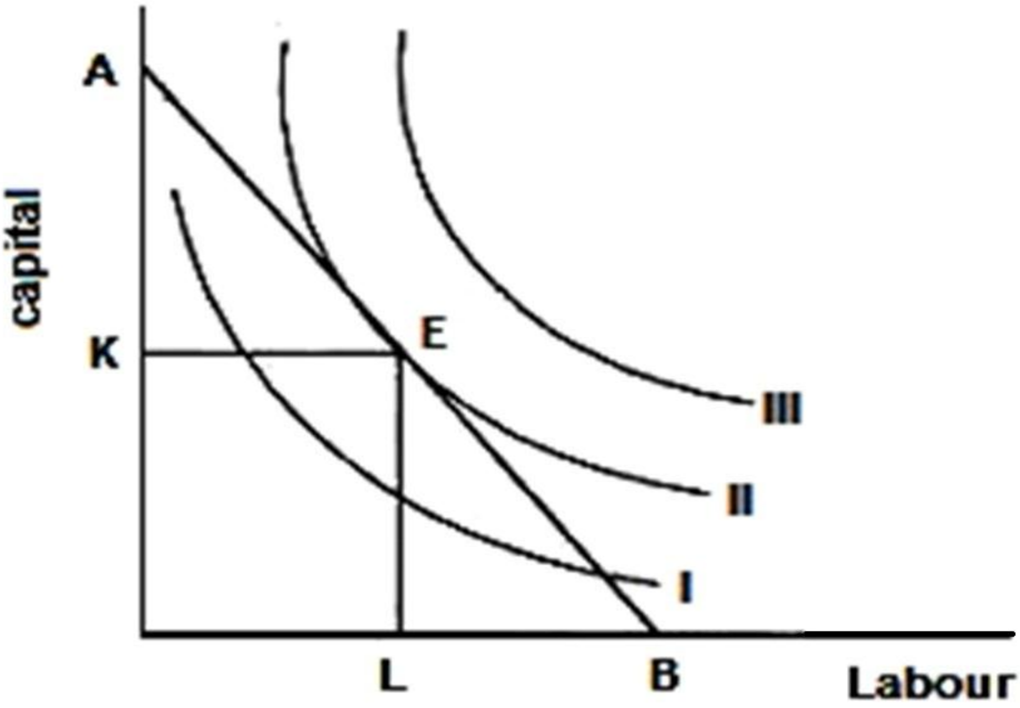


Figure 1. Optimum input combination

The cost line AB shows the different combinations of capital and labour available to the producer for a fixed outlay on inputs, Relative prices of labour and capital are represented by the slope of AB, while the curves I, II and III represent isoquants, signifying successively greater levels of output as one moves upward and to the right, each isoquant showing as we move along it different combinations of capital and labour (i.e, inputs) capable of producing the given level of output.

The optimal input combination is at point E on isoquant II, at the point of tangency between the given isocost line and the highest possible isoquant. From any others point on the isocost line, the producer will be able to obtain an increased quantity of output for the given expenditure by substituting one input for the other, so that the cost-minimizing output-maximizing factor combination is OL of labour and OK of capital. Thus, given the nature of the isoquant map, the optimum input combination depends on relative factor prices (shown by the slope of the isocost line, AB), which, in turn, depend on relative factor availabilities.

In determining the optimal choice of technique, the relative factor prices thus emerge as an important element of the model. In a developing country, with relatively abundant labour and scarce capital, shown by the relatively low slope of the isocost line GH in Figure 2, labour will be relatively cheap and capital relatively expensive. The investor will choose a labour-intensive method of production at point T. using more of the relatively cheap factor (labour), and less of the relatively dear factor (capital), than in an economy with less abundant labour in relation to capital. The figure also shows that in a developed country, with less labour in relation to capital, as shown by the steeper slope of the isocost line EF, a capital intensive method of production will be chosen, as at point S. The growth of output in the developed country (DC) facing a higher capital-labour ratio, will follow the ray DC*, while growth in output in the developing country, facing a lower capital-labour ratio, will follow the ray LDC*

The analytical tools advanced by the neoclassical school enable us to adopt a coherent approach to both production and consumption behaviour, although the theoretical coherence has been criticized as illusory in practice. Correspondingly, the model allows us to represent, in the case of production, how a producer may choose techniques in a way that fails to make use of available resources and thus fails to maximize output or minimize cost.

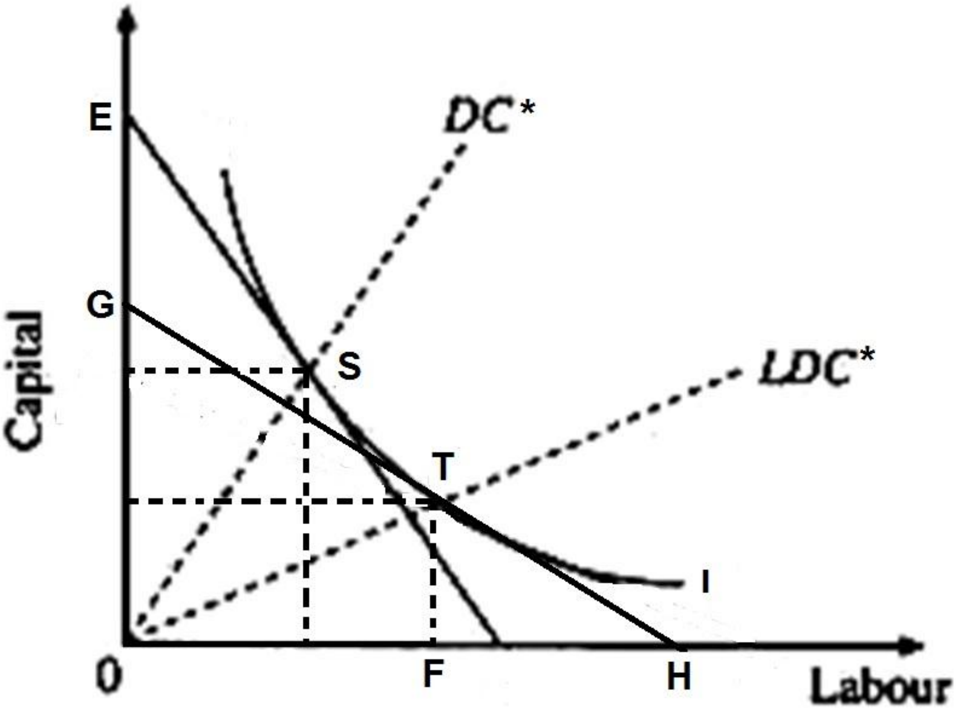


Figure 2. Optimum technical choice in developed and developing countries
Notes: DC = developed country, LDC = developing country.

The neoclassical assumption of competitive markets is a useful analytical device but not necessarily a close representation of actual market behavior. Market failure as a result of departures from the ideal are recognized as common. For example, the prices of factors often fail to reflect their true availability. Thus, as has been observed in many situations, the actual choice of techniques in developing countries often hardly differs from that found in developed countries. It is true that there are many other factors that have contributed to such technical choices, but the failure of factor prices to reflect factor availability has often featured prominently.

For the present purpose the major criticism of the neoclassical model of technical choice is its static approach. The effect of the passage of time is ignored, so that everything is analysed in a timeless context.

These is also in the model a built-in presumption that at any scale of production there is an infinite range of techniques actually or potentially with every possible combination of inputs represented. All that is required of the producer is to choose the input combination that will minimize costs for the output required. Because the relevant factor prices will reflect the relative abundance or scarcity of the factors, this combination will represent the most socially efficient use of resources. The model fails to consider the reality that different techniques are likely to emerge at different periods, in response to particular kinds of output and scales of production, so that, as argued by Grieve (2003, p. 27), the hypothetical techniques do not necessarily represent practicable alternatives for producing a particular volume of specific product at a particular point in time. Thus, the stylized neoclassical model stands, in sharp contrast to the thinking of Smith and Marx, who were keen to understand technological improvements and the resultant productivity enhancement, based on actual innovations taking place over time.

The neoclassical approach tended to treat technology choice as a mere matter of factor substitution, viewing technology as a sort of black box which, in some mysterious way, was helping labour productivity and the process of production. "It may be recalled that the classical economists were keen to explore how specific systems of production, based on the use of particular tools and machines, helped labour productivity to increase. Thus, classical thinking provided a vision of the growth process with technology advancing and productivity increasing in a cumulative manner, an ongoing process driven by profit-seeking entrepreneurs' search for competitive advantage through undercutting and outplaying their rivals. Smith envisaged a dynamic sequence such that improved productivity in one sector of the economy, by lowering output costs and raising real incomes of customers, thereby widened markets throughout the economy. These new market opportunities would then be exploited by other sectors via improvement of products and production methods, thus in turn lowering their costs, raising incomes, and further stimulating the cumulative process of growth.(Grieve, 2004)

Neoclassical orthodoxy of the late nineteenth and early twentieth centuries ignored too much of the classical heritage, in particular of the growth process resulting from continuous improvements of labour productivity. Classical growth economics had approached technology in the context of a dynamic model that had analysed the conditions of economic growth over time.

It may be added that development economics has had to be concerned both with the choice of techniques (the neoclassical preoccupation) and with the technical advance and accumulation capital on which the classical writers laid such stress–outward movement of the technical frontier rather than simply finding the right position on its Course–and it is the critical need to realize in developing countries this expansion of technical possibilities that leads to the importance of building technological capability.

Intermediate technology: a radical idea

Ernst Schuacher (1911–1977), a German economist who spent most of his life in Britain، is the founder of the 'radical appropriate–technology movement which argued for the adoption of labour–intensive, small–scale methods of production. Because the techniques envisaged were neither standard 'modern' nor simple unimproved traditional, they were described as representing intermediate technology. In his ground–breaking book, Small is Beautiful (1973), which became a worldwide best–seller, Schumacher argued for avoiding the current practice of adopting modern large–scale, capital–intensive and labour–saving plants which, according to him, were not doing any good to the vast majority of people in developing countries, who were living in rural areas. Schumacher argued that, given the limited investible resources, developing countries would fail to create enough jobs by concentrating on the modern capital–intensive industries with high capital requirement per job Such a focus to Schumacher, would give rise to a situation of dualism, with a small, relatively high income, modern sector as an island in the midst of a vast traditional economy with very low productivity: so Schumacher advocated the use of intermediate technologies:

If we define the level of technology in terms of 'equipment cost per workplace, we can call the indigenous technology of a typical developing country symbolically speaking-a £1- technology, while that of the developed countries could be called a £l,000-technology. The gap between these two technologies is so enormous that a transition from the one to the other is simply impossible. in fact, the current attempt of the developing countries to infiltrate the £ 1000-technology into their economies inevitably kills off the £ 1-technology at an alarming rate, destroying traditional workplaces much faster than modern workplaces can be created and thus leaves the poor in a more desperate and helpless position than ever before. If effective help is to be brought to those who need it most, a technology is required which would range in some intermediate position between the £1-technology and the £1000 technology. Let us call it – again symbolically speaking-a £1l00 technology.

Such an intermediate technology would be immensely more productive than the indigenous technology (which is often in a condition of decay), but would also be immensely cheapter than the sophisticated, highly capital-intensive technology of modern industry (Schumacher, 1973, pp. 148-9)

In the report which Schumacher prepared for the Indian Planning Commission, he argued that a technology must be evolved which is cheap enough to be accessible to a larger sector of the community than the very rich and can be applied on a mass scale without altogether excessive demands on the savings and foreign exchange resources of the country' (Schumacher, 1981, p. 19), George McRobie, another principal exponent, argues, that

to be appropriate the technology should be capable of local operation and maintenance and local or at least indigenous manufacture, it should be owned and operated by its users, and result in a significant increase in their net (real or money) income; it should utilize to the maximum extent local and renewable raw materials and energy; and it should lend itself to widespread reproduction using indigenous resources and through the medium of local markets. (McRobie, 1991, p, 169).

Thus, according to his approach, for a technology to be 'appropriate' it must have specific characteristics (Stewart, 1985), such as (in comparison with typical commercial method) being

- more labour–using (high labour/output ratio, L/O)
- Les capital–using (low capital /labour ratio, K/L)
- Less skill–using
- making more use of local material resources
- Being smaller scale
- Producing more appropriate products (e.g., a simpler product designed for lower–income groups, or more intensive in the use of local material resources).

The intermediate Technology Development Group (ITDG, established in 1965 in London has played a major part in popularizing this radical approach, often termed the Appropriate Technology movement. Beside ITDC, known since 2005 as 'Practical Action' other organizations that have helped to develop and disseminate knowledge of this type of small-scale technology include Volunteers in Technical Assistance (VITA) in the US and the Brace Research institute (Canada). They have been joined by others such as AT international in the US, TOOL in Canada and the Appropriate Technology Development Association in India. International agencies such as UNICEE, the ILO, UNIFEM and IFAD have also helped various organizations to introduce intermediate technologies in developing countries, See Kaplinsky (1990), McRobie (1991) and Grieve (2003).

Such small-scale technologies are aimed at benefiting in particular the people in the lower-income groups Given that high unemployment and low productivity have featured prominently in developing economies, it is not difficult to see the wide appeal of the notion of technologies whose equipment is easy to produce locally at much lower cost per unit than that of their modern counterparts. ITDG catalogues and other publications have actively promoted the dissemination of these technologies, by providing designs and instruction for manufacturing machinery and equipment for use in agriculture and transport, construction, textile manufacturing, food processing, energy supply (biomass, biogas, micro hydro, solar and wind), provision of safe water and healthcare.

During the 1960s and 1970s the approach became particularly appealing as, in the name of industrialization, many developing countries were importing, on a vast scale, the equipment for modern large-scale, capital-intensive technologies which were not operating fully and were also apparently failing to create adequate numbers of jobs. Indeed, may people started criticizing the use of modern capital-intensive technologies which were considered to be wrong in terms of the scale of production, type of machinery and equipment, and even the goods produced (see, e.g., Stewart, 1977; Rahim, 2004).

The capital-saving and labour-using bias of this approach has strong similarities with Some early criteria advanced by economists for evaluating investment in developing countries. An example is provided by Polak and Buchanan with their Minimum Capital/Output Ratio investment Criterion (Sen, 1968).

The advocates of intermediate technology believed that it would help the poor to help themselves by paving the way for a sustainable path of economic development with a strong 'grass-roots' foundation. According to Schumacher, the vast majority of people developing countries, especially those living in rural areas, would find intermediate technologies much more accessible, in financing, operational and organizing skill, and marketing than standard modern methods.

However, it should be mentioned that the approach suffers from a number of limitations. First, the limited availability of technologies of this type presents an obvious in-built constraint, Second, the capital-saving and labour-using bias, though appealing can at times lead to the selection of techniques which ate inferior financially of economically/socially or both, if efficient resource allocation is the objective: that is, there may be alternative techniques which can give higher output than the technique chosen, given the financial input costs (or the economic/social input costs). There are some techniques indeed that are inferior whatever the relative prices of the inputs. Third, the ITDG approach is more concerned with the increase of immediate employment and income and fails to take into account the objective of generating capital so as to maximize the present value of output and employment over a relevant future (Sen, 1968).

Technology evaluation based on economic efficiency

Morawetz (1974, p. S17) defined appropriate technology from an economic viewpoint as the set of techniques which makes optimum use of available resources in a given environment. For each process or project, it is the technology which maximizes social welfare if factors and products are shadow priced. This test thus requires a profit-maximizing or cost minimizing technology from the social point of view, and it is convenient to apply the conventional DCF (discounted-cash-flow) method to identify such a technology.

The NPV and IRR based on shadow prices.

The two versions of the DCF method, Net Present Value (NPV) and Internal Rate of Return (IRR), have been extensively used for evaluating investment projects, especially public-sector projects, in developing countries. in order to take care of the distortions in market prices shadow prices are used The incorporation of shadow prices for estimating NPVs for investment appraisal came to be widely used from the early 1970s, thanks to pioneering works produced under the auspices of the Organization for Economic Co-operation and Development (OECD) Little and Mirrlees, 1968 and 1974) and the

United Nations industrial Development Organization (UNIDo) (Dasgupta, Marglin and Sen, 1972). These were designed to allow appraisers to take into account (in the shadow-prices that they used) all the main reasons why developing countries might judge market-price signals inadequate. Standard Conversion Factors (SCFs), often supplied by the World Bank, for correcting the distortions in market prices have made life relatively easy for planners and project analysts.

Identifying least-cost technology by social cost-efficiency analysis

If we suppose the same output yield from alternative technologies, an evaluation of the cost side can help us to obtain the 'least-cost technology' and also to rank various technologies on their relative costs.

During the 1970s this approach was extensively used tor evaluating alternative technologies in a number of individual industry investigations conducted at the David Livingstone institute (DLI) University of Strathclyde (the DLI studies) put formally،

$$PVC = \sum_{n=1}^{t} \frac{(K_n + W_n + L_n + M_n + N_n) - V_n}{(1+i)^n}$$

Where,

PVC is present value of costs

K_n is fixed capital in year n

W_n is working capital in year n

L_n is Labour cost in year n

M_n is material input costs in year n

N_n non–material input costs i year n

V_n is residual value and recovery of working capital in year n

i is the discount rate.

By calculating PVCS tor alternative techniques for each and every sub–process, and selecting least–cost techniques for each sub–process, we can identify the least–cost technology. If all the cost variables are expressed in appropriate shadow–prices, then the PVC will be in social/economic prices. we thus have a method which can help us to select a technology that can pass the economic–efficiency test of society's profit maximization.

This approach, comparing costs for the different methods of achieving a given outcome، is what is described as cost–efficiency (as distinct from cost–benefit analysis، though the principle is exactly the same.

We can then quality the choice by considering the likely degrees of capacity utilization with the techniques that otherwise come out as most eligible, This may rule out some for which the scale required would exceed the size of the probable market. We can also take into account risks and uncertainties, if any, by incorporating sensitivity analysis based on probability values.

However, the method is basically neoclassical in its approach in the sense of being static, and it ignores the questions of how in practice technologies, with the capacity to apply, modify or invent them, can best be introduced to the economies of the developing countries. The approach fails to consider many dynamic elements such as the costs and benefits of technology learning and the externalities generated.

In brief, the approach aims only to select the cost-minimizing technology (from the World Technology Shelf). However, for a successful transfer of technology the following two other conditions also need to be satisfied (Centre on Transnational Corporations, United Nations 1987).

1. The assimilation and diffusion of those technologies in the host economy

2. The development of indigenous capacities for innovation.

Mastering technology: a learning process

The literature which has been developing since the mid.1980s has been of great help in clarifying our understanding in this area. Contributors to the topic include Enos and Park (1988) Dahlman et al. (1987); Lall (1987 and 1992); (Huq et al, 1992 and 1993; Hikino and Amsden (1994): Bell and Pavitt (1997); Hug (2003a and 2004); and Grieve (2003 and 2004).

An important feature of this new approach to technology evaluation is that it takes into account the development of technological capability. This is viewed as a process of learning which involves several components. A critical part of it is the development of human capital. This is the process that enables the labour force to select, instal, maintain، assimilate, design, manufacture and even create the technology. The workers do not need to be the inventors, but must have the ability to absorb borrowed technologies successfully. The mass educational development that took place in South Korea (and also in Singapore، Taiwan and Hong Kong preceding their success in industrialization is often cited as a model of appropriate preparation.

Another important component is Research & Development (R&D), considered to be the core of technological capability building. it extends and elaborates the skills that are thee to be mastered. The act of performing R&D is also an educative process for those engaged in it. So it may also be considered as an element in the human-capital investment. no less than straight operational experience. Freerman (1987) identifies a country's R&D with its national system of innovation and describes it as the decisive factor. The ease of absorbing new technologies in agriculture, thanks largely to the successful R&D carried out in Asian and South American countries, has contributed greatly to the success of the Green Revolution.

There is a very high social rate of return from R&D in agriculture, typically exceeding 20 cent and often higher than 40 per cent (Khan and Akbari, 1986). Unfortunately however in low-income developing countries R&D investment in the manufacturing sector is negligible.

As may be seen from Table 1,even the higher-income developing countries such as Malaysia, Mexico and Brazil are faring badly- at least very differently from the big high-income countries - when it comes to investment in R&D and also in the number of scientists and engineers engaged in R&D.

Country	Research and development			Number of Scientists and Engineers in R&D (1987-1997
GNP per capita 1995, US$)	year	As% of GDP	R&D per capita (USS$)	(per million people)
Developed countries				
UK (18 700)	1996	2.04 (1.4)	384	2448
Canada (19 380)	1997	1.66 (n.a.)	315	2719
France (24 990)	1997	2.25 (1.5)	545	2659
USA (26 980)	1996	2.64 (1.7)	655	3676
Germany (27 510)	1998	2.41 (1.5)	675	2831
Japan (39 640)	1996	2.80 (1.9)	1226	4909
Developing Countries				
Bangladesh (240)	1995	0.03 (n.a.)	0.1	52
India (340)	1994	0.73 (0.22)	2.4	149
Pakistan (460	1997	0.90 (0.0)	4.4	72
China (620)	1995	0.61 (n.a.)	3.8	454
Indonesia (980)	1994	0.07 (0.04)	1.0	182
Thailand (2740)	1996	0.13 (0.04)	4	103
South Africa (3160)	1993	0.70 (n.a.)	21	1031
Mexico (3320)	1995	0.24 (0.17)	11	93
Brazil (3640)	1996	0.81 (n.a.)	37	168
Malaysia (3890)	1996	0.24 (0.17)	11	93
South Korea (9700)	1994	2.60 (2.0)	271	2193
Taiwan (12 400)	1993	1.70 (0.8)	180	n.a.
Hong Kong (22 990)	1995	0.10 (n.a.)	23	98*
Singapore (26 730)	1995	1.13 (0.6)	300	2318

Table 1. investment in R&D and the availability of scientists and engineers in R&D in selected developed and developing countries

Note: figure in brackets show in col (1) GNP per capita in US$ and in col (3) R&D expenditure incurred by industry

*Data for Hong Kong for the number of Scientists and Engineers refer to the period 1985-95.rou

Figure have been rounded off.

Source : Given the difficulty of obtaining the relevant data, especially for developing countries, we have depended on various source and in some cases there may be some slight discrepancies, e.g, the year of data relating to the percentage of R&D in the industrial sector may not exactly match with that of R&D expenditure as per cent of GDP. However, the discrepancies are not of such a magnitude as to provide any misleading information the sources of data are UNESCO, statistical Yearbook (various issues) World Bank, World development report (various issues), and ADB and OECD (1998), The Future of Asia in the World Economy (edited by Foy et al).

There is, however, a positive correlation of GNP per capita with R&D variables: the lower the per capita income the lower is the investment in R&D as a percentage of GDP.

A similar relationship is also observed between GNP per capita and the number of scientists and engineers in R&D, the correlation coefficient being stronger here (0.8740, n = 19) than in the former relationship (0.7142. n =19); the causation, however, runs is both directions.

Among the attempts to evaluate how far the dynamic learning process of technological-capability building has proceeded, one can identify two major approaches, shown below

Evaluation of economies on the basis of the level of technology adoption

This was advanced by Enos and Park (1988) while they were investigating a number of large-scale South Korean firms through individual case studies in the following industries: (a) Petro-chemicals, (b) Synthetic Fibres (c) Machinery, (d) Iron and Steel. The approach enables us to examine the incorporation of a foreign technology by looking into various phases of the transfer process, namely:

1- Planning and investigation

2- Negotiation with suppliers

3- Design of plant and equipment

4- Purchase of equipment, construction

5- installation and initial operation

6- Production and maintenance (minor technical change)

7- Development of improved technique (major technical change)

These processes can be conveniently classified into three main stages:

Stage 1: Selection/Purchase (1 and 2)

Stage 2: Absorption (1 to 6)

Stage 3 : Diffusion (7)

The undeniably important Stage 1 in the process of technology transfer can be taken care of through the least-cost identification outlined above, but Stages 2 and 3 definitely contain a number of dynamic elements that are not incorporated in the approaches already considered.

Absorption may be viewed as the initial process of technology adaptation and involves the importer in mastering, learning, adapting an improving the technology. Diffusion refers to the final stage of technology transfer and is reached when the technology is subsequently adopted by others with the help of the original recipient. The technology - transfer deals in the British automobile industry between the British firm Rover and the Japanese firm Honda provide a very good example of the absorption of technology by Honda, which led subsequently to diffusion when Honda successfully sold improvements to others including Rover itself.

Evaluation on the basis of selected capabilities

This another way of evaluating the transfer process, particularity some of the dynamic aspects this time by viewing particular capabilities that are components in the general development of technological capability, Dahlman et al. (1987) originally suggested three of capabilities (production, investment and innovation), and subsequently Lall (1992) added a fourth linkages

1. Production capability This is needed to operate productive facilities. It is reflected in productive efficiency and in the ability to adapt operations to changing market circumstances.

2. Investment capability. This is needed to establish new productive facilities and expand existing facilities. It is reflected in the project costs and in the ability to tailor project designs to suit the circumstances of the investment.

3- Innovation capability. This is needed to create new technology. it is reflected in the ability to improve technology or to develop new products or services that better meet specific needs.

4- Linkages capability. This is defined as the

skills needed to transmit information, skills and technology to, and receive them from component or raw material suppliers, sub-contractors, consultants service firm and technology institutions. Such linkages affect not only the productive efficiency of the enterprise (allowing it to specialize more fully) but also the diffusion of technology through the economy and the deepening of the industrial structure, both essential to industrial development.

It is often difficult. however, to quantify the level of, say. absorption and diffusion, or to measure the various capabilities. Yet, in spite of the difficulties, the importance of the learning process can hardly be overemphasized. According to Hikino and Amsden(1994), developing countries wanting to compete effectively with advanced countries will have to Sharpen their own managerial and organizational skills, shorten their learning period and...make incremental improvement. They further highlight the fact that no technology is perfectly transferable and adapted to the relevant market. The view that development requires more than just basic foreign technology investment was also supported by Nelson (1993), who found that countries also require capabilities in science and education if they are to be able to catch up. Kaplinsky (l990. p 25), a keen observer of technological change in developing countries, believes that development of technological capability is expensive, it takes time; and the greater the scientific content in production, the greater the cost, and the longer the wait. The effective use of a new technology will depend on a number of factors including development of new skills, and improvement of managerial and administrative capability. Capability for selecting and installing new machinery and equipment, though important, is only an initial stage of technological capability building. The recipient will also need to develop the required human skills for operating the plant and also for achieving product and process improvement so as to remain competitive in the market.

