

REFLECTIONS ON UNLIMITED LABOUR

By W. Arthur Lewis

Development Research Project

Woodrow Wilson School
Princeton University
Princeton, New Jersey

Discussion Paper No. 5

October 1968

Note: Discussion papers of the Development Research Project are preliminary materials distributed to stimulate discussion and critical comment. Please do not refer to discussion papers without permission of the author.

REFLECTIONS ON UNLIMITED LABOUR.

This paper seeks to clarify and expand two articles which I published on this subject respectively ten and fourteen years ago (27, 28). Clarification seems necessary since the large literature to which they have given rise is somewhat confusing.

1. Some Misconceptions

The purpose of the model was to provide a mechanism explaining the rapid growth of the proportion of domestic savings in the national income in the early stages of an economy whose growth is due to the expansion of capitalist forms of production. The chief historical example on which the model was based was that of Great Britain where, as we may deduce from the later figures of Deane and Cole, net saving seems to have risen from about 5 per cent before 1780 to 7 per cent in the early 1800's, to 12 per cent around 1870, at which level it stabilised (8, pages 265-7). A similar rise is shown for the United States by Gallman (13, page 11), starting around the 1840's with gross domestic saving at 14 per cent, and continuing up to 28 per cent in the 1890's, where the figure stabilises. Similar changes can be found since the second world war for many less developed countries such as India or Jamaica.

The explanation of capitalist sector growth provided by the model turned on the higher than average propensity to save from profit income, and on the rise of the share of profits in the national income in the initial spurt of economic development. Some such model was needed at the time of writing since the dynamic models then in use usually assumed constant savings and profits ratios. Even today our economic journals still publish many articles on savings functions which do not

distinguish between profits and other incomes; a notable exception, specially valuable for bringing in less developed countries, is the article by Houthakker (18).

Given the purpose of the model, the division of the economy into two sectors had to turn on profits. The two sectors are a capitalist and a non-capitalist sector, where "capitalist" is defined in the classical sense as a man who hires labour and resells its output for a profit. So a domestic servant is in the capitalist sector when working in a hotel but not when working in a private home.

This distinction was vital for my purpose. Other writers, with different purposes, have made different divisions. A now popular division is between industry and agriculture, but capitalist production cannot be identified with manufacturing, as anyone familiar with a plantation economy must know. The model is intended to work equally well whether the capitalists are agriculturists or industrialists or anything else, and indeed in its first version (as we shall see in a moment) the model presupposes that the capitalist sector is self-sufficient and contains every kind of economic activity.

This explanation may serve to refute the charge that the model identifies economic growth with industrialisation. A further misconception is that it necessarily identifies economic growth with capitalist production. The anti-socialist aspect of this attack is easily beaten off. Since a capitalist is one who hires labour for profit, it makes no difference to the model whether the capitalists are private or public; the model gives a pretty good explanation of the sharp rise in the share of savings in the U.S.S.R. between, say, 1929 and 1939. The accusation that the model disparages peasant production is on a different plane. The model

does not deny that peasants can grow rich by producing more, or more valuable output; it does not argue that capitalist production is more valuable; it is not normative. This author is delighted that there are economies where the productivity of peasants increases steadily and that some portion of that increase goes into capital formation. This does not render it useless or dangerous to study models of economies where in the initial stages the dynamism of growth is located in capitalist expansion.

In the model the non-capitalist sector serves for a time as a reservoir from which the capitalist sector draws labour. The original paper makes clear that this labour does not all come from agriculture -- a fact which has escaped the attention of many subsequent writers. The paper mentions inter-alia domestic service and the self-employed (especially in handicrafts and petty retailing). It also points out that the labour force itself expands through increased participation of women as well as by natural increase and by immigration. The last of these sources, immigration, played a substantial role in economic development during the nineteenth century (e.g., U.S.A., Brazil, Malaya, Australia) and, according to Kindleberger (25) is an important explanation of why some European economies have grown faster than others since the second world war.

The existence of such a reservoir is important to the model since it explains why the capitalist labour force can for a time grow faster than the 3 per cent per annum limit which natural increase would now impose on the less developed countries, or the 1.5 per cent population limit on Western Europe in the nineteenth century. This is important in explaining why profits can grow much faster than national income. But it

receives added significance in these days since we have observed that in one part of the capitalist sector, namely manufacturing industry, the rate of growth of productivity is a positive function of the rate of growth of employment. For this means that productivity can grow faster if there is a labour reservoir than if there is not.

In the model the capitalist sector is said to have unlimited access to a labour supply, thanks to the existence of this reservoir. The use of the word "unlimited" has caused confusion. It means that if capitalists offer additional employment at the existing wage, there will be far more candidates than they require: the supply curve of labour is infinitely elastic at the ruling wage. One condition for this is that the ruling wage in the capitalist sector exceeds the earnings in the non-capitalist sector of those who are willing to transfer themselves. The other condition is that any tendency which the transfer may set in motion for earnings per head to rise in the non-capitalist sector must initially be offset by the effect of increases in the labour force (natural increase, immigration, or greater female participation). This is discussed more fully later in this paper. The model does not attempt to derive the conventional wage: as in the classical system this depends not only on productivity but also on social attitudes. The model simply postulates as facts that in the initial stage the supply of labour at the given wage exceeds the demand, and that this condition will continue for some time despite the expansion of the capitalist sector. This postulate is inconsistent neither with history nor with reason.

Since all that the model needs is the fact that supply exceeds demand at the current wage it was not necessary to say anything about

the productivity of marginal units of labour in the reservoir, beyond noting that it must be less than the wage offered by capitalists. As the original article said:

"Whether marginal productivity is zero or negligible is not however of fundamental importance to our analysis" (page 142).

It was probably a mistake to mention marginal productivity at all, since this has merely led to an irrelevant and intemperate controversy.

