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Traditionally employment and output have been the major two criteria for evaluating aggregate performance in a dual economic model for less developed countries. This has been mainly discussed by transferring labor from the agricultural sector to non-agricultural use. Most models are specified in such a manner that the migrated agricultural workers will be absorbed in non-agricultural jobs. In reality though, the transformation of labor to the non-agricultural sector (i.e., industrial or urban) has created an unemployment problem in that sector.

The purposes of this paper are (1) to study some of the relevant common characteristics of less developed countries, (2) to review the literature related to labor employment, and (3)

to demonstrate the importance of the efficiency of employment and output in dualistic development models.

This paper has reviewed three classes of models. First, this study has considered the Fei-Ranis model of economic development which has drawn heavily from W. A. Lewis's model of economic development with unlimited supplies of labor (Fei-Ranis is primarily a classical model). Second, the Jorgenson's model of development of a dual economy has been presented. This model is based on Harrod-Domar's concept of steady growth. Third, this study looks at a more recent model, the Todaro model, which considered the practical problem of urban (industrial) unemployment. The problem of urban-unemployment is not considered by the first two models. Todaro's approach to the development of a dual economy may be the beginning of a new trend in the literature.

On the basis of findings of this work it was concluded that:

(1) The transformation of an agricultural surplus labor economy to an industrial surplus labor economy, can only be justified by a careful consideration of the production possibilities of each case, and the demand for the products of each sector.

(2) The rate of growth of each sector will be dictated by the optimum growth path. This is the locus of optimum combination of output and employment of resources in each sector in the given time period. Because production possibilities and demand considerations operate to determine the optimum growth path, this path will rarely if ever coincide with the straight-line balanced growth path prominent in the Fei-Ranis model.

The Role of Employment in Dualistic Economic Development Models

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THE ROLE OF EMPLOYMENT IN DUALISTIC ECONOMIC DEVELOPMENT MODELS

I. INTRODUCTION

Background

It has always been hard, if not impossible to design a general theory of economic development which would apply equally to all nations. An obvious reason for the existence of such a problem is the diverse characteristics of countries. On the other hand, there are some common characteristics among the less developed countries which are largely responsible for any attempt which has been made to construct a model of economic development and growth for them. Some of these characteristics are:

1. Occupational Structure

In most less developed countries a majority of population is in agriculture. As it has been shown in Table 1, in most advanced countries a very large percentage of the population is engaged outside of agriculture. Most advanced countries have less than 30 percent of their population in agriculture. In the United States, Canada, and United Kingdom less than 10 percent of the population is in agriculture. On the other hand, in a developing nation like India as much as 70 percent of the population is engaged in agriculture. In other words, one can say that there is

Table 1. Agricultural Population and Population Economically Active in Agriculture in Selected Countries (estimated for 1965). (3, p. 21-23)

Continents and countries	Total population	Agricultural population	Percentage in agriculture	Economically active population		
				Total	In agriculture	Percentage in agriculture
	-----Thousands--------		Percent	--------Thousands----		Percent
Europe:						
France	48,919	7,680	16	20,010	3,600	18
United Kingdom	54,436	2,024	4	25,301	961	4
Yugoslavia	19,507	9,145	47	8,780	4,690	53
U.S.S.R.	230,556	73,271	32	119,170	38,910	33
North America:						
Canada	19,604	1,765	9	6,911	774	11
U.S.A.	194,592	11,700	6	78,357	4,836	6
Latin America:						
Argentina	22,545	4,510	20	8,350	1,505	18
Brazil	80,766	40,383	50	26,175	12,565	48
Chile	8,391	2,349	28	2,655	690	26
Mexico	42,689	22,200	52	13,340	6,970	52
Venezuela	9,240	2,705	29	2,780	815	29
Asia:						
India	486,811	340,768	70	207,598	145,319	70
Indonesia	105,679	70,762	67	37,885	25,005	66

Continued

Table 1--Continued.

Continents and countries	Total population	Agricultural population	Percentage in agriculture	Economically active population		
				Total	In agriculture	Percentage in agriculture
	------Thousands------		Percent	------Thousands------		Percent
Iran	24,549	12,030	49	7,540	3,620	48
Israel	2,563	310	12	912	114	12
Japan	97,960	23,685	24	48,269	11,731	24
Africa:						
Egypt (U.A.R.)	29,849	16,484	55	8,915	4,905	55
Oceania:						
Australia	11,333	1,117	10	4,560	455	10

an inverse relationship between economic development and population in agriculture.

Since countries with more people in agriculture traditionally have experienced less economic development, we can observe a negative trend in the proportion of the population in agriculture as a country develops economically. Table 2 shows the agricultural population of selected countries as a percentage of their total population for three different years. The first year is in the period of 1930-1944, the second in the period of 1945-1964, and the third is 1965 (taken from column 3 of Table 1). It is interesting to note that agricultural population of the United States has decreased from 23 percent of total population in 1940 to only 6 percent in 1965, while in India no change has taken place between 1951 and 1965 even though her total population grew enormously during that period.

L. J. Zimmerman has concluded that there is a very significant relationship between the size of the labor force employed in nonagrarian activities and the per capita income of the country. This is shown in Table 3 (16, p. 47). Professor Zimmerman obtains the following equation:

$$\log y = 0.0202\,X + 1.3235 \qquad (R = 0.92)$$

where y stands for per capita income and X for the percentage of total employment in nonagrarian activities.

Table 2. Agricultural Population as a Percentage of Total Population in Selected Countries. (2, p. 18-19)

Continents and countries	Year	Percentage 1939-1944	Year	Percentage 1945-1964	Percentage 1965
Europe:					
France	1931	29	1962	18	16
United Kingdon	--	--	--	--	4
Yugoslavia	1931	76	1961	50	47
U. S. S. R.	1939	57	--	--	32
North America:					
Canada	1931	32	1961	11	9
U. S. A.	1940	23	1962	8	6
Latin America:					
Argentina	--	--	1952	20	20
Brazil	--	--	--	--	50
Chile	--	--	--	--	28
Mexico	--	--	--	--	52
Venezuela	--	--	1961	31	29
Asia:					
India	--	--	1951	70	70
Indonesia	--	--	--	--	67
Iran	--	--	1960	60	49
Israel	--	--	1950	18	12
Japan	--	--	1960	25	24
Africa:					
Egypt (U. A. R.)	--	--	--	--	55
Oceania:					
Australia	--	--	1950	12	10

Table 3. Per Capita Income and Percentage Employment in the Secondary and Tertiary Sectors. a/ (16, p. 47)

Economic geographic area	Year	Per capita income, dollars (1952-54)	Percentage employment in secondary and tertiary sectors
1. North America	1960	1,900	91.0
2. North America	1953	1,810	87.3
3. North America	1929	1,240	76.6
4. Oceania	1953	960	82.9
5. North America	1913	920	67.3
6. Northwest Europe	1953	680	82.5
7. Oceania	1929	680	75.5
8. Oceania	1913	570	72.8
9. Northwest Europe	1929	530	81.8
10. Northwest Europe	1913	450	76.8
11. Japan	1960	300	67.4
12. Southeast Europe	1953	290	52.7
13. Latin America	1953	260	48.7
14. Far East	1953	110	34.6
15. Southeast Asia	1953	60	27.7

a/ The primary sector comprises agriculture, hunting, fishing; the secondary, industry, mining, construction, power and generally, the services and everything else not covered in the first two sectors are brought together in the tertiary sector.

2. Technological Dualism

Less developed countries frequently have two sectors which have completely different characteristics. The traditional or agricultural sector has a very primitive level of technology. In this sector, operations are generally on a small scale, and labor intensive such as peasant agriculture or handicraft. The more advanced or modern sector is characterized by larger scale, more

capital intensive operations. Application of technology to the operation of this sector is much more intensive and sophisticated than for the traditional sector.

It has generally been assumed that productivity of labor in the traditional sector is considerably lower than that of modern sector.[1/] This is shown in Tables 4 and 4a.

Table 4. Production per Laborer in the Primary, Secondary, and Tertiary Sectors (about 1953). (16, p. 49)

Economic geographic area	Productivity per laborer in dollars		
	Primary sector	Secondary sector	Tertiary sector
North America	2,860	5,530	5,200
Oceania	4,150	2,360	2,430
Northwest Europe	1,040	1,700	1,590
Southeast Europe	310	1,280	720
Latin America	360	1,120	1,480
Japan	400	1,100	1,020
Near East	280	690	680
Southeast Asia	170	370	380

1/ Throughout this paper the terms agricultural, traditional, rural and subsistence sectors will be used interchangeably. We will use the terms modern, industrial, and urban sectors interchangeably also.

Table 4a. Production per Laborer in the Primary and Tertiary Sectors, as Percentage of the Secondary Sector (16, p. 49)

Economic geographic area	Primary sector	Tertiary sector
North America	54	97
Northwest Europe	62	94
Southeast Europe	24	56
Latin America	33	132
Japan	33	92
Near East	41	99
Southeast Asia	40	101

3. Regional Dualism

From his European experience, Professor G. Myrdal suggested that less developed countries are characterized by large and increasing gaps in productivity and income among major regions, and advanced nations by small and diminishing ones (11, p. 23-38). He believes that this characteristic is so universal that it could be taken as a measure of economic development. One of the keys to economic development and growth is to step up the development of these lagging regions, and prevent the leading regions from getting so strong that lagging regions become chronically poor.

Statement of the Problem

A major problem may arise if both regional and technological dualism overlap. Under conditions of technological dualism, we may observe a satisfactory increase in both investment and income per capita in the modern sector, without observing a corresponding improvement of the traditional sector.

The worst situation arises when an already lagging region falls into the traditional sector. In this situation, people from low productivity jobs (mostly farmers) will try to move to more productive jobs. This would require not only moving from one region to another, but from a traditional sector to a modern sector. Quite often, the rate of transformation of labor from the traditional sector to the modern sector is greater than the rate of availability of new employment opportunities in the modern sector. As a result, what we end up with is underemployment in the modern sector. Practically all major cities in Asia and Latin America are examples of this case.

W. A. Lewis, in his paper on "Economic Development with Unlimited Supplies of Labor", points out that in most less developed countries the price of labor is a wage at the subsistence level. At this wage, as long as supply of labor exceeds demand, the supply can be viewed as unlimited (8, p. 403). In other words, we can

conclude that, since marginal productivity of labor in traditional sector is considerably lower than in the modern sector, there is surplus labor time in agriculture. The existence of this surplus labor time in agriculture has been the backbone of most theories of economic development for a dual economy.

Rural-urban migration of the labor due to technological and regional dualism, as we have already pointed out, creates a pool of underemployed labor in the modern sector. This pool of labor should be very carefully considered, for otherwise it will not only create an obstacle to economic growth, but it will be a threat to political system of most of less developed countries. Most leading economic development theories for a dual economy view the surplus labor as located in the agricultural sector. Since this does not characterize many countries it is possible that these theories might lead us to inappropriate conclusions.

Purposes of Study

The purposes of this study are as follows:

a. To examine current economic development models for dual economies with respect specifically to labor employment.

b. To analyze the conclusions of such models under alternative specifications of the labor situation.

c. To examine the welfare implications of the surplus labor dual economic models.

Plan of Study

Chapter II reviews the relevant literature written on the subject. Special attention will be given to the Fei-Ranis model of economic development and its policy considerations.

Chapter III defines an alternative situation and analyzes the situation through existing Fei-Ranis development model (reversal of Fei-Ranis model). This chapter will evaluate the development models (Fei-Ranis and its reversal) from the welfare standpoint.

Chapter IV summarizes the findings and reemphasizes the policy considerations of the study.

II. REVIEW OF LITERATURE

In the last two decades the majority of the essays on the issue of economic development with unlimited supply of labor have followed the classical tradition. This is mainly due to the fact that all classical economists argued that at subsistence wages the supply of labor will be unlimited. In the classical framework, the process of production over time had a key requirement. The key was the capital formation process, which was explained in terms of distribution of income and the growth of income, rather than relative prices of the commodities which was only an issue of secondary importance.

Once the neo-classical tradition developed, income distribution maintained its importance, prices were given more attention, and the assumption of unlimited supply of labor was completely disregarded. Neo-classical models had the empirical support of the European countries where no unlimited supply of labor was observed. But in some of the less developed countries, mostly Asian, where supply of labor was unlimited at the subsistence wages, the neo-classical theory could not apply.