From the experience of the successful East Asian industrialization, it appears that starting point is the introduction of technologies that are relatively accessible to developing countries, given existing resources and capabilities, Gradually the recipient will be able to move up the ladder, taking up more advanced technologies, As found by Kim (1995, p. 94.(Korea followed a dynamic strategy for industrialization', with progressive technological upgrading starting with relatively labour – intensive light industries such as textiles, garments, footwear and simple electronics, and then gradually moving into more capital-intensive industries, such as steel and petrochemicals, and further on technologically complex sectors such as shipbuilding, car manufacturing and advanced electronics, Similarly, in Taiwan one finds a gradual shift from the acquiring of relatively simple technologies to the adoption of others, intensive in higher levels of skill and knowledge. At each stage a serious learning process is involved, so that there is a progressive development of technological capability.

The volume of high-technology exports can perhaps give an idea of the ability of a developing country not only to produce such goods but also to export them, thus ensuring technology-learning at some key stages As may be seen from Table 2, in developing countries such as Malaysia, Korea, China and Brazil, high-technology exports have featured strongly, and in some cases have been even higher as a percentage of manufactured goods than those recorded by some developed countries. This gives a somewhat different picture of technological advance from that suggested for Malaysia and Brazil by the quantity of their R&D investment and their numbers of scientists and engineers, as shown in Table 1. However, it is possible that the relevant abilities are still confined to the FDI sector; so we need more detailed information than is available in Table 2.

country	GDP per capita in US$	Exports as %of GDP	Manufactured exp. % of merchandise exports	Manufactured exports:% of GDP	High technology exports as % of manufactured exports	High technology exports as % of GDP
Bangladesh	**440**	**13.32**	**89**	**11.85**	**0**	**0.00**
Pakistan	**600**	**14.69**	**85**	**12.49**	**1**	**0.12**
India	**620**	**10.75**	**77**	**8.28**	**5**	**0.40**
Sri lanka	**1 010**	**29.59**	**74**	**21.90**	**1**	**0.21**
China	**1 290**	**35.38**	**91**	**32.20**	**27**	**8.69**
Eygpt	**1 310**	**10.22**	**31**	**3.17**	**1**	**0.01**
Algeria	**2 280**	**37.46**	**2**	**0.75**	**2**	**0.01**
Tunisia	**2 630**	**36.36**	**81**	**27.03**	**4**	**1.11**
South Africa	**3 630**	**27.78**	**58**	**16.11**	**5**	**0.63**
Malaysia	**4 650**	**108.02**	**77**	**83.18**	**58**	**47.97**
Brazil	**3 090**	**17.47**	**52**	**9.08**	**12**	**1.00**
Korea rep.	**13 980**	**37.73**	**93**	**35.09**	**32**	**11.12**
Israel	**17 380**	**31.37**	**93**	**29.17**	**18**	**5.25**
Italy	**26 120**	**23.01**	**87**	**20.02**	**8**	**3.24**
France	**30 090**	**24.26**	**81**	**19.65**	**19**	**3.47**
Germany	**30 120**	**36.75**	**84**	**30.87**	**16**	**4.53**
UK	**33 940**	**17.14**	**78**	**13.37**	**26**	**3.27**
US	**41 400**	**6.74**	**80**	**5.39**	**31**	**1.74**
japan	**37 180**	**11.99**	**93**	**11.15**	**24**	**2.73**

Table 2 High technology exports from selected developed and developing countries, 2004
Source: world Bank, World Development Report(various issues)

Technology development in an age of globalization'

What is the best strategy for the development of technological capability? in this age of globalization, some might argue that the task of technological – capability building is best done without any government intervention.

This is too important a question to be settled by an appeal to ideology in developing countries, as in any other country, such questions cannot reasonably be answered by deduction from a doctrine that government intervention is either a good or a bad thing – or a good or a bad thing specifically for developing countries. Much serious policy failure has resulted from that style of thinking.

Case for financial support

As far back as Adam Smith economists have accepted the case for government support to public education. In one form or another it is indisputably what we would now call a pure public good. Certain elements of general education at least produce benefits in which all (not only those individually being educated) can be expected to participate: no one can be excluded from these benefits on the ground of not being prepared to pay for them, and my enjoyment of them does not diminish yours. The question then is simply whether the accumulation of human capital represented by the nation's or community's acquisition of technological capability in the senses discussed in this chapter is one of those elements of public education and if so whether, unless paid for in whole or in part by the state, it might not be provided.

Alternatively–as another way of looking at the same question – building technological capacity could be seen as conveying a positive externality. In other words, the total social gains from the learning that takes place under that heading are greater than the (private) gains for which the firms and others whose decisions generate the learning have to pay. So failing to subsidize the process risks under-investment on the part of the society in this element of human capital.

If any country accepts the imperative of development entailing significant and consistent economic growth, and expects that growth to involve manufacturing as a leading element, it seems likely to need technological capabilities comparable in some way to those acquired by the East Asian Tigers as they went through this process. But the details of what each requires will probably be peculiar to itself, depending on the particular industries that each will find it is developing.

Because the course of industrial development-which industries it involves will depend largely on private decisions, the role of any state support must inevitably be to some extent that of going with the flow, Beyond formal trade and technician and professional training in engineering and related skills (of a generalist character in the sense that it is not tied to the needs of particular firms or particular lines of production), the case that may be made is for support, in the form of subsidies or tax concessions for example, of what R&D and specific training activities thee firms themselves wish to undertake.

We have seen in the East Asian stories of successful industrial development that it may be more or less 'guided' in its choice of industries. South Korea provides an example at the guided end of the spectrum. At the same time we have seen (as in the extreme case of Ghana) the risks of disastrous pitfalls when the state makes these decisions, especially if it also sets out to conduct the industrial investment itself. So we assume that the investment in relatively high-tech industries that is the subject of consideration will be essentially private−sector investment, with at most influence on the choice of industries on the part of the government. Whether under guidance or not, will be the industries in which firms decide to invest about which the question must be raised whether their role as formal or informal instructors, and hence as investors in social capital, justifies state support.

On the other hand, can support of this kind be defended against possible international criticism on the ground that it is protectionist and in conflict with the (generally desirable) rules of international competition?

It is important here that a distinction is made between trade policy and technology policy, with the latter considered as a form of social investment. A completely liberal regime is more suited to the former than to the latter. Technology trade (in the sense of paying for imported material inputs ad hiring imported intellectual property and know−how) is the type of activity that can fare adequately in a liberalized market. However, there are reasons for thinking that technological capability building is a task that will experience difficulties in most developing countries if left entirely to market forces. This is because it is a matter very largely of learning by doing. Where experience of more or less high−tech activities is sparse in a particular host country, each new investment in these fields is a potential opportunity for learning on the part of the people and institutions of the host country to take place. If that learning occurs, it will generate a benefit to the host community over and above what the investment earns for the foreign or other investor, Similarly each act of R&D in such a context not only serves the commercial purposes of the investor but also extends the rang of directly productive possibilities open to the host community while at the same time again potentially providing informal training in how such a development can be brought about: in how to do R&D.

So, when it comes to technological-capability building through human-capital development and R&D initiatives, there are likely to be important positive externalities: the market rates of return to the investors will exclude an important element in the social returns. Withdrawal of the state from any active role -in an all-out pursuit of liberalization-would entail ignoring those externalities and forgoing a possibility of actively supporting the home team's learning and hence its capacity for adaptation and innovation.

Furthermore, though domestic firms that are investors or potential investors may well have a medium-term interest in promoting the community's technological-learning process (over and above their immediate commercial interest in the outcome of their own individual investments), they will need to be mobilized and co-ordinated if they are to make jointly the necessary supportive outlays. One of the justifications for the existence of government is that is can solve such co-ordination problems.

So, evaluated from the viewpoint of the country's own population, such support can be justified on the ground that it is compensating for a positive externality, à potential gain to its people that would otherwise be ignored by the market, or (a closely related point) that it is paying for a pure public good.

Against outside-world opposition on the ground that such differential help to own country industries departs from the liberal ideal, the answer is that it is justified on the same grounds as the financing of own-country technical education A country that is low in an important element of human capital has an implicit right to invest in building it up.

Eligible forms of support

What possible forms of support should be considered?

Enough has probably been said in this book to warn against the approach that would set out to attract the high-tech industries that might be the source of the learning at any cost. Industries that private investors would not at least contemplate establishing, in country A on commercial grounds are likely to be a millstone around the neck of any government that somehow induces the investors to introduce them. The first prerequisites is to adopt those general policies that will make foreign and indigenous investors feel secure and that well avoid burdening them with unnecessary costs, If that works in a country with very little manufacturing, it is likely to attract first relatively low-tech industries bottling plants, clothing textiles, certain form of assembly, possibly as either 'market-seeking' or efficiency seeking investment from abroad. These should not be despised. You have to walk before you can run. The East Asian Tigers went through the same experience. If relatively low-tech industries flourish in the marketplace without extraordinary assistance and the essential infrastructure is in place and efficiency-wages are low enough, then more diversified investment may follow.

Part of the infrastructure required is technical education, generalist in the sense that it is not tied to the needs of particular products and firms, but framed in quantity and content to be just sufficiently ahead of immediate manpower needs. Some of it at the higher professional levels may be most efficiently carried out abroad, but overseas training has unfavorable as well as favorable aspects. Clearly maintain format trade, technician and professional training adequate to the direction and pace at which industry seems to be going is an important part of the support for the development of technological capability.

The other element of the capability-building is the informal part. Here it is highly desirable to frame the measures of support so that they do not involve favours to particular industries and firms. This is important not only to strengthen the defence against possible liberal objections, but also to keep the aid that is given efficient from the country's own viewpoint. So there might be subsidies or tax concessions on R&D and on industry-specific or firm-specific technical-training programmes. It would be necessary then to define R&D and technical training for the purposes of the measure, so that, as far as possible, it would provide a clear and unambiguous criterion, reducing the scope for executive discretion, which is always at risk of corruption and favoritism.

A third element, also directed at informal learning, would require knife-edge balancing on the part of government. This is ensuring that foreign investors in the relevant industries pass on the skills of their expatriate staff to local staff, through programmes, for example, of localization, understudying, mentoring. The risk is of course that the requirements will tie the firms up so that their activities are unduly impeded, or that firms that might invest fail to do so because they fear such impediments. To help resolve the conflict, there might be certain minimal requirements on localization, say – laid down by law, and consultation with each firm on how it might set more ambitious targets for itself. There is always the possibility that negotiation might lead to solutions on localization that are win– wins , where the firm gets the credit for an ambitious programme and a reduction in its costs, while the country gets the additional human capital. There is a particular ground for subsidizing localization programmes, or at least the training associated with them. This is that they may involve a positive externality over and above the one to which we have referred, the externality lies in the fact that a firm that has invested in training one worker to a high level of skill may find her or him poached by another firm. The training firm's return, and maybe in advance its expected return, may then be, for that reason as well, below the full social return on the training investment.

Framework for technology policies

Technological–capability development in developing countries would thus call for the state to be prepared to play an active role, but without the illusion that a sufficiently active government can make anything desired possible, We have seen how externalities and market imperfections involved in technology development can 'justify' certain forms of intervention, both in the sense of making them rational as national policies and in that of defending them as consistent with international fair play; but it is also important to recognize the limits of those arguments, so as to form some rational idea of the amount of subsidy she eternality could justify.

There are a number of developing countries that would seem at the moment far from being likely to host high-tech manufacturing industries, but it is probably worthwhile for these to (some of them with important mining activities and almost all of them with some involvement already in modem public utilities) to develop explicit technology policies.

A major task of technology policy in developing countries is to provide the institutional and organizational framework that would allow the various 'actors' in the development process to interact. The actors concerned include the state; the investors foreign and local; the training institutions, universities and research establishments; and accreditation bodies. However, such a framework and he incentives for the actors to interact fruitfully are generally conspicuous by their absence in developing countries.

Given the institutional and organizational fragmentation and the widespread capacity deficits characterizing the socio-economic formation of developing countries, unmitigated ne to liberalization policies is unlikely to help the task of technology-capability building. As noted above, the interventionist role of the state, expressed inter alia in the form technology policy with commitment and focus, is crucial for the development of technological-capability building. Globalization would in the meantime be expected to broaden the outlook of policy, thus orienting its focus towards the wider and long-term objective of sustainable economic development.

The main concern is how a developing country can acquire the ability to adopt imported technologies successfully. Human-capital development and R&D will undoubtedly remain important elements in the learning process it is not an easy task, and a country's government will need to remain committed to a coherent supporting role if the objective is to be achieved.

What we now know is that certain countries that were not long ago in the middle-income, or even the low-income, range have moved into the high-income class; that acquiring technological capability seems to have been an important ingredient of their success; and that there is every sigs that they have followed deliberate policies for reaching that goal.

Every developing country, even one with very little manufacturing industry, needs a technology policy, however rudimentary. Modern technology will be involved in mining and utilities, as well as in manufacturing. Transfers of whatever know-how is available will need to take place. This will require the provision of formal technical education (a public good); suitable forms of partnership between government and foreign firms; encouragement of R&D and of industry-specific and firm-specific training (which will have positive externalities); and recognized conventions, or an individual understanding with each important inward investor, on localization.

Chapter Six

Financing development from domestic resources

Chapter Six

Financing development from domestic resources

The main of goal to studying this chapter to understand the following topics

1- The prior – saving approach

2- Fiscal policy and taxation

3- The Keynesian approach to the financing of development

Chapter six

Financing development from domestic resources

Introduction

The topic of financing development from domestic resources has two major aspects. The first concerns the ways in which saving can encouraged in developing countries, because only if society is willing to save can resources be devoted to the production of capital goods, saving is necessary to fund investment. In a primitive subsistence economy, without money or monetary assets, saving and investment will tend to be simultaneous acts, in the sense that saving and investment will be done by the same people, and saving will be invested in the sector in which the saving takes place. Those who sacrifice time and resources that would otherwise be used for consumption purposes do so to develop the means of production. They do not hold money or interests bearing assets .in more sophisticated money exchange economy, however, there is no guarantee that saving will necessarily be converted into investment, with the existence of money and monetary assets; the act of saving becomes divorced from the act of investing.

Those who want to do the investing may be different from those who want to do the saving, and the process of capital accumulation is likely to require financial and credit mechanisms to redistribute resources from savers to investors. Indeed, with a banking system with the power to create credit, investment can take place without prior saving through the process of borrowing. In other words, saving funds investment, but does not necessarily finance it. Investment generates its own saving through increases in output and profits. In fact, in the early stages of development, savings may not be the major barrier to capital formation but rather an unwillingness or inability to invest.

Unwillingness to invest may stem from cultural attitudes or simply from a realistic assessment of the risks involved.

We analysed in Chapter 1 − 2 why poor people may be risk averse. The inability to invest, on the other hand may result from shortages of cooperating factors of production (including foreign exchange), or lack of access to credit because of the underdeveloped nature of the financial system. The second important aspect of financing development from domestic resources, therefore, has to do with the role of the banking and financial system in promoting and financing investment. The financial system is important for encouraging saving, financing investment and allocating savings in the most productive manner.

In this chapter, we focus primarily on the determinants of saving, the role of the financial system in promoting savings, investment and growth, and also the process of credit-financed growth initiated by the government, which may be inflationary. This leads us to consider the relation between inflation and economic development.

Saving

There are three broad groups in society that save: the household sector, the business sector and the government. The household sector saves out of personal disposable income (personal saving), the business sector saves out of profits, and the government can save out of tax revenues if it spends less than it receives on current expenditure (that is , runs a budget surplus on current account). Household and business saving is sometimes referred to as private saving, while government saving is public saving. Each the sectors' motive for saving will differ, and we shall consider the determinants of saving later.

As far as the nature of saving is concerned, three broad types may be distinguished: voluntary, involuntary and forced. The origin of these types of saving is fairly self- explanatory:

- Voluntary savings are savings that arise through voluntary reductions in consumption out of disposable income both the household and the business sector may be a source of voluntary savings.
- Involuntary savings are savings brought about through involuntary reductions in consumption. All forms of taxation and schemes for compulsory lending to governments are traditional measures involving involuntary reductions in consumption.
- Consumption may be reduced because of rising prices. This is referred to as forced saving and may happen for a number of reasons. People may spend the same amount in money terms, but because prices have risen this means they spend less in real terms (money illusion).People may want to keep; he real value of their holdings of money constant, so they accumulate more money as prices rise (the real balance effect). Also inflation may redistribute income to those with a higher propensity to save, such as profit earners.

For a variety of reasons, which will be considered later, inflation is likely to be a natural concomitant of development, but it can also be deliberately induced by governments financing budget deficits at full employment by monetary expansion. This is the idea of inflation as a tax on money, it should also be remembered that if an economy is at less than full employment, there can always be more saving by activating unemployed or underemployed resources, provided not all of the increase in output is consumed.

Domestic savings for investment can also be supplemented from abroad. Private foreign investment is a direct source of capital formation and provides a direct addition to domestic investment. It can also be a source of savings by stimulating income and employing previously underutilised resources Second, Borrowing from abroad provides resources for investment by enabling imports to exceed exports, which in the national accounts shows up as investment in excess of domestic saying. Foreign assistance may be from multilateral or bilateral sources and may take a variety of forms, ranging from loans at commercial rates of interest to outright gifts of goods and services and technical assistance.

Finally, a country's commercial policy can stimulate savings and release resources for investment purposes. Trade itself, improvement in a country's terms of trade, can provide additional resources for investment if the resulting increase in real income is not fully consumed, likewise policies to restrict imports of consumption goods can release additional resources for investment, provided that domestic saving is not reduced by purchasing power released being switched to home consumption goods. These topics are taken up in subsequent chapters.

The amount that countries save and invest is a proportion of their gross domestic product (GDP) differs enormously, affected by differences in the ability and willingness to save and invest. Some countries disserve. Consuming more than they produce. Some countries save more than they invest, which means they are investing abroad, and other countries invest more " than they save, which means they are net importers of capital. The experience by country and by continent for the years 1980 and 1995 is shown in Table 1. The first thing to note is that the savings ratio much lower in poor countries than in rich ones, but that the savings ratio does not continue to rise for ever as countries grow richer. It tends to level off in the middle- income group of countries and then stabilise. The weighted average savings ratio in the low-income countries (excluding China and India) is only 10 per cent of GDP compared with 25 per cent in the middle-income countries and 21 per cent in high income countries. Some countries in the low income category dissave, for example Tanzania, Burundi, Chad and war-torn Rwanda. Most of the low income countries also have investment ratios that are higher than their domestic savings ratios, indicating that they are net capital importers, the average investment ratio is 20 per cent, compared with a savings ratio of 10 per cent.

The second important observation is the enormous disparity in saving performance between continents, particularly between the high savings ratio of the highly successful East Asian countries and the much lower savings ratios in the less successful economies of Latin America and Sub-Saharan Africa. The ratio in East Asia (35 per cent) is nearly double that of Latin America (19 per cent), and more than double that of sub-Saharan Africa (16 per cent). The question that naturally arises is: did high savings precede rapid growth in East Asia, or did rapid growth generate its own high savings ratio? Some might argue that it was policies to stimulate saving that were important, including financial the amount liberalisation. Some might say it was policies to stimulate investment, partly through control of the banking system, that generated growth and therefore saving. Others might say it was the deliberate involvement of the government in generating and reallocating new resources.

There is no easy answer to question, but the different replies that might be given high light the differences in the three broad analytical approaches to the study of financing development from domestic resources, which we will use as the organising framework for the rest of the chapter. The three approaches are as follows:

Table 4 Saving and investment ratios asa percentage of GDP									
	Cross domestic investment		Cross domestic investment			Cross domestic investment		Cross domestic investment	
Country	1980	1995	1980	1995	Country	1980	1995	1980	1995
Low in come economics excluding China	24	32w	22w	30w	Lower-Middle income economies				
And India	..	20w	..	10w	Lesotho	42	87	-62	-9
					Egypt, Arab Rep.	28	17	15	6
Mozambique	22	60	1	5	Bolivia	15	15	19	8
Ethiopia	9	17	3	7	Macedonia FYR	..	15	..	4
Tanzania	29	31	19	-7	Moldova	..	23	..	24
Burundi	14	11	-1	-7	Uzbekistan	..	23	..	24
Malawi	25	15	11	4	Indonesia	24	38	37	36
Chad	4	9	-6	-10	Philippines	29	23	24	15
Rwanda	16	13	5	-7	Morocco	24	21	14	13
Sierra Leone	18	6	2	-9	Syrian Arab Republic	28	..	10	..

Nepal	18	23	11	12	Papua New Guinea	25	24	15	39
Niger	37	6	23	1	Bulgaria	34	21	39	25
Burkina Faso	17	22	−6	6	Kazakhstan	..	22	..	19
Madagascar	15	11	−1	3	Guatemala	16	17	13	8
Bangladesh	15	17	2	8	Ecuador	26	19	26	21
Uganda	6	16	0	7	Dominican Republic	25	20	15	16
Vietnam	..	27	..	16	Romania	40	26	35	21
Guinea Bissau	30	16	−6	−5	Jamaica	16	17	16	10
Haiti	17	2	8	−7	Jordan	..	26	..	3
Mali	17	26	−2	10	Algeria	39	32	43	29
Nigeria	22	18	32	20	El Salvador	13	19	14	6
Yemen Rep.	..	12	..	10	Ukraine	..	..	..	..
Cambodia	..	19	..	6	Paraguay	32	23	18	14
Kenya	29	19	18	13	Tunisia	29	24	24	20
Togo	30	14	25	9	Lithuania	..	19	..	16
Mongolia	46	..	27	..	Colombia	19	20	20	16
Gambia	26	21	1	5	Namibia	29	20	39	17
Central African					Belarus	..	25	..	20

Republic	7	15	−10	6	**Russian Federation**	22	25	..	26
India	21	25	17	22	**Latvia**	26	21	..	16
Lao PDR	..	..	..	..	**Peru**	29	17	32	11
Benin	15	20	−5	9	**Costa Rica**	27	25	16	24
Nicaragua	17	18	−2	−9	**Lebanon**	..	29	..	−22
Ghana	6	19	5	10	**Thailand**	29	43	23	36
Zambia	23	12	19	3	**Panama**	..	24	..	22
Angola	..	27	..	43	**Turkey**	18	25	11	20
Georgia	29	3	..	−9	**Poland**	26	17	23	19
Pakistan	18	19	7	16	**Estonia**	..	27	..	18
Mauritania	36	15	7	11	**Slovak Republic**	..	28	..	30
Azerbaijan	..	16	..	17	**Botswana**	38	25	28	23
Zimbabwe	19	22	16	17	**Venezuela**	26	16	33	21
Guinea	..	15	..	11	**Upper –Middle−income**				
Honduras	25	23	17	14	**economies**				
Senegal	15	16	0	10					
China	35	40	35	42	**South Africa**	28	18	36	18
Cameron	21	15	20	21	**Croatia**	..	14	..	1
Cote d' Ivoire	27	13	20	20	**Mexico**	27	15	25	19

Albania	35	16	..	−8	Mauritius	21	25	10	22
Congo	36	27	36	23	Gabon	28	26	61	48
Kyrgyz Republic	..	16	..	10	Brazil	23	22	21	21
Sri Lanka	34	25	11	14	Trinidad and				
Armenia	29	9	..	−29	Tobago	31	14	42	25
Czech Republic	..	25	..	20	High – income				
Malaysia	30	41	33	37	economies	23	21w	23w	21w
Hungary	31	23	29	21	Korea. Rep.	32	37	25	36
Chile	25	27	20	29	Portugal	34	28	21	18
Oman	22	17	47	27	Spain	23	21	21	22
Uruguay	17	14	12	13	New Zealand	21	24	20	26
Saudi Arabia	22	20	62	30	Ireland	27	13	14	27
Argentina	25	18	30	30	Israel	22	24	11	13
Slovenia	..	22	..	21	Kuwait	14	12	58	18
Greece	29	19	23	7	United Arab Emirates	28	27	72	27
Low− and middle					United Kingdom	17	16	19	15
income economies	26	27w	30w	22w	Australia	25	23	24	22
Sub−Saharan Africa	23	19w	27w	16w	Italy	27	18	24	22
East Asia and Pacific	28	39w	28w	38w	Canada	24	19	25	21
South Asia	20	23w	15w	20w	Finland	29	16	28	24

Europe and Central Asia					**Hong Kong**	25	35	34	33
					Sweden	21	14	19	19
					Netherlands	22	22	22	29
Middle East and N Africa	26	..	45w	..	**Belgium**	22	18	19	24
					France	24	18	23	20
Latin America and caribbean	25	20w	23w	19w	**Singapore**	46	33	38	…
					Austria	28	27	26	26
					United States	20	16	19	15
					Germany	….	21	..	23
					Denmark	19	16	17	21
					Norway	25	23	31	29
					Japan	32	29	31	31
					Switzerland	24	23	20	27
					World	24	23w	25w	21w

- The prior saving approach to the financing of development stresses the importance of prior savings for investment and the need for policies to raise the level of savings either voluntarily or involuntarily, or both. The approach is very classical in, conception, emphasising saving as a prerequisite of investment. The approach is also characterised by a strong aversion to inflation and a belief that saving will readily find investment outlets.
- The so–called quantity theory approach points to the role of government monetary expansion in appropriating resources for development through forced saving or the inflation tax.[22] If developing countries are characterised as fully employed in the Keynesian sense (with no spare in the consumption goods industries). both the Keynesian and the quantity theory approach to the financing of development will involve inflation. Plans to invest in excess of plans to save at full employment will drive up the price level, and so will monetary expansion by government. In this sense there is an important practical as well as a theoretical difference between the prior– savings approach and the other two approaches. In the poor– saving approach the resources released for investment come from voluntary and involuntary saving and no inflation is involved. In the Keynesian and quantity theory approaches the resources are released through the process of inflation, by income redistribution from classes with low propensities to those with higher propensities to save, and by inflation as a tax or money.

[22] - the approach gets us name from the quantity, theory of money, which predicts that increases in the quantity of money will always eventually lead to increases the price level.

The prior savings approach

In classical theory saving and investment are one and the same thing. All saving finds investment outlets through variations in the rate of interest. Investment and the development process are led by savings. It is this classical vies of the development process that underlies such phrases. In the development literature as the mobilisation of savings for development and also underlies the policy recommendation of high interest rate to encourage voluntary saving. Lewis's influential model of the development process, which we considered in chapter 5, is a classical model stressing the importance for development of reinvesting the capitalist surplus.