This debate has been further confused by the fact that I did not mean by "marginal product is zero" what most of the subsequent writers have meant. I meant (and said so explicitly) the marginal product of a man, whereas they mean the marginal product of a manhour. For example, in many countries the market stalls (or the handicraft industries) are crowded with people who are not as fully occupied as they would wish to be. If ten per cent of these people were removed, the amount traded would be the same, since those who remained would do more trade. This is the sense in which the marginal product of men in that industry is zero. It is a significant sense, and its significance is not diminished by pointing out that the fact that others have to do more work to keep the total product constant proves that the marginal product of manhours is positive. That intelligent men like Professors Jorgensen (22, 23) and Wellisz (39) believe that my model stands or falls by whether marginal productivity per manhour is zero testifies only to the obscurity of my writing.

Why did I bring in zero marginal productivity (per person)? For two reasons, neither of which is fundamental to the model. Since all the model requires is that the supply of labour exceed the demand, zero marginal productivity was not a necessary condition. My first reason

for introducing it was that I was concerned with the relative rates of growth of output in the capitalist and non-capitalist sectors, since this affected the share of profits and thus of savings in national income. Relative rates of growth would depend partly on how the output of the non-capitalist sector would be affected by the loss of labour, so I mentioned zero marginal product as a limiting case. This is clearly a peripheral reference.

The second reason is not even a part of the model. I was concerned, as many others have been, with the possibility that under-employed labour might be put to productive capital formation. This again raises the question by how much the output of the non-capitalist sector would thereby be reduced, and zero is again the limiting case. But it makes no difference whether the loss of non-capitalist output is zero or positive, so long as it is less than the value added by the labour in the sector to which it is transferred.

Egypt is an excellent case because it illustrates both the kind of labour market which the model fits, and also the misconceptions even of some distinguished writers on this subject. Here is a passage from Hansen and Marzouk (15, pages 16-17) which specifically rejects the model, while actually describing a situation which exactly fits it! After noting the "remarkable" stability of prices in the 1950's, the authors continue:

A basic condition for the price stability is to be found in the labour market. Although the supply of labour is certainly not infinitely elastic in the Arthur Lewis sense (absolute surplus labour in agriculture probably did never exist in Egypt), there is no doubt that the supply has increased so rapidly during the postwar years that the increasing demand has never led to a real shortage, at least in the major categories of labour. Construction is probably the only sector where labour shortage and wage drift has been a real problem. And Government money wage rates have, if anything, been falling for the post-war period as a whole.

Elsewhere they state specifically, referring to agricultural labour, that "during the fifties the wage rate remained unchanged" (page 78).

The authors' confusion, in using an infinitely elastic labour supply to explain why the price level and money wages remained constant, while at the same time denying that the labour supply was infinitely elastic, derives from their erroneous identification of infinite elasticity with a zero manhour marginal product of labour in agriculture. Elsewhere in their analysis they supply adequate explanations for the elastic labour supply.

- (a) Population was growing by about 3 per cent per annum (p. 23).
- (b) In spite of this, the agricultural labour force remained constant. There was terrific migration to other occupations, whose potential labour force must thus have been growing by about 6 or 7 per cent per annum (p. 61).
- (c) There was considerable underemployment in the service industries, such that between 1952 and 1962 the numbers in commerce increased only by 49 per cent, whereas the volume of goods handled increased by 65 per cent (page 320). The government service was notoriously overstaffed.
- (d) The proportion of women in the labour force was only 10 per cent (p. 37).

These are typical phenomena of an infinitely elastic supply situation

Though zero marginal productivity (whether per person or per manhour) makes no difference to my model, there is so much confused writing about marginal productivity in the agriculture of overpopulated countries that I will complete this section with a few remarks on this subject.

First as to manhour productivity. It is quite certain that if farmers were willing to work longer hours they would produce more. Agricultural extension officers show the farmers many ways of increasing output per acre (e.g., transplanting instead of broadcasting seed, or

weeding their plots more frequently) which the farmers often reject because they involve more work. Moreover most of these require work not at the peak season (usually but not always the harvesting), but in earlier slack seasons when the farmers are undoubtedly underemployed. They do not work because the extra work would not in their view be adequately compensated by the extra output. So here is an example of a situation where the marginal product of persons is zero (in my sense that output would be the same with fewer people) while the marginal product of manhours is positive in the sense that more work would raise output.

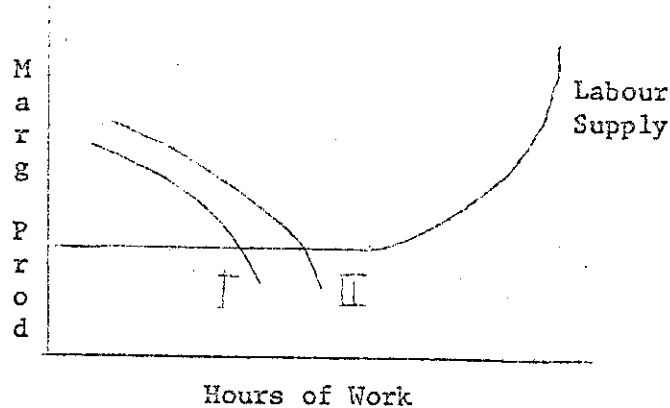
Here is another example. If the statement that the marginal product of persons is sometimes zero has caused anger, the statement which I have also made that it has sometimes been negative has come near to causing apoplexy. Nevertheless, in primitive agricultural societies, if numbers pass a certain limit, the land becomes exhausted. Fallow periods are reduced; trees are cut excessively; and soil conservation is prevented by the pressure to cultivate some parts of the land which should be covered by grass or trees. History is full of examples of good land reduced to desert by excessive population, and the same alas is happening in some part of Africa today. This is why geographers, anthropologists and historians are so interested in what Dr. Allen has called "the Critical Population Density" (1). It is legitimate to say in these cases, as the historians say, that the cause of declining output was: too many persons on the land -- negative marginal productivity of persons. Yet in all these situations output could have been increased if each person had given extra labour to improvements that preserve land -- to terracing, to moving stones into the right places, or to planting trees or grass. The marginal product

of manhours was positive even while the marginal product of persons was negative.

So far I am assuming that the time of the farmers is not fully occupied. The proposition that if one member of the family migrates the others will do his work has also been attacked (e.g.,3). The argument runs as follows. The departure of, say, the fifth working member of a family gives each of the others in effect one-fourth more land to cultivate. Assuming constant returns to scale, if each works one-fourth more hours on one-fourth more land he will get one-fourth more product, leaving total output the same as it was before the fifth member left. But the marginal value of output is diminishing in terms of leisure, so if a person was originally in equilibrium he will not work one-fourth longer to get only one-fourth more output.