The publication of Keynes' "General Theory of Employment, Interest, and Money" inspired the set of theories which are known as steady growth models. These models are essentially directed

toward the problems of more advanced countries. They were very effective on the problems of secular stagnation and/or chronic unemployment. As Higgins points out, the theories are general enough that with appropriate modifications they can be applied to less developed countries (6, p. 106).

On the other hand, the Keynesian approach has not been very practical in the field of economic development of less developed countries. W. A. Lewis points out that:

> When Keynes's General Theory appeared, it was thought at first that this was the book which would illuminate the problems of countries with surplus labor, since it assumed an unlimited supply of labor at the current prices, and also in its final pages, made a few remarks on secular economic expansion. Further reflection, however, revealed that Keynes's book assumed not only that labor is unlimited in supply, but also, and more fundamentally, that land and capital are unlimited in supply--more fundamentally both in short-run sense that once the monetary trap is turned the real limit to expansion is not physical resources but the limited supply of labour and also in the long-run sense that secular expansion is embarrassed not by a shortage but by a superfluity of saving. (8, 400-401)

As a result of these characteristics, the Keynesian analysis does not offer much more than the neo-classical approach for those countries with surplus labor. Primarily because of this widely accepted belief in the development literature, we find most of the recent articles have not only been influenced by the classical tradition, but W. A. Lewis himself.

Since the question of surplus labor is of great importance here,

let us examine this issue a little more closely. Much of the discussion in the literature is about whether or not the marginal productivity of some of the labor force in the traditional sector of less developed countries is equal to zero? T. W. Schultz (14, p. 53-69) makes a distinction between three states of the economy:

1. One in which the marginal productivity of labor in agriculture is very low because of the factors at the disposal of the community, and labor in agriculture produces as much as does comparable labor in other sectors when costs of transfers are properly reckoned;

2. Another is in which the marginal product of labor in agriculture is less than that of comparable labor in other sectors of the economy after the costs of of transfer are taken into account. This state is the type of disequilibrium that characterizes much of modern agriculture; although adjustments are being made there is nevertheless an excess supply of labor in agriculture.

3. Still another state, in which the marginal productivity of part of the labor working in agriculture is zero. (14, p. 56)

It should be noted that it is primarily the second and the third cases that are of interest here.

L. G. Reynolds points out that we should try to define labor in terms of man-hour rather than people. In this case even if marginal productivity of man-hour is not equal to zero we can still observe a labor surplus in the economy. This is primarily due to three reasons:

1. As a result of rural-urban migration, as we have pointed out in Chapter I, unemployment in the cities will rise.

2. Many workers work less than any reasonable definition of full time. These people can be persuaded by some wage increase to work harder.

3. We can quite often observe, as Schultz has pointed out, that the productivity in rural areas is well below the productivity in urban areas.

Due to these three main reasons, Reynolds argues that there is a labor surplus time available in most less developed countries (12, p. 91-93).

In this chapter, we will start with a brief introduction to the W. A. Lewis model, and we will only represent the portion of the model which is relevant to the future discussion; in other words, the demand for and supply of labor in the capitalist sector. Then we will spend some time on Fei-Ranis model, which has very heavily drawn from W. A. Lewis's model. We will also consider D. Jorgenson's model as an alternative way of analyzing the situation (steady growth). Finally, we will look at one of the more recent models which has been formulated by M. P. Todaro.

The Lewis Model (8, p. 400-415)

In his famous article, "Economic Development with Unlimited Supplies of Labour", W. A. Lewis argues that we can observe a surplus labor in most of the less developed countries, especially

countries with large population relative to their natural resources, and in which there are large sectors of economy where marginal productivity of labor is negligible, zero, or even negative. For Lewis, whether or not MPL (marginal productivity of labor) is equal to zero, negligible, or negative, is not the fundamental issue. What is important, however, is that the labor force has a subsistence wage level. Then supply of labor would be unlimited as long as the supply of labor at this price exceeds the demand. In his model surplus labor could be seen in:

a) Agriculture

b) Housewives who are not employed

c) Increase in population from excess births over deaths

d) Marxian reserve army, the unemployment generated due to labor-saving efficiency in the modern sector.

Let us assume that we have a closed economy and an unlimited supply of labor is available. Since capital is scarce, only so much labor can be used with capital. The limit, then, is where MPL is equal to zero. But on the other hand since wages are greater than zero even when the supply of labor is unlimited, labor then would only be applied up to the point where MPL will be equal to current wages.

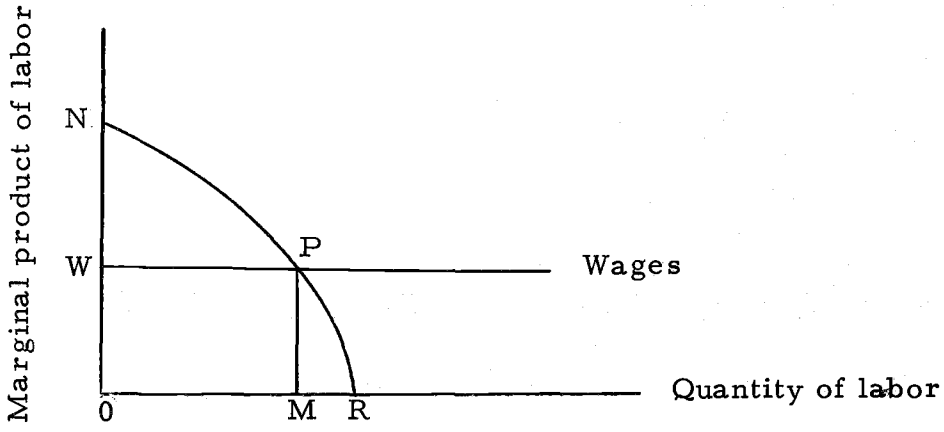


Figure 1. Lewis's model for the capitalist sector

In Figure 1, we have a fixed amount of capital in the capitalist sector. OW is the current wage rate. If MPL was equal to zero (outside the capitalistic sector), then OR would be the amount of labor employed. But since they have to pay OW wage rate, the capitalist sector would employ OM where MPL is equal to the wage rate. NWP would be the capitalist surplus. OWPM would go as wages to the workers in the capitalist sector.

As it is obvious by now, Lewis has two sectors in his model--a capitalist sector and a subsistent sector. A capitalist sector is one that uses reproducible capital, and pays capitalist for the use of it. A subsistent sector is one that does not use reproducible capital. The wages in the capitalist sector are determined by what people earn in the subsistent sector. This fact has great political

importance; capitalists have a direct interest in holding down the productivity of the subsistent workers (wages in the subsistent sector are equal to average product of the subsistent workers). Of course, the wages in the capitalist sector would be higher than the subsistent sector. This could be explained in several ways. One way is the economic and social costs of transferring from the easy going way of life of the subsistent sector to the more regimented and urbanized environment of the capitalist sector. Some incentive is required to induce workers to transfer.

It is quite important to notice that in Lewis's model the key to economic expansion is the use that the capitalist will make of his surplus. If he reinvests his surplus to create new capital, the capitalist sector will expand, and employment in this sector would increase. Once the capitalist has reinvested his surplus, the process of capital accumulation will start. As we can see in Figure 2, the capitalist surplus will even be greater in the second stage (where MPL=N_2Q_2). This process will continue until the surplus labor disappears. OS is the average subsistence wage rate, OW is the capitalist wage rate. $WN_1\ Q_1$ is the capitalist surplus in the first stage. He reinvests his surplus, fixed capital is increased, MPL shifts to the right, and as a result Q_1Q_2 will be the net increase in employed labor. This process can and will continue with the existence of surplus labor.

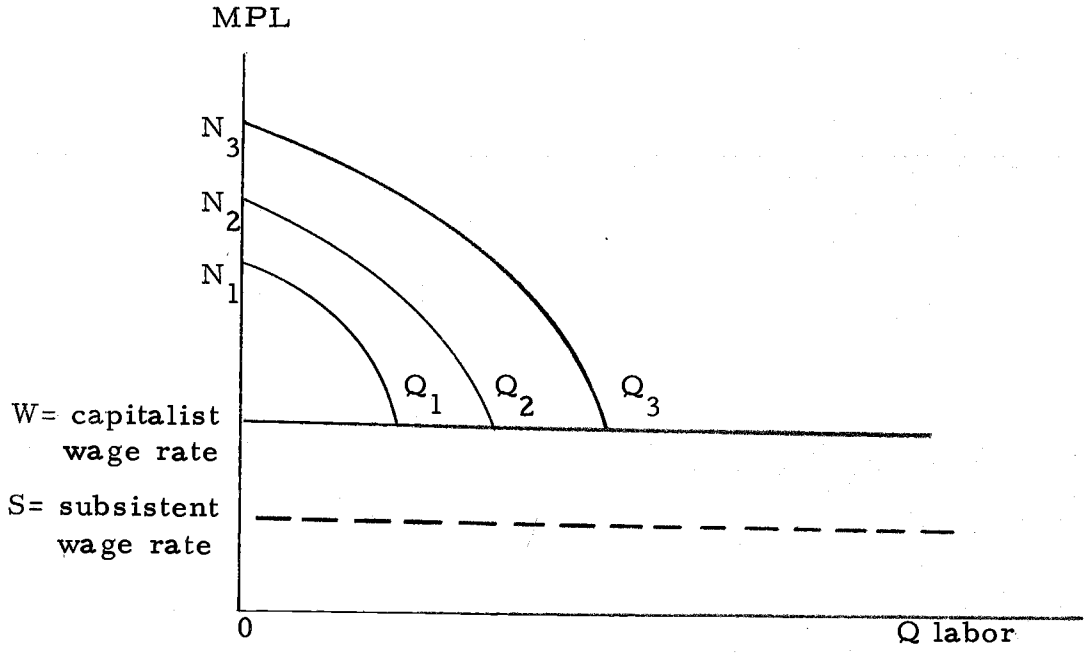


Figure 2. Lewis's model for capital formation in the capitalist sector

Notice that the growth and application of technical knowledge outside the capitalist sector would increase the level of the subsistence wage and would force an increase in the level of capitalist wage rate. This in turn would cut the amount of capitalist surplus, which in turn would slow the process of capital accumulation.

It is interesting that in his model Lewis has suggested that employment can only be raised in the capitalist sector. This is due to his assumption that capital accumulation can only be observed in the capitalist sector. What this means then is that the capitalists would try to keep the productivity of the subsistence workers down, and since capital accumulation can only be observed in the

capitalist sector, the government might be solicited to support them. Thus the economy would develop at the cost of the subsistent sector.

The assumption that the capitalist would reinvest his surplus in the capitalist sector is consistent with the classical definition of a capitalist. An interesting question is what would happen if the capitalist did not reinvest his surplus (a commonly observed phenomena in less developed countries)? It seems as if the whole analysis of Lewis's article will fall apart. Development of a capitalist sector at the cost of a subsistent sector is a very complicated question which should be answered for each individual case separately. The greatest contribution of W. A. Lewis's article has been his approach in mobilizing the assumed surplus labor in the subsistent sector for economic growth.

Fei-Ranis Model (4, p. 533-557)

Fei and Ranis, in their article on "The Theory of Economic Development" start by assuming that the underdeveloped countries in their model have at least three common characteristics: first, they all have surplus labor, and second, the vast majority of people are engaged in agriculture, and third, the rate of population growth is quite high. Here in this chapter we will not consider the impact of population growth on their model, and we assume that the size of

the population (labor force) is fixed and constant. Their starting point has been derived from the work of Lewis which, as we have seen, develops a two-sector model and explores the expansion of the capitalist sector by means of use of cheap labor. Fei-Ranis have substituted the industrial sector for the capitalist sector of Lewis's model. In other words, they argue that capital formation will take place in the industrial sector. This cheap labor will be provided to the industrial sector, just as in Lewis's model, by the agricultural sector where we observe a subsistence level of living. In order to set up their model, Fei and Ranis show the relationship of productivity of labor in industrial and agricultural sectors, and then go on to explore changes in production for each sector.

Before going into the model, we must mention some of their major assumptions.

1. A closed economy (no foreign trade).

2. The supply of land is limited.

3. There is a constant institutional wage rate which is free of the forces of the market, and at this wage labor supply to the industrial sector is perfectly elastic.

4. Redundancy of labor in agriculture exists. Some of the population of the agricultural sector have a marginal productivity equal to zero.

5. Innovation in the industrial sector which increases labor demand, will transfer labor from agriculture to industry.

In Figure 3, the industrial sector has been represented by Figure 3a. Here we have Lewis's diagram. The demand curve for labor has been designated by dtf, and the supply curve has been designated by Stt'S'. Figures 3b and 3c represent the agricultural sector.