The level of saving and the ratio of saving to national income in developing countries are likely to be a function of many variables affecting the ability and willingness to save. The main determinants of the ability to save are the average level of per capita income, income, the rate of growth of income, the distribution of income between rich and poor and the age composition of the population. In turn, the willingness to save depends on such monetary factors as the existence of acceptable and reliable monetary institutions, the interest rate offered in relation to risk and time preference, and general societal attitudes towards consumption and the accumulation of wealth. Differences in cultural attitudes between countries may distort the estimation of saving functions across countries based on economic variable alone.

Turning to the empirical evidence, the time–series and cross–section evidence suggests that the level of saving per head and the saving ratio are primarily a function of the level of per capita income and growth of income – other factors, including monetary variables, are of lesser importance.

The hypothesis that savings per head and the savings ratio are a function of income per head is part of the Keynesian absolute income hypothesis, that is, saving is a function of income. If we write the Keynesian savings function as S = a_0 + b_0 (Y) and divide by the population level (N) we have

S/N = − a_1 + b_1(Y/N)

To obtain an expression for the savings ratio we multiply Equation. 1 by N and divide by Y:

S/Y = b_1 − a_1 $(Y/N)^{-1}$

The Keynesian absolute income hypothesis therefore predicts that savings per head (S/N) is a linear (but non proportional) function of income per head (Y/N), and that the savings ratio (S/Y) is a hyperbolic function of the level of income per head; that is, that the savings ratio will rise with the level of per capita income but at a decreasing rate. As Y/N→∞, S/Y→ to the asymptote b_1. This is shown in Figure 1.

The savings data in Table. Figure 1. suggest this

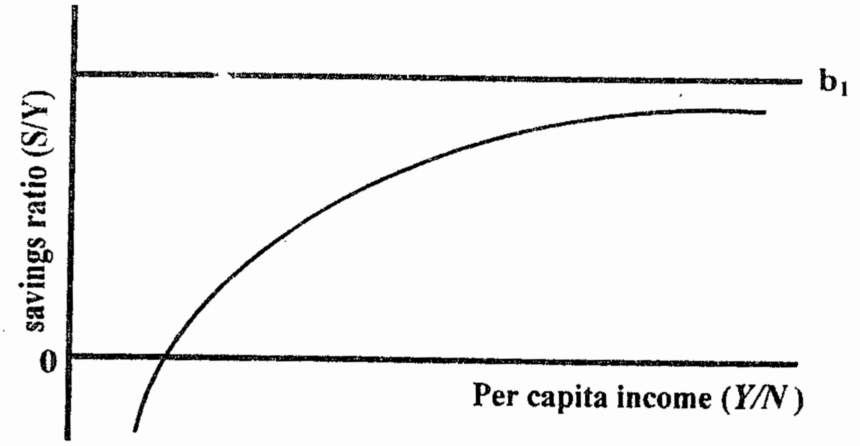


Figure 1

type of relation, as already discussed. Data on the personal savings ratio over the period 1985–93 also suggest this non linear relation, as shown in Table 2. The ratio rises rapidly between the low–income and upper middle income countries and then levels off.

The reason why the savings ratio should rise as per capita income increases and then level off is not clear–cut. It is as if saving is a luxury good in the early stages of development but then loses its appeal. Part of the reason may be purely statistical, arising from the way saving is normally defined in developing countries as the difference between investment and foreign capital inflows.

As investment expenditure becomes more faithfully and accurately recorded as development proceeds (as per capita income rises) the savings ratio is also shown to increase. But there are also a number of economic factors that probably play a contributory role in explaining the relation. One is the growth of the money economy. As money replaces barter for transactions, the public will wish to , hold a higher proportion of their income in the form of money, which they can only do by giving up command over real resources. This hypothesis is supported by what we know about the income elasticity of demand for money in developing countries, which exceeds unity (For evidence of this, see Thirlwall, 1974, CH.5.)

Table 2 personal savings ratio

Countries	**Personal saving as % of GDP (average 1985093**
Low income	**11.2**
Lower middle - income	**16.7**
Upper middle income	**195**
High income	**20.0**

a higher proportion of their income in the form of money which they can only do by giving up command over real resources. This hypothesis is supported by what we know about the income elasticity of demand for money in developing countries, which exceeds unity. (For evidence of this, see Thirlwall. 1974, CH.5)

A second possible explanation is that population growth decreases with increases in the level of per capita income, so that population growth absorbs household saving to a lesser and lesser extent. Another plausible hypothesis is that in the early stages of development the distribution of income, both personal and functional, grows more unequal but at a decreasing rate. It higher-income groups have higher propensities to save than lower-income groups, and profit earners have a higher propensity to save than wage earners, the savings ratio will be positively related to the degree of inequality in income distribution (personal income distribution) and to the share of profits in total income (functional income distribution). Some evidence of the widening distribution of income in the early stages of development was given in Chapter.

It will be remembered from chapter 5 that in Lewis's model of development with unlimited supplies of labour, it is not the absolute level of per capita income that is the prime determinant of the savings ratio but the size of the capitalist surplus and the distribution of income between entrepreneurial profits and other income according to Lewis (1955), if we ask why the less developed countries save so little the answer is not because they are so poor but because their capitalist sector is so small. Lewis also expressed the view that no nation is so poor that it could not save and invest at least 12 per cent of its national income if it so wished. Investment as a proportion of national income is not small because of an incapacity to save but because the surplus generated in developing countries is used to maintain unproductive hoards of retainers and for conspicuous consumption in general:

Lewis's view is very much in line with our earlier remark that in the early stages of development there may be savings investment gap in the sense of incapacity to save, but an unwillingness to save or to use saving for productive formation.

Other recent studies show that the savings ratio is positively related to the rate of growth of income, which is the prediction of the lifecycle hypothesis of saving (see Modigliani, 1970). The idea is that people wish to smooth out consumption over their lifetime, so that they dissave when their income is low (in youth old age) and save when they are working and their income is high. If income growth then accelerates for some reason, people will save more to give themselves a higher level of consumption in retirement. Thus if income growth is faster in one country than another, this will produce a higher savings ratio. Edwards (1995) has analysed the private savings ratio across 36 industrial and developing countries over the period 1983 to 1992 and finds that one of the most important determinants of high savings is the growth of output. The age distribution of the population also makes a difference, and the degree of urbanisation negatively affects the savings ratio.

The dependence of savings on income suggests that development and rising living standards is a cumulative phenomenon. Growth depends on saving and capital formation, but saying in turn depends on growth and the level of capita income. A virtuous circle can be started once the growth of income rises above the growth of population, allowing per capita income to rise. The virtuous circle of growth must be initiated by directly raising the low levels of per capita income of the vast majority of people by making their labour more productive. This is the first task of financing capital formation by domestic voluntary means within the prior savings approach. The second task is to encourage and exhort those with the ability to save to curtail extravagant consumption and to invest productively the surplus of income over whatever level of consumption is decided upon. The encouragement to save and invest productively must come from the government and government agencies concerned with promoting economic development. This is where monetary and fiscal policies become important. At the practical level, this is what the prior savings approach to development is concerned with designing monetary and fiscal policies that raise the level of savings directly, and also indirectly by allocating resources in the most productive way possible. While monetary factors may not be so important as income in determining savings behaviour, economic development itself is dependent on the sophistication of the financial system, and there is evidence that saving may be more responsive to interest rates when the level of income rises above subsistence. Research on this topic by Ogaki, Ostry and Reinhard (1996) is reported in Table 3[23].

[23]- The data refer to the change (in percentage points) in the saving rate owing to a 1 percentage point increase in the real interest rate. For example, in high − income countries with a real interest rate of 3 per cent, a1 percentage point rise in the real interest rate would raise the saving rate by nearly two thirds of a percentage point (0 584 of a percentage point) at higher baseline levels of the real interest rate, the saving response diminishes slightly.

Table 3 interest sensitivity of savings under alternative we scenarios'

Country groupings	Real interest initial		
	3 per cent	4 per cent	5 per cent
Low-income			
Average for group	0.312	0306	0.300
Average for 10 poorest	0.177	0.174	0.171
Lower-middle-income	0.532	0.522	0.512
Upper-middle-income	0.560	0.519	0.539
High-income	0.584	0.573	0.562

Source M Orgako. J.D. Ostry and C.M reinhart (1996)

The data refer to the change (in percentage points) in the saving rate owing to a 1 percentage point increase in the real interest rate. For example, in high - income countries with a real interest rate of 3 per cent, a1 percentage point rise in the real interest rate would raise the saving rate by nearly two thirds of a percentage point (0 584 of a percentage point) at higher baseline levels of the real interest rate, the saving response diminishes slightly.

Income over whatever level of consumption is decided upon. The encouragement to save and invest productively must come from the government and government agencies concerned with promoting economic development. This is where monetary and fiscal policies become important. At the practical level, this is what the prior savings approach to development is concerned with designing monetary and fiscal policies that raise the level of savings directly, and also indirectly by allocating resources in the most productive way possible. While monetary factors may not be so important as income in determining savings behaviour, economic development itself is dependent on the sophistication of the financial system, and there is evidence that saving may be more responsive to interest rates when the level of income rises above subsistence. Research on this topic by Ogaki, Ostry and Reinhart (1996) is reported in Table 3.

It appears that saving is very unresponsive to interest rates in low income countries where there is little margin of income over subsistence needs, but its responsiveness rises as consumption rises above subsistence needs and people can exercise choice about increasing their present or future consumption.

This leads us to the extensive topic of financial systems, financial policy and economic development

Fiscal policy and taxation

There is another arm of the prior savings approach to the financing of development from domestic resources that needs to be considered, and that is the use of fiscal policy and taxation. Fiscal policy has two major roles in the financing of development. The first is to maintain the economy at full employment so that the savings capacity of the economy is not impaired. The second is to design a lax policy to raise the marginal propensity to save of the economy as far above the average as possible without discouraging work effort and consistent with an equitable distribution of the burden.

Using fiscal policy to maintain full employment will involve deficit finance if unemployed or underused real resources exist in the Keynesian sense. While deficit finance is likely to be inflationary in the short run until supply has had time to adjust , there is an important analytical distinction between the means by which resources are made available for investment through deficit finance at less than full employment and the means by which savings are generated by inflation. In the isomer case savings are generated by an increase in real output, in the latter case by a reduction in real consumption through a combination of factors, including a real balance effect on outside money. Income redistribution from low savers to high savers, and money illusion.

Fiscal policy to raise the marginal propensity to save above the average is concerned with the implementation of taxes to reduce consumption in the private sector. Saving brought about by taxation is involuntary saving. How much taxation a country raises as a proportion of national income depends on two major factors: the capacity of the country, and the effort made by the country in relation to its taxable capacity. The taxable capacity of a country depends on such factors as the overall level of per capita income of the country, the distribution of income, the level of literacy and urbanisation. The size of the industrial sector, the importance of trade. Whether the country has mineral resources, and the amount of foreign investment. In turn, the tax effort depends on the extent to which a country exploits these various tax bases and the rates of tax applied to the bases.

The overall buoyancy of a tax system is measured by the proportional change in total tax revenue ($\Delta T/T$) with respect to the proportional change in national income ($\Delta Y/Y$). and is composed of two parts: the elasticity of tax revenue ($\Delta T/T$) with respect to the tax base ($\Delta B/B$) and the elasticity of the base ($\Delta B/B$) with respect to income ($\Delta Y/Y$), that is.

$$(\Delta T/T)/(\Delta Y/Y) = (\Delta T/T)/(\Delta B/B) * (\Delta B/B)/(\Delta Y/Y) \quad (3)$$

If the Tax system is progressive (with higher tax rates applied to higher levels of income or expenditure), then the elasticity of tax revenue with respect to the base will be greater than unity, and buoyancy will be greater than unity provided the elasticity of the base with respect to income is at least unity, if buoyancy is greater than unity, then tax revenue as a proportion of national income will rise as national income rises. The buoyancy of the tax system can be increased by increasing the rates of tax or extending the base.

Any measured change in tax revenue with respect to income is likely to consist both of an automatic increase in tax revenue as income increases if the rate structure is progressive, and the effect of discretionary changes in tax rates and extension of the tax base. The elasticity of a tax system is measured as buoyancy minus the effect of discretionary tax changes. There are techniques for estimating the elasticity of the tax system but we will not describe them here – suffice it to say that the greater the elasticity, the more that tax revenue and saving can increase without the need for discretionary changes. This is desirable feature of tax systems in circumstances where it may be difficult to implement discretionary changes.

Tax effort depends on the elasticity of the system and overall buoyancy, and needs to be measured in relation to capacity. One way of doing this, pioneered by the IMF (see Tait et at., 1979) is to take a cross-section of countries and relate their ratios of tax to national income to the various measures of tax capacity mentioned earlier, namely per capita income, the importance of trade and industry and so on . Estimating such an international tax function gives an equation of the form:

$$T/GDP = a + b_1(PCY) + + b_2(X/GDP) + b_3(L/GDP) \text{ and so on} \quad (4)$$

Where T/GDP is a country's ratio of national income, PCY is per capita income. X/GDP is the ratio of exports to GDP, I/GDP is the ratio of industrial output to GDP, and the coefficients b1, b2, b3 and so measure the average effect of each of the variables on the tax ratio across countries. For example, if b2 was estimated as 0.5, this would mean

Table 4 Composition of tax systems by major type of taxes , tax 1992						
	Taxes trade share of GNP	Taxes on international trade	Domestic commodity taxes	Domestic income taxes	Social security taxes	Other taxes
Low income countries	16.0	25.2	32.9	18.8	0	23.0
Lower-middle- income countries	19.0	17.8	28.3	31.5	1.7	20.7
High middle – income countries	21.0	9.3	29.1	25.2	14.8	21.6
Upper – income countries	27.0	1.1	18.2	42.5	27.9	10.3
Source Gillis- Perkins, Kroemer and Snodgrass: 1996						

that a country with an export ratio that is 1 per cent above the average for all countries will have a tax ratio that is 0.5 above the average for all countries, other things remaining the same.

By time method, a country's tax effort can be measured by substituting values for PCY, X/GDP, I/GDP and so on in Equation 4 . predicting what the tax ratio should be and then comparing the predicted value with the actual value of the tax ratio. If the actual value is greater than predicted, the country can be said to be making a good effort; if it is less then the tax effort can be regarded as weak.

The facts on tax revenue in developing countries are that tax revenue as a percentage of national income is typically low, averaging less than 20 per cent compared with nearly 30 per cent in high income countries, and taxes on income are a minor source of tax revenue compared with indirect taxes, as can be seen in Table 4. The proportion of the population that pays income tax in developing countries is correspondingly low, averaging about 20 per cent, compared with the vast majority of the working population in developed countries, who constitute over 40 per cent of the total population.

On the surface there would appear to be a great deal of scope for using tax policy to raise the level of community saving relative to income; two important points must be borne in mind, however. The first is that the rudimentary nature of the tax system in developing countries is partly a reflection of the stage of development itself. Thus the scope for increasing tax revenue as a proportion of income may in practice be severely circumscribed. There are the difficulties of defining and measuring the tax base and of assessing and collecting taxes in circumstances where the population is dispersed and primarily engaged in producing for subsistence, and where illiteracy is also rife. And there is also the fact that, as far as income tax is concerned, the income of the vast majority of the population is so low anyway that it must fall outside the scope of the tax system. Whereas 70 per cent of national income is subject to income tax in developed countries, only about 30 per cent is subject to income tax in developing countries.

Even if there is scope for raising considerably more revenue by means of taxation, whether the total level of saving will rise depends on how tax payments are financed whether out of consumption or saving and how income (output) is affected. It is often the case that taxes that make tax revenue highly elastic with respect to income are taxes that are met mainly out of saving or have the most discouraging effect on incentives. For example, very progressive income tax will discourage work effort if the substitution effect of the tax out weight the income effect; and to the extent that high marginal rates of tax fall primarily on the upper income groups with a low propensity to consume, saving may fall by nearly as much as tax revenue rises.

To avoid such large reductions in private saving, an expenditure tax on upper income groups, which exempts saving from taxation, is an alternative to a progressive income tax, but the disincentive effect on work effort is not necessarily avoided. This is so because if the expenditure tax encourage saving, the tax rate must be higher to yield the same revenue as the income tax. If people work to consume and the price of consumption is raised, work- effort will be curtailed if the substitution effect of the change outweighs the income effect. The more successful the expenditure tax is in stimulating saving out of a given income, the higher must be the rate of tax to keep the yields from the two taxes equal, and the greater the disincentive to work effort is likely to be. If the expenditure tax is in addition to the income tax, however, there is no reason to expect any substitution effect in favour of private saving, so that whether aggregate community saving increases depends on how much work effort is discouraged and on the relative propensity to consume and save of those who pay the tax compared with those of the government. In general the most effective tax policy to raise the level of saving relative to income is to impose taxes on those with a high marginal propensity to consume, namely the poor, but there are obvious considerations of equity to bear in mind m pursuing such a policy, as well as the practical consideration of political feasibility

The predominant importance of agriculture in developing countries makes agricultural taxation a potentially significant source of tax revenue and a means of transferring resources into investment. There are a great variety of tax instruments for taxing agriculture, including taxes on land area, on land value, on net income, marketing taxes, export taxes, land transfer taxes and so on. If revenue is the aim, then marketing and export taxes are probably the most efficient and the easiest to collect. As far as exports are concerned, two main systems may be adopted. Either the state- controlled marketing board may pay the producer a price that is lower than the international price received, or the government may require that all foreign exchange receipts be surrendered, with compensation given in local currency at an exchange rate that overvalues the local currency.

Export taxes may, however, have disincentive effects. The substitution effect of export taxes will be discourage production, or to switch production to the home market the home market is not saturated. Either way, the yield from tax will fall if the tax base (the level of exports) falls more than in proportion to the rise in the export tax. Trades taxes have also been shown to be very unstable because of the volatility of primary product exports (and of imports), which can lead to severe budgetary problem for countries that rely on them (see Bleaney et al,. 1993).

In theory, land taxes are probably the most desirable way to transfer resources from agriculture, but in practice land taxes are not important as a source of tax revenue.

It is also worth mentioning that no developing country has yet successfully applied a conventional income tax to agricultural income. The nearest that countries have come to this is to tax the value of land, the imputed income from land or the potential physical yield from land.

The balance between direct taxes on income and indirect taxation on expenditures and trade in the economy at large is heavily weighted in the direction of the latter, particularly in the form of import duties and sales taxes. The emphasis on indirect taxes originates from the difficulties already mentioned of levying direct taxes, and the disincentive effects that direct taxes can have. this is not to say that indirect taxes are totally devoid of disincentive effects, but they are probably less especially if taxes such as sales taxes and import duties can be levied on necessities without too much social hardship. Indirect taxes on luxuries will raise revenue, the more so the more price inelastic the demand, but the taxes may largely be paid out of saving to the extent that luxuries are consumed by upper income groups with a low propensity to consume. The equity grounds for such taxation, however, are still strong.

Taxes on business are easy to collect and administer, but again business taxation may merely replace one form of saving with another. The marginal propensity to save out of profits is typically high. The main justification for company taxation must be to retain control of resources that might otherwise leave the country if the business is foreign owned, or to substitute public for private investment on the ground that public investment is more socially productive than its private counterpart.

The Keynesian approach to the financing of development

The Keynesian approach to the financing of development by inflationary means stresses, first, that investment can generate its own saving by raising the level of income when the economy is operating below capacity, and by redistributing income from wage earners with a low propensity to save to profit earners with a high propensity to save when the economy is working at full capacity. Second inflation itself can encourage investment by raising the nominal rate of return on investment and reducing the real rate of interest. Only the first of these two aspects of the Keynesian approach will be considered here.

Unemployed resources provide the classic argument for Keynesian policies of inflationary finance. If resources are unemployed or underused, real output and real savings can be increased by governments running budget deficits financed either by printing money or by issuing government bonds to the banking system and the public.

In a situation or genuine Keynesian unemployment, any tendency towards inflation. Whatever method of deficit finance is used. Should burn itself out as the supply of goods rises to meet the additional purchasing power created. Some economists have questioned, however, whether the observed unemployment of labour in developing countries is strictly of the Keynesian variety, and whether the supply of nut-put would respond very much to increased demand. It is probably true that most unemployment in developing countries results not from a shortage of demand, but from a lack of cooperating factors of production to work with (mainly capital), and the direct multiplier effects of government expenditure may be low, but some deficit- financed projects may have considerable secondary repercussions on output if they eliminate production bottlenecks at the same time.

In the agricultural sector of developing countries, and in the production of consumer goods in the industrial sector, there are many opportunities for investment that can yield outputs several times the money value of capital invested in a very short space of time. In agriculture, the use of fertiliser and the provision of transport facilities are good examples. Credit expansion for these activities can soon generate sufficient output to absorb the demand creating effects of the new money in circulation.

Thus while ii may be conceded that much of the unemployment in developing countries is not of the Keynesian variety, it does not follow that monetary expansion in conditions of unemployment cannot generate secondary employment and output effects. The capacity generating effects need to considered in conjunction with the emphasis on demand in Keynesian static multiplier theory.

Let us turn now the Keynesian full employment case. At full employment, inflation is the inevitable result of the Keynesian approach to development. In contrast to classical and neoclassical theory, Keynesian theory specifies independent saving and investment functions and allows price changes in response to excess demand in the goods market to raise saving by redistributing income. Inflation is the means by which resources are redistributed between consumption and investment. In Keynesian models, investment is not constrained by saving, but by the inflation rate willing to be tolerated by wage earners who have had their real wages cut.

If plans to invent exceed plans to save it is reasonable to suppose the both investors and consumers will have their plans thwarted investment is less than firms desire, but greater than consumers plan to save. Let us assume. Therefore, that the actual growth of capital is a linear combination of planned saving and planned investment.

$$\frac{dK}{K} = a\frac{I}{K} + (1-a)\frac{S}{K} a < 1 \qquad (5)$$

Where k is the quantity of capital, I is planned investment and S is planned saving. Now assume that the rate of inflation is proportional to the degree of excess demand as measured by the difference between plans to invest and save:

$$\frac{dP}{P} = \lambda \left(\frac{I}{K} - \frac{S}{K}\right) \lambda > 0 \qquad (6)$$

Where P is the price level. Substitution the expression for I/K into (5) gives

$$\frac{dK}{K} = \frac{a(dP/P)}{\lambda} + \frac{S}{K} \qquad (7)$$

S/K is planned saving and a (dP/P)/ λ is forced saving per unit of capital. Forced saving results from the inability of consumers to fulfil their planned consumption in conditions of excess demand. The underlying mechanism that thwarts the plans of consumers is inflation, which redistributes income from wage earners to profits. Other things remaining the same, if prices rise faster than wages, real consumption will fall and real saving increase as long as the propensity to save out of profits is higher than the propensity to save out of wages.

In Keynesian models, therefore the effect of inflation on saving depends on two factors: the extent to which income is redistributed between wages and profit; and the extent of the difference in the propensity to save out of wages and profits.

The relation between wages, prices and profits, and the consequent effect of income redistribution on saving, is best illustrated using simple algebra. Let Z labour's share of national income so that

$$Z = \frac{W}{PY} - \frac{wL}{PY} - \frac{W}{Pr}$$

Where W is the wage bill, w is the wage rate, P is price per unit of output, Y is income and r = Y/L is the productivity of labour. Hence the rate of change of labour's share may be written as from this equation a number of interesting propositions can be established. First, given a positive rate of growth of productivity, a sufficient condition for a redistribution of income from wages to profits is that prices rise faster than wages. Note, however, that in a growing economy (with positive productivity growth) it is not a necessary condition. Labour's share will fall and the share of profits rise as long as (dw/ w − dP/P) < dr/ r; that is, as long as the real wage rises less than the growth of labour productivity. In a growing economy, therefore, there is no necessary clash between the real wage and profits/ The real wage can rise and the share of profits in income can also rise as long as some of the gains in labour productivity are appropriated by the capitalists.

$$\frac{dZ}{Z} - \left(\frac{d}{w} - \frac{dP}{P}\right) - \frac{dr}{r} \qquad (9)$$

Second, if can be shown that, on the classical savings assumption that the propensity to save out of profits is unity and the propensity to save out of wages is zero, the rise in the aggregate savings ratio will be equal to the fall in labour's share of income. If ail wages are consumed and all profits are saved Equation 9 may be written as

$$\frac{dZ}{Z} = \frac{dc}{c} - \frac{dr}{r} \qquad (10)$$

Where C is real consumption per worker. Hence

$$\frac{dZ}{Z} = \frac{dc}{c} + \frac{dY}{Y} = \frac{d(C/Y)}{C/Y}$$

Where C is aggregate consumption, Y is income and C/Y is the consumption-income ratio. Since d (C/Y) /(C/Y) = − d(S/Y) / (C/Y) and dz = d (C/Y), we have the result that − d (S /Y) = dz, that is, labour's share and the aggregate savings ratio change by exactly the same amount (in opposite directions).

The basic Keynesian notion that investment determines saving forms the backbone of neo- Keynesian growth theory, as expounded by Robinson (1962) and Kaldor (1955-6). Variations in the savings ratio resulting from inflation and income redistribution is one of the many possible adjustment mechanisms for raising the warranted growth rate towards the natural rate (see chapter 4). As Robinson used to argue, in response to the neoclassical adjustment mechanisms of variations in interest rates and the capital−output ratio, there is nothing in the laws of nature to guarantee growth at the natural rate, but if entrepreneurs wish to invest sufficient to grow at the natural rate then saving will adapt, subject to inflation barrier.[24]

When a steady rate of growth is going on, the share of savings adapts to it. In effect, the actual growth rate pulls up the warranted growth rate by forcing saving

Saving adapts to investment through the dependence of saving on the share of profits in income, which rises with the level of investment relative to income in the way that has already been described. Profits in turn depend on what happens to real wages when the system is out of equilibrium. The basic equation of Robinson's model is tire distribution equation:

$$PY = wL + \pi PK \qquad (11)$$

Where π is the gross profit rate R/K. and P, Y, W, L and K are as before. Dividing by P and rearranging to obtain an expression for the profit rate, gives Given the capital labour ratio, the rat of profit depends on the relationship between output per head and the real wage. If all wages are consumed and all profits are saved, the rate of profit gives the rate of capital accumulation and the rate of growth. This follows

[24] -in a static economy the inflation barrier means where a real wage solow that wage earners react to price increases to prevent the real wage from falling futher. In a growing labour economy. It is the point at which labour resists any further reduction in its share of national income, is that where labour appropriates all increases in labour productivity itself in the form of increased real wages.

since S = I $=\pi K$, and $\Delta K = \pi K$ there for $\Delta K/K = \pi$. And if the capital output ratio is fixed, $\Delta K/K = \Delta Y/Y$:hence $\pi = \Delta K/K - \Delta$ Y/Y

$$\pi = \frac{(Y/L)-(w/P)}{(K/L)} = \frac{R/L}{K/L} = \frac{R}{K} \qquad (12)$$

Ratio the rate of profit depends on the relationship between output per head and the real wage. if all wages are consumed and all profits are saved, the rate of profit gives the rate of capital accumulation and the rate of growth. This follows since S = I = πK and $\Delta K = \pi K$ therefor $\Delta K/K = \pi$. And if the capital output ratio is fixed, $\Delta K/K = \Delta Y/Y$:hence $\pi = \Delta K/K - \Delta Y/Y$

Variations in the rate of profit and corresponding variations in the real wage provide the mechanism that equilibrates plans to save and invest and the actual and warranted growth rate s.