One can reply to this in two ways. One can accept the approach through the valuation of leisure, but reject the valuation given to leisure. In particular there is no basis for the assumption that the supply curve of work is upward sloping (in terms of output) throughout the relevant range. A person is trained by his parents or his society that he should work for at least so many hours per day, and until this point is reached he may give no thought to leisure. Indeed, if he can get, say, only 6 hours at his regular job, he may gladly work an extra three hours at half price in some other situation, partly for the money, and partly for self-respect. If in addition he has a fixed idea of what his time is worth, the best representation of his supply curve of work is a horizontal straight line which turns upward sharply when he passes what he considers to be the right number of hours per day.

The accompanying diagram expresses this situation



Curve I shows the marginal yield of work to the individual workers when the family has five working members on its two acres. Agricultural extension agents want the worker to go beyond the point where this curve cuts the labour supply curve, but he refuses to do so, even though he has much idle time. Curve II shows the situation when the family is reduced to four working members. The farmer now works one-fourth more time on one-fourth more land with the same marginal product. Without empirical data one cannot assert that the supply curve of labour is horizontal in these circumstances but this assumption is as reasonable and more likely than the assumption that the supply curve is rising throughout the day.

The other answer is to reject this type of analysis for people in these situations. A farm family with 2 acres wishes to cultivate the farm in accordance with the standards of its community. It will do what needs to be done whether there are 4 or 5 working members of the family. The mistress of the house likes it to be clean. If the opening of a factory nearby reduces the number of her servants from 5 to 4, she will still keep up the standards of her class, even if this means that she and her children must now do a little more for themselves. Marginal analysis applies to the means by which individuals attain their goals.

It is not correct to assume that the goals will be altered just because they became marginally more costly or more easy to attain. Keeping the farm cultivated is amenable to marginal analysis if it is a means, but not if it is a goal.

Let us however move away from these cases, in which the existence of leisure is implicitly accepted, and pass to the attack on under-employment itself. Nobody denies that in the overpopulated countries handicraft workers, petty traders, dock workers, domestic servants and casual workers have a lot of spare time on their hands, and that most of them (except the domestic servants) would be glad to exchange extra work for extra income at the current rate. Neither does anybody deny that there is much seasonal unemployment in agriculture. The dispute is confined to the situation on small family farms at the peak of the agricultural season, in some parts of Asia and the Middle East.

The argument turns mostly on the labour situation at the time of harvesting, which for most crops (but not, e.g., for manioc) makes the peak demand for labour. The reason for this peak is usually that once the harvest is ready it must be reaped as quickly as possible if it is not to spoil by remaining on the stalk, or to be spoilt by a change in the weather. For this reason, no practicable number of people is too large at this time, since the more hands, the faster the harvesting is completed. It may nevertheless be possible to take off the same harvest with fewer hands if each person works more hours per day, or if the harvesting is spread over a few more days: there is no fixed ratio of number of persons to tons of crop. Harvests vary enormously from one year to another, but somehow or other even the largest harvest gets reaped -- though not always the complete 100 per cent. Hansen and

Marzouk (15) note that the labour force in Egyptian agriculture was the same in 1960 as in 1950, but was reaping a 25 per cent larger harvest at the later date without any significant increase in machinery. But they fail to deduce the corollary that the farmers could probably have taken off the 1950 harvest with a labour force smaller by (say) 10 per cent. In spite of all they say about labour shortage, one may surmise that if the harvest is 10 per cent larger five years from now, the present labour force will manage to take it off somehow or other.

Even if there were a fixed ratio of men to tons in harvesting, one cannot justify keeping men idle for eleven months so that they may harvest for the twelfth. In the days before harvesting machinery the standard European solution was for these men to work at non-agricultural occupations during eleven months of the year, and go into the fields for the twelfth. Where this practice is followed, a peak demand for labour at harvest time is quite consistent with transferring men from agriculture into other occupations during the rest of the year.

I do not believe that the productivity of a manhour is zero in agriculture, domestic service, petty retailing, handicrafts, or any other part of the non-capitalist reservoir. Nevertheless, I have seen nothing in the now vast literature of under-employment to alter my belief that in India or Egypt one could mobilise a group equal to (say) ten per cent of the unskilled non-capitalist labour force without reducing significantly the output of the non-capitalist sectors from which they were withdrawn. (One might not be able to use this group effectively without drawing skilled labour, supervisors, food, raw materials or capital equipment from the other sectors, but that is a different story.)

Professor Schultz's doubtful statistics (36) about India's influenza

epidemic in 1918-19 do not meet the conditions specified, because the labour must come only from the small family farms and other underemployed pockets; besides at the time of which he speaks India's population was smaller by 200 million than it is today. Professor Paglin (2, 34) confuses total input with labour input. His figures actually show (though he did not spot this) that the marginal productivity of labour on small farms is zero or negative, but only because bullocks, which also are underemployed on small farms, are treated as a continuously variable input. Most of the other articles relate to the marginal productivity of manhours, or embrace the naive idea that there is a fixed ratio of men to tons harvested, and are therefore not germane.

What our colleagues want to emphasise is that even in very overpopulated countries like India or Java, agricultural output could be increased by additional inputs of labour, if the farmers could be persuaded to spend more time on transplanting, weeding, fertilising, etc. I agree with this completely, and have always favoured heavy expenditure on agricultural extension. But this position is not inconsistent with recognising that, as things now stand in such countries, labour squads could be recruited for useful works off the farms without significantly reducing agricultural output, since those who were left behind would manage to do what needs to be done.

However, this is all an irrelevant digression, since the model in no way depends on the marginal product in agriculture, whether per person or per manhour. All we need is a situation where the supply of labour exceeds the demand, in the capitalist sector -- a situation which may exist either because the capitalist wage significantly exceeds non-capitalist earnings, or because the labour force is increasing (natural

increase, immigration, or female participation). We do not even need to know why supply exceeds demand; it is enough for our purposes that it does.