In Figure 3c, ORCX represent total physical productivity in agriculture. At the initial breaking point we can assume that all labor is in the agricultural sector, OA (here we are using labor and population interchangeably). This labor force produces a total of AX. $\frac{AX}{OA}$ is what Fei-Ranis have called (arbitrarily) the institutional wage. Then only at point R, as shown on the graph, will the marginal physical product of labor be equal to the institutional wage rate because the slope of the total product curve at R is parallel to OX. Hence AP (Figure 3c) is what is known as "disguised-unemployment". Based on the arbitrary institutional wage, OP should be the size of the labor force in agriculture, and AP should be transferred to the industrial sector.

In Figure 3a, the demand and supply curves determine the size of the employment in the industrial sector. St is that portion of supply curve where supply of labor is unlimited. We should note that if due to an increase in stock of capital the MPP curve shifts to the right of t, labor supply will not be unlimited at a fixed wage rate.

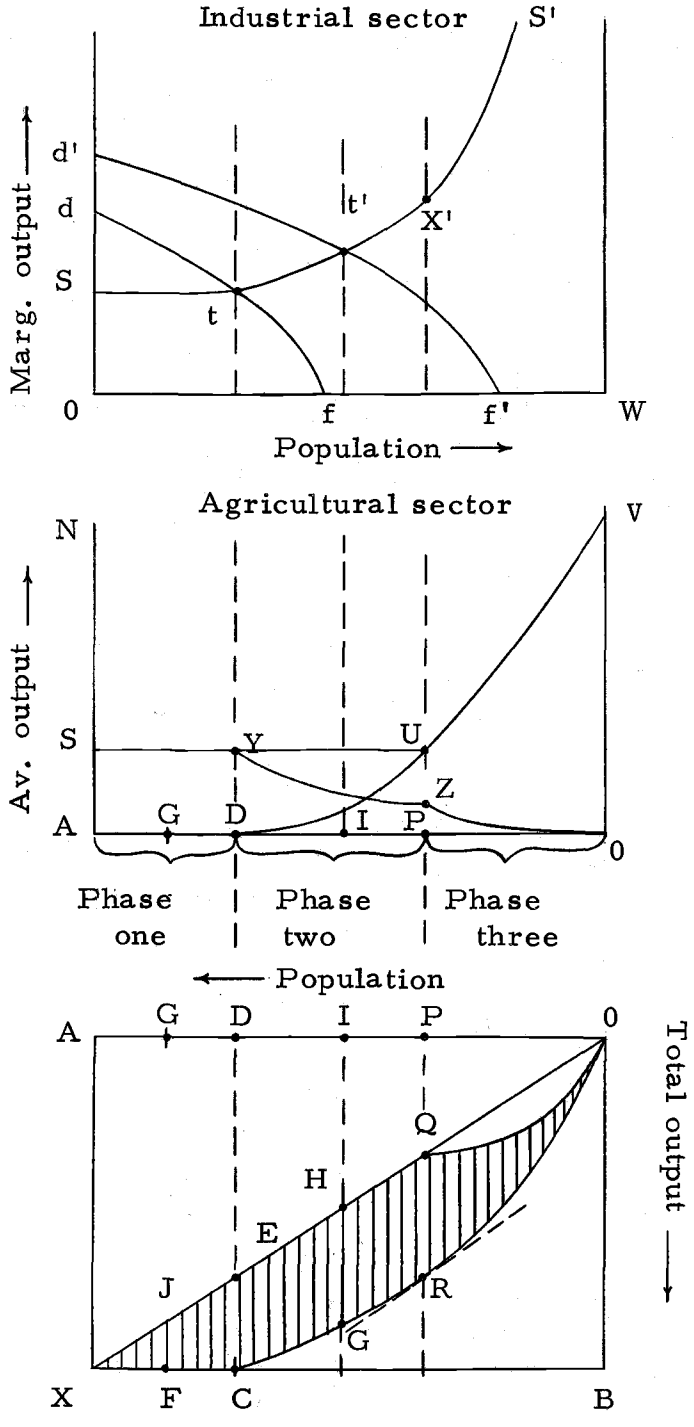


Figure 3. Fei-Ranis; basic structure [a]

[a] Units are the same for all horizontal axis.
Units are the same for all vertical axis.

In Figure 3b, ADUV represents MPP of agricultural workers, and AS represents the institutional wage. SYZO represents the average agricultural surplus curve (total agricultural surplus, TAS is equal to TPP of agricultural sector minus total consumption, agricultural population times the institutional wage, of the agricultural sector. AAS is defined as total agricultural surplus available per head of allocated industrial workers). AN, in the same figure, measures the average agricultural output.

If we consider ADUV, (MPP of agricultural workers), we will notice three different phases: phase one, where MPP=0 and AD represents the redundant labor force; phase two, where MPP is greater than zero but smaller than institutional wage rate; and phase three, where MPP is greater than institutional wage rate. We assume that the institutional wage rate AS will prevail during the first two phases, and in the third phase wage rate would be equal to MPP. Notice that it is only in the third phase that agriculture has become commercialized. Then SUV would represent the real wages of agricultural sector.

In Figure 3c, as labor is being withdrawn from agricultural sector, agricultural surplus will appear. In phases one and two the vertical difference of ORCX and OX represents the total agricultural surplus. In phase three since wage rate equals MPP of labor the TAS would be smaller than vertical distance between ORCX

and OX and is equal to the vertical distance between curve OQ and OX. Notice that SYZO in Figure 3b represents AAS. SY portion of AAS curve remains constant because of MPP=0. In phase two since MPP is positive there will not be sufficient agricultural output to feed all the new industrial workers at the institutional wage rate. As a result in phase two AAS would decline while TAS would continue rising. In phase three both AAS and TAS would decline.

In diagram 3a the supply curve of labor during the process of reallocation of labor from agriculture to industry, would turn up for two main reasons. First, due to shortage of agricultural goods which has been caused because of the disappearance of the redundant agricultural labor force (phase two). Second, the change in wage rate of agricultural sector, again due to complete disappearance of disguised unemployment (phase three). Fei and Ranis have chosen to call the boundary between phases one and two a "shortage point". This is due to the declining AAS. They have further chosen to call the boundary of phase two and three as "commercialization point". This label signifies the beginning of a phase where MPP of agricultural workers would be equal to wage rate in the agricultural sector.

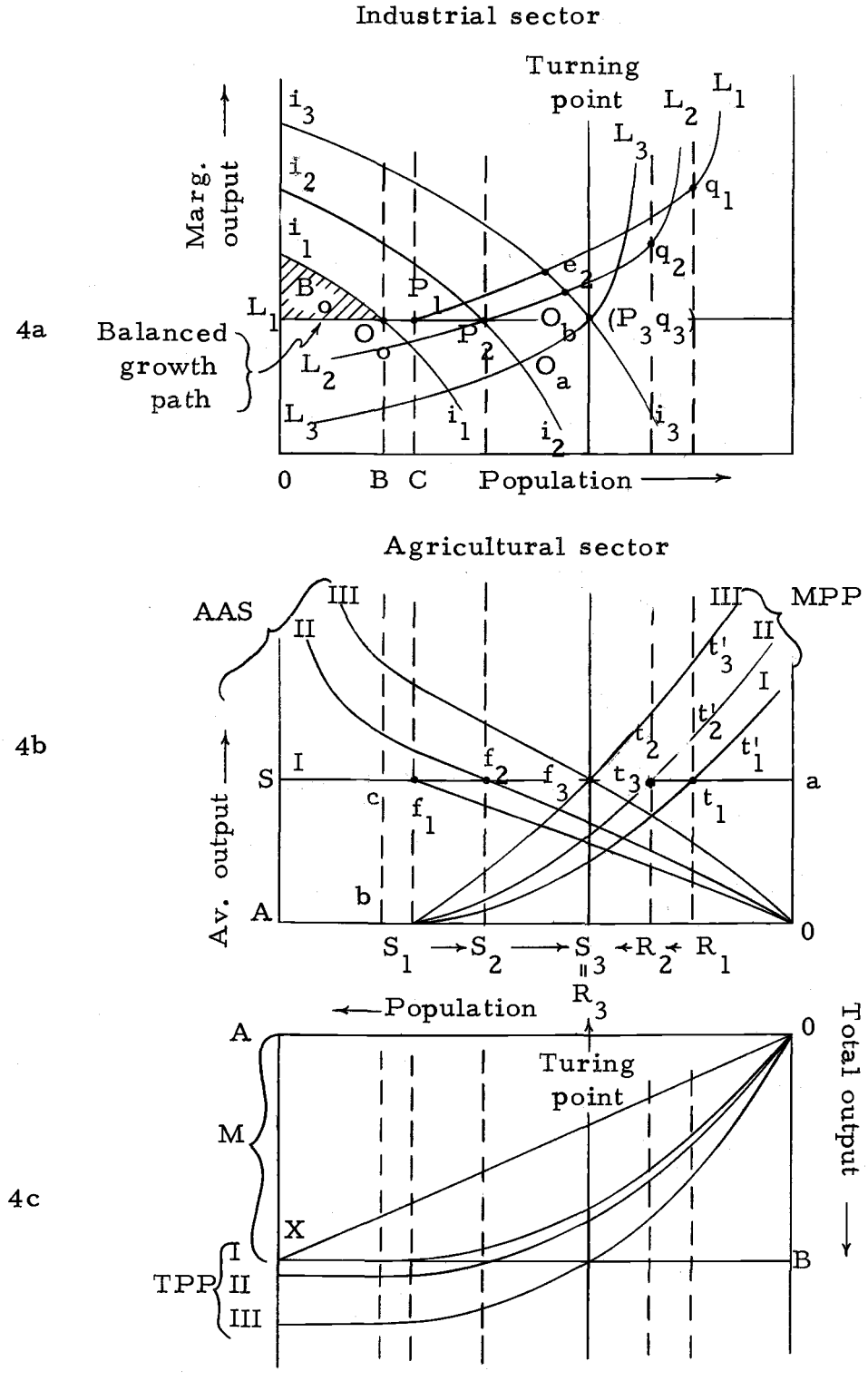
Now that we have developed the general framework of the Fei-Ranis model, let us explore the impacts of productivity changes

in the two sectors. Figure 4 illustrates these changes in both the industrial and the agricultural sectors.

Consider an increase in productivity of the agricultural sector, so that MPP of all but redundant labor in this sector would increase. We notice that TPP will shift out (down), as shown in Figure 4c. In Figure 4b, we have plotted MPP and AAS for the three given TPP curves assuming no changes in the institutional wage. MPP will shift up with an increase in productivity of the agricultural sector. St_1t_1', St_2t_2', St_3t_3' represent labor supply curves (in terms of agricultural goods) for different MPP curves for the agricultural sector.

Notice that S_1, S_2, and S_3 are respective shortage points for AAS_1, AAS_2, and AAS_3. R_1, R_2, and R_3 are commercialization points for respective labor supply price curves. In other words, increases in agricultural productivity diminish the scope of phase two by: (a) enlarging the agricultural surplus (assuming a fixed institutional wage), and (b) enlarging the labor force that can be productively (i.e., MPP=institutional wage) employed in agriculture.

As a result of the upward shift of labor supply curves (Figure 4b), the horizontal portion (phase one and two) will be shortened, and as a result phase three will be reached sooner. On the other hand, given number of agricultural workers if TPP increases and total



4a

4b

4c

Figure 4. Fei-Ranis with changes in the total production of the agricultural sector

consumption remains constant, both TAS and AAS will increase. Because of this rise, AAS would shift up and as a result we will move from S_1 to S_2 and finally to S_3. Finally where $S_3=R_3$ is the point where commercialised and shortage quantities have vanished, and this point has been called the "turning point", a phrase which has been taken from W. Lewis.

In Figure 4, as shown, the upward shift in AAS will move the industrial supply curve downward before the turning point. An increase in AAS will worsen the terms of trade for the agricultural goods, at the institutional wage rate. This simply means that the industrial wage in terms of industrial goods must decline. It takes fewer industrial goods to equal institutional wage if fixed in terms of agricultural goods. On the other hand, an increase in MPP will raise the real wages of the agricultural sector after the turning point, and this effect would cause the industrial supply curve for labor to turn upward after the turning point. Since the "real-wage change" effect would eventually be greater than "terms of trade effect", we observe that L_2L_2 curve crosses L_1L_1 from below.