If the actual growth rate equals the natural rate, the warranted and natural growth rates will also be equalised. If the real wage remains unchanged as investment takes place, however, saving cannot adapt and a greater volume of real investment cannot be financed. This is the inflation barrier in a static model. It appears, in fact, that in a static context the growth rate can only be raised at the expense of the real wage, which comes close to the pessimistic development theories of Ricardo and Marx. In a growing economy such pessimism would be unfounded because it can be seen from Equation 12 that the rate of profit and capital accumulation can rise even if the real wage is rising, as long as the growth in labour productivity exceeds the increase in the real wage.

Kaldor's model also makes saving adjust to the desired level of investment through a rise in the share of profits in national income. The model consists of three basic equations

$$Y = W + R \qquad (13)$$

$$I = S \qquad (14)$$

$$S = s_w W + s_y R \qquad (15)$$

Where R is profits. W is wages, S_W is the propensity to save out of wages and SY is the propensity to save out of profits. Using the three equations we can write

$$I = s_w\,(Y + R) + s_y R$$

$$= (s_r - s_w)\,R + s_w Y \qquad (16)$$

Making investment the independent variable in the system and dividing by Y gives

$$\frac{R}{Y} = \left(\frac{1}{S_Y - S_w}\right)\frac{I}{Y} - \frac{S_w}{S_Y - S_w} \qquad (17)$$

The ratio of profits to income and the investment ratio are positively related as long as the propensity to save out of profits exceeds the propensity to save out of wages. The investment ratio must clearly be the independent variable in the system. Capitalists can decide how much they are going to consume and invest but they cannot decide how much profit they are going to make. If SY =I and Sw =0, then I/Y = R/Y, and, multiplying both sides of Equation 17 by Y/K we have Robinson's result that the rate of profit, the rate of capital accumulation and the rate of growth are all equal A higher level of investment can raise the rate of capital accumulation by raising the profits rate and the share of saving in total income subject, of course, to the inflation barrier. The mechanism that gives this result is rising priced−relative to wages.

It is interesting to consider, using a model like Kaldor's how much inflation is necessary to raise the savings ratio by a given amount, there are two ways of approaching this, and both can be considered using the same model. One is to consider the redistributive effects of inflation through time and ask how much inflation there would have to be within a certain time period for the savings target to be achieved, holding the parameters of the model constant. The second approach is to consider what increase in the rate of inflation is required for a once and for all increase in the savings ratio of a given amount. Both methods of approach can be considered if Kaldor's model is formulated in continuous time. Taking a savings function of the Kaldor's type, S = s_wW + s_yR left

Exercises

Question on Chapter six

The choice of techniques Part A True – false questions

Circle whether the following statements are true (T) or false (F):-

1- It is certainly that saving will necessarily be converted into investment.

2- Those who want to do the investing may be different from those who want to do the saving.

3- In the early stages of development, savings may not be the major barrier to capital formation but rather an unwillingness or inability to invest.

4- Unwillingness to invest may stem from cultural attitudes or from a realistic assessment of the risks involved.

5- The financial system is important for encouraging saving , financing investment and allocating savings in the most productive manner.

6- Household and business saving is referred to as public saving.

7- Both the household and the business sector may be a source of voluntary saving

8- All forms of taxation involving involuntary reductions in consumption.

9- Money illusion 'people spend less in real terms become of rising in prices.

10- Inflation can be deliberately induced by governments financing budget deficits at full employment by monetary expansion.

11- Plans to invest in excess of plans to save at full employment will drive up the price level.

12- Low interest rate encourage voluntary saving.

13- Acc to Keynesian , the saving ratio will rise with the level of per capita income at an increasing rate

14- LDCs save so little because they are so poor.

15- If income growth is faster in one country than another, this will produce a higher saving ratio.

16- Saving is very responsive to interest rates in low income countries.

Part B : multiple – choice questions

Circle the appropriate answer:

1- Unwillingness to invest may stem from:

a) cultural attitudes. b) a realistic assessment of the risks involved.

c) a and b d) nor a either b

2- If government spends less than it receives on current expenditure: it runs

a) a budget deficit. b) a budget syrplus.

c) dissaving d) saving

3- Are saving that arise through voluntary reductions in consumption out of disposable income this means

a) involuntary saving b) voluntary saving

c) forced saving d) none of the above

4- The main determinants of the ability to save are

a) Average level of per-capita income.

b) the rate of growth of income.

c) Age composition of the population

d) All of the above

e) a and b only

5- The main determinants of the willingness to save are:

a) reliable monetary institutions

b) interest rate offered in relation to risk and time preference

c)societal attitudes towards consumption.

d) All of the above

e) a and only.

References

- Fouquin , M (2009) , Financing development, Organisation for Economic cooperation and development. The OECD observer, 34.

- Hammouda, H. B., & Osakwe, P.N. (2006), financing development in Africa: trends , issues, and challeng, s. African Trade Policy Centre.

- Kemal, A . R. (2000), financing economic development, the Pakistan Development, review, 39 (4), 293-311.

- Kregel , J. (2010), trade technology and financing for development, studi economic.

- Sy, A. N,. & Sow, M (2016), domestic resources Mobilization , and external financing: when does goverance matter? Evidence from sub-saharan Africa.

Chapter seven

The Economic Growth Models

Chapter (7)

The Economic Growth Models

We need studying the following topics

1- Harrod - Domar model

2- Kaldor's model of growth

3- Joan Robinson's model of capital accumulation

Chapter seven

Harrod Domar Model Kaldor Model

Fixed coefficients production function suppose we have only production factors capital (K) , labour (L)

K = capital stock

L = Labour

Y = real national product

A = Technological level, notice, the technological progress is neutral we can write the fixed coefficients production function as a following

Y = A min $(K/v, K/u)$

Where

V = Ratio the capital stock to production, it's constant $K/Y = V$

U = Ratio the labour to production its constant $u = L/Y$

Y = production level determinant by minimize the ratios

$(L/u , K/v)$

// Suppose dominant constant return to scale this means the double inputs result double output as follows.

If the all input increase by quantity C where $(C > 0)$ then the output increase by the same quantity

Y = A, min $(K/v, L/u)$

$= (CK/v, CL/u) = CY$

// The lost assumption for this production function with factor substitute where we assume no substitute between production factors. Because the form of this kind of production function do note allow to substitution between capital and labor for example

$$Y = A\,(K/V)^{X}\,(L/U)^{B}$$

Where $X + B = 1$

The equation of model

Harrod–Domar Model

The hypothesis

H1 (1) $K = vY$ full capacity

H2 (2) $L = uY$ full employment

H3 (3) $S = I$ equal $I = S$

H4 (4) $S = sY$ saving function $O < S <$

H5 (5) $\Delta \frac{L}{L} = n$ natural labour force growth

We can use the fixed coefficient

$Y = A \,.\, \min(K/_{v}\,,\, L/_{u})$

Suppose $A = 1$ to simple

From the first $\overline{H}$, we can result

If $K = vY$

Then $\Delta K = V\Delta Y$

From the second H_2, we can result

If $L = uy$

The $\Delta\, L = u\Delta y$

$$\frac{\Delta K}{K} = \frac{V\Delta y}{vy} = \frac{\Delta y}{y} ,$$

$$\frac{\Delta L}{L} = \frac{u\Delta y}{uy} = \frac{\Delta y}{y}$$

Model construction

When (H) K = vy , (H2) L = uy

From H1, H2

This Yo = (Ko/v , Lo/u)

Stationary state

For any change from K $(\Delta K) or\ L\ (\Delta L)$

Then we have

(H)1 $\Delta K = V\Delta y$

(H)2 $\Delta L = U\Delta y$

By divide (H1) , (H2) on (H1) , (H2) we can get the rate of growth as following

$$\frac{\Delta K}{K} = \frac{V\Delta y}{vy} = \frac{\Delta y}{y}$$

$$\frac{\Delta L}{L} = \frac{u\Delta y}{uy} = \frac{\Delta y}{y}$$

$$\frac{\Delta K}{K} = \frac{\Delta L}{L} = \frac{\Delta y}{y}$$

We know $\Delta K = I$

From H3 I = S

From H4 S = sy

Then $\Delta K = V\Delta Y = I = S = sy$

$$V\Delta Y = sy$$

Marginal S/v = $= \frac{\Delta y}{y}$

Propensity to save

Because $Hs \quad \frac{\Delta L}{L}$ = N

Then $$\frac{\Delta L}{L} = \frac{\Delta y}{y} = N$$

This is the $S/_V$ = N

Equilibrium condition

Staple condition

Suppose you have the following values for Harrod– Domar Model

V = 5 U = 10 S = 0.10 n = 0.02

L_o = 40 K_O = 20

Calculate the real values for (L) , (K) , (Y) and equilibrium state for both (0) , (1) period

From

H1 K = vy = 5y

H2 L = uy = 10y

H3 S = 0.10 y

H5 Δ L/L = n = 0.02

Then

$$Y_o = \min\left(K/_5\ ,\ L/_{10}\right)$$

$$= \left(20/_5\ ,\ 40/_{10}\right) \qquad = \min(4,4) = 4$$

Ko = v y_o = 5(4) = 20

Lo = u y_o = 10 (4) = 40

The values in period 1

From the H3 S = I

Where S_o = 0.10 (y_o) = 0.4

But S = I

When ΔK = Io = So = 0.4

Then the capital stock in next period (K_1)

$$K_1 = K_o + \Delta K$$

$$= 20 + 0.4 = 20.4$$

And n = 0.02

Where Δ L /L = 0.02

this mean $\Delta L = 0.021$

$$L_1 = L_o + \Delta L \quad = 40 + 0.2\ (40) = 40.8$$

The new equilibrium level of Y_1

$$Y_1 = \text{then } \frac{20.4}{5}\ ,\ \frac{40.8}{10} = (4.08\ ,\ 4.08) = (4.08)$$

The model is stable

In the other hand

The demand on labour force in period is

$$Ld_1 = 10y_1 = 10\ (4.08) = 40.8$$

Then $Ls_1 = Ld_1$

Because $Ls_1 = L_0 + \Delta L = 40 + 0.02\ (40) = 40.8$

$$Kd_1 = 5\ (y_1) = 5\ (4.08) = 20.4$$

$$Ks_1 = K_o + \Delta K = 20 + 0.4 = 20.4$$

Then the planned rate of growth equal with actual rate of growth

Where S/V = n $\frac{0.10}{5} = 0.02$ = n

period	Y	L	K	case
0	4	40	20	stabile
1	40.8	40.8	20.4	stabile

Suppose the n ratio change from 0.02 to 0.03 or L3 then the labour supply increase than labour demand the result its unemployment

We know from period (o) data

$$\frac{\Delta L}{L} = n = 0{,}03 \quad \Delta L \qquad = L\,(n)$$

Then $\quad \Delta L = (0.03)(40) \qquad = 1.2$

Then $\quad L_1 = L_0 + \Delta L \qquad = 40 + 1.2 = 41.2$

also $\quad K_1 = K_0 + \Delta K \qquad = 20 + 0.4 = 20.4$

$$Y_1 = \min\ {}^{20.4}\!/_{5} \quad , \quad {}^{41.2}\!/_{10} \quad = 4.08\ , 4.12 \quad = 4.08$$

period	Y	L	K	The Model Care
0	4	40	20	Stabile
1	40.8	41.8	20.4	Labor surplus

We note the

$$Kd_1 \;= 5(4.04) = 20.2$$

While $Ks_1 \;= K_0 + \Delta K = 20.4$

Then the model instable because it in the capital surplus case

Kaldor Model

$$Y = w + p \qquad (1)$$

Where $\qquad w = \text{wages}$

P $=$ profit

S $= Sw$ W $+$ sp P (2)

Divided By y

$$\frac{S}{Y} = \text{Sw} \quad (w/y) \quad + \quad \text{sp} \quad (p/y)$$

The Ratio of Saving to Income | the share of the wage from the income | the share of the profit from the income

S $=$ Sw $({}^{w}/_{y})$ $+$ sp $({}^{p}/_{y})$ (3)

But

$$y = w + P$$

then $$\frac{y}{Y} = \frac{w}{Y} + \frac{w}{Y}$$

$$1 = {}^{w}/_{y} + {}^{p}/_{y}$$

$({}^{w}/_{y})$ $= 1 - ({}^{p}/_{y})$ (4)

From (3) and (4)

Then S $=$ sw $-$ $(1-({}^{p}/_{y}) +$ sp $({}^{p}/_{y})$

$$S = sw - (^{p}/_{y}) + sp\ (^{p}/_{y})$$

$$S = sw + [sp - sw]\ (^{p}/_{y}) \qquad (5)$$

Now we can use the Kaldor's saving function to treatment the instable in harried dormer model

Suppose we have Kaldor's saving function as follows

$$sw = 0.02 \qquad sp = 0.42$$

$$^{p}/_{y} = 0.20 \qquad ^{w}/_{y} = 0.80$$

By using the Kaldor model we can transform the isstable harried dormer model to stable or equilibrium by using Kaldor's saving function. We can do it by redistribute the income between wages and profit to increase the saving ratio from 0.10 to 0.15 where this value allow to real equilibrium dynamically as follows

$$^{S}/_{V} = n$$

$$S = n.v \qquad = 0.03 \times 5 = 0.15$$

$$S = sw + [\ sp - sw]\ (^{p}/_{y})$$

$$0.15 = 0.02 + [\ 0.42 - 0.02]\ (^{p}/_{y})$$

$$0.13 = 0.4\ (^{p}/_{y})$$

$$(^{p}/_{y}) = \frac{0.15}{0.4} = 0.326 \qquad \text{or } \%32.6$$

Then $\quad ^{w}/_{y} = \%67.5$

Now we can write the results as follows

$\Delta K = I = S = 0.15y = 0.15 \times 4 = 0.6$

$K_1 = 20 + 0.6 = 20.6$

$Y_1 = \min \quad ^{20.6}/_{5} \ , ^{41.2}/_{10} = \min\ [\ 41.2\ ,\ 41.2] = 4.12$

We note the surplus labour is delete where the demand for labour become

$Ld_1 \qquad = uy$

$\qquad = 10 \times 4.12 = 41.2$

Also $Ls_1 \qquad = Lo + \Delta L$

$\qquad = 40 + 0.03\ (40) = 41.2$

Then we can result the Model stable and $^{S}/_{V} = n \quad$ or $\frac{0.15}{0.4} = 0.03$

The new result table

period	Y	L	K	case
(0)	4	40	20	stabile
(1)	40.2	41.2	20.6	Labour surplus

Kaldor's Model of growth

The neo classical models treat the causation of technical progress as completely exogenous. But Kaldor attempts to provide a framework for relating the genesis of technical progress to capital accumulation.

Assumptions

The assumption of Kaldor's model are follows:

(1) It is based on the Keynesian full employment assumption in which the short – period supply of aggregate goods and services is inelastic and irresponsive to any increase in money demand

At point P the percentage rate of growth of capital and the percentage rate of output (income) are equal.

(2) Income consists of wages and profits where wages comprise salaries and earning of manual labour and profits comprise incomes of entrepreneurs as well as property owners.

(3) Total saving consists of savings out of wages and savings out of profits.

(4) It is assumed that the share of profits in total income is a function of investment, given the propensity to save out of profits.

(5) All macro–economic concepts of income, wages profits capital saving and investment used in the model are expressed at constant prices

(6) kaldor assumes as investment function which makes investment of any period partly a function of the change in output and partly of the change in the rate of profit on capital in the previous period

For the operation of the model Kaldor postulates three functions:

The savings function

$$S_1 = \propto P_{t-1} + \beta \, (Y_{t-1} - P_{t-1}) \qquad (1)$$

Where savings S_t consist of savings ($\propto$) out of profits (P_{t-1}) and savings (β) out of wages $Y_{t-1} - P_{t-1}$ in period t . The inqualities $1 > \propto \beta \geq o$ show that $\propto$ and β lie between 0 and 1 and that $\propto$ (savings out of profits) is greater than β (savings out wages).

Investment function

$$K_t = \bar{\propto} P_{t-1} + \bar{\beta} \left(\frac{P_{t-1}}{K_{t-1}}\right) \quad Y_{t-1} \qquad (2)$$

$$I_1 = K_t - K_t \qquad (2.1)$$

Where

$$\bar{\propto} > 0 \text{ and } \bar{\beta} > 0$$

Equation (2) shows that the stock of capital (K_t) at time t is a coefficient $\bar{\propto}$ of the output of the previous period (Y_{t-1}) and a coefficient β of the rate of profit on capital of the period $\frac{P_{t-1}}{K_{t-1}}$ multiplied by the output of the previousY_{t-1}.

In equation 2.1 shows the investment function where invest in period t equals the stock of capital in the previous period (K_{t-1}) minus the stock of capital in the current period(K_t)

The inequalities $\bar{\propto} > 0$ and$\bar{\beta} > 0$ reveal that the value of the coefficient $\overline{\propto\alpha}$ and $\bar{\beta}$ are greater than zero.

Technical progress function

$$\frac{Y_t - P_{t-1}}{Y_{t-1}} = \bar{\bar{\propto}} + \bar{\bar{\beta}} \qquad \frac{I_t}{K_t} \qquad (3)$$

Where

$$\bar{\bar{\propto}} > 0 \ , 1 > \bar{\bar{\beta}} > 0$$

Equation (3) shows that the rate of growth of income (and labour productivity) is an increasing function of the rate of net investment expressed as the proportion of the stock of capital (I_t/K_t) in period t multiplied by the capital per head β plus the coefficient of technical progress $\propto$. Here the value of the coefficient of technical progress in greater than zero but of capital per head lies between 0 and 1.

The technical progress function as gives by equation (3) shows the growth of income and capital from periodt_1 onwards whereby the economy gradually moves from a short period equilibrium to a long period equilibrium of steady growth taking the identity $S_t \equiv I_t$ it is the level of profits which brings about the equality of saving and investment for a stable equilibrium path, the following condition should be fulfilled.

Question

Prove that the rate growth the optimal rate of growth which the economy couch the stability situation

$S_t = 40$ $Y_{t^{-1}} = 385$ $P_t = 20$ $K_{t^{-1}} = 760$ $\ltimes = 0.4$ $\beta = 0.08$ $\bar{\bar{\ltimes}} = 0.02$ $\bar{\bar{\beta}} = 1.4$

The answer

$$S_t = \ltimes \ P_t + \beta \ (Y_t - P_t)$$

$40 = 0.4(20) + 0.08\ (Y_t - 20)$

$40 = 8 + 0.08\ Y_t - 1.6$

$40 - 8 + 1.6 = 0.08\ Y_t$

$$Y_t \frac{33.6}{0.08} = 420$$

$s_t = I_t$

$$I_t = 40$$

$I_t = K_t - K_{t^{-1}}$

$$K_t = K_{t^{-1}} + I_t$$

$$K_t = 760 + 40 = 800$$

$$\frac{I_t}{K_t} = \frac{40}{800} = 0.05$$

But $\frac{\Delta Y}{Y} = \frac{Y_t - Y_{t-1}}{800} = \frac{800-800}{385} = \frac{35}{385} = 0.08$

We know from the technical progress function

$$\frac{Y_t - Y_{t-1}}{Y_{t-1}} = \overline{\overline{\propto}} + \overline{\overline{\beta}} \quad \frac{I_t}{K_t}$$

By substitute the above result

$$0.09 = 0.02 + 1.4\ (0.05)$$

$$0.09 = 0.02 + 0.07 \text{ It} = 40$$

By $I_t = 40 \quad K_t = 800$ can reach the stable equilibrium growth

Joan Robinson 's model of |Capital accumulation

Assumption: Mrs. Robinson's model is based upon the following assumptions:

(a) There is a laissez faire closed economy

(b) In such as economy capital and labour are the only productive factors

(c) Total savings consist of savings out of wages and savings out profits

(d) There is neutral technical progress

(e) There are only two classic – the workers and the entrepreneurs between whom the national income is distributed

(f) Workers save nothing and spend their wage income on consumption.

(g) Entrepreneurs consume nothing but save and invest their entire income (from profits) from capital formation if they have no profits the entrepreneurs cannot accumulate and if they do not accumulate they have no profits.

(h) There are no changes in the price level

Net national income income in the Robinson model is the sum of the total wage bill plus total profits which shown y = w N + pK

Where Y is the net national income, w the real wage rate, N the number of workers employed P the profit rate and K the amount of capital

Here Y is a function of N and K. since the profit rate is crucial in the theory of accumulation. it can be shown as

$$P = \frac{Y - w\,N}{K}$$

Divided by N $\quad P = \dfrac{\frac{Y}{N} - wN}{\frac{K}{N}}$

By putting Y/ N = L and K/ N = θ (theta) We have

$$P = \frac{L - w}{\theta}$$

Thus the profits rate in the ratio of labour productivity minus the total real wage rate to the amount of capital utilized per unit of labour, is other word, the profit rate (P) depends on the income, labour productivity (L) , the real wage rate (w) and the capital–labour ratio (θ)

On the expenditure side, net national income (Y) equals consumption expenditure (C) plus investment expenditure (I)

Y = C + I

Since Joan Robinson assumes zero saving out of wages but attributes saving to entrepreneurs profits are meant for investment only we have

S = I

The saving investment relation may be shown as

S = PK

And I = ΔK [ΔK is increase in real capital]

[S = I]

PK = ΔK

Or $$P = \frac{\Delta K}{K} = \frac{L - w}{\theta}$$

The growth rate of capital ($\Delta K/K$) being equal to P) the profit rate), it depends on the ratio of the return on capital relative to the given stock of capital.

The Golden Age

Besides the growth rate of capital $(\Delta K/K)$, another factor which determines the growth rate of an economy is the growth rate of population $(\Delta N/N)$. when the growth rate of population equals the growth rate of capital I.e., $\Delta N/N = \Delta K/K$ the economy is in full employment equilibrium.

The golden age is explained diagram matically in figure No.1, capital – labour ratio K/N or θ Along the horizontal axis and per capital output on the vertical axis.

The growth rate of labour force is taken to the left of along the horizontal axis , the curve of shown the production function, every point on this curve shows the ratio of capital to labour in order to find out the capital – labour ratio and the wage – profit relation , we draw a tangent NT which touches the production function OP. At point G and cuts vertical axis at w. point G shows the capital –labour ratio for the golden age which is measured by ok, per capita output is OA , out of this OW is paid as wages and WA or EG is the surplus which is the rate of profit on capital.

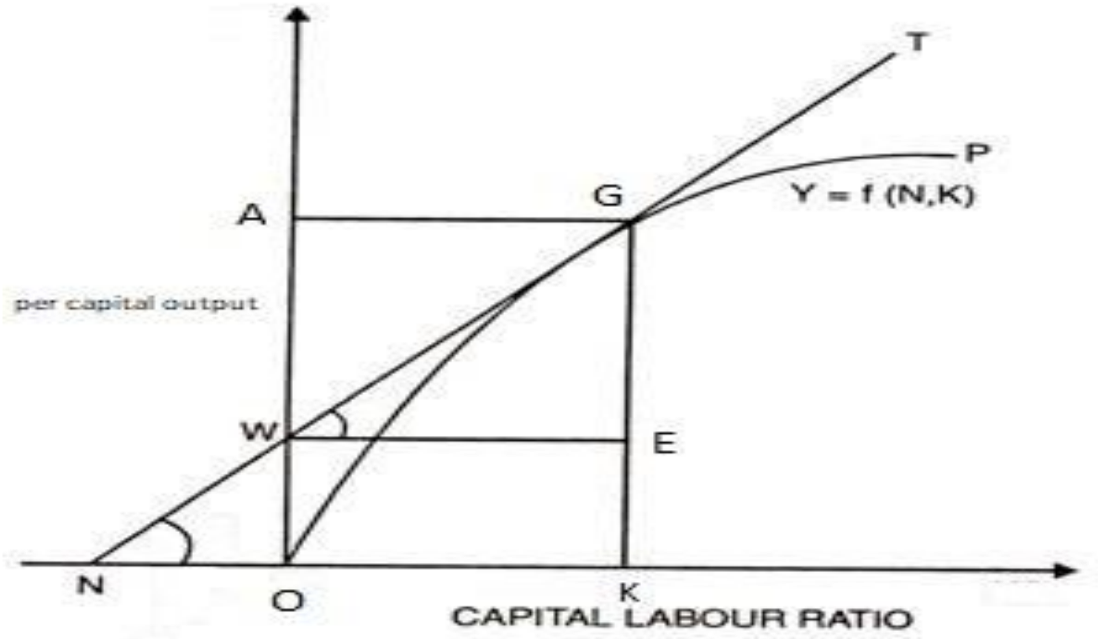


Fig. 1

This figure also proves that the growth rate of capital $(\Delta K/K)$ equals the growth rate of labour $(\Delta N/N)$,where EG/EW reflects $\Delta K/K$, and OW/ON reflects N/N

Thus

$\frac{EG}{EW} = \frac{OW}{ON}$ where [tan ∝ tan =β]

According to Mrs Robinson a economy is in a golden age when the potential growth ratio is being realized. The potential growth ratio represents the highest rate of capital accumulation that can be permanently maintained at a constant rate of profit. This potential growth ratio is approximately equal to the proportionate rate of labour force plus the proportionate rate of growth of output per head

A critical appraisal

(1) Mrs Robinson assumes that capital and labour are employed in fixed proportions to produce a given output. This is an unrealistic assumption because in a dynamic economy there are no fixed coefficients of production rather substitutability between capital and labour takes place through time. The degree of substitutability being dependent upon the nature of technological changes

(2) This model is based on the unrealistic assumption of constant price level , when an economy moves on the path to progress, investment has to be increased continuously which tends to raise the demand , this leads to rise I prices, thus price rise is inevitable with growth.