2. The Model's Turning Points.

It is important to realise that this model comes in three different versions.

In the first version we have (i) a closed economy and (ii) no trade between the two sectors. The capitalist sector is completely self-contained, except that it imports labour. The first turning point then comes only when the labour supply ceases to be infinitely elastic and the wage starts rising through pressure from the non-capitalist sector. One can vary this model slightly to take in whole countries developed by immigration, such as Malaya or the U.S.A.; or to consider the effects of immigration on growth in Western Europe during the 1950's.

In the second version (i) we have a closed economy, but (ii) the capitalist sector depends on trade with the non-capitalist sector, e.g., for food or raw materials. Now we have an additional turning point, since the capitalist sector may be choked by adverse terms of trade, even if the labour reservoir is still teeming with people.

The third model is a variant of the second. Here we have (i) an open economy which (ii) trades either with the labour reservoir or with the outside world. Here the capitalist sector can escape the stagnation of the non-capitalist sector by importing from the outside world, but the resulting import surplus may slow growth or produce structural inflation.

Model One. It is useful to begin with a model in which the capitalist sector is self-contained, since this enables us to focus attention upon the labour supply, without considering the terms of trade. Besides there are many economies where the capitalist sector gets labour from the non-capitalist, but neither food nor raw materials.

In this version the supply of labour exceeds the demand at the current wage. One would expect this wage to hold constant for some time as the capitalist sector expands. There are two turning points. The first occurs when the check to the growth of the non-capitalist sector raises average earnings there to the point that the capitalist wage is forced upwards. The second turning point comes when the marginal product is the same in the capitalist and non-capitalist sectors, so that we have reached the neoclassical one-sector economy.¹

The first turning point comes when the changes in the non-capitalist sector begin to react on the wage. We must distinguish between exogenous and endogenous changes. The supply price of labour may rise because something happens to make people richer in the non-capitalist sector; e.g., the farmers may begin to grow a profitable crop for export; or may learn to use fertilisers. Favourable exogenous changes may be expected to raise wages; we must look out for them in any attempts at historical verification, but we cannot take them into the model. (In the same way, as we shall see in a moment, the wage rate may rise exogenously

¹The second turning point is exactly the same as in Fei and Ranis (11, pages 201-5). The definition of the first turning point is also the same, but the mechanism for reaching it is different, since Fei and Ranis are working with model II, in which the capitalist sector depends on the non-capitalist for agricultural products.

for reasons which have nothing to do with the non-capitalist sector; e.g., because the government enacts minimum wage legislation.) The model incorporates only those endogenous changes in wages which result directly from the transfer of labour from the capitalist sector.

This transfer automatically causes consumption per head to be higher than it would otherwise be in the non-capitalist sector. If the people transferred are farmers, farm output will fall by less than their consumption, since land is assumed to be scarce (their consumption equalled average product, which exceeded marginal product). If the people transferred were in petty retailing or handicrafts, those who remain will get more trade.

Several writers (e.g., 8, 14) have assumed that this increase in non-capitalist consumption per head must immediately force up the capitalist wage, but there are two reasons why this is not so. The first of these is that in my model, as distinct from those used by these and other writers, there is a substantial gap between the capitalist wage and non-capitalist consumption per head, and this gap is not fixed rigidly. If you transfer 5 per cent of the labour force from the non-capitalist sector you are increasing very substantially (perhaps doubling) the capitalist labour force, but the difference this makes to consumption per head in the non-capitalist sector is small, and need not be enough to force up the capitalist wage. That wage is determined conventionally, and we know that conventional money wages hold stable even when prices move a few points in one direction or the other.

This is one factor which distinguishes my model from those of Fei and Ranis (11) or Jorgensen (21, 22, 23) or other writers who, desiring to find some reasonable basis for the conventional wage,

tie it rigidly to agricultural productivity. This tie seems specially appropriate if one further assumes, as they tend to do, that the reservoir consists exclusively of agriculturists, which of course is not the case. Their rigid assumptions yield precise numbers for wages and earnings, and one can calculate precisely how these numbers alter as labour transfers from one sector to the other. But what is gained in precision is lost in realism.

The second reason why the conventional wage does not necessarily rise as labour is transferred is that in my model the labour force in the non-capitalist sector is still growing in the first stage (though not proportionately as fast as in the capitalist sector). At this stage, therefore, the transfer does not raise consumption per head in the non-capitalist sector in the absolute sense; it merely prevents consumption from falling by as much as it otherwise would. The increase in the labour force may be due to population increase, to greater participation of women, or to migration.¹ We should also remember Marx's point that capitalism creates its own labour force; competition from factories may put the handicraft workers out of business; increasing use of domestic appliances may throw the domestic servants onto the labour market. In sum, there are forces at work tending to reduce consumption per head in the non-capitalist sector. These would not necessarily have reduced the capitalist wage, since, as we have just said, the gap between the capitalist wage and non-capitalist consumption is flexible, and the conventional wage may

¹J.H. Clapham (7, pages 168-9) remarks that as French peasants migrated to the towns at the end of the nineteenth century, Belgians, Spaniards, Poles and Italians immigrated into French farming in their place.

hold constant despite a few percentage points of rise or fall in non-capitalist consumption per head.

Thus, bearing all these factors in mind, and in particular the population factor, there is no reason to expect the capitalist wage to rise endogenously as soon as the capitalist sector begins to grow. It may rise immediately, or an increase may be long delayed: this is a matter for historical research in each case.

Ultimately the capitalist wage must rise, since a successful transformation implies that the capitalist sector has grown rapidly enough to overtake population growth and reach the second turning point.

Critics of the model make enormous play with the question how long it takes to reach the first turning point, i.e., the question whether there really is a period during which the wage is constant. But this question is of no consequence. The decisive turning point is not the first but the second, for it is here that we pass the boundary into the neoclassical system. The model would have achieved all that it set out to do even if it could be shown (and it cannot) that historically there never has been a case where the real wage did not begin to grow as soon as the capitalist sector began to expand.

The point becomes even clearer when we investigate what is meant by "the real wage." Everyone recognises that we are talking about unskilled labour, so this is not the problem; skilled wages will certainly rise as skills increase. We are also talking about capitalist wages and not the wages of domestic servants -- this is part of our definition. The problem is not in defining the wage, but in defining "real."