Let us define L_1P_3, the horizontal line in Figure 4a, as the balanced-growth path. Notice that all industrial labor supply curves between L_1L_1 and L_3L_3 (the one corresponding to the turning point) will cross the balanced-growth pathattheir shortage

points. This is due to the fact that at each shortage point, AAS and the subsistent wage rate of the agricultural sector are equal. Hence the same real wage, in terms of industrial goods, must prevail every time.

We should explain what we mean by balanced-growth. In Figure 4a, the demand curves for labor in the industrial sector (i_1, i_2, i_3) will shift to the right as capital accumulation takes place (Lewis diagram). On the other hand, due to the change in productivity of the agricultural sector at the same time, we observe that supply curve for labor in the industrial sector moves outward (to the right) also. Hence, the main issue from a balanced-growth point of view would be the harmonization of the changes in both sectors so that:

a. The terms of trade of the two sectors does not change radically in favor of one and against the other (output criterion).

b. Investment should be so allocated that at a given constant industrial wage rate, the industrial sector be able to absorb exactly the same number of workers which has been freed from the agricultural sector so that MPP (measured in either industrial or agricultural goods) is equal in both sectors, allowing for transfer costs; for the entire labor force.

In Figure 4a, $i_1 i_1$ is our initial demand curve for labor. The supply curve of labor is shown by $L_1 L_1$. At this level, the industrial sector would hire $L_1 O_0$ of the labor force. B_0, the shaded area would be the profit of the industrial sector. To

achieve balanced-growth this profit should be reallocated to both the agricultural and industrial sectors. As a result the productivity in the agricultural sector on one hand, and the demand for labor on the other hand would go up (i_2i_2 would be the new demand curve, and L_2L_2 the new supply curve of labor in the industrial sector). Notice that O_0P_2 is the additional labor which is hired in the industrial sector which in turn is equal to additional labor which is being released from the agricultural sector. Notice that since L_2L_2 and i_2i_2 have intersected the balanced-growth path the terms of trade criterion has not been violated.

In reality, we would expect that the actual growth path to fluctuate around the balanced-growth path, but there will be some counter forces which would push it back to equilibrium. Assume that the growth path is at a point like e_2 above the balanced-growth path. Investment in the agricultural sector has shifted the supply curve of labor to L_2L_2, while investment in the industrial sector has shifted the demand curve for labor to i_3i_3. Here we have an over-investment in the industrial sector. The shortage of food will raise the real wages of the industrial sector and hence would discourage investment in that sector. As a result more investment in the agricultural sector will take place, and hence will cause the actual growth path to shift back toward the balanced-growth path.

Reynolds in his paper on "Economic development with surplus

labor: Some complications", points out that Fei and Ranis model is unrealistic. He questions the practicality of real wages remaining constant while increases in productivity are all channeled into capital accumulation. He argues that Fei-Ranis have set up a rather unusual agricultural organization, in which landlords hire wage laborers. It is because of the assumed surplus labor that the landlords are able to keep the wages constant. In a system of peasant agriculture, Reynolds points out the behaviour of real earnings depends on numerous factors (the elasticity of demand for foodstuffs, the rate of increase of real consumer income in the economy, etc.), and there seems no a priori reason to suspect the real earnings in agriculture would remain constant rather than either falling or rising(12, p. 93-94).

It seems as if agricultural surplus is the key to the transformation of labor from agriculture to the industry. As long as this agricultural surplus can be taken out of the agricultural sector to feed industrial workers economic transformation can proceed. This would suggest that as long as agricultural surplus is not completely absorbed in the industrial sector, the contribution of the agricultural sector to the economic development is only the labor force that it provides for the industrial sector. As Mellor has pointed out a capital shortage in the industrial sector would slow down the process of transformation (flow of labor is a function of

availability of jobs in the industrial sector). With ample food, the labor force which is transformed from agriculture, plays a part in the accumulation of part of the capital in the industrial sector, and this is the extent of the contribution of agricultural sector to the capital accumulation process (9, p. 24-25).

Jorgenson Model (7, p. 309-334)

In Dale Jorgenson's model of development of a dual economy, the economy has been divided into modern and traditional sectors. Resources in the economy are land, labor, and capital. In the traditional sector, he has assumed that no capital accumulation takes place, and as a result production would be a function of land and labor only. His model further assumes that the supply of land is limited and all available land has been cultivated. The relevant factors of production in the modern sector would be capital and labor only.

In order to be able to look at his model we should familiarize ourselves with some of his assumptions.

a. Agricultural activities, in the traditional sector, are characterized by diminishing returns, while the modern sector's production activities are characterized by constant returns to scale.

b. Production functions of both sectors are such that each will shift over time in a manner that a given number of factors will generate a higher level at one date than at an earlier date.

These autonomous shifts in the production functions are due to technological changes. He has assumed that technological changes will take place at some more or less constant rate, and that all changes are neutral (marginal rate of substitution of factors of production before and after the change would be the same).

Population growth in this model depends on the supply of food per capita and what Jorgenson calls the "force of mortality." Force of mortality is assumed to be given but it can be changed by the state of medical techniques. The birth rate depends on the supply of food per capita. This rate can reach its maximum in two ways: (i) it can either reach its physiological maximum, or (ii) one given by a special social situation and of course the medical knowledge, provided that the supply of food is sufficient.

Then if the supply of food is more than sufficient, there is an agricultural surplus, and as a result labor can be freed from agriculture and taken to the modern sector. In other words, if there is no agricultural surplus, all labor will stay in agriculture. For, any transfer of labor from the agricultural sector to the modern sector, at this time, would reduce the total production of the agricultural sector. As a result, the rate of transfer of labor from the agricultural sector to the modern sector is directly proportional to the rate of growth of agricultural surplus. Further, the growth of the manufacturing sector, after some initial capital formation

has taken place, would depend on the rate of growth of manufacturing employment, and the terms of trade between the two sectors. Because of the steady trend of migration of labor from agriculture to the modern sector, it would be logical to assume that there is a differential between wage rates of the agricultural and industrial sectors, and this differential will be proportional to the manufacturing wage rate, and determines the terms of trade between the two sectors.

The key to economic development in this model is technological innovation in the agricultural sector. If the agricultural sector can not only overcome the food shortage but can increase its surplus, the system will start the process of development of both sectors. Jorgenson is quite aware of this situation and he further realizes that in order to be able to obtain such a goal, there should be a definite attempt to change the traditional structure quite drastically.

Mellor has pointed out that Jorgenson's model assumes that all agricultural labor has a subsistent level of living. As a result the only agricultural surplus would be due to one of the two reasons. First, we may have an increase in production; and second, the surplus belongs to that portion of labor which is being transferred to outside agriculture. Mellor argues that in fact quite a few farmers have incomes higher than the subsistent level (9, p. 25-27).

The major difference between the Fei-Ranis model and that of Jorgenson is that Fei-Ranis assumes redundant labor in agriculture. In other words in the Fei-Ranis model total agricultural production will not be diminished by the withdrawal of the redundant labor force. On the other hand in Jorgenson's model, the minute you withdraw one man from the agricultural sector the total agricultural production will be reduced by the amount equal to the marginal production of that man (similar to phase two and three of Fei-Ranis).

For Jorgenson the characteristics of an economy which is experiencing steady growth depends upon the existence of agricultural surplus and technological conditions in the advanced sector. As a matter of fact he argues that the advanced sector will ultimately have a faster rate of growth and will dominate the economy (7, p. 334).

Todaro Model (15, p. 138-147)

In contrast to the preceding models where the emphasis was on transferring labor from the subsistence sector to the modern sector, M. Todaro in his paper on "A Model of Labor Migration and Urban Unemployment in Less Developed Countries", recognizes the very critical problem that significant urban unemployment and underemployment already exist in many countries. What makes it

more and more critical is the fact that most of the writings in this field seem to be preoccupied with the idea of migration of labor from the agricultural sector, and limited attention is being given to the problems that this migration may and will create in the urban (modern) sector.

Todaro's paper has formulated an economic model of rural-urban migration. In order to do so, he argues that the one-stage process of transfer of labor so commonly used in the development models is not realistic. By one-stage he means the direct transfer of labor from low productive agricultural jobs to much more productive industrial jobs. He suggests that this phenomenon be looked at as a two-stage process rather than one-stage. In the first stage the unskilled labor spends a period of time in what he calls "urban traditional" sector. This is where all workers who are not regularly employed in the modern sector, unemployed, and under-employed exist. In the second stage the previously rural worker has attained a more secure job in the modern sector. According to Todaro this approach enables us to consider the conditions surrounding:

a. The decision to migrate

b. the size of the urban-traditional sector

c. accelerated economic growth.

The decision to migrate to the industrial sector in Todaro's model

depends on two variables: first is the urban-rural real income differential, and second the probability of finding a job in the industrial sector. The second variable becomes quite important. It is not certain how long it will take for the industrial sector to absorb the migrant labor.

The major conclusion of his paper is that there are significant interdependencies among industrial expansion, growth in productivity, the expected differential in rural-urban real earnings, the rate of migration, and finally the occupational distribution of the labor force in the urban sector.

The most interesting policy implication of this model is the difficulty of reducing the size of the urban traditional sector without making the rural life more attractive. By controlling the size of the urban traditional sector we can control the size of unemployed and underemployed labor in that sector.

III. A WELFARE EVALUATION OF DUAL ECONOMIC MODELS

In Chapter II we have developed some of the main theories which have demonstrated the possibility of mobilizing the labor force for the industrial use. This has been, until very recently, the major issue in the dualistic economic development models with surplus labor. As a matter of fact, most of the theories have been so much concerned with the transformation of agricultural labor to the industrial sector that they have overlooked the possibility that the industrial sector may not be able to absorb this labor force.

One should ask a very critical question. Assuming that the industrial sector will not be able to absorb the total number of laborers who have migrated from the agricultural sector (rate of migration to industrial sector is greater than the rate of new employment opportunities in that sector), will the system be any better off by a movement from a surplus agricultural labor economy to a surplus industrial labor economy? An example of this situation is what happened in Kenya in 1964. Professor F. H. Harbison has pointed out that:

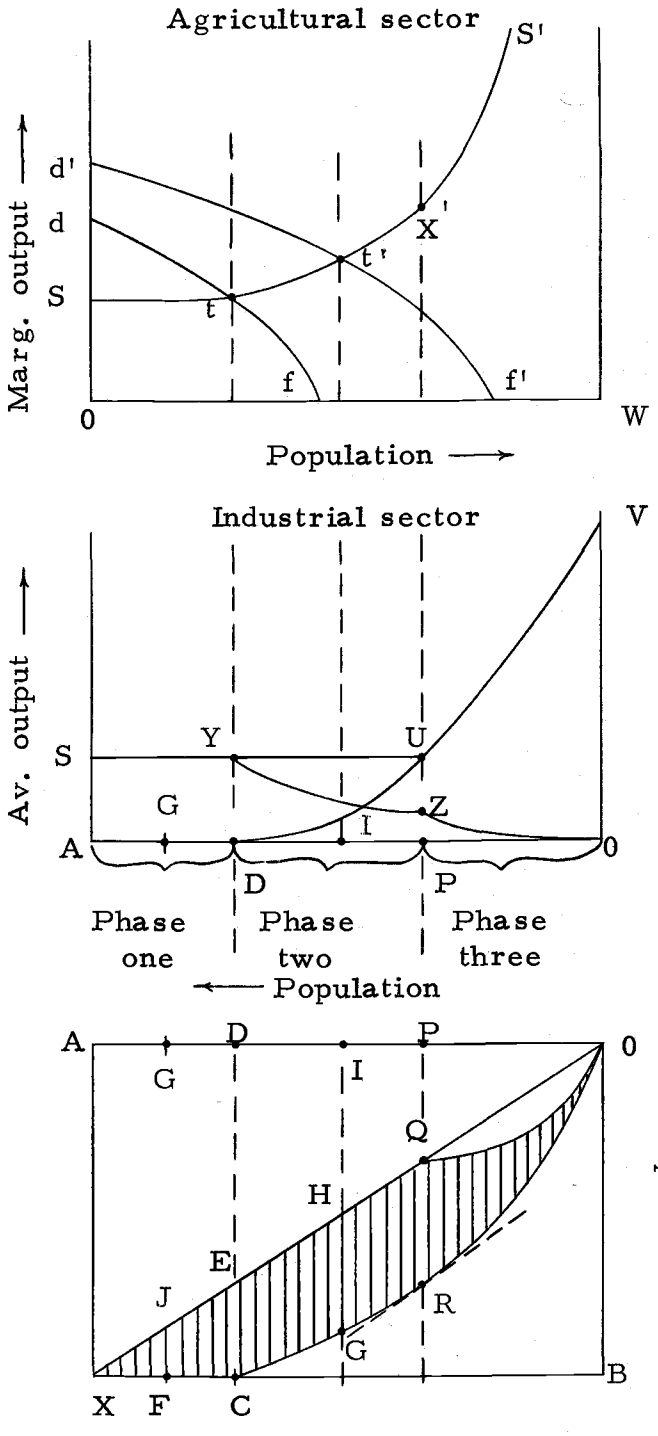
> . . .Here a major effort was made to wipe out unemployment under a "tripartite agreement" whereby the government, private employers and the trade unions agreed that all major employing institutions would increase their employment by 15