(3) Joan Robinson's Model is based on the assumption of a closed economy. But this is an unrealistic assumption because capitalist countries are open rather than closed economies in which foreign trade plays a crucial role in accelerating the growth rate

Question

Suppose you have the following gives

$$\frac{\Delta K}{K} = 0.02 \qquad Y = 120 \qquad N = 20 \qquad w = 2$$

Calculate the capital stock (K) which economy reach the golden age or stable equilibrium

Answer

In the golden age situation

$$\frac{\Delta L}{L} = \frac{\Delta K}{K}$$

$$0.02 = \frac{\Delta K}{K}$$

$$\Delta K = 0.02K$$

We known S = PK

And S = I in golden age situation

And I = ΔK

$$\Delta K = PK$$

P = $\frac{\Delta K}{K}$

If $P = \frac{L - w}{\theta}$

Where $L = \frac{Y}{N} = \frac{120}{20} = 6$

$$P = \frac{\frac{Y}{N} - w}{\frac{K}{N}}$$

$$0.02 = \frac{6 - 2}{\frac{K}{20}}$$

$$= 2 \times \frac{20}{K}$$

$$0.02\,K = 80$$

$$\boxed{K = \frac{80}{0.02} = 4000}$$

Exercises

Questions on Chapter seven

The economic growth models

The choice of techniques Part A True – false questions

Circle whether the following statements are true (T) or false (F):-

1- According to the Harrod-Domar model a higher savings rate increases the rate of growth of per capita income.

2- The Harrod-Domar predicts the neutrality of growth rates with respect to per capita income

3- We can use the Kaldor's saving function to treatment the instable in harried dormer model.

4- The one of assumptions of Kaldor's model is that the short-period supply of aggregate goods and services is elastic and irresponsive to any increase in monetary demand

5- The one of assumptions of Kaldor's model is that the percentage rate of growth of capital and the percentage rate of output (income) are equal.

Part B: multiple – choice questions

Circle the appropriate answer:

1- Harrod-Domar growth model suggests that growth is

a) directly related to savings and inversely related to the capital/ output ratio

b) directly related to the capital/ output ratio and inversely related to savings

c) indirectly related to savings and the capital/ output ratio

d) directly related to savings and the capital/ output ratio

2- Which one of the followings is Not an assumption of the Harrod – Domar model?

a) fixed capital –output ratio

b) variable marginal and average propensity to save

c) closed economy

d) capital is the only factor of production

3- Which among the following statements is not true for the golden Age equilibrium in the growth model of MRs. Joan Robinson?

a) rate of profit treads to be ruing

b) level of real wages rise without per worker

c) technical progress is natural

d) population in growing at a steady rate.

4- Joan Robinson's growth model deals with

a) desired growth rate

b) possible growth rate

c) natural growth rate

d) warranted growth rate (June)

5) A technical change is neutral if remains unchanged at constant ratio: (June)

a) Kaldor b) Harrod c) Hicks d) Solow

6- The classical model of economic development emphasizes

a) capital accumulation

b) laissez faire policy

c) both a and b are correct

d) Question does not provide sufficient data or is vague

Pat C : Problems

1- Suppose you have the following value for Harrod- Domar model

V = 12 U = 24 K0 = 36

L0 = 72 S = 0.36 n = 0.03

Required

a) The real value of YO is

b) The real value of YI is

c) The real value of supplied KI is

d) The real value of supplied LI is

e) The real value of demand K1 is

f) The real value of demand LI is

2- Suppose the n value increase to n = 0.05

a) Then the real value of supplied L1 is

b) And new real value of supplied KI is

c) The real value of YI is

d) The new real value of demanded KI is

e) The new real value of demanded L1 is

f) The calculation of unemployment is L factor is

3- Suppose the n value decrease to n = 0.01 then

a) The new value of supplied L1 is

b) The new value of supplied KI is

c) The new value of Y1 is

d) The new value of demanded KI is

e) The value of capital surplus is

4- We can use Kaldor saving function to treatment the instability in Harrod- Domar where SP = 0.90 sw -0.10

a) Then when n-0.05 the saving percent must be

b) The new value of YI is

c) The ratio of total profit to output is

d) And ratio of total wages to output is

e) When n -0.01 the saving percent must be

f) And new value of Y1 is

g) The ratio of profit to output is

h) The ratio of wages to output is

References

- Acemoglu, D. (2012), **introduction to economic growth**, journal of economic theory, 147(2), 545-550

- Davidson, C (2000) **economics growth and the environment alternatives to the limits paradigm**, bioscience, 50 (5), 433-440.

- Hongyu, L., Park , y. W., 4 siqi , Z (2002), **the interaction between housing investment and economic growth in china**, international real estate review, 5 (1) , 40-60.

- Pieroni L. (2009), **military expenditure and economic growth**, defence and peace economics, 20(4), 327-339.

- Ventura, J. (2005), **A global view of economic growth**, in Handbook of economic growth (Vol. 1 , PP. 1419-1497)Elsevier.

Chapter eight

The "Magnificent Dynamics" of Smith and Malthus

Chapter eight

The "Magnificent Dynamics" of Smith and Malthus

In The Wealth of Nations (1776), Adam Smith wrote a handbook of economic development. Achievement-oriented, Smith preached the great efficiency that comes from specialization, division of labor, and exchange. He stressed the need to remove the blundering hand of mercantilistic governments; to cultivate attitudes of honesty, zeal, and thriftiness; to unleash the competitive profit motive, which would-as if led by an Invisible Hand-achieve the maximum well-being of all.

Labor Theory of Value in a Golden Age Smith had also a theory of dynamic development. He and Malthus began with a hypothetical golden age- "that original state of things, which precedes both the appropriation of land and the accumulation of stock-when labor alone counted, when land was freely available to all, and before the use of capital had begun. What determined pricing and distribution in this simple and timeless dawn?

Answer: The undiluted labor theory of value.

To see this, consider once again Smith's famous case of deer and beaver. Suppose 2 hours of hunting yields 1 deer; or 4 hours yields 1 beaver. Then the competitive price ratio of exchange between deer and beaver will be set by comparative labor time alone: the price of 1 beaver will equal 2 deer. Why 2 deer per beaver? Because the price ratio can be computed in necessary labor time as 4 hours (of sweaty work)/2 hours (of sweaty work).

The determination of price by labor cost alone would apply no matter how many goods there were. It is still true that supply and demand are operating in this golden age; but the situation is so simple that we do not need elaborate dd and ss curves. The long-run ss curves for the different goods are simple horizontal lines at the stated labor costs; so long as there is enough demand to have the goods produced at all, labor costs will be determining of prices.[25]

Population Growth Now consider Smith-Malthus dynamics. Life is pleasant in the golden age. Babies are born, and the population doubles every 25 years. Since land is plentiful, people move west and spill over onto more acres. National output exactly doubles as population doubles. Price ratios of deer and beaver remain exactly as before.

What about real wages? Real wages still get all the national income, there being as yet no subtractions for land rent or interest on capital.

What is the real wage per hour? So long as land can expand proportionally to the expansion of labor, the law of diminishing returns cannot come into operation. The wage rate per hour remains at one-half deer or at one-fourth beaver, as determined by labor productivity.

That would be the end of the story until, say, some clever inventor found a new way of doing in 1 hour what used to take 2 hours. This would raise the national product per capita. Such a balanced improvement

[25] Note: demand is still there in the background, thus, if it would cost 10 hours to hunt a skunk, and yet nobody received any utility from skunks, skunks would not be hunted and not be bought and sold at a price of 10 hours, or of 5 deer.

would leave the price ratio of beaver to deer unchanged; but it would double the real wage rate. In the rude dawn of the undiluted labor theory of value, inventions can only raise wages and speed the pace of balanced expansion

Scarce Land and Diminishing Returns Even had golden ages ever existed; they could not have lasted once all land became fully populated. Malthus pointed to a fatal flaw in the happily expanding economy, Once the frontier of virgin land disappears, new laborers begin to crowd onto existing cultivated soils. For the first time, private property in land springs up. Now land is scarce, and a rent is charged to ration it.

Growth does take place in this new classical world of Smith-Malthus following on the golden age. Population still grows, and so does national product. But product can no longer grow proportionally to labor. Why? Because, with new laborers added to fixed land, each worker now has less land to work with. Naturally, therefore, the law of diminishing comes into operation. The increasing labor-land and decreasing output-land ratios mean a declining contribution to product of each last (or marginal) worker, and hence declining real wage rates. As David Ricardo essentially pointed out:

A conflict of interests arises between classes. More babies mean lower per capita incomes and wage rates; lower wage rates mean higher rent rates per acre of land. Landlords gain as labor loses. This is why Carlyle criticized economics as the "dismal science."

"To understand the brute fact of economic inequality, we have to jettison the simple labor theory of value and study the effects of scarcity in the productive factors that labor needs access to.

Paradise Lost and Regained How bad can things get? Gloomy Malthus thought, at least in his first edition of 1798, that the end of economic development could be an equilibrium only down at the minimum level of subsistence.

Above this subsistence wage, population would continue to grow. Below it, population would die off. Only at this level could there be lasting equilibrium.

Biological fecundity was a fact of nature. And diminishing returns was a fact of nature. Only sentimentalists could refuse to face the sad facts of life prevailing once Adam and Eve left Eden.

It is for precisely these reasons that Adam Smith had earlier said: Lucky is a nation that is growing rapidly, for it has not yet made its sad rendezvous with its destined equilibrium at the minimum of subsistence. Sad is that nation which has reached the stationary equilibrium of the subsistence level, where deaths just cancel out births.

What did Malthus (and Smith) forget, or at least underestimate? Malthus failed to realize how technical innovation could intervene–not to repeal the law of diminishing returns, but to more than offset it. He stood at the brink of a new century and failed to anticipate that the succeeding two centuries would show the greatest scientific gains in history–a chastening fact, well to keep in mind as one listens to the Club of Rome computer as it sings out its Malthusian dirge.

Detailed Economic Analysis of Smith-Malthus

To understand the world's population problem for the next centuries-and the problems of India, Indonesia, and China in the next two decades-we must master the above classical model, which may have more future relevance for the world than it has had for the West since Malthus time. As a bonus, the same graphical tools will apply when we investigate the role of capital formation as a factor of growth for Germany, Japan, the United States, and the less developed countries.

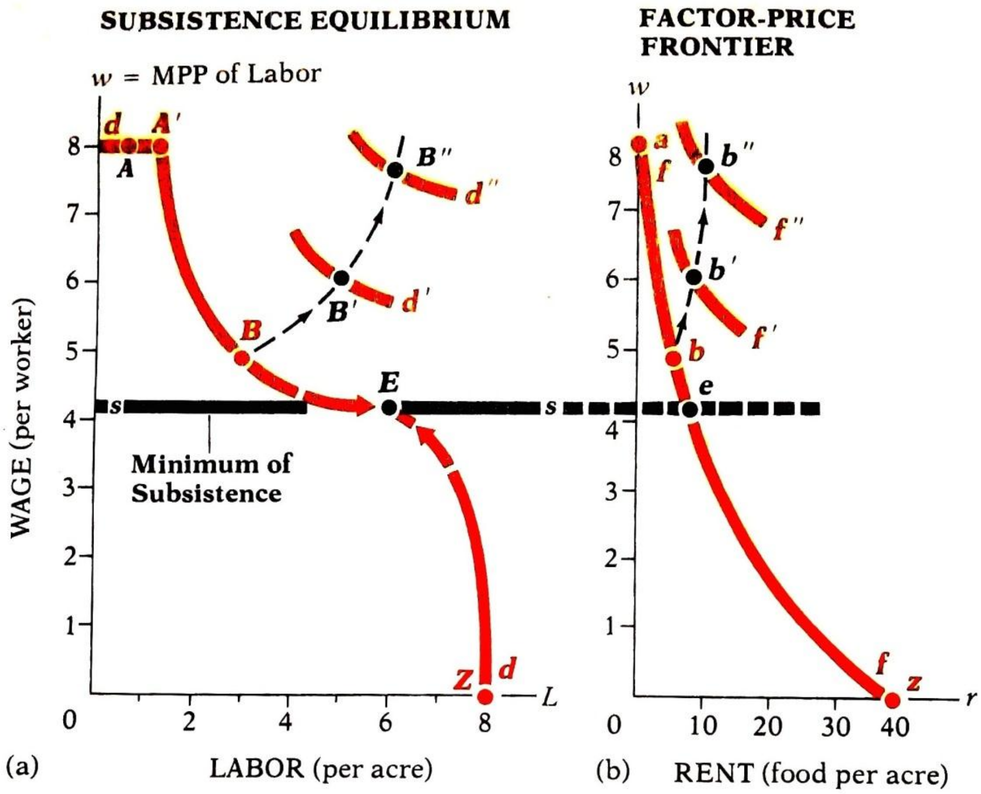
Figure 1 depicts all this. In Fig. 1(a), all the land is settled once A' is reached. Beyond that, We see the wage rate declining as the law of diminishing returns pushes labor's marginal productivity downward along orange dd (which goes through d, A', B, E, and Z).

What keeps the wage from falling down to zero on this dd demand curve for labor? Actually, the wage stops falling where dd intersects the black ss horizontal supply curve set by the minimum wage at which people can subsist and just barely reproduce their numbers. The Malthusian final equilibrium at E is a gloomy one, anything but golden.

Gloomy or not, it does represent a stable equilibrium. Test it.

Let a plague temporarily reduce numbers, moving us to the left of E. Real wages then become high (as they actually did after the Great

Plague of 1665), standing at a point on the dd curve above E, But the system cannot stay there, With wages high enough to cause population to grow, we again move gradually back toward the equilibrium at E, as shown by the converging orange arrows. (Note that a temporary growth of population beyond E, as from a temporary run of good harvests, soon induces a wage rate so much below subsistence as to kill people off until the arrow moves us up dd back to E.)



FIG, 1

Numbers grow until Malthusian state of minimum subsistence is reached

Population growtlh moves us from the golden age of A, A', and a-down the diminishing-returns marginal-product curve dd to the Malthusian equllibrium at intersection with black ss supply curve of subsistence wage, The fall in real wage rate from a to b to e implies rising rent rates along the orange "factor-price frontier" ff. Because inventions shift dd and ff upward and rightward, historically the real wage rose from B to B' to B" levels, with rent also rising from b to b' to b".

Figure 1(b) shows that the rent rate per acre rises as the wage rate per hour falls." On what may be called "the factor-price frontier" (shown as orange ff), landlords are seen to be better off at the high-rent Malthusian subsistence equilibrium e than they were in the earlier golden age at a.

No wonder some landlords greeted with joy the introduction of the white potato, which enabled people to live on cheaper calories, and hence in effect lowered the old ss subsistence curve and raised equilibrium rents. And no wonder some self-centered landlords regarded the spreading of birth-control information as a threat to their own standards of living. One person's slavery is another person's comfort.

Land Rent Ends the Labor Theory of Value

The simple labor theory of value, which said that the price ratios of goods can be predicted from labor costs alone independently of the marginal utilities that bring out a demand for the goods, thus must be dropped to account for the facts of land scarcity. Costs of production now include rent as well as wage payments. Two goods, like food and clothing, may now have equal labor costs per unit; but if food requires more land cost per unit than clothing does, they will no longer sell on a one-to-one basis.

Worse than that from the standpoint of an advocate of a labor theory of value, suppose that people in a socialistic or capitalistic state shift their demand toward producing more food and less clothing. This makes the price of food rise relative to that of clothing. Why? Because food requires more land per worker than clothing does. Hence, the fixed land becomes more scarce when people want more of the product that is "land-intensive," thereby bidding up rent at expense of the wage.

Under neither planned socialism nor market capitalism can we succeed in predicting actual (or needed) commodity prices from labor requirements alone, taking no account of the pattern of tastes and demand and its effects on scarcity of nonlabor factors.

What about labor's right to all the product? Labor is the only input that is human and can sweat, laugh, cry, and pray. True, yet, even though dirt cannot sweat or cry, it does contribute toward the going of potatoes and, when scarce, does need to be economized in the good society.

If you want to make a logical case for labor's being "exploited" you need not handicap yourself by a simple labor theory of value, you may challenge the title to land of those who call themselves landlords and their right to rents. You may claim that only the peasants have a valid title to the land and to rent, or that only the state has valid title.

Who receives rents is an ethical or legal problem. But whatever its solution, rational use of land does require that a rent cost be charged the consumers who buy its products and the factors that are best fitted to work with it.

Technical Advance and Classical Growth Theory

As mentioned, real wages have risen historically, not fallen. Population has not stabilized at subsistence levels. Land rents per acre have risen surprisingly little and, relative to other factor-prices, have actually declined. It is evident that life has not consisted of a movement down an unchanged factor-price frontier or a marginal-product curve.

Inventions of science, of engineering, and of managerial practice have shifted the curves of Fig 1 rightward and upward. The black lines of progress-BB'B" and bb'b"-show the actual course of history. The reader is invited to draw the shifted dd and factor-price frontiers that run through B' or B" and through b' or b". Such shifts have more than won the race with diminishing returns, making the Malthusian equilibrium point of subsistence unrealistic in Western economies so far. (so far!)

Not all inventions are even-handedly favorable to labor and to land. Thus, inventions which help to drain swamps or to grow more food on poor acres of land might help wages more than they help rents. Some economists would call these "land-saving inventions." In contrast, any inventions that tended to raise rents more than wages, thereby tending to increase landlords share of GNP, might be called "labor-saving inventions." In between would be the case of inventions that raised both factor returns by the same percentage, leaving relative shares of GNP unchanged: these might be called "'neutral inventions." In the history of the West, inventions have appeared to be land-saving on balance.

The ghost of Thomas Carlyle should be relieved to know that economics, after all, has not been a dismal science-in the advanced and advancing world.

Ricardo-Marx-Solow° Models of Capital Accumulation

So far we have stressed the classical preoccupation with scarce land. In the remainder of this chapter, we shall survey the more important model of capital and labor, pushing land to the side as being less important for the developed part of the world. We can now use much the same tools in a simplified two-factor model.

Basic assumption of capital–labor model: One productive factor grows relative to the other. Now population will be regarded primarily as a noneconomic variable, being stationary (or growing slowly for sociological reasons). Successful accumulation will make capital the varying factor. In an oversimplified model where output is produced by a relatively fixed and a relatively varying factor, the law of diminishing returns sets in.

The return of the augmented factor falls; the return of the relatively scarce labor factor rises. In absence of technical change, a stationary state of equilibrium is ultimately approached.

Notions of Capital It is now capital, written as K, that is the factor growing relative to labor, L. Capital goods consist of a great variety of things: machines of various kinds, plants and houses, tools, raw materials and goods in process (seed grain, growing wheat plants, harvested wheat, flour, dough, warm loaves, wrapped and delivered bread), and canned and frozen edibles.

Society can sum the market values of these physical goods to get total wealth or total capital value; but it cannot command a million dollars of electric generators to transmute themselves into a million dollars of oil–refining equipment. It is true, however, that as generators wear out, the resources which could have gone to replacing them can be shifted to turn out extra refining equipment. The financial counterpart of this physical alchemy is to have investors in the generator industry take the money funds accruing on account of depreciation there and transfer them over to finance extra investment in the equipment industry. Result:

although the total balance sheet of money capital may show a practically unchanged total and although the national-income statistician shows only a cancellation of one kind of disinvestment against another kind of investment, still society has managed to change the physical composition of its capital stock without undergoing any change in current consumption of goods.

To give the idealized or stylized story of development all the rope it needs, we shall oversimplify as all the statisticians and economic historians do, we shall work with an index number of real capital goods, K, supposing that its return is the rate of interest or profit.

Effects of Capital Deepening What happens to per capita output when capital grows relative to labor-that is, when capital "deepens"? Recall what happened to output per acre when labor grew relative to land. Output grew less than proportionally to the growth in the varying factor (labor), and its factor-price (the wage) had to fall. A similar law of diminishing returns comes into operation in our oversimplified model whenever one factor (such as capital) grows faster than the other (such as labor) with innovation absent:

1. Output will not grow in proportion to the growth in the capital stock.

2. The return to capital, the interest rate per annum, will fall as capital deepens. (Or, what is the same thing if we rule out risk and technical change, the profit rate will fall.)

3 What happens to the wage rate now that each person works with more capital goods and with the more intricate capital goods that the

economy can now afford in the environment of a lower interest and profit rate? Just as the rent earned by relatively scarce land rose in Fig. 1, here the competitive wage return to relatively scarce labor will rise, as workers become worth more to capitalists and meet with spirited bidding up of their market wage rates. (Note: Competition, not altruism, is at work.)

4. Higher wage rates and lower interest rates do not necessarily imply a higher percentage share for labor at the expense of the percentage share of capitalists. Why not? Because the increase in capital relative to labor might offset (or even more than offset) the decline in the interest rate and the rise in the real wage.

5. Finally, since output (per capita or total) grew less than in proportion to the increase in capital (per capita or total), the capital–output ratio would rise in the absence of technical change (e.g., from capital value being 3 times annual GNP up to $3\frac{1}{2}$ times).

Here is a final summary:

Deepening of capital (no technical inventions): Capital/labor up; capital/output up; interest or profit rate down; wage rate up.

Deepening of Capital in Diagram Form

Figure 2(a) and (b) are like Fig. 1(a) and (b). But now capital is the relatively growing factor. Capital's amount per capita is given on the horizontal axis of (a), and its interest or profit return goes on the vertical axes. And now labor is the relatively fixed factor, and its wage goes on the horizontal axis of (b) just the way land rent did in Fig 1(b).

In the absence of technical change, capital accumulation takes us down the orange dd curve from A to B (and perhaps ultimately to the Ricardian equilibrium point E at which people feel it no longer pays them to save any per cent of their incomes for enhanced future consumption). On the factor-price frontier ff in Fig. 2(b), society can successively be at a; or it can be at b with the higher wage rate and lower interest rate that are implied by an augmented capital stock (more machines available of every kind per man); or it can be at e with a still higher capital-output and capital-labor ratio, The earlier literary summary of the effects of capital deepening is verified by these graphs.

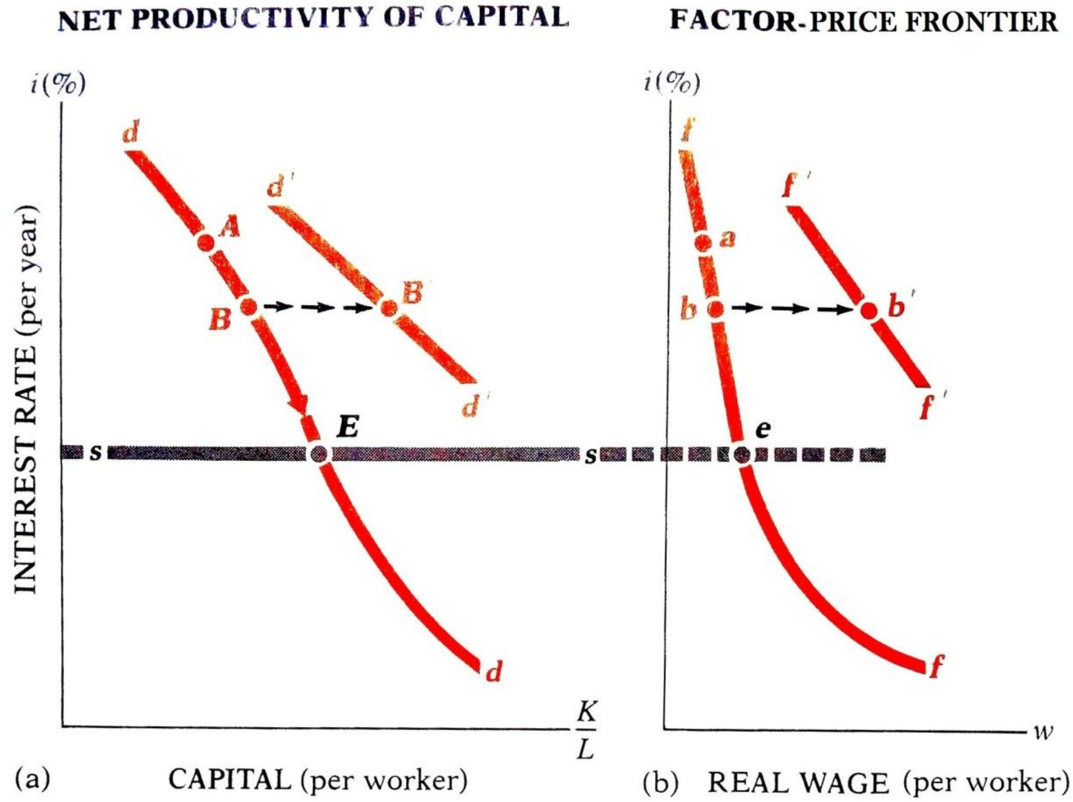


FIG. 2

Accumulation lifts real,output and wage, and it depresses interest or profit rate

Adding more and a greater variety of capital goods to fixed labor will, in the absence of technical change, add less and less to total product, causing interest rate earned to fall along dd from B to E, which is the Ricardian equilibrium point at which saving will cease. Along ff, fall in interest rate from b to e must raise the real wage earnable from labor's higher productivity.

Historically, technical innovation has shifted dd and ff rightward just about fast enough to offset diminishing returns and to keep the interest and profit rate almost unchanged, as shown by horizontal arrows from B to B' and b to b'.

Technical Progress and Wages

Now let us reintroduce improving technology. This will shift the dd and ff curves outward, for example, to d'd' and f'f'. Instead of moving from B down to E, society may find that diminishing returns is offset. And the economy might in actual historical fact move from B to B', negating or concealing the Ricardo–Marx law of the declining rate of profit from capital deepening. Note in Fig 2(b) that the real wage rate must definitely rise, with or without technical improvements, so long as the profit rate stays the same or falls.

An alternative theory would ascribe the rise of wages under capitalism to (1) trade–union pressure, (2) government regulation of monopoly, and (3) interventions of a welfare and regulatory kind by democratic governments reacting to militant political pressures from the masses. This alternative hypothesis cannot be rejected as without substance, for we have seen throughout this book that government actions do have consequences for both good and evil.

Still, the magnitude and pattern of the rise in real wages in this last century have been such as to cast doubt on union or political action as an important element in its explanation. Thus, the America of Calvin Coolidge was run on the basis of limited government intervention: trade–unions were weak, monopoly was certainly not shrinking; yet real wages rose strongly. Similarly, Japan and West Germany have shown sharp growth in real wages linked with sharp growth in labor productivity–and this when governments seemed pro–business rather than pro–labor.