"Real" wage has many meanings. The most common is the money wage rate (w) divided by the cost of living (c)

$$(1) \frac{w}{c} = \text{the cost of living wage.}$$

However, since we are also interested in the relationship between the standard of living of the capitalist worker and the income of the non-capitalist worker (a), by which it is ultimately affected, we must also consider the relationship

$$(2) \frac{w}{a} = \text{the factorial wage}$$

Ultimately, however, what interests us is profit, which depends inter alia on the ratio of wages to prices. A crude index of this is given by dividing the wage index by an index of the price (p) received by capitalists

$$(3) \frac{w}{p} = \text{the wage/price ratio}$$

This is not a good index of profits, because profits also depend on productivity, i.e., on real output (Q) divided by the quantity of labour (L). Also the price of the product includes the cost of raw materials, which should be deducted to get the value added price of the product (v). Profit then depends on the ratio of wages to value added

$$(4) \frac{wL}{pQ} = \text{the product-wage.}$$

If the system does not import raw materials, as in this first version of the model, the product-wage becomes

$$\frac{wL}{pQ}$$

Given this wide variety of types of real wage, what do we mean when we talk about the real wage being constant, for the purpose of this model?

The answer derives from what we are seeking. Our interest is in the share of profits in the national income. This is determined by two factors, by the share of the capitalist sector as a whole in the national income, and by the share of profits in the capitalist sector (which is unity minus the product wage). The share of the capitalist sector in national income will grow so long as the product-wage is favourable to growth. We can therefore concentrate our attention in the first instance on the product-wage.

We can now formulate more precisely what we are after. The model postulates that the product-wage will fall (the profit ratio rise) during an initial period because capitalists will not have to share with their workers the fruit of technological advance (Q/L). During this initial period the wage-price ratio (w/p) is assumed to be constant, but sooner or later the rise in non-capitalist consumption per head (a) forces up w . This is the first turning point. From here on both w/p and Q/L are rising. Sooner or later w/p will be rising faster than Q/L , which means that the profit ratio will have begun to fall. We enter the neoclassical system at the second turning point, where the marginal product of labour is the same throughout the system. We also believe that at this point the product-wage wL/pQ stabilises, though we have no theoretical explanation why this should happen. It is sufficient for our purposes that sooner or later we expect the product-wage to start rising, as we move from the first turning point towards the second.

Thus to test the historical validity of the model, the questions to ask for any particular country are (i) was w/p initially constant, and (ii) did wL/pQ ultimately rise?

As to the first question, the data are not easy to find, since even in those cases where we can put together some kind of money wage index it is very hard to make an index of the price of domestic capitalist output (which has, in an open economy, to be not p but \underline{v}). In a closed economy with a self-contained capitalist sector, if we can assume that the prices of capital goods and consumer goods all move together, we can write

$$p = v = c$$

and can ask ourselves the simpler question -- whether the real cost of living wage remained constant initially. This also is difficult to answer, but it is easier to find data for w/c than for w/v . However, even if we get an answer for w/c we have to remember that in the real world \underline{p} , \underline{v} and \underline{c} are not equal to each other, and that therefore the answer we get for the cost-of-living wage is not conclusive for w/p .

When the first article was being written, the historical wages data uppermost in my mind were those for the cost of living wage in Great Britain in the first half of the nineteenth century, and the U.S.S.R. in the 1930's. Historians still dispute what happened to the real wage rate in the first half of the nineteenth century (16, 17), but it seems a good bet that the rate of increase was slight. Deane and Cole's version (9) of Wood's data on money wage rates shows a rise in Great Britain from 70 in 1790 to 100 in 1840. Phelps Brown and Hopkins's index (5) of the price of consumables rises in that period from 68 to 100, indicating a slight decline in the real wage rate over those 50 years. Indeed the Phelps Brown-Hopkins index of the real wage rate of building craftsmen shows it

only 4 per cent higher in 1840-44 than it had been ninety years earlier in 1750-54. One can get different results with different figures, but it is safest to conclude that the cost-of-living wage did not rise substantially in Great Britain during the first fifty years of the industrial revolution. (This is not inconsistent with the standard of living rising through a fall in underemployment or movement from worse into better paid jobs; wages per head can rise even if wage rates are constant.)

The British case is not necessarily typical. The wage-price ratio (w/p) will remain constant only if non-capitalist earnings a are not rising, or if the capitalists are not sharing productivity gains with their workers. Both conditions may have been met in Britain 150 years ago, but there are plenty of other cases. Thus, in the U.S.A. productivity on family farms was rising sharply in the middle of the nineteenth century, through the adoption of machinery, so industrial wages could not have been held constant. Similarly in Japan farm productivity was rising at the end of the century. Okhawa's cost of living data (33) starting only in 1893, show real wages rising by 17 per cent in the 18 years from 1893/95 to 1911/13. They did not rise as fast as industrial productivity; he puts the productivity increase in secondary industry at 38 per cent, which is rather low for our purpose, since it includes handicrafts. Thus the capitalists conceded part of the increase in productivity to the workers, but they did not concede it proportionately. According to Okhawa the terms of trade between primary and secondary sectors altered little in this period, so profits in the industrial sector must have risen relatively to wages.

Study of the Japanese materials brings out another important phenomenon, which is also found elsewhere, namely, a widening gap between industrial and agricultural wages. The data given in Minami (31) show

the real agricultural wage constant in the two decades before the first world war, when the industrial wage was rising, and agricultural productivity rising even faster. Hansen and Marzouk (15) also show for Egypt in the fifties the industrial wage rising, the agricultural wage constant, farm productivity rising, and farmers' incomes rising even faster (because of the land reforms). How do agricultural wages remain constant while farmers' incomes are rising? The answer is already in our model. The agricultural wage initially exceeds the marginal product of labour. It is established conventionally for the landless class. Farmers employ labourers for tasks whose productivity exceeds the wage; less productive tasks they do at other times with their own family labour. The agricultural wage of landless labourers is not tied to the farmers' incomes, and may stay constant or rise very slowly for a long time, even though farm income is rising.