> percent. In this case, the unions also agreed to forego their demand for general wage increases. The effort was a colossal failure. The private employers did take on additional workers, and this acted like a magnet attracting new workers into urban labor markets. The government, which faced financial stringencies, simply could not afford to pay for additional workers and thus failed to carry out its part of the agreement. In a few months the working forces in most of the private establishments had dropped to their former levels through attrition not offset by new hires. In the end, the volume of unemployment, as a consequence of the expansion of the modern labor force in response to the prospect of more jobs was probably increased rather than decreased. (5, p. 183 fn**)

The question of increasing urban unemployment, or for that matter unemployment in the industrial sector, is a very serious one that should be given adequate attention. Recognizing the existence of this problem in the theory and practice, this chapter will explore only one aspect. I will attempt to show that the pure and simple transformation of labor from agriculture to industry would by no means be a sufficient proof for increasing welfare in the economy. In order to do so I will first show that the only critical point about the Fei-Ranis model is the assumptions of the model itself and one could easily set up a similar set of assumptions about the industrial sector. In other words, due to increasing industrial unemployment and underemployment, it will be realistic to assume the existence of surplus labor in the industrial sector. Later I will convert this whole analysis in terms of welfare economics and evaluate the validity of each case.

Reversal of Fei-Ranis Model

Figure 5 is the reproduction of the basic framework of Fei-Ranis model except this time we have changed the sectors. In order words, in Figure 5c, we have assumed that all labor is in the industrial sector (OA). This labor force produces AX, $\frac{AX}{OA}$ is the arbitrary institutional wage rate. OP is the optimum size of the industrial sector, and AP should be shifted to the agricultural sector. In Figure 5b ADUV is the MPP of the labor force in industrial sector, AS is the institutional wage rate. Hence we can argue, just as Fei-Ranis have in the original model, that in phases one (MPP=0) and two (MPP greater than zero but smaller than institutional wage rate) wages will be equal to the institutional wage rate; in the third phase (competitive situation) wages will be equal to MPP of labor. As a result SYUV will represent the real wages of the industrial sector in terms of industrial goods. SYZO will represent the AIS (average industrial surplus) which is equal to total industrial surplus available per head of the allocated agricultural workers. Total industrial surplus is equal to the total industrial production minus total industrial consumption. Figure 5a represents the supply of and demand for labor in the agricultural sector. The major difference between this figure and that of Lewis or Fei and Ranis, is that capital



5a

5b

5c

Figure 5. Reversal of Fei-Ranis; basic structure

formation takes place in the agricultural rather than industrial sector. Again it is purely a question of initial specification of the model that makes the difference.

Let us assume that the productivity of all but redundant labor has increased (as shown in Figure 6c). Notice that the three curves, designated as TPP I, II, and III, represent different levels of productivity. Similar to the original argument this increase in productivity will cause MPP to shift upward (MPP rises for all but redundant labor), and average industrial surplus will also rise. This would create a series of shortage and commercialized points which are similar to those discussed in Chapter II. In this reversal situation an increase in average industrial surplus will depress the terms of trade against the industrial sector. On the other hand, an upward shift of MPP will accompany an increase in real wage of the industrial sector after the turning point and will raise the labor supply curve to agriculture after that point. We could demonstrate changes in agricultural productivity, and present the argument of balanced growth in much the same way as Fei-Ranis developed it in the original model.

Thus we see that it is only the assumptions of the Fei-Ranis model which permits their line of argument and conclusions. A re-definition of assumptions, as shown, can change the orientation of the model. The assumption that the economy has a significant

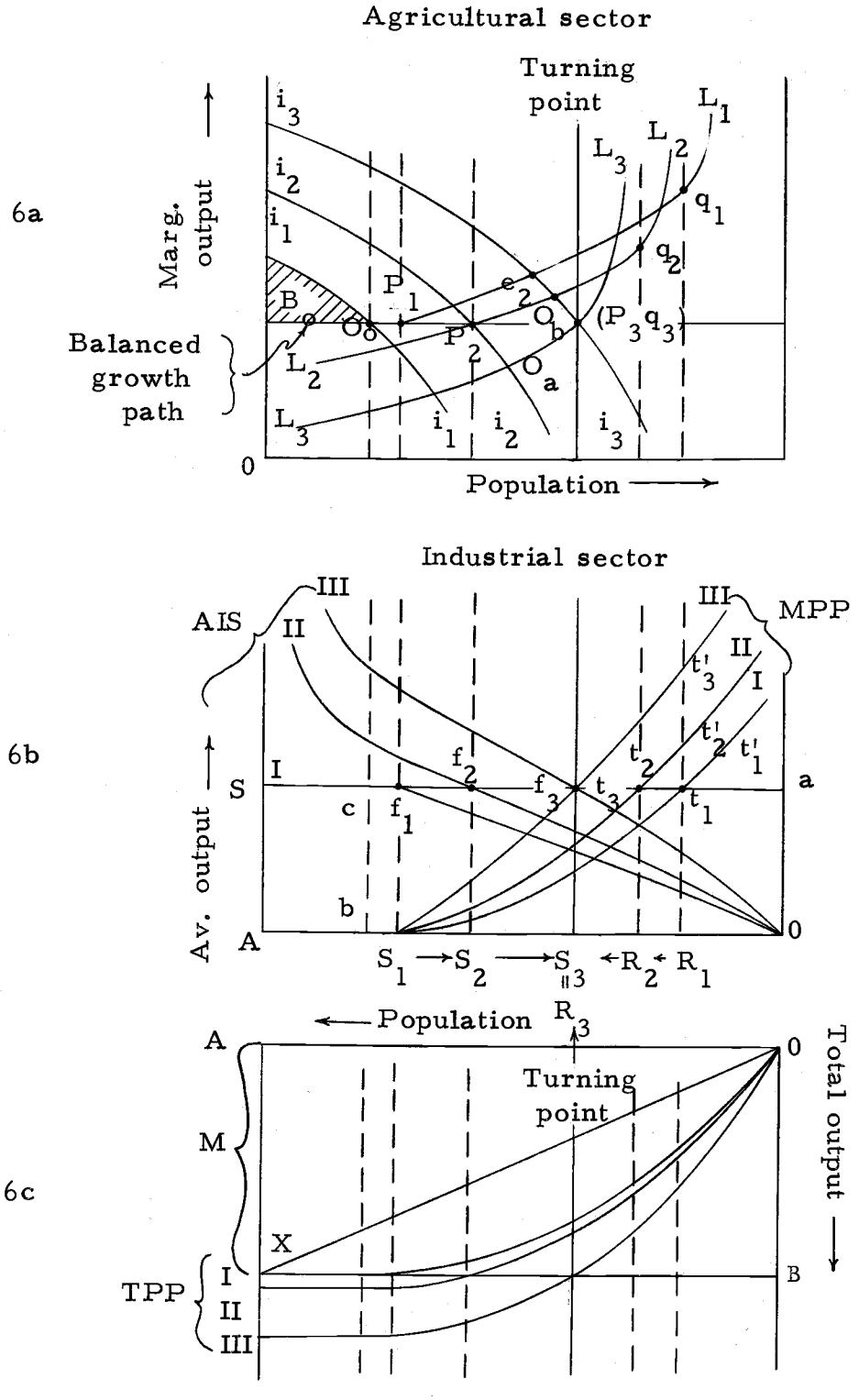


Figure 6. Reversal of Fei-Ranis with changes in the total production of the industrial sector

portion of its underemployed labor in the industrial sector seems as realistic as to assume it always is located in the agricultural sector.

Evaluation of the Efficiency of the Models

Both the Fei-Ranis model and the suggested reversal, emphasize the transfer of labor from one sector to the other. We can argue that the important question is not simply the transfer of labor, but whether or not this transfer would increase the efficiency of the system. There is no doubt that the absolute level of employment and output could be viewed as indicators of the performance of an economic system. On the other hand, it seems to me, we should be just as much concerned with the composition of output (and thus employment), and the efficiency of the use of resources. We will attempt in this section to convert the question of allocation of factors of production (labor for our case) between the two sectors into a welfare economic question.

Continuing to assume a two sector economy, the original Fei-Ranis model can be represented by a production possibility curve as shown in Figure 7. OA is the total production of agricultural sector if all labor is in agriculture, and OA' will be the total production of industrial sector if all labor is in that sector. We assume that all resources (labor and non-labor) are fixed and

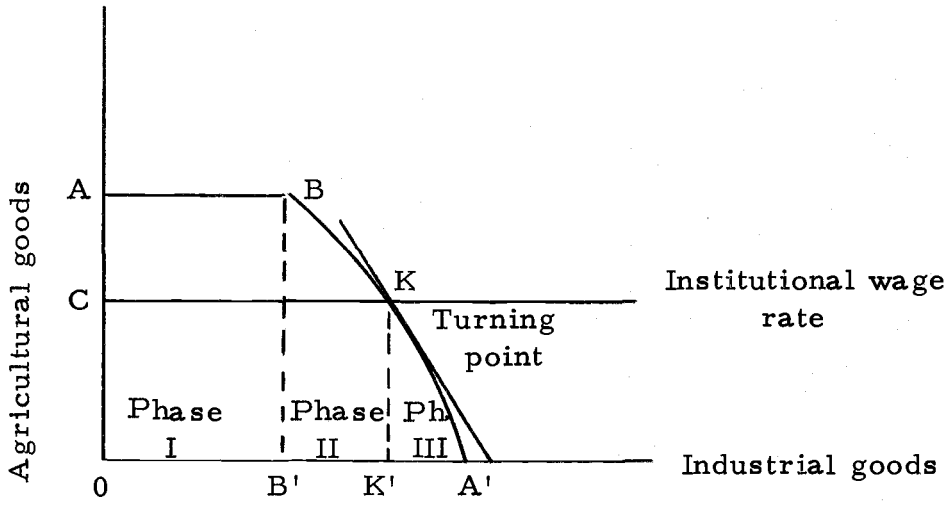


Figure 7. Fei-Ranis model (basic structure) converted into production possibility curve

that the level of technology is constant. Notice that we have also assumed that we have potential surplus labor in agriculture and this surplus corresponds to AB when all labor is located in this sector. In other words, we could increase the industrial production by AB without reducing agricultural production. A major assumption in this analysis is that agricultural workers who shift to the industrial sector will be able to find jobs. In other words, in their model, Fei-Ranis assume that at the beginning period the whole population (labor) of the economy is in agriculture. This is to say that these are primarily agricultural workers; that when totally put to industrial use, they will produce OA'. Thus, there are no special skills required for industrial jobs. Further, we

assume perfect mobility of labor. Different combinations of agricultural and industrial goods are not restrained by the geographical location of labor.[2/]

In the original Fei-Ranis model capital formation takes place in the industrial sector (this is shown by Sdt, in Figure 3a, Chapter II). The important point though, is that this accumulated capital will only be used in the second period of production (as shown by $d'f'$ in Figure 3a, Chapter II). As long as the amount of available capital for each period of production remains fixed, the production possibility ABA' will be a realistic presentation of the model in the given period. Once the accumulated capital is reinvested in both sectors, the production possibility will shift out (we will discuss the shifts in production possibility curve in a later part of this chapter).

The slope of the production possibility curve ABA', is the marginal rate of transformation (MRT) of industrial goods into agricultural goods. Notice that over AB, MRT equals zero. In the BA' portion, MRT is increasing. AB would be similar to the portion of redundant labor in Fei-Ranis model (phase one). We can assume an arbitrary institutional wage rate, represented by CK, where CO is equal to $\frac{OA}{\text{total population}}$. Then BK would be similar to phase two (MRT is smaller than institution wage rate).

2/ For the derivation of production possibility curve, see Bator (1, p. 385-388).

Finally KA' will represent phase three (MRT is greater than institutional wage rate). The turning point, K, is where MRT is equal to the institutional wage rate.