With the advance of technology and the piling up of a larger stock of capital goods, it would take a veritable miracle of the Devil to keep real wages of labor from being bid ever higher with each passing decade. Who fails to see that fact fails to understand economic history as it happened. Economic theories that do not fit these facts have to be sacrificed and replaced by others that do.

The Approximate Facts of Modern Development

Let us summarize our theoretical researches. First we studied the crucial role of limited land and growing labor in economic progress. Then we passed from the labor-land world of Smith- Malthus to one that studied the role in economic growth of capital accumulation relative to labor. Last, but far from least, we stressed the factor of technological change and innovation. A look at the facts will now show that scientific and engineering progress has been vital for growth.

Thanks to Simon Kuznets' Nobel-prize-winning Work at the National Bureau of Economic Research, to the work of others there, and to Robert Solow and Edward Denison, we can formulate certain uniformities of economic development in the United States and other advanced nations.

The ratio chart of Fig. 3 the great trends of economic development for America in this century. Similar findings apply abroad. Figure 3 is important. Linger over it.

The upper chart shows the growth since 1900 of labor and capital. The resulting growth of real output tops the chart.

Population has more than doubled in 80 years of steady growth. (Taking into account shortening of the working week and changes in age distribution and in labor-force participation, the growth in total number of work-hours has been even more modest.) While labor has about doubled, the stock of physical capital has increased more than eight-fold! Thus the substantial increase in capital per worker, the K/L ratio, does represent a significant amount of "capital deepening.

What about the growth in output? Has output grown less than in proportion to capital, as in a model that ignored technical change? No. The fact that the Q curve is not in between the two factor curves, but actually lies up near the capital curve itself, shows that there must have been technical change in actual history. The close proximity of the output and capital curves shows that the capital-output ratio has not risen as in the simple deepening model.

Instead, as the lowest curve in the bottom chart shows, the capital-output ratio remains remarkably close to 3 years (i.e., a balance-sheet calculation of current value of all capital goods would show it to equal about 3 years of total product).

Rising Wages and Trendless Profit The real wage has indeed risen steadily. This is in accordance with what one would expect from the growth in the capital tools available to cooperate with labor, and from favorable technological trends. The real interest rate (corrected for price inflation) or, if we could get complete statistics, the rate of profit actually earned on more risky investments-does not show the decline that would be predicted from simple deepening of capital and diminishing returns.

Interest rates and profit rates fluctuate much in business cycle and war, but display no strong trend upward or downward for the whole period. Either by coincidence, or as the result of some economic mechanism that needs study, technological change has just about offset diminishing returns.

FIG. 3

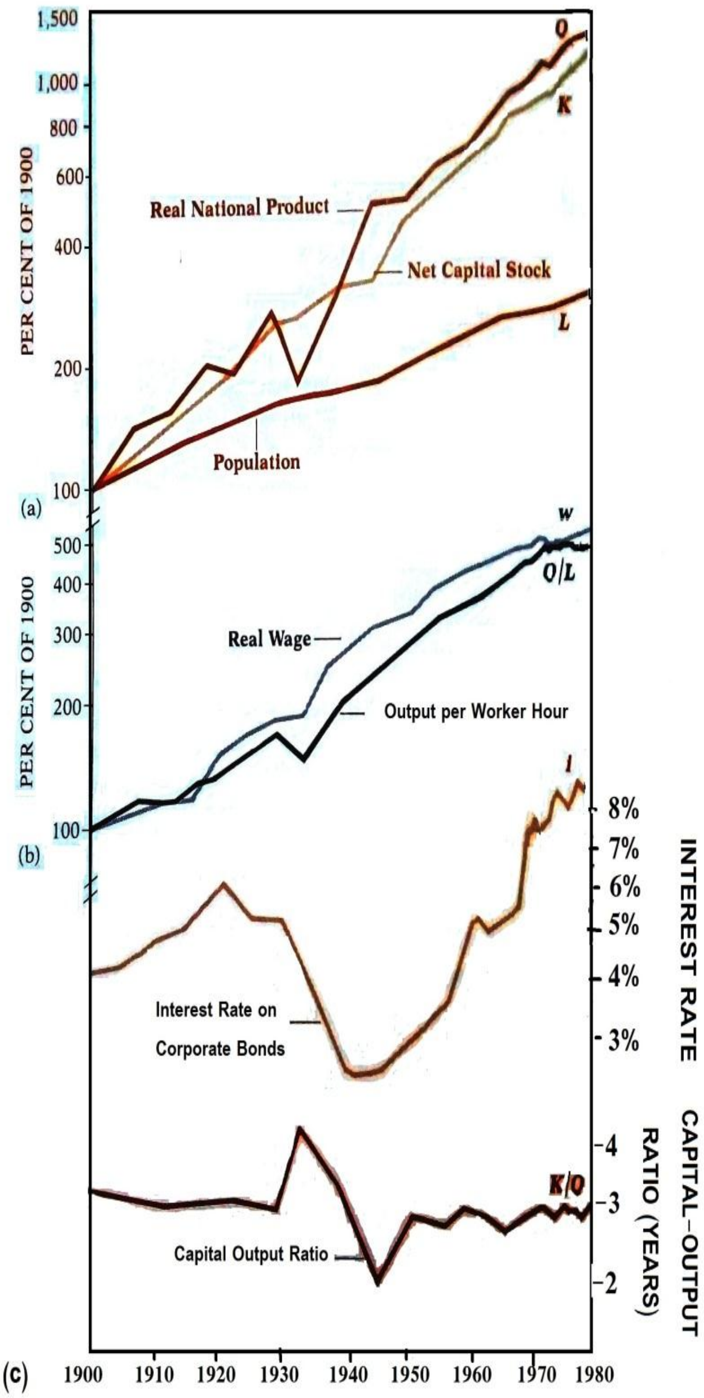
Economic growth has displayed striking long-run regularities

(a) Capital stock has grown faster than labor supply. Total output has nonetheless shown rate of growth in full pace with capital.

(b) Real wage rate has grown steadily, if anything overmatching growth in average labor productivity per man-hour. No pauperization or immiserization of the working class shows up in broad wage statistics. (But note the OPEC-induced slowdown in the trend for the 1970s.)

(c) Without technical invention and innovation, deepening of capital rela tive to labor would depress interest rate and raise capital-output ratio. But, in fact, technical change seems to have just about offset diminishing returns to capital accumulation. (Hence, statical curves of Fig. 2 must have been shifting rightward. REMARK: If higher money interest rates were corrected for price inflation, trendless oscllation ot interest and profit rates would be more apparentin defiance of any strong Law of Declining Rate of Profit.)

BASIC TRENDS OF U.S. DEVELOPMENT



Output per work-hour is the solid black curve shown in the middle chart of Fig. 3. As could be expected from the deepening of capital and from technological advance, Q/L has risen steadily. Moreover-and this too represents a remarkable coincidence or the result of some economic mechanism needing study-the percentage growth in wage rates per hour has almost exactly matched the percentage growth in product per work-hour.

This does not mean, as some Wall Street arithmetic has implied, that labor has captured all the fruits of productivity advance. It means, rather, that labor has kept about the same share of total product, with property also earning about the same relative share throughout the period. (A closer look at the middle chart suggests there might have been a slow upward creep in the share of labor in GNP, with property's share dropping gently; but part of this might be the return to capital invested in educations()-called "human capital.")

Six Basic Trends of Economic Development

These basic facts of economic history in the advanced nations can be summarized approximately by the following trends:

Trend 1. Population has grown, but at a much more modest rate than the capital stock, resulting in a "deepening of capital.""

Trend 2. There has been a strong upward trend in real wage rates.

Trend 3. According to what is often called Bowley's Law, the share of wages and salaries relative to the total return to property has shown considerable constancy in the long run (but perhaps with slight signs of an edging upward of labor's share).

Trend 4. Instead of observing a fall in the real rate of interest or profit, we actually observe their oscillation in the business cycle but no strong upward or downward trend in this century.

Trend 5. Instead of observing a steady rise in the capital-output ratio as the deepening of capital invokes the law of diminishing returns, we find the capital-output ratio is approximately constant in this century.

Trend 6. The ratio of saving to output has oscillated in the business cycle-reaching about the same level at various high-employment phases of the cycle. Or, taking into account the approximate constancy of the capital output ratio, we can convert this approximate constancy of the ratio of investment-to-income into the following: National product has generally had a trend rate of growth at a roughly constant percentage rate per year.

Analyzing the Laws of Motion of the Mixed Economy

While these are only approximate truths and not like the unrepeatable laws of physics, they portray fundamental facts about economic growth. How to explain them?

Trends 2 and 1-higher wage rates when capital deepens-fit nicely together with classical and neoclassical theories of production and distribution. Trend 3-Bowley's Law that the wage share is approximately constant-is an interesting coincidence that could consistently hold under all kinds of conditions only in a statical neoclassical model that possessed a special kind of production function relating Q to L and K (for which relative factor shares are constant).

Trends 4 and 5, however, warn us that neoclassical theory cannot hold in static form! A steady profit rate and a steady capita–output ratio are incompatible with the more basic law of diminishing returns under deepening of capital.

We are forced, then, to introduce technical innovations into our statical neoclassical analysis to explain these dynamic facts. And a good thing it is we are told to introduce technical change, since we have much independent evidence of the modern importance of science and engineering.

In terms of the analysis back in Fig 1), we are forced to introduce an outward shift in the dd and ff curves there to account for all the trends. Thus, the eastward move in Fig. 2(a) from B on dd to B' on d'd', which corresponds to the eastward move in Fig. 2(b) from b to b', will be consistent with trends I to 6. The tendency toward diminishing returns has just been offset by the technical shift, with interest remaining at the same horizontal level and the wage rate rising just as much as output per head. The capital–output ratio, which cannot easily be read in Fig. 2, must stay constant if the interest return on capital is to constitute the same relative share as before.

Professor Solow, utilizing his own methods of analysis and corroborating the independent findings of numerous scholars at the National Bureau of

Economic Research and elsewhere, has come up with the following remarkable conclusion:

Scarcely half the increase in America's productivity per capita and in real wages can be accounted for by the increase in capital itself. At least half the increase in productivity is a "residual" that seems to be attributable to technical change–to scientific and engineering advance, to industrial improvements, and to "know–how" of management methods and educational training of labor.

This vital finding needs careful interpretation. First, although it is customary to measure and speak of the enhanced productivity of labor, there is no necessary implication that all the higher productivity (or most of it, or little of it) came from greater effort on the part of workers, or from more intensive conditions of sweat and strain; nor that it came from more effort and education, or from more initiative and incentives of the human labor force; nor, for that matter, from more energetic and clever executive management. The facts do not point to any simple interpretation. We must reserve judgment pending further researches.

Second, it is artificial to separate capital formation and technology completely, New techniques do tend to be embodied in new kinds of equipment, It is possible to imagine a stationary state–like the optimistic one of John Stuart Mill in which there is no net saving and investment, but in which there is considerable technical progress as the depreciation charges of worn–out equipment finance their replacement by technically better equipment. Still, no one will deny that innovations can be introduced faster in a society that is performing net investment in addition to the gross investment corresponding to replacement. We all do learn from actually doing, and the society which gets to try out more new things will run that much ahead of the one doing little or no net saving.

Are Inventions Labor-Saving or Capital-Saving?

Any invention that wins its way under competition must raise the real wage, the interest rate, or both.

However, some inventions will by their nature have a tendency to increase the relative share of labor; others to increase the relative share of capital (of property generally); and others to affect both factors in about the same degree. This suggests the convenience of the following definition:

Definition: An invention is called "labor-saving," "capital-saving." or "neutral," depending upon whether it tends to lower the relative share of labor, to lower the relative share of property, or to leave their relative shares unchanged.

An extreme example of a labor-saving invention would be one that enabled unmanned machines to turn out robots that could do any of the manual and intellectual tasks of human labor. This would no doubt reduce the competitive wage drastically and could conceivably drop human labor's share of NNP from its present level of between 75-80 per cent to below 50 per cent.

An example of a capital-saving invention would be the case of a cheap computer that enabled firms to get along with much less inventory; or the invention of Kleenex tissue to replace durable handkerchiefs, or the invention of easily launched, wave-reflecting satellites that made ocean cables unnecessary. Try to see if you can specify other examples of capital- saving or labor-saving innovations and of neutral innovations in between.

The steady rise in wage rates is thought by many economists to induce employers to come up with labor-saving inventions. This tendency is often offered to help explain the failure of the profit- and-interest rate to fall as capital is accumulated.

Marx, a century ago, had used such an explanation to account for the success of capitalists in resisting a rise in wages and in creating an industrial reserve army of the unemployed. Sir John Hicks of Oxford has, in our day, advanced similar arguments of an inherent bias toward labor-saving innovation.

We have seen that economic analysis can throw much light on the laws of motion of the mixed economy. And when we look at the 1980-2000 United States projections by the Wharton School or other computer models, we see that these trends are still persistent, but with a slowing down of progress as affluence and the OPEC energy constraints cause a deceleration of productivity.

Admittedly, growth theory is still at the frontier of economics, and the experts are not all agreed on the mechanisms of past and future paths of development. Some alternative theories are presented in the Appendix to this chapter.

However, we are now armed to tackle in coming chapters the problems of growth in less developed economies, advanced economies, and collectivist systems like the Soviet Union.

SUMMARY

1. Many writers have tried to read into economic history a linear progression through inevitable stages, such as primitive economy, feudalism, capitalism, and some form of communism. The actual facts have not agreeably stuck to such timetables. In particular, the mixed economies that dominate the western world came into being without permission of social prophets.

2 The classical models of Smith and Malthus describe economic development in terms of fixed land and growing population. A simple "labor theory of value" prevails so long as land is superabundant; and output develops steadily with population in this golden age where labor gets all the product.

3 In the absence of technical change, increasing population ultimately exhausts the supply of free land. The resulting increase in population density invokes the law of diminishing returns: Fixity of land keeps output from growing proportionally to increased labor. With less and less of land to work with, each new worker adds less and less extra product; the decline in labor's marginal-product means a decline in the competitively earned real wage. As each acre of land gets more and more labor to work with, its marginal-product and competitively earned rent go up.

A fundamental factor-price frontier depicts how the rent rate must rise as the wage rate falls (but no one can predict what will happen to the relative shares of land and labor in national product).

4 The Malthusian equilibrium comes when the wage has fallen to the subsistence level, below which the supply of labor will not reproduce itself. However, in realistic fact, technical change has kept economic development progressing in the West by continually shifting the productivity curve of labor upward.

5 The Ricardo-Marx-Solow model stresses the deepening of capital, i.e., the process of accumulating capital goods of varied types faster than the growth in population and labor hours. In the absence of technical change, an increase in capital per capita would not be matched by a proportional Increase in output per capita-because of diminishing returns. Hence Capital deepening would lower the interest rate (which is the same as the "profit-rate" if risk is ignored), raise the real wage along the factor-price frontier, and raise the capital-output ratio.

6 Historically, trends1 and 2 a rise in K/L and in w-could be consistent with the statical model. Trend 3's approximate constancy of relative shares of labor and property-as measured by wL/Q and ik/Q, where Q = wL + iK-Is not mandatory in the statical model, but is consistent with a special technical case or it (Cobb-Douglas). However, trends 4 and 5-the failure of the interest and profit rate to fall and of the capital-output ratio to rise-show clearly that technical change must be brought into the analysis. Trend 6-approximate constancy of the investment-

income or saving ratio–taken with the constancy of the capital–output ratio arithmetically implies a constant percentage growth of output.

7 The facts suggest the hypothesis that capital accumulation is second to technical change in explaining rising productivity. But innovation and investment interact, as new techniques get embodied in new equipment and people learn by trying new investments. Increasing productivity can expressed conveniently in terms of labor productivity–.e., Q/L–but this does not necessarily imply anything about the reasons for the rise.

8 Inventions are defined as labor–saving, capital–saving, or neutral, depending upon whether they reduce labor's relative share of national product reduce property's relative share, or leave shares unchanged. Experience with rising wage rates makes firms seek labor–saving inventions.

Either by coincidence or cancellation of offsetting trends or as the result of economic mechanisms needing study, the pace of invention has turned out to be about enough to offset the effect of diminishing returns to capital on the interest and profit rate; and innovations have not turned out to be so labor–saving or capital–saving as to change much the relative shares of labor and property. Innovation itself explains much of progress.

APPENDIX: Modern Discussions of Development Theory

Economics, not being a settled subject, is itself still undergoing development. While the broad facts of historical development discussed in the chapter are not in dispute, different interpretations of them are given by different authors. Some further ideas associated with the names of Joseph A. Schumpeter, Sir Roy Harrod of Oxford, W. W. Leontief of Harvard, Professors Joan Robinson and Nicholas Kaldor of Cambridge University, and various American economists are sketched briefly in this Appendix.

While an elementary textbook cannot pretend to resolve advanced topics, today one would consider an introduction to physics old-fashioned if it did not somewhere give the reader a glance at fundamental issues on the frontiers of knowledge: atomic theory, elementary particles, generalized relativity, etc.

Similarly, many beginning students of economics will want to have a glimpse of the issues at the frontier of current economic analysis. Without mastering every intricacy of this Appendix, the interested reader can capture the flavor of developing economic thought from it. In particular, many readers who are not concerned with the rest of the theories discussed in this Appendix may still want to turn to its final discussion the fascinating and Useful subject, input-output analysis by Nobel laureate W. W. Leontief.

SCHUMPETERIAN INNOVATION

Joseph Schumpeter (1883-1950) of Vienna and Harvard was author of two economic classics: The Theory of Economic Development (English ed. Harvard University Press, Cambridge, Mass., 1934) and the posthumous History of Economic Analysis (Oxford University Press, New York, 1954).

Schumpeter emphasized the role of the innovator–i.e., the inventor, the developer, the promoter, the person who initiates and recognizes technical improvements and who succeeds in getting them introduced. Like Carlyle's faith in the role of the great leader in history, Schumpeter's theory regards the innovators as the dynamic actors of capitalism, who rule profitably for a day, only to have their profits nibbled away by imitating competitors.

Figure 2(a), well represents Schumpeter s notion of what would happen if all innovations ceased. Competition and capital accumulation would quite quickly push society down the curve of diminishing returns dd. Indeed, Schumpeter thought that the long–run ss horizontal line at which the supply of new saving will disappear would be at a zero rate of interest and profit, being properly drawn in Fig. 2(a) down on the horizontal axis itself. (His much–attacked theory of a zero interest rate in the innovationless stationary state can be replaced by a low–positive–interest–rate floor without much altering his theory of cyclical development.)

But now Schumpeter plays his trump card. Innovation is periodically shifting the dd curve upward and outward. The violin string is plucked by innovation; without innovation it dies down to stationaries, but then along comes a new innovation to pluck it back into dynamic motion again. So it is with the profit rate in economic life.

The profits due to innovation, we have seen, will be competed away by imitators, with labor and consumers soon benefiting from price reductions. The innovation–induced rise in interest rates will soon coax out saving and capital formation, until the accumulation of the augmented capital stock leads to diminishing returns, a "profit squeeze," and minimal interest. But then along comes a new burst of innovations–e.g, railroads, electricity, automation, coal liquefaction–to pluck the system back into dynamic motion, and we are off on new repetition of the process.

Ignoring Schumpeter's specific theories of the business cycle, we see that his theory of development is completely consistent with the first two trends of economic history: rising real wage rates, and capital increase outstripping population increase. His general theory does not specifically call for constant relative shares, a trendless profit rate, a constant capital–output ratio, or a trendless average propensity–to–consume–and–save. Still, all or any of these could be quite consistent with Schumpeter's general schemata.

Unemployment In The Stationary State?

Ricardo, Alfred Marshall, and Schumpeter had one thing in common with Lord Keynes of The General Theory of Employment, Interest and Money. They all thought that profit rates would be pushed to minimal levels in the absence of technical change. But Ricardo and company all thought that when this day of Judgment came, the economy would be voluntarily consuming 100 per cent of its full–employment income. Although positive investment would cease, people would then be spending enough on consumption to maintain full employment.

(In terms of Part Two's diagrams, in the Ricardian stationary state the C + I + G curve would be intersecting the 45° line at the full-employment level, with C + I + G actually equal there to C + replacement + G, because net investment ceases in the stationary state. For the remainder of this chapter we shall interpret I as net investment rather than as gross investment; likewise, we deal with net saving rather than gross saving.)

Keynes, on the other hand, feared that such minimal rates of interest and of profit on risky ventures might create a stationary state of stagnation with chronic unemployment:

People might still want to save at full employment, but no matching real investment would be forthcoming when the promised profit rate is too low to coax out risk taking. When the interest to be earned on short-term gilt-edge government bonds has become so low as to make people indifferent between hoarding much or little safe, idle money, central bank policy can't do much to prevent stagnation.

This notion of a troublesome stationary state did not die with the 1930s. Prominent followers of Keynes at Cambridge University, such as Professors Joan Robinson and Lord Kahn, have grave doubts concerning the possibility of a successful deepening of capital accompanied by full employment in a mixed economy. At the least, they would stress that it will never happen by itself in a country 1that confines itself to orthodox fiscal and monetary policies. At the most, they would harbor severe doubts that "managed capitalism" could-or would!-

pursue the unorthodox policies of monetary and fiscal expansion implied by a successful synthesis of neoclassical and post Keynesian analysis.

Readers who go on to advanced economics may be referred to writings of these Cambridge authors. Here, briefly, will be presented some of the points that need to be considered in doing justice to both sides of the argument as it bears on long-term economic development. No attempt will be made to identify ideas and writers meticulously.

Unchangeable capital output ratio

The land-output and labor-Output ratios were not constants in the first Smith-Malthus model of development. And the capital-output ratio in the Ricardo-Marx-Solow model of Fig. 2 was likewise not supposed to be a technical constant. In the absence of technical change, successful capital formation by society would enable output to grow; and the resulting phenomenon of diminishing returns would imply a smoothly growing capital-output ratio as capital deepening took place. On this view, dynamic technical change has seemed historically to provide about the extra productivity needed to offset statical diminishing returns, keeping the measured capital-output ratio constant.

Many modern economists-Robert Eisner of Northwestern, the late Alvin Hansen of Harvard, Luigi Pasinetti of Cambridge, and others-hold that the capital-output ratio is very nearly a technical constant; and that any attempt to accumulate capital beyond the rate required by the annual growth in output will soon be unsuccessful. Profits or rents from equipment will fall off badly after any surge of capital investment.

Excess capacity will follow, and the resulting profit squeeze will kill off private investment, as it did in the sluggish years following 1929 and 1973. Therefore, they argue, any long-term theory must utilize an invariable capital-output ratio like that shown in Fig. 3.

Harrod-Domar Growth Models

These concepts can be illuminated by some interesting models of balanced compound-interest (or "exponential") growth developed by Sir Roy Harrod in England and Professor E. Domar in America. This theory, which can be Skipped by the time-pressed reader, has two aspects: the long-term "natural rate of growth" and the so-called "warranted rate of growth"

THE NATURAL RATE OF GROWTH

The historical data of Fig. 3 can help explain Harrod's arithmetic. And, in turn, a simple Harrod-Domar model can give an oversimplified "explanation" of those historical trends

Suppose hours of labor L grow steadily at about 1 per cent per year. And for extreme simplicity, assume that technical change is in effect making9 every person s efficiency as a laborer grow at another 2 per cent per year. Either because of more scientific methods of production or better education, it is as if 100 workers can this year do what it took 102 to do last year; and this is repeated indefinitely. To coin a phrase, while actual L in its human-hour units is growing at but 1 per cent per year, the number of "efficiency units of labor" L* is growing at 3 per cent per year because of the annual 2 per cent efficiency improvement. This leads to the concept of the natural rate of growth.

Definition: The natural rate of growth of a simplified Harrod system is the percentage growth per year of its labor supply expressed in "efficiency units" (which means natural labor units as augmented by the presumed increase in technical effectiveness of each person−hour); as a condition of balanced growth, output and capital must also be growing at this same natural rate per year.

With GNP (or Q) and with L* growing steadily at this natural rate of 3 per cent per year, the stock of capital K must also grow at the same natural rate of 3 per cent per year if it is to keep in balanced pace. How much net investment is required each year to keep K growing at this natural rate of 3 per cent? Or, in other words, how much must people be steadily saving and investing out of their annual full−employment product to keep growth nicely balanced?

Evidently the needed saving−income, or saving−GNP, ratio depends on the numerical value of the capital−output ratio K/Q times the natural growth rate."

We are now in a position to write down the arithmetic formula relating three historical things: the Harrod natural rate of growth of .03 per year, or in the general case g per year, the historical capital−output ratio of, say, $3\frac{1}{3}$, or in the general case K/Q; the required saving/GNP ratio of .10, or in the general case s. We get

$$S = g \times \frac{K}{Q} \qquad \text{or} \qquad .10 = .03 \times 3\,\frac{1}{3}$$

This relationship determines the amount of voluntary saving and investment that is needed if the Harrod natural rate of growth is to be an equilibrium state.

Explaining the Trends

Can this simplified Harrod–Domar model or balanced natural rate of growth account for all six of the basic trends listed earlier? Yes, as footnote 20 hinted earlier, Let us check off the trends.

The model certainly gives a deepening of capital relative to hours of actual L, since K grows at 3 per cent and L only at 1 per cent. [However, in this simplified model, an observer who concentrates only on L*, labor in efficiency units, will see a constant (K/L)* With no "deepening" going on but merely an apparent "widening of capital" to keep K and L* balanced.]

Trend 2 is verified also. The wage rate rises–actually at 2 per cent per year. Why? Because actual persons (L, not L*) collect the marginal product of the increasing efficiency units in them, and these units work with their full quota of capital goods.

Trend 3 is verified and is no longer a coincidence. Because technical change was so nicely neutral as to make each person take on "the strength of ten," the balanced growth in K and L* means we are dividing shares between the factors in precisely the same way as before. (Recall that an observer of L* alone merely sees balanced widening of capital, not deepening: note that no Cobb–Douglas assumption therefore needs to be made.)

Trend 4's constancy of the interest rate is now precisely verified, being neither an approximation nor a coincidence. Each unit of K, being matched exactly by the same amount of L* as before, experiences no diminishing returns and has imputed to it the same competitive interest rate. (If degree of risk is the same, constancy of the interest rate means constancy of the somewhat higher profit rate.)