In sum, we are now talking about three different kinds of earnings

- (1) the wages of landless labourers
- (2) the earnings of small farmers
- (3) the earnings of unskilled industrial workers.

The crucial test of whether labour is in surplus supply in the countryside will be what happens to the wages of landless agricultural labourers.

If, as in Japan or Egypt, these remain constant while the other two are rising, we can be quite sure that a labour surplus exists. What interests our model, however, is the wage that the capitalists have to pay, and there is no doubt that this may rise even in the face of a labour surplus in the countryside.

We should pause for a moment to note that such wide divergencies in wage movements are themselves a sign of an immature pre-neoclassical

economy. In a mature economy labour circulates freely between occupations and industries, and we should expect over the long period that differences in earnings of individuals will reflect mainly differences in natural ability. Since the distribution of natural ability is pretty stable, a mature economy should show a stable distribution of individual earnings from wages and salaries. This is exactly what the British data do show, as assembled by Thatcher (37).

U.K. Earnings Quantiles as % of Median.

	<u>Lowest Decile</u>	<u>Lower Quartile</u>	<u>Upper Quartile</u>	<u>Highest Decile</u>
1886	68.6	82.8	121.7	143.1
1938	67.7	82.1	118.5	139.9
1966	68.6	82.4	120.7	143.0

This remarkable stability over eighty years is associated with a sixteen-fold increase in money wages! It gives us a third phenomenon to associate with the upper turning point: (a) marginal productivity is equalised in capitalist and non-capitalist sectors; (b) the wage-profit ratio stabilises; and (c) differences in earnings between occupations and industries come to reflect mainly differences in innate skills.

When we turn to the less developed countries of our own times and ask what is happening to the industrial wage, the answer, from a very large number, if not from all, is that the cost of living wage w/c is rising, even in situations where there is open mass urban unemployment, not to speak of under-employment. Why is this happening?

In some countries rising a is clearly a contributing factor. The small farmers' output of food per head is more or less constant, but their output of coffee, cocoa, peanuts, rubber, cotton, etc., has been

rising swiftly, and in some countries, especially in Africa, the increase in output per head has been greater than the decline in the price received by the farmers. In those countries one would expect the capitalist wage to be forced up.

However, the evidence, even from such favorably placed countries, is that in most places the gap between \underline{w} and \underline{a} has widened; wages have risen much faster than farmers' incomes. This means that the capitalists are sharing productivity gains with the workers to a greater extent than one would expect if the abundance of the labour supply were the only element to be considered. Why they are doing this is not clear,¹ though explanations have been offered (12, 29, 35).

It seems therefore that what we should expect in overpopulated countries is that the real agricultural wage will remain constant, if the labourers are landless. What happens to the urban wage will depend partly on what is happening to \underline{a} (the farmers' income) and partly on the extent to which the capitalists share technological gains with their workers. The industrial wage may well be rising faster than industrial prices, but this will not cut into profit unless it is also rising faster than industrial productivity. If we assume that the capitalists share technological gains equally, the product-wage will remain constant. It makes little difference to the model whether one assumes w/p constant or wL/pQ constant. The system expands faster on the first assumption than on the second, but it is still capable of rapid expansion until wages start rising faster than productivity. A constant product-wage

¹That they will pay a \underline{w} higher than \underline{a} to get higher productivity through higher consumption of food, etc., is clear enough. But this does not explain why the gap between \underline{w} and \underline{a} should widen continually for unskilled labour.

is what Hansen and Marzouk (15) report for Egypt's industrial sector during the 1950's.

Whether the product-wage stays constant or falls somewhat in the initial stages of development, it must ultimately rise when the combination of rising a and diminution of the labour reservoir combine to push up w/p faster than labour productivity. We cannot document this historically, since we do not have profit-wage data for the first three quarters of the nineteenth century for the countries which are now developed, but contemporary cross-country data throw light on the situation.

The United Nations' The Growth of World Industry 1953-1965

(38) summarises data from censuses of manufactures taken between 1961 and 1963. Comparable data for the percentage share of wages and salaries in value added can be computed for several countries, e.g.,

Denmark	59	Venezuela	38*	Ghana	26
Sweden	57	Japan	37	Brazil	26
U.K.	53	Jamaica	33	Nigeria	25
Norway	51	Colombia	32	Phillipines	24
U.S.A.	49	Peru	29	Ivory Coast	24
Israel	46			Iran	22

The difference between the highly industrialised and the least industrialised countries is striking. Some part of the difference is due to heavier depreciation cost in the least industrialised (imported capital costs relatively more, and the life of equipment is relatively shorter), but removing this element would still leave net profits much lower relatively to wages in the most developed countries.

The cross-country data do not, like the historical data, support the notion that the real wage or even the product-wage is constant

*1953

initially (most of the countries shown here are not overpopulated). They show very high initial profits, and since the capitalist sector is growing very rapidly (the modal rate of growth of large scale manufacturing in Asian and African countries is about 10 per cent per annum), they are consistent with a rapid increase in the share of profits in the national income as a whole, in the countries at the bottom of the list. The generalisation which the cross-country data would support for our own times (as distinct from the nineteenth century) is that the share of profits in national income grows rapidly at the start because both the profit margin and the rate of growth of the capitalist sector (relatively to the whole) are high, and that the share stabilises eventually because both the profit margin and the relative growth rate of the capitalist sector are reduced. For evidence that initially the profit margin increases (England, Japan) or remains constant (Egypt) we have to look at historical data from countries known to have had large labour reservoirs.

The cross-country data support the proposition that the profit margin ultimately stabilises. More appropriate evidence can be derived from the U.S. Censuses of Manufactures. From these one can calculate the following ratios of wages and salaries to value added:

1899	48.6 per cent
1909	50.3 " "
1929	46.7 " "
1963	48.6 " "

Recognising that 1909 was a relatively depressed and 1929 a relatively prosperous year, one may surmise that changes in the later stages of development are very small in comparison with those which occur in the middle years.