Next consider the demand side as represented by the preference for agricultural versus industrial goods. Assume that the indifference maps of both agricultural and industrial workers for the production of each sector are given to us (these are shown in Figure 8a, 8b).

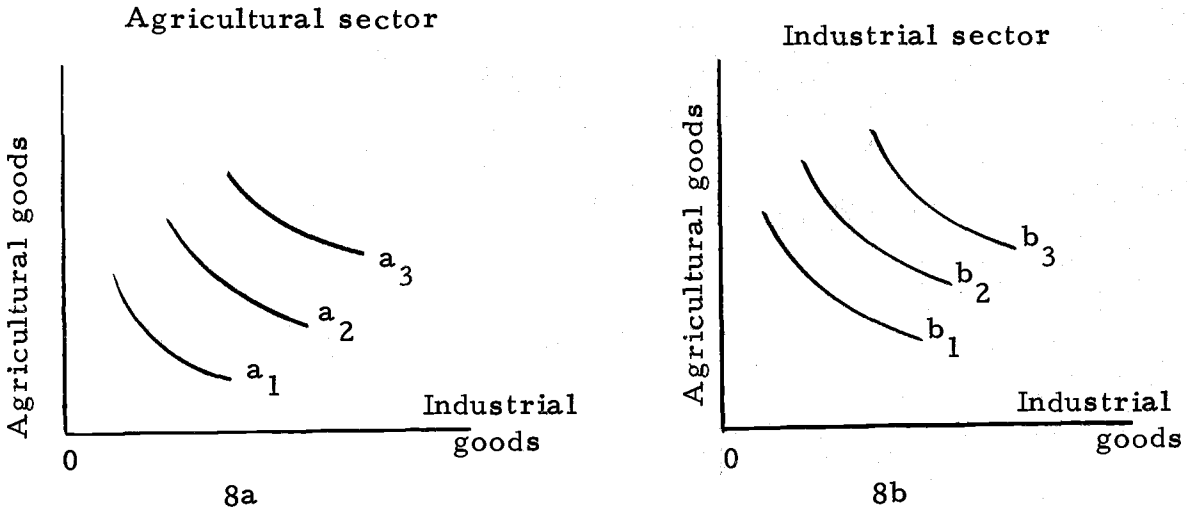


Figure 8. Indifference maps of agricultural and industrial sectors

Industrial workers are indifferent as long as they are on a single indifference curve (b_3, e. g.), and agricultural workers are indifferent as long as they are on a single curve such as a_1. Having this information in hand, we can derive the community indifference map. Then, we can set up the conditions of pareto-optimum level of production, and as a result allocation of factors of production (most important to us is labor) between the two sectors (Figure 9).[3/]

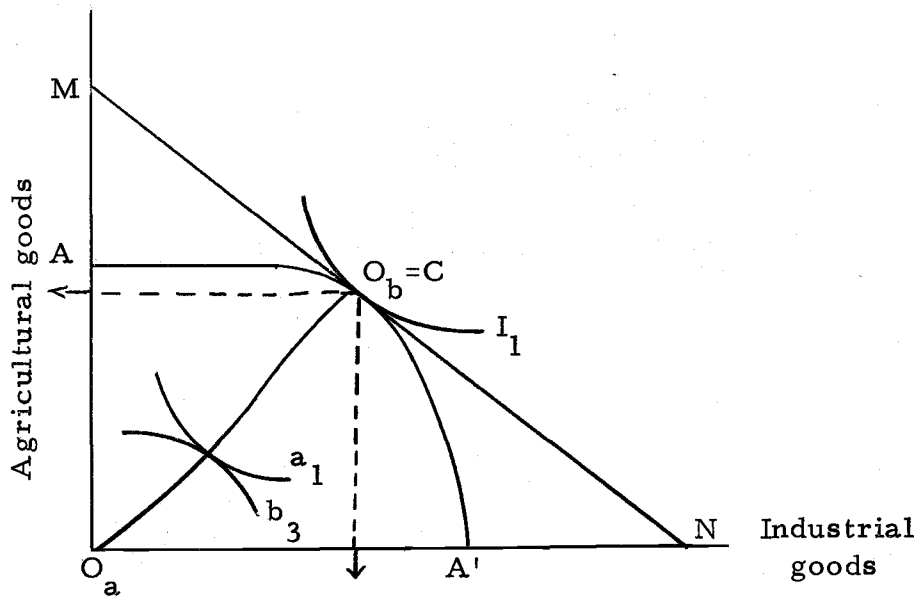


Figure 9. Optimum level of allocation of resources in the converted Fei-Ranis model

3/ For a more detailed treatment, see Bator (1, p. 385-391).

Point C gives us the pareto-optimum level of production in each sector. This point is where marginal rate of substitution (MRS) in both sectors is equal to marginal rate of transformation (slope of MN) of industrial goods for agricultural goods. This point was arrived at through construction of an Edgeworth-Bowley Box (1, p. 385-388). Notice that in a sense what we are saying is that the terms of trade for neither of the two sectors has deterioriated. What is more important is that the welfare of the society, given the tastes and preferences, cannot possibly be increased by any other combination of industrial and agricultural goods.

So far we have been talking about the original Fei-Ranis model. For the reversal of their model, our production possibility curve would have a different shape. This time we are assuming that we initially have a potential surplus labor in the industrial sector (as shown in Figure 10). This time the population at the beginning is in the industrial sector. As a result, we can argue that the workers are primarily industrial workers, and when put to use in agriculture, can produce a total of OA agricultural goods in the given period. Notice that A'B represents the surplus labor in the industrial sector. Here we define the MRT as the amount of industrial goods which will be given up for one unit of agricultural goods (so that MRT=0 over A'B). We will notice that after the

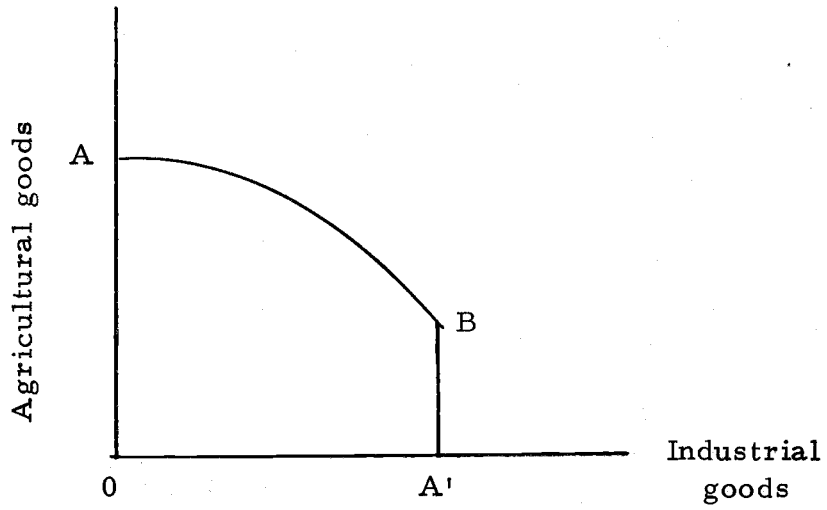


Figure 10. Reversal of Fei-Ranis (basic structure) converted into production possibility curve

surplus labor has been removed from the industrial sector, MRT will start increasing. Here we have the same assumptions that we observed for the production possibility frontier of the original Fei-Ranis model. We could also set up an arbitrary institutional wage rate and define the three phases in the same manner that we did for the original model. Again in order to obtain the pareto-optimum level of production in each sector, assuming we have the indifference map of both industrial and agricultural workers for the products of the two sectors, we can follow the same line of argument as for the original model. In other words, we will find it to be the combination where marginal rate of substitution of industrial goods for agricultural goods is equal to marginal rate of transformation of the two (at M in Figure 11, MRS=MRT). Here the pareto-optimum level of production of the industrial sector is OK, and for the agricultural sector it is OL. By using the underlying production functions, the corresponding optimum allocation of the labor (size of employment in each sector) can be found.

The earlier derivation of the Fei-Ranis reversal with surplus labor in the industrial sector was based on the actual problem of industrial unemployment and underemployment. Moreover, as I have tried to point out, this has mostly occurred because of the inability of the industrial sector to absorb all migrated labor from the agricultural sector. If the industrial sector is not capable of

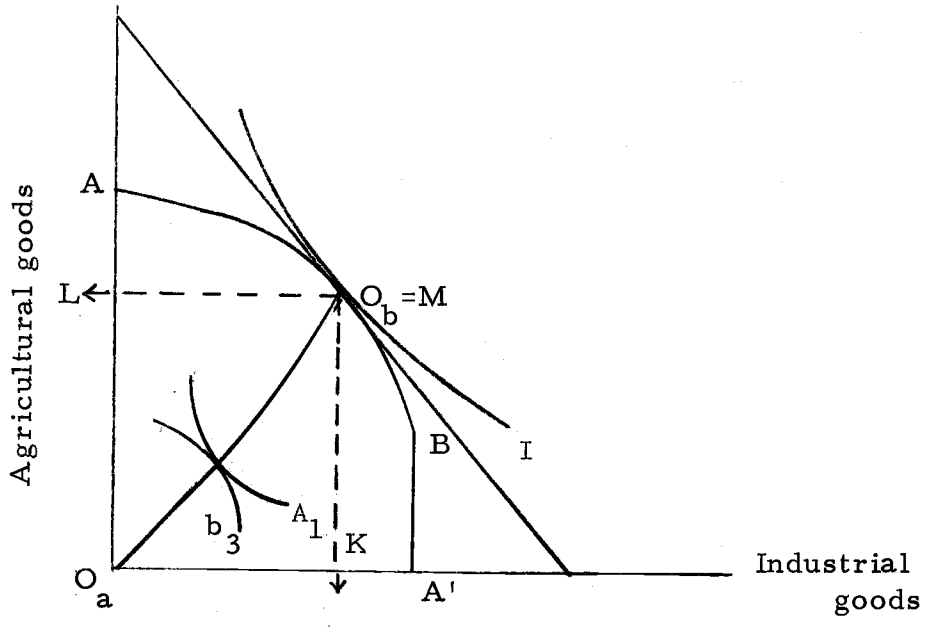


Figure 11. Optimum level of allocation of resources in the converted reversal of Fei-Ranis model

absorbing this surplus labor in the agricultural sector, then one difference between the Fei-Ranis model and its reversal is the location of surplus labor. A more important difference, which is not necessarily related to the existence of surplus labor, is in the composition of the labor force in the original and the reversal models of the Fei-Ranis. As we have already pointed out, in the original model the population is totally composed of agricultural workers who may be transferred to the industrial sector. In the reversal, we have the exact opposite situation. In other words, the population is totally composed of industrial workers who may be transferred to the agricultural sector. It should be

clear then, that the composition of the labor force (population) makes a significant difference in the structure of the society. For our discussion this difference will be shown by the existence of two production possibility curves which are open to the economy as alternatives. In other words, the society may choose to industrialize and hence commit itself to the production possibility curve with a labor force which is primarily industrially oriented. This means that they have foregone the alternative that was open to them (namely choosing the production possibility curve with a labor force which is primarily agriculturally oriented).

It should be noted that the shift from one situation to another (primarily industrial to primarily agricultural, or vice versa), is not an easy one. There are many complicated problems involved. The most important for us would be the difference of the skills of the two populations. Then the only possible way that one can make such a shift is through time. So once we represent two production possibility curves, it is quite important for us to realize that society can only commit itself to one of them. Then, the other can only be made available to the society over a period of time, and it is not feasible for the society to move from one to the other in the same time interval. So, again, it is the question of an alternative which could be opened for the society. In this sense then one can raise a very critical question: Should the society change its structure (in terms of agricultural and industrial population) over

time? In other words, would the society be distinctly better off, if they move to the alternative position over time?

We have derived the production possibility curve of the original Fei-Ranis model and we have also observed the production possibility of the same economy with surplus labor in the industrial sector. We could consider these two as the alternatives for an economy, and then compare the two from a welfare standpoint. Here we can consider two cases:

Case A:

Here we have assumed that production possibility curves cross each other (Figure 12 represents Case A). ABA' is the production possibility curve with surplus labor in the industrial sector, and ADA' is the production possibility for the original Fei-Ranis model. It should be pointed out that here we are assuming that our labor force, as a group, is just as productive in industrial use as it is in agricultural use.

Given the tastes and preferences, Q_1 represents the pareto-optimum level of production of agricultural and industrial goods when surplus labor was in agriculture. Q_2 represents the pareto-optimum level of industrial and agricultural goods when surplus labor was in the industrial sector. Then the critical question here is whether or not the society will be better off to move from position Q_1 to Q_2.