Trend 5 is also verified, since the Harrod natural rate of balanced growth assumes from the beginning an unchanged K/Q ratio. In terms of the Ricardo-Marx-Solow model, even if the capital-output ratio could smoothly change, it will not have to change at all in a situation where widening of K to match L* means no diminishing returns and entails Q growing in full proportion to K.

Trend 6's constancy of the saving-income ratio is verified from the basic Harrod formula for the natural rate of balanced growth at the same compound interest rate per year: s = constant g x constant K/Q.

Interdependence of Trends

The six trends are not all logically independent. We could have saved time by checking any two or the three trends 3, 4, and 5, knowing that their correctness would arithmetically guarantee the correctness of the remaining trend. Here is why. If property always gets the same fraction of output, say, one-fourth, and if the profit rate stays constant, then the process of capitalization of an income stream shows that the value of the capital stock must be a determinate multiple of output. [That is, K's fractional share of Q divided by the interest rate is equal to the capital-output ratio: i(K/Q) ÷ i = K/Q. Thus, if capital gets one−fourth of $3{,}000$−billion−dollar Q, and this property return of $\$750$ billion is capitalized by dividing it through by i = $.07\frac{1}{2}$) = $\frac{3}{40}$, then the value of capital is seen to be determinate at $\$10{,}000$ billion, or $3\frac{1}{3}$ times the value of output.]

Harrod's Warranted Rate of Growth

The natural rate of growth is designed to cope with long−term problems of economic development. A few words can be said about a related tool designed more to explain cyclical instability than the long−term trend.

What if society's actual saving fraction differs from that needed to keep the natural growth rate in nice balance? That is, suppose actual desired S/Q = s_a at full employment is greater, or less, than s given by g(K/Q). Too high a schedule of saving, we saw in Part Two, will tend to lead to unemployment. Too low a saving schedule, relative to the investment schedule, was seen to produce an inflationary gap and tendency toward price inflation.

Very well, No longer is the natural growth rate g the one that the system will realize, Growth in balance has now become rather irrelevant. Still Harrod can ask this rather odd question:

Starting from enough unemployed resources so that the natural growth rate of labor and other resources encounters no bottleneck or ceiling−starting from there, what rate of growth of output, W, if it could be achieved and maintained, would lead to a large enough volume of investment to justify (via the multiplier analysis) a continuance of its own growth rate W? The answering W is defined as the "warranted rate of growth.

In short, to get W, reinterpret the old Harrod relations s = g(K/Q); instead of taking g as given in it, work the relation backward to solve for the unknown growth rate of Q. Follow these steps: (1) Replace s by the actual saving ratio S/Q people insist on having namely, s_a. (2) Replace the g specified by labor force and technological growth by the unknown warranted rate of growth W. (3) Provided that the capital–output ratio K/Q is a hard constant, let it stand. (4) Solve for W by removing K/Q to the denominator under S/Q.

We go from the natural rate to the warranted rate thus: s_a = W(K/Q) replaces s = g(K/Q), and then

$$W = \frac{s_a}{K/Q}$$

An example will help. With g = .03 and K/Q = $3\frac{1}{3}$, Harrod needs s = .10 for his natural–growth process. But suppose people want to save s_a = $.13\frac{1}{3}$ >.10. This overthrift would lead to unemployment. But suppose somehow Harrod could start a faster expansion, of W per cent per year in Q, which can always get the labor it needs from the ranks of the unemployed. Then how fast must it expand to generate enough I/Q to match S/Q = s_a = $.13\frac{1}{3}$? If every dollar of expanded Q requires K to expand by $3\frac{1}{3}$ dollars, our answer is W =$.13\frac{1}{3}/3\frac{1}{3}$= .04. Q growth higher than W = .04 will generate I/Q> $13\frac{1}{3}$, Just as Q growth less than .04 will generate I/Q<$.13\frac{1}{3}$.

The warranted rate is an odd concept. It does not tell you what will in fact happen, but only what would–if it came to happen by design or by luck–have certain self–warranting properties. Such a growth rate of output, W, if it could somehow be established and maintained, warrants a level of investment just big enough to match the voluntary saving that its own income growth entails.

Cycles and Instabilities

Two observations should be made about cyclical instabilities involved in the warranted rate of growth.

1 Once all the unemployed are back at work, the natural rate of growth g must set a ceiling against which, alas, the faster warranted rate of growth must eventually collide. Thus W of 4 or 5 per cent per year and g of only 3 per cent per year ultimately means the Harrod warranted expansion will very soon hit full employment. On business cycles, some writers have constructed a theory of a collapse into recession based upon a bouncing back of the system from its collision with the natural–rate employment ceiling.

2 The warranted rate of growth, even if originally established, will not persist after being disturbed. In the Harrod model it is definitely unstable. To see this, note that if the actual growth rate temporarily exceeds W = 4 per cent, this new income will be generating in desired investment more than the $13\frac{1}{3}$(= 4% x 3) per cent ratio of desired saving–thereby accelerating its own growth still faster above W. (A less than 4 per cent initial growth rate will similarly create a deficiency of

intended investment relative to the $13\frac{1}{3}$ per cent intended saving, thereby decelerating its own growth still further below W.)

Just as an unmanned bicycle, which is unstable if disturbed from the vertical, can be converted into a stable system by a steadying and compensating human hand, so can a Harrod–Domar growth path that would be unstable under laissez faire be made stable by compensating monetary and fiscal policies in a mixed economy.

NEOCLASSICAL DYNAMICS

The Ricardo–Marx–Solow model of smooth substitutability of labor for capital (1.e., of labor for a great variety of alternatively producible capital goods) has less need to work with Harrod–Domar concepts than those models which regard the capital–output ratio as a hard constant. However, it is useful to interpret the Harrod–Domar concepts for a neoclassical model like Fig. 2.

By a simple "neoclassical growth model" is meant one in which the state uses monetary policies to make sure that thriftiness does not lead to unemployment and abortive thrift: By making equity and loan funds available at lower interest and profit rates (and possibly by unorthodox credit policies that provide guarantees against risks and uncertainties), such a managed system can contrive deepening of capital, as described earlier. Alternatively, this neoclassical model can be interpreted as describing the technology of an efficiently run collectivist society that never faces macroeconomic problems of unemployment or of inflation due to lack of proper effective demand.

In such a society, where whatever is withheld from consumption goes into capital formation, any rate of growth is essentially a "warranted rate of growth. This is because there is (1) no dichotomy of saving-investment problem and (2) no hard constant for the capital-output ratio.

Here is an idealized example. Add a new supply of L to a system that has a certain K and has previously been producing a certain Q. This new L can be put to work with the given K as rapidly as we like. There results a growth rate of Q that can be as high as the growth in L can produce. People can consume and invest out of the new output as much or little as they like. Depending on whatever amount of capital formation they decide on, there will result a gradual accumulation of K with the K/L ratio able to move in any way without trouble.

All the above is in sharp contrast to a model with fixed capital-output ratio, which calls for a specific W growth rate of Q. Contrast the Harrod case with the italicized words in the above paragraph!

Three Sources of Growth

Neoclassical output growth can be decomposed into three separate sources: growth in labor or L, growth in capital or K, and technical innovation itself. Momentarily ignoring technical change, note that a 1 per cent per year growth rate in L together with a 1 per cent per year growth rate in K is assumed to cause output to grow also at a 1 per cent per year rate. (Resist the temptation to add 1 per cent to 1 per cent and come out with 2 per cent; L and K cooperate in production, each needing the other.)

Suppose L grows at 1 per cent per year and K at 5 per cent. It is tempting, but wrong, to guess that Q will then grow at 3 per cent, the simple average of 1 and 5. Why wrong? Because the two factors do not contribute equal shares to product: about three-fourths of all product goes to labor as wages and only one-fourth of Q to property as its interest-profit share. This means L's growth rate gets 3 times the weight of K's; so, the correct answer is that Q will grow at 2 per cent per year (= $\frac{3}{4}$ of 1% + $\frac{1}{4}$ of 5%). Hence, output growth per year follows the law

$$\% \text{ Q growth} = \frac{3}{4} (\% \text{ L growth}) + \frac{1}{4} (\% \text{ K growth}) + \text{T.C.}$$

where T.C. means technical changes that raise productivity by shifting the dd curve of Fig. 2; and where $\frac{3}{4}$ and $\frac{1}{4}$ would of course later be replaced by new fractions if the relative shares of the factors later come to change.

If we seek to explain per capita growth, matters are simpler still, since this enables us to get rid of L as a separate growth source. Now, using the fact that capital gets one-fourth share of output, we have

$$\% \ \frac{Q}{L} \text{ growth} = \frac{1}{4} \left(\% \frac{K}{L} \text{ growth}\right) + \text{T.C.}$$

This relation shows clearly how deepening of capital would raise the capital- output ratio if there were no technical improvements being made: output per capita would grow only one-fourth as fast as capital per capita, reflecting one aspect of diminishing returns.

This relation now explains the meaning of Solow's conclusion-that more than half the increased output recorded in historical statistics seems to be a "residual" attributable to scientific advance rather than to thrift and capital formation. This means that the second term in the above relation–T.C. for per cent Q growth due to technical change–appears, on statistical measurement, to have been bigger than the first term representing the investment contribution. When Solow tries to allow for the fact that new techniques get embodied in new capital goods, the relative importance of the first term rises somewhat. (Although the primacy of technical change seems corroborated by German and Japanese statistics, the importance of the capital factor does seem greater in Britain, Canada, and Russia.)

ALTERNATIVE THEORIES

Repudiation of Aggregate Production Functions

Professors Joan Robinson and Nicholas Kaldor of Cambridge University are skeptical that "capital can be usefully measured as an aggregate, which together with labor produces aggregate output. This is certainly a healthy skepticism. They are even more skeptical that the marginal productivities calculated from such an alleged production function can be used to explain wage and profit rates and the relative shares in GNP of labor and property. They go too far, I think, in their doubt that economists can work with a detailed breakdown of numerous heterogeneous capital goods–machines of type A, B,C,... –to get quantitative results at all like the neoclassical case, in an actual realistic mixed economy of uncertain growth.

Dissenting Voices

Robinson and Kaldor by no means agree on what is to replace the aggregative analysis. Both incline, but in different degree, toward a macroeconomic theory of income distribution with the following property:

Here is an economy with high property share and high growth. How wrong to think it is the thrift of the rich (or anybody else) which causes that fast growth. The causation runs the other way: fast growth produces high profits, rather than vice versa.

This presumably wishes to assert something more than the familiar observation that when a country like Japan or West Germany experiences a miracle of productivity growth, people find it easiest to be thrifty out of the increase in income and to be slow in renegotiating real wage rates commensurate with the recent rises in marginal productivities. It is beyond controversy that such induced thrift does further speed up capital formation and tends (in neoclassical fashion) to speed up growth still further, but that is another story.

Exercises

1. In Fig 1, the solid line OP is the ordinary diminishing–returns diagram. (Disregard for the present the two broken lines OQ and OR) OP shows how output of good Q increases as more and more of variable input A is added to a fixed quantity of another input, B. The line is straight from O to H. This means that until the A quantity reaches OD, the marginal–product of A is (increasing / constant / decreasing). Thereafter, it is (increasing / constant / decreasing). This marginal–produce is measured by the slope of the line; so marginal–product reaches zero when the line is (flat / vertical)–i.e., when A's quantity reaches (OD / OE / OF / OG)

2. In very early attempts to construct economic theory (e.g, in Adam Smith), the discussion was often carried on as though production were exclusively a matter of labor cost (thus, the labor cost of hunting animals for food). So long as only one type of input is considered, there cannot be any conflict between two or more input classes over division of the output they cooperatively produce.

Soon, however, it became evident (and this drew major emphasis in the works of Malthus and Ricardo) that land was likewise a productive input and one scarce or limited in supply, whereas there was no comparable limit to the size of population that might ultimately appear. Hence "the law of diminishing returns" evolved–and with it, consideration of the clash between interests of the two input categories.

a. In the Malthus–Ricardo approach to diminishing returns. (land / labor / capital) is the fixed input, and (land / labor / capital) is the variable one. Malthus felt that a final "equilibrium" would be reached when labor had (increased / decreased) sufficiently to make the wage per worker just equal to the minimum–subsistence level.

b. This wage per worker would be labor's (marginal– / total) product. The remainder of total product, after these wages were paid, would go to landowners. In Fig. 1 terms, the Malthusian equilibrium would be reached with labor at a total (of OG/ necessarily less than OG, say, OE or OF), and with total output (NG / JE or MF)

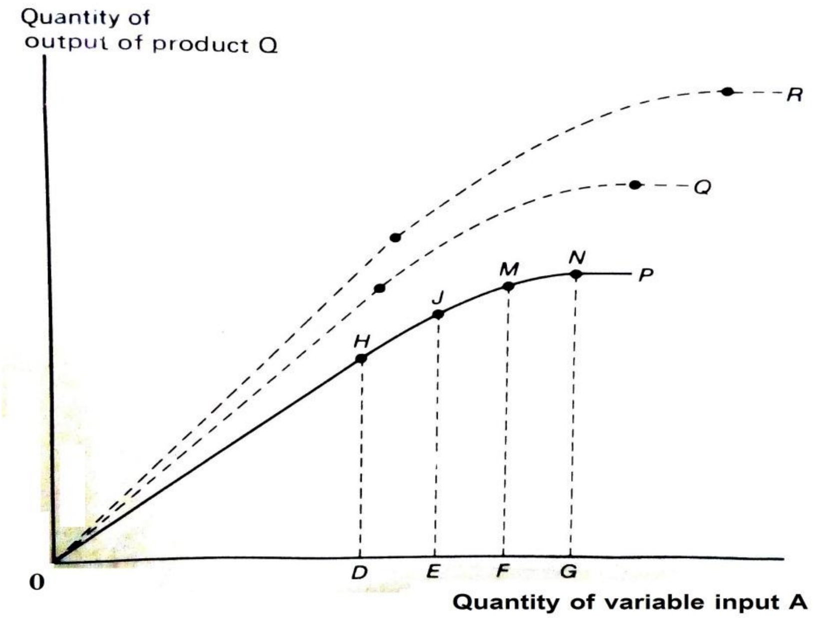


Figure. 1

3. a. As this "Malthusian equilibrium," in which labor earns only a subsistence wage, is approached, land becomes, in relative terms, more scarce. So its price (the rent per acre) must (rise / fall)

b. Offhand, one might think that as this painful situation (for labor) is approached, the relative share of landowners in total income must rise just as the price per unit of land rises. This is not necessarily so. The absolute amount of income going to land–owners must rise; the relative share of landowners in total income could fall.

The total product and its division between the two input classes is as follows.

(1) Price of labor ×	(2) Number of units of labor =	(3) Labor's total income
(4) Price of land ×	(5) Number of units of land =	(6) Land's total income
		(3) + (6) = Total product

As the labor supply increases, moving toward the Malthusian equilibrium, these six magnitudes behave as follows:

Item (1), the price of labor, (rises / falls / remains constant).

Item (2), number of labor units, (rises / falls / remains constant).

Item (3), labor's total earnings, may go either way. It may rise, remain constant, or fall (since its two components move in opposite directions).

Item (4), land's price, (rises / falls / remains constant).

Item (5), quantity of land, (rises / falls / remains constant)

Item (6), land's total earnings, (rises / falls / remains constant).

So item (3) could possibly rise sufficiently to outstrip, in relative terms, the rise in item (6). This is most likely when the "bite" of diminishing returns is not yet acute, so that increases in the labor quantity do not push down labor's marginal-product (the price of labor) by very much. But the more closely the point of zero marginal-product is approached (even though this point is never actually reached), the less likely this outcome becomes.

4. a. The two ingredients in Malthus-Ricardo diminishing-returns analysis were land and labor, with labor the variable and increasing element. In modern development theory, the participants change. The fixed input is considered to be (land / labor / capital). The variable input is (land / labor / capital). When this variable input is increased relative to the fixed input, the condition is described by economists as a (widening / deepening / maintenance) of capital.

b. If the stock of capital (i.e., machinery, tools, and other such equipment) is gradually increased over time, we would expect that increase to be accompanied by at least some technological improvement-i.e., the appearance of different and more efficient capital goods. But suppose we consider such technological change absent, and apply the analysis of question3. An increase in capital with labor or population fixed-or more generally, an increase in the ratio of total capital to total labor-would lead to (an increase / a decrease) in the return to each unit of capital (the profit rate or interest rate), and (an increase / a decrease) in the wage paid to labor.

5. Consider the process indicated in question 4 in more detail Designate the variable input capital as K, the fixed input labor as L, and quantity of total output as Q . Then–with no technological progress–the following results are to be expected as K is increased relative to L:

(1) The capital–labor ratio, K/L, (increases / decreases).

(2) The capital–output ratio K/Q (see text), will (increase / decrease), because when the law of diminishing returns is operating, any increase in the variable input–i.e., (in K / in Q / in L)–yields an increase in output, Q , that is (less than / exactly / more than) proportionate to the K increase.

(3) As the K/L ratio increases, the interest or profit rate (price of K per unit) (increases / decreases), and the wage rate (price of L) (increases decreases)

(4) The fractional or percentage share of total output going to K owners (must increase / might increase / must decrease), just as in question 3.

6. In Malthus–Ricardo analysis, the diminishing–returns process came to a halt when labor's wage fell to the minimum–subsistence level. In the more recent diminishing–returns reasoning outlined in questions 4 and 5, the process ends when (pick one):

a. The marginal product of capital reaches zero.

b. Wages reach the maximum–subsistence level.

c. The rate of interest falls to a level where people choose to save no part of their income.

This drying up of saving ends the growth in K, since there is no longer any more money to finance further increases in K. This reasoning assumes that the rate of interest (is / is not) the governing factor as to the amount of income that is saved. (There is more on this point in the chapter Appendix.)

7. a. In the United States, over the past century, the stock of capital has grown more or less steadily, and grown more rapidly than population or the labor force. To this extent, then, it is appropriate to apply the reasoning of questions 4 through 6.

But what about technological progress, which improves the Performance of K (capital), and which was specifically ruled out in those questions? In terms of Study Guide Fig. 1 (where the variable input is now K), technical progress lifts the output curve from OP to OQ, and from OQ to OR. [The black dots on the OQ and OR lines mark the points at which curvature begins (the line begins to "bend over")–i.e., the point at which the influence of diminishing returns first begins to set in.] Thus even though K is increasing, the shift in position of the total product curve means that the marginal-product of K will (increase / decrease). The rate of interest or profit (per unit of capital) will thus (fall / rise) relative to labor's wage rate.

b. Combining the two effects (diminishing returns and technological progress), we see that the increase in the capital stock (raises / lowers) total output. Technical progress (raises / lowers) total output. The increase in the capital stock (disregarding technical progress) (raises/ lowers) the demand for labor. Hence we would expect labor's wage or price to (increase / decrease). The exception to this is the case of technical progress which greatly (increases / decreases) the interest or profit rate and (increases / decreases) the demand for labor.

8. The facts of U.S. growth since 1900, as indicated in the text, are these:

a. The labor force has approximately (remained constant / doubled / increased fourfold / increased sixfold). The stock of capital has approximately (remained constant / doubled / increased fourfold / increased eightfold)

That is, the capital stock, in proportion to the labor force, has (increased / decreased) by a factor of (2 / 4/ 6). There (has / has not) been a deepening of capital.

If both capital and labor had increased eightfold, we would expect output (disregarding technical progress) also to have increased by a factor of 8. But with labor only doubled, we would expect the output increase to be (more / less) than eight times its value in 1900.

b. In fact, output has increased by a factor of about (2 / 4 / 8). This means that the ratio of capital stock to annual output–the capital–output ratio–has (increased / remained about constant / decreased). Things (have / have not) worked out as the simple law of diminishing returns would indicate, the reason evidently being (that the law has been incorrectly set out / technological change / the higher real wage paid to labor).

c. The actual capital–output (K / Q) ratio in the United States is at present about (1 year/ 3 times K / 3 years / 5 times L).

d. Real wages (have risen / have fallen / show no clear trend either up or down). The interest or profit rate–the "price of capital" (has risen / has fallen / shows no clear trend either up or down).

e. Output per work hour, or Q/L, has (risen / remained constant fallen). The increase in the wage rate (has exceeded / is approximately equal to / has fallen behind) the (increase / decrease) in output per work hour.

9. The terms "labor–saving" and "capital–saving" innovations lack precise, universally accepted meanings. The text suggests that an "X–saving" innovation is one which has the effect of reducing (X's price / X's relative share in total product / amount of X employed per unit of output)

LEARNING OBJECTIVES

After studying text, the preceding review material, you should be able to meet the following objectives:

1. Define or explain briefly (a) the labor theory of value; (b) the law of diminishing returns; (c) the capital–output ratio; (d) the "deepening" of capital.

2. Outline the major problem (or problems) opened up for economic analysis once that analysis moves beyond the simple "labor theory of value" to recognize that there are two (or more) types of inputs involved in production.

3. Describe briefly the sequence of events predicted from application of the Malthus-Ricardo interpretation of the law of diminishing returns.

4. Describe similarly the sequence predicted when capital is considered the variable and increasing factor, and labor the fixed factor-without technological change. Explain how the conclusions so reached are altered (if at all) when allowance is made for technological change.

5. Summarize briefly the results that have occurred in the United States since 1900 with respect to (a) total real output; (b) real wages; (c) the real rate of interest or profit; (d) growth in the capital stock; (e) growth in population or the labor force; (f) the capital-output ratio; (g) the effect (it any) of the diminishing- returns law.

QUIZ: Multiple Choice

1. Suppose agricultural output requires only two inputs, labor and land. The quantity of land available is fixed: the quantity of labor is variable. Then, as labor quantity is increased in order to increase output quantity, the law of diminishing returns will begin to operate, and (1) the ratio of labor to land will increase; the ratio of land to output will fall, (2) both the labor-land ratio and the land-output ratio will fall: (3) both the labor-land ratio and the land-output ratio will increase: (4) the labor-land ratio

will fall. and the land–output ratio will increase: (5) the labor–land ratio will increase, but the land–output ratio will not change.

2. In the simple labor theory of value, demand for goods plays the following role: It (1) interacts with supply to determine price, as in any other case: (2) dominates over supply in the determination of price, but does not influence quantities produced and consumed: (3) settles quantities produced and consumed, but has no influence on price; (4) has no influence either on quantities produced and consumed or on price: (5) dominates over supply both as to price and as to quantities produced and consumed.

3. The most important single factor accounting for increased productivity and growth in the American economy thus far appears to have been (1) a deepening of the capital stock: (2) technological change: (3) a widening of the capital stock; (4) the use of growth–encouraging monetary and fiscal policy: (5) the increase in skills of the labor force

4. Since 1900, the stock of capital in the United States (according to the text) has increased (1) eightfold, and operation of the diminishing–returns law has significantly reduced the capital–output ratio; (2) tenfold, and operation of the diminishing returns law has significantly increased the capital–output ratio (3) only by an amount proportionate to the increase in the labor force, so that the diminishing–returns law has had no application; (4) threefold and operation of the diminishing–returns has significantly reduced the capital–output ratio; 5 eighetfold, but the capital–output ratio has not increased significantly, despite the diminishing returns law.

5 In the United States (according to the text) the share of wages and salaries in national product since 1900 (1) has significantly increased, (2) has remained about constant, or shown a very slight upward trend: (3) has significantly fallen, except for a Period during and immediately after World War II. (4) rose fairly steadily until about 1930 and remained constant until 1945 (excluding World War II,) but has fallen perceptibly since then; (5) is not correctly described by any of the above.

6. If the amount of capital employed is increased, if the amount of labor and other inputs stays approximately fixed, and if the capital-output ratio remains constant, then (l) the capital-labor ratio must have fallen;(2) the price of capital must have fallen. (3) the law of diminishing returns has been in operation; (4) technological improvements would explain this result: (5) total output must have fallen.

7. 1f the capital-output ratio increases, then it should follow that (1) the real wage of labor must fall if there has been no technological change, but not otherwise; (2) the real wage labor must fall, regardless of the extent of technological change; (3) the total stock of capital must have decreased, or at best remained constant: (4) the real rate of interest or profit must fall if there has been no technological change, but not otherwise; (5) the real rate of interest or profit must fall, regardless of the extent of technological change.

8. A deepening of capital must, in the absence of technological change, (1) increase the capital-output ratio: (2) decrease the capital-output ratio, (3) increase output more than proportionately to the increase in

capital; (4) increase output in proportion to the increase in capital: (5) increase the share of capital owners in the total of output

9. According to the law of diminishing returns, if land is the fixed input and labor the variable input, then as the quantity of output is increased, (1) the relative share of labor in total product must fall; (2) the price of land must fall; (3) the share of labor in total product or output must rise; (4) land's percentage share in total product or output must rise; (5) none of the above is necessarily correct.

10. By "deepening of capital" is meant (1) an increase in the stock of capital relative to the size of the labor force; (2) the introduction of new capital goods which embody technological change; (3) a change either in productivity or amount of capital which increases the share of capital-owners in total product; (4) an increase in the productivity of capital which reduces, or at least does not increase, the total of the capital stock; (5) none of the above.

11. 1f capital is considered the variable input, then in the operation of the law of diminishing returns (without technological change), as output is increased, (1) the share of capital-owners in total output must increase; (2) the capital-output ratio must decrease; (3) the share of capital-owners in total output must decrease; (4) the capital-output ratio must increase: (5) the capital-output ratio must, by definition remain constant.

12. If a nation's capital- output ratio gradually increases overtime, this indicates that (1) the share of capital-owners in total output is

increasing; (2) the diminishing-returns stage has not yet been reached with respect to capital, (3) the marginal-physical-product of capital must have reached zero; (4) technological progress must be improving the productivity of capital: (5) the law of diminishing returns is operating with respect to capital's productivity.

APPENDIX: Modern Discussions of Development Theory

Because much of the material in this Appendix is at the frontier of economic knowledge, it is by no means as well organized or integrated as the topics outlined (for example) in Parts 2 and 3 of the text. Some of it may seem difficult-as, for example, the "Harrod-Domar growth models These growth models are really fairly simple-but they do not seem simple at all until you have mastered the elements that go into their construction

1. Economic growth analysis often begins by drawing on the Ricardo- ill idea of the stationary state. (It is also mentioned briefly in reference to Mills thought.) Many classical economists thought that nations would grow until they reached a final "stationary state condition Thereafter, there would be no further growth- not, at any rate, in the capital stock. When this final state is reached, the economy's stock of capital goods may be very large, but there is (positive / zero / negative) net investment-i.e., the capital stock (is / is not) being increased. There is just enough investment each year to balance that year's depreciation of the existing capital stock. The interest rate is (positive / zero / negative) No net investment is being undertaken because (1) all the capital-goods projects carrying a yield higher than the prevailing interest rate have

already been undertaken, and (2) at that prevailing interest rate, the amount of saving out of income is (positive / zero / negative).