Let us return for a moment to the widening of the gap between w and a which results from capitalists sharing the gains of technology in spite of the abundance of labour. Whatever their reason for doing this, the consequences for unemployment and under-employment are serious. The ratio of w to a is one of the factors determining how many people flock into the capitalist sector looking for work. Apart from full-time jobs this sector offers much casual employment (at the docks, in building, etc.) so everybody who looks for work stands some statistical chance of getting casual employment -- whether for 5 or 10 or 20 days per month. Others can become self-employed, in retailing, or handicrafts, doing some business, though not much. The higher the wage, the greater the inflow, and the less work for each person, though presumably to each level of w/a there corresponds some degree of under-employment which would be enough to stop further migration. As the ratio of w to a has risen since 1950, there has been a massive exit from the countryside into unemployment and underemployment in the towns. This is now one of the major problems of under-developed countries.

Here we tie into another problem, namely, what is the appropriate capital intensity for economies where the wage rate in the capitalist sector exceeds the marginal product outside that sector. This has been investigated by a long line of writers, summarised by Chenery (6), and the debate continues (10, 26). But the issue is largely political, and our model throws no light on it.

In sum, the model seems to survive the tests of its relevance if one sticks to what is crucial in it, namely, first, the abundance of labour at the current wage, which facilitates the rapid growth of capitalist output and profits; and secondly the notion that in due course wages will

rise faster than profits until some upper levelling off is reached. If the model is not destroyed by showing that the marginal product of manhours in agriculture is not zero, neither is it rendered useless by showing that the real (cost of living) wage is not necessarily constant.

Model Two. In this version our two sectors produce different commodities, and therefore trade with each other. Thus the capitalist sector faces the additional hazard that it may be checked by adverse terms of trade, arising out of the pressure of its own demands, long before any shortage of labour begins to be felt.

This is the version which has been worked out in great detail by Fei and Ranis working with models in which each of the variables is or can be precisely determined. Jorgensen and others also prefer to work with this model. It is a good model for studying the economic history of countries before about 1870, when railways, steamships and the Suez Canal began the great explosion of world trade. Up till then transport costs were so high that countries had virtually to be self-sufficient in basic necessities. But since then the terms of trade are determined by international rather than national forces. If the capitalists were hindered by failure of the non-capitalist sector to produce what was wanted, the capitalists would simply import from other countries whatever they might need (including food for their workers and raw materials for their machines).

This is true for the great majority of countries now underdeveloped, and mainly dependent on foreign trade. It is still not true, however, of huge economies like those of the U.S.S.R. or of India which have been developing with their price levels largely isolated from those of the world market. It is still possible for such economies to grind to a

standstill through over-emphasis on industry and under-emphasis on agriculture, showing up in shortages of food, raw materials and foreign exchange -- contemporary Indian experience illustrates only too vividly the continued relevance of this model.

Let us therefore pursue it. For the moment (until we reach model three) we assume a closed economy without international trade. We simplify by assuming that just two commodities are produced, and our interest is in the terms of trade between them. Thus our specifications are altered. The division between the two sectors now turns on commodities rather than on capitalists; it makes no difference to us whether there are capitalists in the slow-growing sector, provided we specify that their profits are not reinvested in the fast-growing sector. What we still need is a substantial initial difference between real wages in the two sectors, so that labour supply is not initially a problem to the fast-growing sector. Following the conventions, we will now divide the economy into an industrial and an agricultural sector, with industry paying significantly higher wages than agriculture.

Thus stated the problem is an exercise in the study of unbalanced growth in a closed economy. It is normally approached by specifying the conditions under which balance (which here means constant terms of trade) would be maintained. But this balance carries no normative implications. The industrial sector may grow quite rapidly for some time even if the terms of trade are moving against it. And since industry has no intrinsic merit over agriculture, economic policy does not require that the terms of trade be moved in favour of industry. The only economists who wish to impoverish the peasants are those who have set the creation of a modern industrial state as their target, for its own sake.

Since what we are studying is the behaviour of the terms of trade between two sectors, ready answers are already available in the corpus of international trade theory. I like the answer given by Johnson (19). Let us write:

e = price elasticity of demand
 z = income elasticity of demand
 r = rate of growth of output
 p = price of agricultural products relatively to manufactures
 a = subscript denoting the agricultural sector
 m = subscript denoting the industrial sector

Then, after various manipulations, detailed by Johnson (p. 141), we get the annual change in the terms of trade

$$\frac{dp}{dt} \times \frac{1}{p} = \frac{z_a r_m - z_m r_a}{e_a + e_m - 1}$$

From this it follows that the terms of trade will be constant if

$$z_a r_m = z_m r_a$$

i.e., if

$$\frac{z_m}{z_a} = \frac{r_m}{r_a}$$

This equality means that the terms of trade will be constant if the relative growth rates of industry and agriculture are the same as the relative income elasticities. E.g., if the income elasticity of demand for manufactures is twice that for agricultural products, then the output of manufactures must grow twice as fast as the output of agricultural products if the terms of trade are to remain constant.

This next answer reminds us that the terms of trade may move in either direction. If agricultural productivity is rising very fast, the terms of trade will move in favour of industry, which can then pay a lower product wage and expand faster. (Since labour is available, expansion does not depend on consumption; more capital can be used to hire proportionately more workers (27)). But if agricultural productivity rises too slowly, rapid growth of manufacturing will be checked by a constantly rising product-wage. Several writers (e.g., 4) have explored the case of "immiserising growth," which is an extreme form of this proposition.

It should be noted that nothing in the analysis requires the terms of trade to be constant; movement checks or helps the rate of expansion of the industrial sector, by checking or spurring the rate of growth of profits. but since industry and industrial workers are not more valuable than agriculture or farmers, the analysis has no emotional content. Also, even if the terms of trade are rising, industrial expansion will not necessarily cease. Productivity is rising in the industrial sector, so if real wages (w/c) are constant, the profit margin will not fall unless the terms of trade rise faster than industrial productivity. Real wages cannot be constant if agricultural productivity is rising significantly, since this would be moving the factoral terms of trade against industry. So what will happen to profits in any particular case will depend on a race between agricultural productivity, industrial productivity, real wages (which may rise on their own for exogenous reasons), and the commodity terms of trade. If one makes precise assumptions about these magnitudes one can get precise answers, as Fei and Ranis have done. I do not dwell on this model, since I have nothing to add to their work.