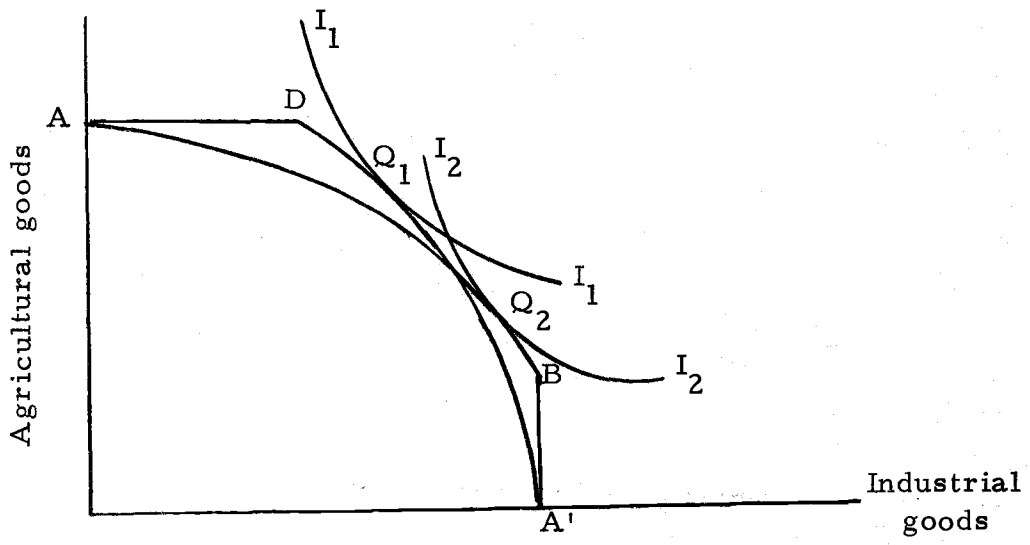


Figure 12. A welfare comparison of converted Fei-Ranis and its converted reversal

In order to deal with such a question, we will have to use what is known as Kaldor-Hicks-Scitovsky criterion. Let us assume that in Figure 13, Q_1 and Q_2 represent the optimum situation in Figure 12. Let us also assume that we have the necessary knowledge of tastes and preferences of agricultural and industrial workers for the production of each sector (this was shown in Figure 8).

In order to justify the movement from position Q_1 to Q_2, the Kaldor-Hicks criterion requires that position Q_2 would be preferred to position Q_1 by the society (industrial and agricultural workers). The Scitovsky criterion requires us to look back again, and this time make sure that position Q_1 is not preferred to position Q_2.

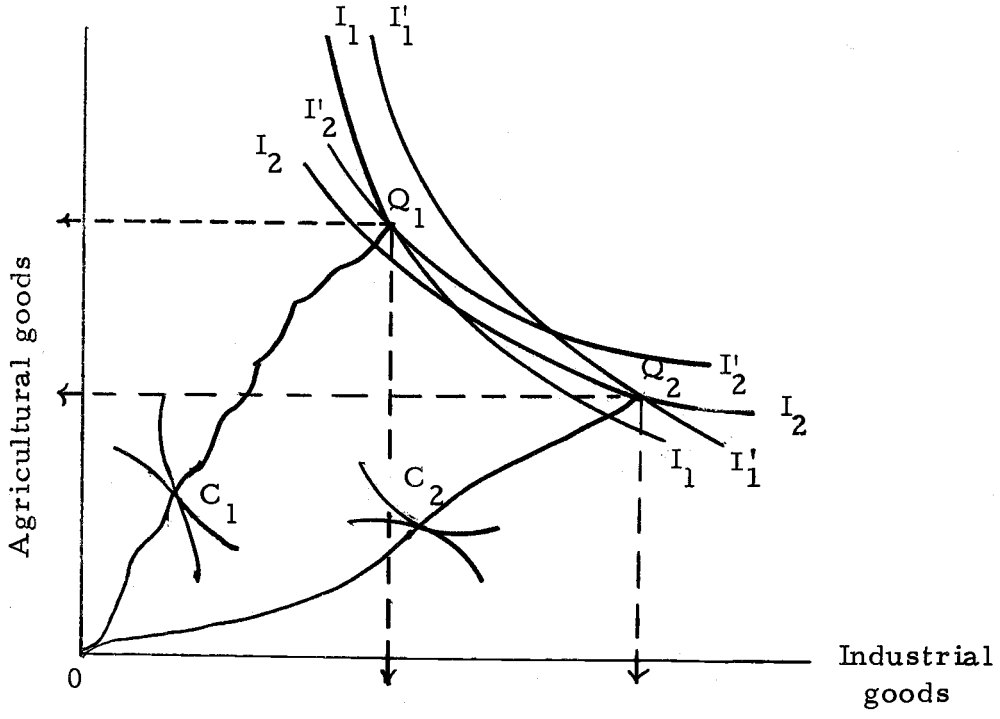


Figure 13. A welfare comparison of Q_1 and Q_2 combinations (Kaldor-Hicks-Scitovsky criterion)

Finally, the only time that position Q_2 proves to be more efficient than position Q_1 is when the Kaldor-Hicks and Scitovsky criteria have both been met.

This is by no means clear. Notice that indifference curve I_1 (representing C_1 distribution of agricultural and industrial goods), and I_2 (representing C_2 distribution of agricultural and industrial goods) are not comparable. In Figure 13 in order to answer Kaldor-Hicks criterion we have passed an indifference curve, I'_1, parallel to I_1, through point Q_2. This would indicate that on contract

curve OQ_2 there is another distribution (other than C_2), that would make every one better off than they were at Q_1. But notice that this can easily be done with Q_1 also (Scitovsky's contribution). In other words, we can pass an indifference curve, I_2', parallel to I_2 through Q_1. Through a similar argument, this means that there is another distribution than C_1 on contract curve OQ_1 which would make every one better off than they were at Q_2. So once Q_2 is preferred to Q_1, the other time Q_1 is preferred to Q_2. As a result there is no a priori reason to justify the movement from Q_1 to Q_2.[4/]

It is very important to look at the implication of this case. This case suggests that if the production possibility curves of the surplus labor in agriculture, and surplus labor in industry cross each other, there is no clear answer to why society should choose one rather than the other. This could easily be the case in less developed countries that have attempted to industrialize through changing the composition of their population (agricultural to industrial), and have not found themselves any better off than they used to be.

Case B:

This case is quite similar to Case A. Here we are assuming

4/ For a good treatment of Kaldor-Hicks-Scitovsky criterion, see Mishan's Welfare Economics (10, p. 37-51).

that a population which is primarily composed of industrial workers will make more of industrial goods and less of agricultural goods than a population which is primarily agriculturally oriented. These are shown on Figure 14. ABA' represent the production possibility frontier with an industrially oriented population, and CDC' represent the production possibility with an agriculturally oriented population.

In order to find out whether or not position Q_2 is preferred to Q_1 (or vice versa), we can use the Kaldor-Hicks-Scitovsky criterion in exactly the same manner that we did for Case A.

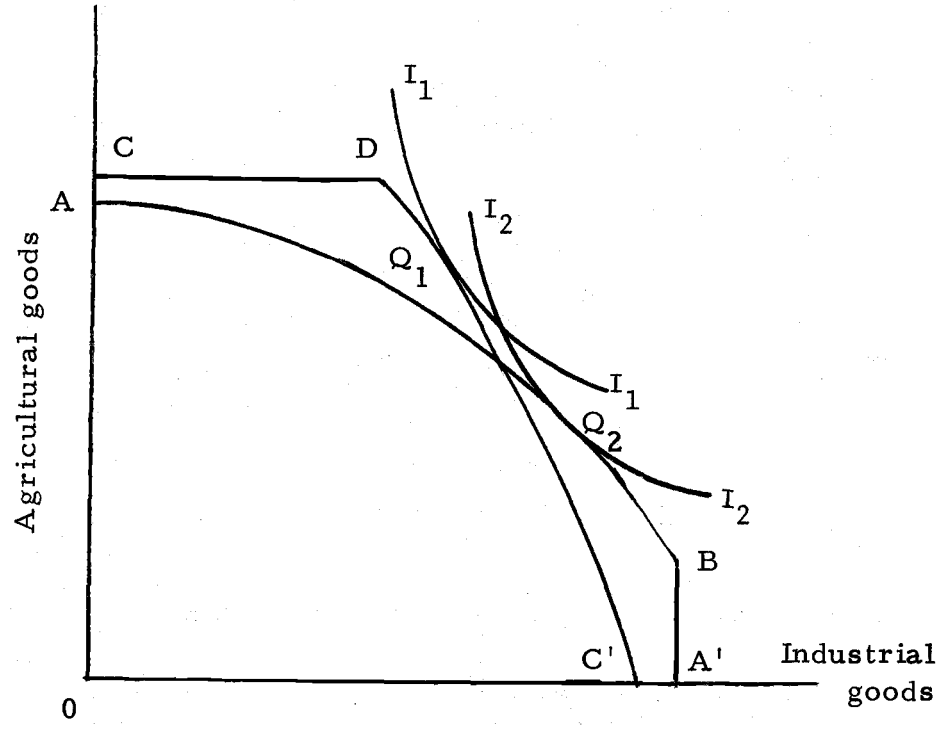


Figure 14. A welfare presentation of converted Fei-Ranis and its converted reversal (different population composition)

Of course, it is conceivable that the society may be totally indifferent between the two alternatives. In this case the original location of the surplus labor (in agriculture or industry) is not important any more. Figure 15 represents this situation where society is indifferent between Q_1 and Q_2. One could conceivably observe a situation where a population is primarily industrially oriented (agriculturally oriented) can produce more of both goods than a population which is primarily agriculturally oriented (industrially oriented). In this case one production possibility will be completely outside of the other.

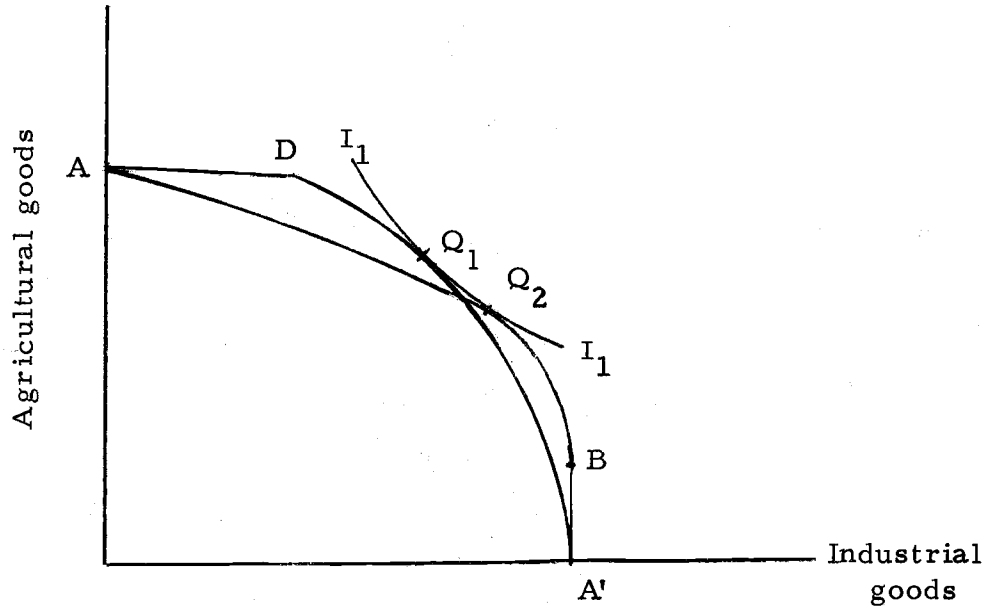


Figure 15, A case where society is indifferent between converted Fei-Ranis and its converted reversal

Technological Changes and Capital Formation

The impact of technological changes in both sectors for any of the models would simply shift the production possibility curve out, and in each case would increase the welfare of the economy. On the other hand, if we observe a technological change in one sector alone this would only increase the production of one sector and as a result the terms of trade between the two sectors will change. These two cases are shown in Figures 16a and 16b.