The points to note especially are these: (a) capital growth stops because there is no saving to finance investment; (b) saving stops because the interest rate is insufficiently high to persuade people to save any part of income. So the classical belief in a stationary-state tendency relies heavily on the view that the interest rate is important to people in deciding how much (if anything) they will save out of incomes.

2. More recent views have been sceptical of this alleged drift toward a stationary-state equilibrium. Perhaps the strongest counterargument emphasizes the fact of technological change the drive toward which has been powerful in capitalist economies.

The stationary-state economists conceded that increases in per capita output might be possible via better technology. But-for the stationary state-the introduction of these improvements would have to be financed entirely out of depreciation allowances-i.e., net investment would have to be zero, that being one of the conditions of stationary-state equilibrium. In actual fact, new technologies usually find their expression in new and different machines or equipment, the development of which calls for positive net investment.

Joseph Schumpeter was prominent among the critics of the stationary-state idea. He argued that-insofar as any such tendency exists at all-it is repeatedly offset by the work of crazy and not-so-crazy inventors who want to do things differently and-perhaps-better.

There is an important distinction to be made here. The inventor is one who thinks up a new idea. But there is a huge gap between that new idea and the new (or improved) and commercially successful product in which the idea finds its expression. Schumpeter called the individual who bridges (or tries to bridge) that gap (a speculator / an economist / an innovator).

In Schumpeter's view, if you want to understand what "capitalism" has meant, and how it has really behaved over the past 100 or 150 years, you must look at the process of technological change- and in more detail, at the two stages of that change. Inventors invent. Innovators seek to profit from invention.(Inventor and innovator may or may not be the same individual.) Some innovators have succeeded; some very few have succeeded spectacularly. Most of them have (with less publicity) gone broke. But the lure of winning the grand prize in the innovation lottery remains undiminished.

Normally, innovators go to the money capital markets, seeking the finance they need. They have thus bid (up/ down) the interest rate, thus (encouraging / discouraging) saving out of income as financing for the new projects. Repeated innovations thus keep pushing the economy into bursts of capital accumulation and growth.

3. Stationary-state reasoning has also been attacked tor its view that the amount people save out of income is governed primarily by the level of interest rates. In the Keynesian view, people save against life's uncertainties, and they go on saving no matter how low the interest rate may be.

The interest rate may instead dictate what people do with income saved. People may save when interest rates are low–but they do not necessarily lend. Instead, they may display "liquidity preference". In periods when profit opportunities look bleak, investment will be (high / low), and the reduced demand for investment money will make the interest rate (high / low). However, this (high / low) interest rate will not of itself reduce saving. So the disparity between saving and investment must be ironed out by a (rise / fall) in incomes and production, and by unemployment.

This is, of course, "'short–run analysis" (as Schumpeter pointed out with respect to Keynes). These periods of unemployment may in time be overcome by further technological change, and consequently a surge of new investment. If we combine Schumpeter's views with those of Keynes, the conclusion is that capitalist economies are more likely to continue to grow rather than to drift toward a stationary–state equilibrium. Technological change will persistently create new investment opportunities, and the public's continued disposition to save will (except, just possibly, in certain low–interest–rate periods) provide financing for investment.

4. Much of this Appendix deals with the concepts of the natural rate of growth and the warranted rate of growth, used in Harrod–Domar growth models.

"Growth" means here year–to–year increases in total output. These models tackle the question: Can a capitalist economy maintain reasonably steady growth without drifting off its growth path into unemployment and depression on the one side, or inflation on the other? The answer: Yes, provided several independent forces mesh together properly; otherwise, no.

The major forces involved are: (1) The rate of increase in the capital stock–ie., rate of net investment. (2) (The rate of saving out of income by the public (saving being the means by which investment is financed). (3) The rate of increase in population, and consequent increase in the labor force. (4) The law of diminishing returns. (5) Technological change.

To approach the Harrod–Domar models in detail, begin with the chapter's discussion of diminishing returns. If the capital stock K is increased, then total output will increase also. But it K grows more rapidly than the labor force L, then the percentage output increase will be less than the percentage K increase–i.e., K will feel the impact of diminishing returns. However, K's "marginal productivity" can be restored or even improved it new and more efficient capital goods are developed–in other words, if there is technological innovation: This would have to be "labor–saving innovation: less L needed in production per unit of K.

Now let's tackle the "natural rate of growth." We begin by assuming there is no technological change. Thus as K increases, it is under a continuing diminishing–returns threat. However, we here use the diminishing–returns law in simplified form.

The usual diminishing-returns outline (e.g, Study Guide Fig1) says that as the amount of the variable input is increased (relative to the fixed-amount input), its marginal product will gradually fall, ultimately reaching zero. It is often argued that this outline exaggerates the extent to which variability of input proportions is typically possible in actual production. By and large, in this view, a given capital stock needs a given labor force to operate it. If there are insufficient capital goods, some part of that labor force will be unemployable. If the capital stock is too large, some part of that K will be unusable until and unless L is increased. Note carefully that this is not a denial of the diminishing-returns effect. It says only that this effect, instead of occurring gradually, will occur all at once, at the point where the fixed K/L ratio is reached, suddenly and completely.

In Harrod-Domar models, the relationship in production (dictated by technology) between the total capital stock K and total labor force L is assumed to be sufficiently close to fixed that it is no great distortion to treat this K/ L ratio as being exactly fixed. If this fixed-proportions requirement is not satisfied, the factor in excess, whether K or L, will be unemployable.

Now consider the fact that population and the labor force ordinarily grow year by year. Let this growth rate, expressed as a fraction, be designated g. For example, if the growth in L, is 3 per cent annually, then g = 3_{100}

We have assumed that technology dictates a fixed K/L ratio. Assume further that the current and actual K/L ratio is "just right" (i.e., there is no excess of either input). But L is increasing. This calls for a matching increase in K to maintain the proper K/L ratio. Will it occur? That is the question underlying the "natural–rate–of–growth idea. The forces that govern increases in population and the labor force are markedly different from those that govern increases in K.

Using our example of a 3 per cent annual increase in L, we want K's annual increase to be 3_100 of K, to maintain the proper K/L ratio. More generally, we want the annual increase in K to be gk. However, any increase in K (whether the desired gK or some other figure) is what we more usually call net investment I. There must be just enough of each year's total output Q channeled into investment rather than consumption, to provide the required K increase.

(In growth analysis, the symbol is conventional for "total annual output"– the same thing more commonly called GNP. We shall use Q for the balance of this question. REMEMBER: Q = GNP.)

This means that just the right amount of Q must be saved, since net investment spending is financed out of saving S. (In natural–rate–of–growth analysis, it is assumed that there is no "Keynesian problem, whereby saving tails to flow smoothly into investment.)

So the problem is: How much must be saved out of Q (what fraction of Q must be saved) in order to produce the needed I (the K addition desired so as to match the L addition)?

Let s = the fraction of Q saved annually. Thus total annual saving will be sQ.

Now we can fit things together. By the assumption that all saving flows into investment, we have sQ = I. And the desired I = gK. Hence, if things are to go as desired, we must have sQ = gk. Or to put that equation in the text's form:

$$s = g \times \frac{K}{Q}$$

The expression K/Q, on the right–hand side of this equation, is the capital–output ratio, a measure already introduced in the chapter immediately preceding this Appendix, and one which crops up in all these growth models: the ratio between the value of the total capital stock and the value of total annual output. If total K is valued at \$10, and annual Q is \$3, then the capital–output ratio is 10/3, or 31⁄3 (years). Assuming the same ratio to apply to additional K and additional Q, as is done in these models, this means that if \$10 is spent on net investment in some new capital goods, that investment can yield, for each year of the life of those capital goods, additional output of \$3.

Now consider the commonsense meaning of the equation above. In our example, L grows at 3 per cent per year. So we want both K and Q to grow at 3 per cent also, to stay on the natural–rate–of–growth path. This calls for net investment, hence an equal amount of saving to finance that investment. How much saving and investment? One may be at first tempted to say: 3 per cent of Q. Not so. The capital–output ratio says that that amount of new capital goods would fall short of producing an additional 3 per cent of Q. It tells us that 10 of I is needed for 3 of Q. Putting 10 per cent of Q into investment will yield just a 3 per cent increase in Q annually. (It will also increase K by just 3 per cent. The value of total K is 31/3 times Q. So 10 per cent of Q equals 3 per cent of K.)

a. In brief, given any labor–force growth rate g. we must multiply g by the capital–output ratio K/Q in order to determine the required rate of saving s out of income. With a K/Q ratio of 31/3 and a labor–force growth rate of 3 per cent annually, 10 per cent of income must be saved and invested to keep this economy on its natural–rate–of–growth path.

If, instead, L's annual growth rate is 4 per cent (with the same K/Q ratio), the required s–value would be approximately (8.5 / 10.0 / 13.3 / 15.0 / 16.7) per cent. If the L growth rate is 5 per cent, the required s–value becomes (8.5 / 10.0 / 133 / 15.0/ 16.7).

b. If saving does take place at the percentage rate required, we have "balanced growth: the saving rate is balanced against thee labor–force growth rate. Using the 3 per cent L growth figure, if saving is l0 per cent of Q, then output will grow annually at (3 / 10) per cent. Allowing for population increase, output and income per capita will increase (by 3 per cent / by 10 per cent / not at all). (Hence this is growth only in a qualified sense, we return to this point in question 8.) The capital–labor proportion K/L will (rise / remain constant / fall).

c. If saving falls short of that required by population growth, the ratio K/L will (rise / remain constant / fall), and the result will be (unemployment / inflation) by reason of an (excess/ insufficiency) of capital goods.

5. a. In actual fact, as was pointed out earlier in the chapter, in the United States the ratio K/L has (risen / fallen / remained constant). This suggests that the path followed has not been that of "balanced growth." But in the illustration of question 4, technological change was specifically excluded. When consideration is given this element, U.S. growth may still have been "balanced."

Technological innovation may take many forms. Typically, it appears in the form of new and different capital goods, which human labor is trained to operate. One way of handling technological change analytically is to think of it as a development increasing the productivity of labor.

By this approach, the increase in L (the labor force) does not fully indicate the increase in the "effective" labor supply–if L is increasing not only in numbers but in productive efficiency. The text uses the symbol L* to measure the effective labor force. That is, if L grows, and this growth is accompanied by greater training and skill, L* grows (even faster / more slowly).

If the ratio K/L rises, as it has done in the United States, it is (impossible / still possible) for the ratio K/L* to remain constant.

b. In the United States since 1900, the division of GNP between K owners and L owners has (shifted in favor of K owners / shifted in favor of L owners / remained approximately constant). Further, the capital-output ratio K/Q (i.e., K / GNP) has (increased significantly / decreased significantly / remained approximately constant). These two facts (correspond / do not correspond) to "balanced growth."

c. In the United States, the real wage per unit of L has (risen / fallen / remained constant). In "balanced growth," the wage per unit of L* (rises / falls / remains constant). The actual rise in United States wage per unit of L (can be / cannot be) consistent with "balanced growth." (Remember that L is smaller than L*. So an unchanged per capita income for each L* unit will mean a higher per capita income for each L unit.)

"Balanced-growth analysis, in summary, notes that we must reckon with two basic and largely independent elements: growth in population (or the labor force), and the propensity of the population to save. These two elements must harmonize in the sense that saving finances investment, and that investment takes the form of the new capital goods with which the increase in population must work. Growth is "balanced," and it occurs at "the natural rate," when these two basic elements are in reasonable harmony.

The elements are not in harmony when saving fails to provide the required amount of new capital goods. But they are not necessarily out of harmony when saving appears "too great," so that its tendency is to increase the K/L ratio. This is an incentive toward "labor-saving innovation"-i.e., technological change designed to change the fixed K/L ratio, to increase it to a higher "workable" level.

The economists who argue that factor proportions are fixed (or nearly so) consequently do not regard the observed rise in K/L as a contradiction of their view. They consider input proportions to be fixed only in a particular state of technology–i.e., with given equipment. A more automated technology defines a new and higher (but again fixed) K/L relationship.

6. If the rate of saving is high in relation to the growth in the labor force, it is far from state to assume that technological change will always save the day. Even if such output–increasing changes are directed toward an increase in the K/L ratio (i.e., toward "automation), their effects typically appear rather slowly in actual production.

If we assume, as natural–growth analysis does, that whatever is saved will be invested, then getting just enough in new capital goods to match the population increase reduces to getting just the right proportion of income saved (not used tor consumption).But that reasoning ducks the Keynesian problem. Will the amount of scheduled investment equal the amount saved? the point that investment plans are made dependently of saving plans. If the total of scheduled investment is less than the total amount the public plans to save, GNP will tall. (With incomes lowered, saving will be lowered also.)

There is a further complication, Insofar as net investment creates new plant and equipment, it adds to productive capacity. That capacity is gradually increased; and so is the "full–employment" level of GNP. If the public wants to save some given fraction of its income (a rising income), we need, not steady investment spending, but gradually rising investment spending.

This brings us to warranted-rate-of-growth analysis. It tackles a question different from the natural-growth one: Will enough new capital goods be produced, through investment, to match all the saving the public wants to undertake?

The four beginning ingredients in Harrod's warranted-rate analysis are as follows:

(1) Just as in the natural-rate case, it is assumed that in production, input proportions are fixed-i.e., K/L is fixed. We also have a given capital-output ratio, K/Q, or K/GNP.

(2) We start with more than enough L. tor the existing K. Part of the labor force is unemployed for lack of capital goods with which to work. An increase in K is needed it even part of this unemployment is to be removed. (For this question, it makes no difference whether total L is increasing annually, as in question 4, or is fixed in amount)

(3) Business firms are assured that there will be some extra L available to work with any extra K created. But they still must ask this question: 1f we build this extra K, will there be sufficient demand for the extra output thereby producible to have made that investment worth undertaking? In sum: Will there be a sufficient rise in GNP to justify building the extra K? so the underlying question is: What will be the rate of rise in GNP?

(4) The public plans to save some fixed fraction of GNP. The public does the saving, but a different group–business firms–does the investment (I) spending. The amount of S imposes an upper limit on the amount of I spending possible. But that is no guarantee that business firms plan to spend on I as much as the public plans to save.

Assuming the existing capital stock K to be fully employed, then the amount of I spending planned by business firms will be governed by their expectations as to the future level of GNP (or). (As in question 4, hereafter we use only the term Q, not GNP.)

Suppose that business firms are pretty confident that Q will rise by 10 per cent–say, from S100 to $110 billion. Since their present K is fully occupied, they will want to have built just enough extra K to meet that $10 billion increase in demand for output.

How do we convert that anticipated $10 billion Q rise into a dollar total for extra k? The "rate of exchange" is provided by the capital–output ratio, K/Q. If this ratio is 3, business will want to use saving of $30 billion (and not more), since that amount of investment (addition to K) is just capable of producing an extra $10 billion of Q annually. Thus the combination of business expectations and the K/O ratio will settle the amount of I spending.

a. If business firms instead anticipate a Q rise from $100 to $120 billion, with the same K/Q ratio of 3, their desired I spending will be $(zero/ 20 / 40 / 60 / 80 / 100) billion. If they expect no rise in Q, then their planned I spending will be $(zero/ 20/ 40 / 60 / 80/ 100) billion. The planned I spending total equals the expected Q rise multiplied by the capital–output ratio.

Let W stand for the expected Q rise, stated as a fraction. (If a rise from \$100 to \$110 billion is anticipated, W = 1⁄10 n; if from \$100 to \$120 billion, W =1⁄5.) What is the general expression for I, stated in terms of W, Q, and K/Q?.

b. At long last, we reach the "warranted rate of growth." It is that rate of annual growth in Q , expressed by the symbol W (a fraction of Q) that, once started, would just keep the economy progressing in a smooth, continuing rate of growth. Remember, the fraction of Q that people want to save is assumed to be fixed. That fixed fraction of Q saved would be just enough to equal the amount that business firms would want to invest, given their expectations as to future Q.

The essential requirement, then, is just S = I. And finding W, the warranted rate of growth, is just a matter of (1) putting S in place of I in the equation worked out in part a above, and then (2) rearranging that equation so that W sits alone on the left–hand side thereof. Use a separate scrape of paper for the detail, then show the resulting equation below.

c. In the equation above, S stands for total saving. The text equation uses the symbol s_a to indicate that fixed fraction of Q which the public insists on saving. Thus, S = s_aQ. Make this substitution in the equation above, and you get the text's equation, namely:

W = $\frac{s_a}{K/Q}$

If the fraction of Q that people wish to save is always 12 per cent, and the capital-output ratio is 4, the warranted rate of growth would be (zero / I / 2 / 3 / 4 / 5) per cent per annum. If K/Q is 5, and saving is always 10 per cent of income, the warranted rate would be (zero/ 1/2/3/4/5) per cent growth per annum.

7. The "warranted-rate-of-growth idea is pretty clearly related to the "'acceleration-principle, investment spending is largely governed by the rate of growth in GNP (or Q). But in the warranted-rate outline, such spending is much more dependent upon business firm's expectations as to the likely rate of GNP increase than it is in the acceleration-principle argument.

Notice that the "warranted rate of growth" is not envisaged as a growth rate that will necessarily remove all unemployment of L-even though creation of new plant and equipment will of course add to employment. (Unlike the "balanced-growth" model of question 4, warranted-rate analysis pays relatively little attention to L's size-i.e., is it fixed, or growing? There must be enough L on hand to operate the additional K created-that's about the extent to which warranted-rate analysis considers the L matter.)

The essential point to grasp about the warranted-rate argument is this: It the economy manages to get started along its warranted-rate growth track, it will (so the argument goes, any-how) continue on that steady growth track (assuming the fixed capital-output and saving percentage figures persist) until and unless some disturbance bumps it off.

One possible source of disturbance is the limit on the labor force L. If K grows so rapidly as to overtake L (even though L may be rising), then, with unemployed L removed, K runs into the fixed K/L ratio, and investment meets a bottleneck. The amount of I spending will (increase/ decline), saving will (exceed / fall short of) investment, and GNP will be thrown off its warranted rate path. While in due course technology may change things by increasing the K/L ratio, the shorter-run adjustment may be the Keynesian one: a fall in incomes and in saving.

8. If an economy gets aboard its (positive) warranted-rate growth track, and manages to stay aboard, presumably one result to be expected is something we normally associate with growth, namely, an increase in per capita incomes. But now turn back to the natural-rate-of-growth model examined in question 4. This is growth only in a limited sense. The capital stock K will be increasing-but only in proportion to Q and to L. Everything continues just as it was before, except that it is being done on a somewhat larger Scale. Output Q grows, to be sure. But L grows at the same rate. I here is no increase in per capita income.

Such a growth in K--just enough to maintain the existing K/L ratio-is sometimes called a widening of capital-in contrast to a deepening of capital, which means an increase in the K/L ratio. The results of capital deepening (without technological change) are those described in diminishing-returns analysis. To review part of question 4, and some of the questions used in the chapter preceding this Appendix, when capital is so deepened, Q will grow (more than/ exactly / less than) in proportion to the K increase. The capital Output ratio K/Q must (increase / remain constant / decrease), since K is increasing (faster than / at the same rate as / less than) Q the rate of return to K (the interest rate, or rate of profit) will gradually (increase / decrease). The wage rate, or rate of return to L, will (rise / remain constant / fall).

These results rely crucially upon the assumption of no techno Logical change. In the actual history of recent times, there most certainly has been such change. Hence the results discussed in the text, and in question 5 above.

9. The Leontief input-output system (see text) is not at all concerned, as Harrod-Domar models are, with aggregate growth." Although it involves some interest in the matter of growth, the Leontief construction is microeconomic in the particular sense that it deals with the individual products which collectively make up GNP, and with the individual inputs required for manufacture of these finished products.

Suppose that GNP is composed of just three types of finished goods: X, Y, and Z. Suppose further that (for whatever reason) this problem is posed: We need a 5 per cent increase in X output, a 15 per cent increase in Y output, and we can afford to reduce Z output by 10 per cent. Overall, what would these output changes call for in the way of extra productive inputs needed?

This is the type of question the Leontief system is constructed to answer, As its base, it uses statistical material covering production n past years.

It is appropriate to illustrate the nature of the Leontief system through the example of a three-good GNP. But in real life, thing are rather more complicated. Within any actual GNP, there are thousands upon thousands of different items. Even a computer-aided system cannot take full account of them all. The most appropriate simplification is to lump products together by industry-thus making the industry the microeconomic unit. Even a quite modest plan of division yields several hundred industries for a Leontief system to digest.

Typically, the output of any one industry goes in two directions. part of that output may be a finished consumer good tor households. But part (or all) may go to other industries as inputs. Fuel oil is an output used by families for home heating. It is also an input used by firms for their manufacturing needs.

A Leontief table is built to record this fact. Each industry gets a line (technically a row), showing where its output went. On the X-industry line, so much of X output went to the Y industry as a raw-material input, so much to the Z industry for similar use and finally, so much of X to households for consumption purposes.

This arrangement of rows, one for each industry, means that each industry also gets a column (a vertical listing), showing the inputs it got from other industries-that is, the raw materials it needed to produce its own finished product. At the bottom of each column is a figure showing that particular industry's total labor input.

This is the information at the surface of a Leontief system. Suppose the table indicates that 6 labor units, L, were used per unit of X produced. This is only the direct requirement. X's total L requirements were greater, for X's production also called on inputs from Y and Z, and they used labor too. (Of necessity, a Leontief system must work in money terms, but these money figures are intended as equivalents of real input-output relationships.)

The Leontief system probes for total input-output needs: the total L per unit of X, total Y per unit of X, total Z/X relation, and so on. Each such input-output figure (e.g., 10 L units per X unit) is assumed to be fixed; this is really the same "fixed-factor- proportions assumption used in Harrod-Domar models.

If the Leontief system has developed these "input-output coefficients" correctly, it can then indicate the requirements for any given increase in output. Suppose (to use a simplified version of the illustrative problem with which this question began) the question is: What would be needed in order to obtain a 10 per cent increase in net final output of X -with no increase in net final outputs of Y and Z?

Insofar as Y and Z are needed as inputs in X production, more of these commodities will have to be turned out even though there is to be no increase in their final output. And the required increase in X output may have to be more than 10 per cent-if X is needed as an input in Y production or in Z production.

The Leontief system will accordingly report that such a 10 per cent increase in net final X output would require so many extra units of X, so many of Y, so many of Z, and so much extra I.. We would expect the L requirement to be (less than / the same as/ greater than) the extra L needed directly in the X industry. The rise in Y production will (increase "final consumption" of Y/be fully absorbed as inputs for other industries). The same is true of Z production. Of the increase in Y production, (all will go directly to the X industry / some may go, for example, to the Z industry, hence only indirectly to the X industry).

LEARNING OBJECTIVES

After studying the Appendix and the preceding review material, you should be able to meet the following objectives:

1. Explain what is meant by "the stationary state." Outline the views which prompted some classical economists to argue that there was a long-run tendency for any economy to gravitate toward this stationary state, and set out two counterarguments.

2. Describe what is meant by a "balanced rate of growth," indicating the two independent "rates which are in need of balance. Explain the "Keynesian" possibility which is set aside in the development of such balanced-rate analysis.

3 Describe what is meant by a "warranted rate of growth." Distinguish it from the balanced-rate analysis mentioned above, and cite the two magnitudes that are needed to establish an economy's warranted-rate growth path.

QUIZ: Multiple Choice

1. A "deepening of capital can be expected to reduce the rate of interest or profit unless (1) the capital–output ratio remains constant; (2) the capital–output ratio increases; (3) the capital–labor ratio increases; (4) the capital–labor ratio decreases,; (5)– output remains constant.

2. 1f saving and investment take place in the amounts indicated

by the natural rate of growth, (1) the ratio of capital to labor in production will rise; (2) the ratio of capital to output will rise; (3) the rate of profit or interest will rise; (4) the share of labor–owners in GNP will rise relative to the share of capital–owners; (5) none of the above is correct.

3. According to the analysis of the "natural rate of growth," if

the economy is actually growing at that rate, (1) the capital– output ratio will increase, but at a rate less than the natural rate of growth; (2) technological change will be taking place at a steady rate, and the rate of return on capital will be maintained at a steady level by this technological change; (3) there will be a widening of capital but no deepening of capital; (4) there will be a deepening of capital but no widening of capital; (5) none of the above is correct.

4. "Balanced growth," as the term is used in Harrod–Domar models, involves essentially a balance between (1) saving and 1nvestment; (2) investment and the capital–output ratio; (3) total capital and total labor; (4) investment and the distribution of income between capital and labor; (5) saving and population growth.

5. The principal concern of "warranted-rate-of-growth anatysis is with the (1) rate of increase in the labor force needed to just match the scheduled increase in investment spending: (2) rate of saving needed to just balance against the rate of increase in the labor force; (3) rate of interest that will attract a volume of investment just sufficient to maintain full employment; (4) maximum rate of growth in output that is possible without setting off inflationary price increases; (5) rate of investnent spending needed to just balance against the fraction of income which the publie wishes to save.

6. Which alternative in question 5 would be correct had that question referred, not to the "warranted rate," but to the "natural rate" of growth? (1). (2). (3). (4). (5).

7. The results attributed to "capital deepening" (without technological change) are those produced by (1) the law of diminishing returns; (2) a fixed capital-output ratio; (3) balanced growth;(4) the warranted rate of growth; (5) a decrease in the K/L ratio.

8. "Warranted and "natural" rates of growth differ in this respect, namely, that (1) warranted-rate analysis assumes that capital can be deepened, natural-rate analysis that it cannot; (2)natural-rate analysis assumes unemployment of labor, and GNP

is thrown off the natural-rate path when full employment is reached: (3) the natural rate indicates the fraction of income the public actually wishes to save; (4) the warranted rate is an unstable one, and any disturbance will throw GNP off the warranted-rate path; (5) not at all, since they are two words used by different economists to mean the same thing.

9. A Leontief input–output system records, with respect to the total output of any one industry. (1) only that part going to households, since to include the part going to other industries would be double counting; (2) only that part going to other industries, since its purpose is to record input–output relationships; (3) that part going to households and the part going to other industries as well, but the latter on a value–added basis to avoid double counting; (4) both the part going to households and the part going to other industries, in full; (5) none of the above, since for industries it records inputs, not outputs.