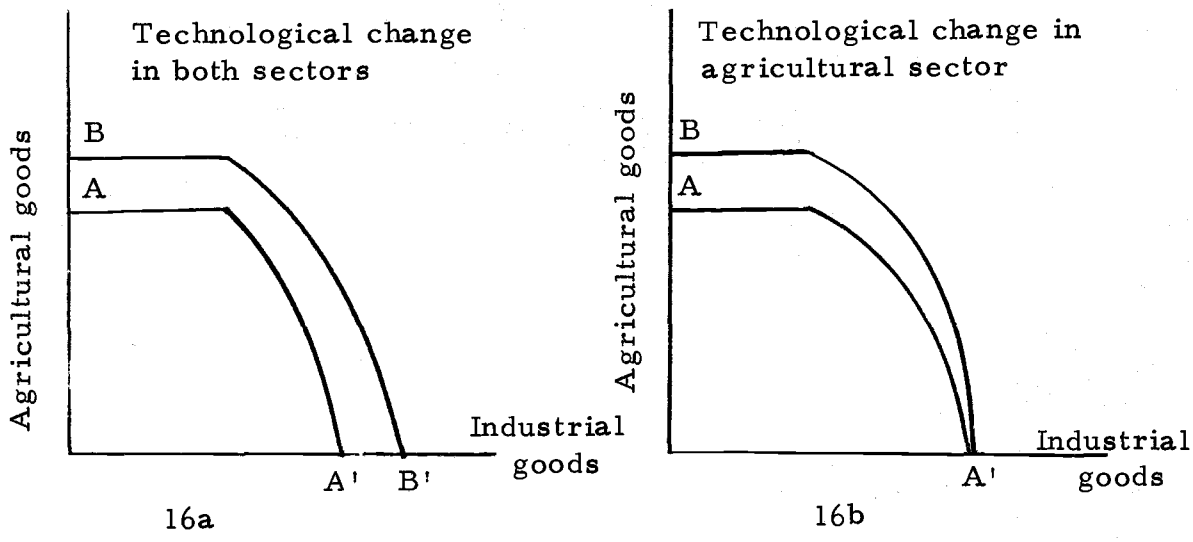


Figure 16. Technological changes and capital formation in the Fei-Ranis model

We could argue that the shift in the production possibility curves have been caused by the reinvestment of previously accumulated capital. Fei-Ranis, as we pointed out earlier,

assumes that capital formation takes place in the industrial sector, and it is due to the investment of this capital that economic growth is observed. One could argue that the new capital invested in the economy and the technological growth of that economy are interrelated. Here we simply accept that both would shift the production possibility to the right.

It is very important to point out that the balanced or unbalanced growth of the two sectors of the economy should only be decided after a careful consideration of the demand for the products of each sector. In other words, just as we have shown in our static model, the optimum level of production of each sector in any given period, will be given to us by the community indifference map and the production possibility curve of the society. This would be true whether the surplus labor is in agricultural sector (original Fei-Ranis), or in industrial sector (Fei-Ranis's reversal). Figure 17 shows a series of production possibility for different periods (production possibilities have shifted to the right as a result of capital accumulation and technological growth). Assuming that the community indifference map is given to us, we can find the optimum level of production in each sector for every given time interval. The growth path would simply be the locus of these optimum points. Therefore, we can argue that a balanced rate of growth "could" be one point on the growth path.

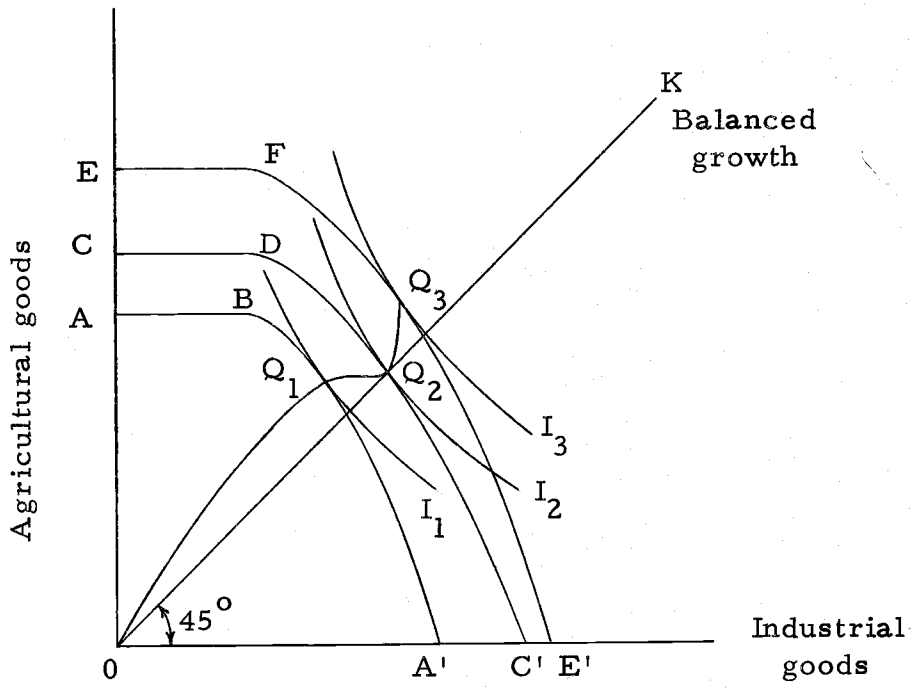


Figure 17. A derivation of the optimum growth path

$OQ_1Q_2Q_3$ represent the actual growth path in Figure 17. Balanced growth is represented by OK. As we have already pointed out, Q_2 is the only point (in our figure), where balanced growth is on the actual growth path of the economy. We could, conceivably, assume a case where the actual growth path would lie on OK. This would simply mean that the rates of growth of the two sectors are the same. However, this would be a rather special case arising from specific demand characteristics for the two classes of goods.

The non-linear growth path has some serious policy implications. Contrary to W. W. Rostow's suggestion of the creation of

a leading sector (industrial) in the developing countries (13, p. 56-59), the society may invest more in the agricultural than industrial sector both in the short and long runs (depending on the shape of the growth path).[5/] On the other hand, the society may invest more in agriculture than industry in period one, and reverse its trend in period two. In short, the suggestion of the existence of a leading sector in the economy seems to be only an exceptional case of our analysis. The optimum policies for the society will be dictated by the growth path. This may or may not be in favor of the existence of a leading sector.

5/ The leading industrial sector, supposedly, has a higher rate of growth than the traditional (agricultural) sector.

IV. SUMMARY AND CONCLUSIONS

Summary

The industrial revolution in European countries,and later in United States and Canada, and its fantastic impact on economic growth of these countries, has led development economists to believe that in order to have a higher rate of growth less developed countries should industrialize. As a result theoretical models of economic development were formulated to analyze this required transformation from a traditional (agricultural) economy to a modern (industrial) one.

Colin Clark, a British economist, as Higgins has pointed out, was probably the first development economist who suggested that economic progress tends to be accompanied by a decline in size of the labor force in agriculture, and an increase in the industrial labor force (6, p. 17). Subsequently, as we have seen in Chapter II, W. A. Lewis suggested the existence of surplus labor in the agricultural sector of the less developed countries, and argued how this labor could be used in the capitalist (industrial) sector. Lewis's article was probably the beginning of the development of dual economic models with surplus labor in agriculture.

On the practical side, this idea reached its peak with the work of W. W. Rostow which received most serious consideration

by the policy makers of most less developed countries. Although Rostow does not directly talk about the issue of surplus labor, he has made it quite clear that one of the pre-requisites for "take-off" (reaching the turning point) is a trend toward the transformation of agricultural system into an industrial one (13, p. 17-36). Suddenly following Rostow's guide line, there seemed to be a definite interest in industrialization of less developed economies. On the theoretical grounds, models were developed to conceptualize the industrialization of these economies. Fei-Ranis, Jorgenson, Todaro, and most other economists who have tried to develop a two sector model economy, have reacted in part to this trend.

The main issue in these models seemed to be that there is a portion of agricultural labor force which is redundant (MPP=0), or at best disguisedly unemployed (MPP is smaller than the institutional wage in Fei-Ranis). Until very recently (except Todaro's model), every one was concerned about transferring this labor from the agricultural sector to industrial use. Whether or not the industrial sector was able to absorb this migrated labor force was not given proper attention. In fact, that is exactly what really happened in numerous countries: the agricultural laborers migrated to the industrial sector, and did not find jobs there. Soon, surely enough, surplus labor in agriculture was eliminated but a similar problem arose in the industrial sector. In other words

the problem of industrial unemployment was created.

Only in the last few years have some economists realized that unemployment in the industrial sector is at least as unhealthy as unemployment in the agricultural sector, and hence have tried to control (theoretically) the major cause of this unemployment (namely transformation of labor from agricultural sector). Todaro's paper cited in Chapter II is an example of this awareness.

As we have observed, the main trend of the literature has been on the transformation of labor from one sector to another. It is argued in this study, that each surplus labor economy has the option of choosing the location of surplus labor (in agricultural or industrial sector). We have attempted to show the importance of efficiency of production, and hence employment of resources (most important to us is labor) to the economy. This has been viewed from a welfare theoretic standpoint.

The approach of this study has some serious constraints. The use of production possibility curves, for example, would require a set of assumptions which like most any other model have made a qualified abstraction of the real world. Thus one should be quite conscious of the need to qualify the conclusions given below.

Conclusions

We have shown, through the use of Fei-Ranis model and its reversal that there may or may not be any justification in movement from a surplus labor agricultural economy to a surplus labor industrial economy over time. The Kaldor-Hicks-Scitovsky criterion was employed to reach this conclusion. Two distinct cases could be defined:

(a) When one production possibility curve lies completely outside the other the movement to the higher curve, if accompanied by a movement to a higher community indifference curve, is justified.

(b) A more general case is when two production possibility curves cross each other. In this case there is no a priori reason why an economy should choose one position to the other. It may turn out that the society is totally indifferent between the two options.

As we have shown in Chapter III, the only time that a movement from a surplus labor agricultural economy to a surplus labor industrial economy is clearly justified is a situation like Case (a). In Case (b) further information is required to justify the movement.

We have also shown that in deciding the rate of growth of each sector, the demand side should be considered. The optimum growth path of a two sector economy is the locus of the points of tangencies between the community indifference maps and the production possibility curves of different time intervals. This may turn out to be balanced or unbalanced growth. Hence employment

of resources and the optimum size of each sector will be dictated by this growth path. Knowledge of the growth path will provide information about appropriate policies to pursue.

BIBLIOGRAPHY

1. Bator, Francis M. The simple analysis of welfare maximization. In: Readings in micro-economics, ed. by William Breit and Harold M. Hochman. Holt, Rinehart and Winston, 1968. p. 385-413.

2. _____ Food and agricultural organization of the United Nations. Production yearbook, Vol. 19. Rome 1965. 566 p.

3. _____ Food and agricultural organization of the United Nations. Production yearbook. Vol. 22. Rome 1968. 814 p.

4. Fei, John C. H., Gustav Ranis. A theory of economic development. Part II. The American Economic Review 51:533-65. 1961.

5. Harbison, Frederick H. The generation of employment in newly developing countries. In: Education, employment, and rural development: proceedings of the conference held at Kericho, Kenya, 1966, ed. by J. Sheffield. Nairobi, 1966.

6. Higgins, Benjamin. Economic development: problems, principles, and policies. Rev. ed. New York, Norton and Company, 1968. 918 p.

7. Jorgenson, Dale W. The development of a dual economy. The Economic Journal 71:309-334. 1961.

8. Lewis, W. Arthur. Economic development with unlimited supplies of labor. In: The economics of underdevelopment, ed. by Amar N. Agarwala and Sampat P. Singh. New York, Oxford University Press, 1963. p. 400-449.

9. Mellor, John W. Toward a theory of agricultural development. In: Agricultural development and economic growth, ed. by Herman M. Southworth and Bruce F. Johnston. New York, Cornell University Press, 1967. p. 21-55.

10. Mishan, Edward J. Welfare economics: five introductory essays. New York, Random House, 1964. 229 p.

11. Myrdal, Gunnar. Economic theory and underdeveloped regions. London, Gerald Duckworth and Co., Ltd. 1957. 168 p.

12. Reynolds, Lloyd G. Economic development with surplus labour: some complications. Oxford Economic Papers 21:89-103. 1969.

13. Rostow, Walter W. The stages of economic growth: a non-communist manifesto. Cambridge University Press, 1960. 179 p.

14. Schultz, Theodore W. Transforming traditional agriculture. New Haven, Yale University Press, 1965. 212 p.

15. Todaro, Michael P. A model of labor migration and urban unemployment in less developed countries. Part I. The American Economic Review 59:138-147. 1969.

16. Zimmerman, Louis J. Poor lands, rich lands: the widening gap. New York, Random House, 1965. 169 p.