Model Three. As I have said, in most of the world since 1870 the terms of trade are determined increasingly not by the relative growths of the two sectors of the same economy, but by the world market in which it is possible to buy and sell.

In model three a rapidly growing industrial sector faced by a too slow agricultural sector is forced to import, and to pay for its imports by exporting.

However, in order to export more it may have to lower its prices, thus squeezing its profits. Its real wages, in terms of agricultural products, are by definition fixed. If we take as given the propensity to import and the inflexibility of the agricultural sector, we can see that the possible rate of growth of such an economy is determined by its propensity to export.

Alternatively the country may devalue its currency. This raises (in domestic currency) the price of food and raw materials, and therefore by definition raises money wages. This is the case well known as "structural inflation," in which a spiral of rising wages and prices is set off.

The open economy may run into trouble even if the agricultural sector is not stagnant. As the economy develops, the product wage rises. This change in the distribution of income will alter the propensity to import -- favourably if the economy specialises in consumer goods, but unfavourably if it specialises in producing capital goods.

This gives us a different aspect of "balanced growth." A country must plan its development in such a way as to secure that its exports will keep pace with needed imports. If it fails to do this, the

rate of growth of output will be constrained by the rate of growth of export earnings. All this is now familiar ground (29, pp. 38-55). There are still writers who worry about the pre-1870 problem, of the balance between sectors. But most writers now recognise that the real balanced growth challenge is that presented by foreign trade.

Finally, the behaviour of capitalists as profit margins diminish relatively to wages cannot be predicted. The original article drew attention to the temptation to export capital, but Kindleberger (25) has pointed out that dynamic capitalists may react rather by speeding up labor-saving innovations. We are still in the dark as to why entrepreneurs act more creatively in some countries than in others, or at one period rather than another in the history of the same country.

III. The Terms of Trade for Tropical Products

In my first article the concept of an infinitely elastic supply was also used to explain the behaviour of the terms of trade for tropical products. I should now like to extend this analysis.

The analysis depends on two pillars

- (a) The chief product of tropical countries is food. Their standard of living is therefore determined in the first place by their output of food per head.
- (b) The commercial crops which tropical countries export (tea, cocoa, coffee, cotton, rubber, oilseeds, etc.) are a small part of their output, and the number of persons and of acres suitable for such production greatly exceed the requirements of the current level of output. There is therefore an infinitely elastic supply of commercial tropical products at prices fixed by the relative outputs per head of food and of commercial products.

Some further simplifications are needed to start the model off.

(c) Food is homogeneous. Wheat, rice, yams, etc., can all be translated into units of equivalent nutritional value which will always exchange at the same price, because food can be traded between all countries. The possibility that prices may diverge robs the model of precision but makes little difference to the reality of its conclusions.

(d) manufactured goods are also homogeneous;

(e) tropical commercial products (hereinafter called commercials) are also homogeneous.

(f) output per head of manufactures and of food is the same in all temperate countries

(g) output per head of food and of commercials is the same in all tropical countries.

(h) there are no transport costs.

These assumptions allow us to start with a model in which initially there are only two countries, say, Germany and Brazil, and three products, say, steel, food and coffee. Let us assume outputs per head as follows, per standard unit of time:

	Steel	Food	Coffee
In Germany	3	3	..
In Brazil	..	1	1

Since food is homogeneous, whether produced in Germany or in Brazil, the model gives us both the factorial and the commodity terms of trade. The commodity terms (found by reading horizontally) are

$$1 \text{ steel} = 1 \text{ food} = 1 \text{ coffee.}$$

The factorial terms are determined by relative productivities in food; so initially, if we call output per head "the wage,"

$$1 \text{ German wage} = 3 \text{ Brazilian wages.}$$

An increase in the productivity of coffee cannot benefit Brazil, since the supply is infinitely elastic. If productivity doubles, the price will halve, and all the benefit will accrue to Germany. This is well illustrated by what has happened to the prices of sugar and rubber, the only two tropical crops in which productivity has increased spectacularly over the last hundred years, mainly through biological improvement. If we divide index numbers of their prices by an index of the prices of all tropical commercials (of which more later) we get the following results

	1880/4	1910/3	1925/9	1960/4
Sugar	100	61	44	54
Rubber	100	163	44	19

Competition forces prices down as technology improves.

For the same reasons, increases in steel productivity benefit "Brazil." So, if food productivity were constant in both countries, the terms of trade would depend on the relative rates of growth of productivity in "steel" and in "coffee."

Although sugar and rubber are the only two cases of large increases in tropical agricultural productivity, another phenomenon is occurring which has the same effect. This is the entry into the world's markets of new countries with lower costs of producing commercials relatively to food. Specifically, the relatively recent conversion of Africa from subsistence to commercial production, with costs lower than those of Latin America, is having a disequilibrating effect.

At this point we must for the moment drop our model's assumption that there are only two countries, and assume that a third country (also tropical) now enters the scene. Its effects on the commodity terms of trade will depend on its relative productivities. If the new country

(call it Guinea) has the same relative productivities as Brazil in food and coffee (say, in absolute terms 1:1 or 0.5:0.5 or 2:2) then the commodity terms are unaltered. But if it produces coffee more cheaply than Brazil (in relative terms: the absolutes don't matter) then it will drive down the price and drive Brazil out of the market. Thus assume the new situation to be

	Steel	Food	Coffee
Germany	3	3	..
Brazil	..	1	1
Guinea	..	0.6	0.9

The commodity terms of trade now become

$$1 \text{ steel} = 1 \text{ food} = 1.5 \text{ coffee}$$

and coffee production becomes unprofitable in Brazil.

Something like this seems to have happened as Africa has come onto the world market. Africa's share (excluding North Africa and the Union) of the exports from less developed continents (Asia plus Africa plus Latin America) has risen from 8 per cent in 1938 to 14 per cent in 1965. The continent is just being opened up with roads and trucks, and the process of conversion from subsistence to market economies is still in full swing. This alone would tend to reduce the relative price of commercials, just as the opening up of empty temperate lands brought down agricultural prices after 1870.

But beyond this is also a difference in productivity ratios.

African productivity in tree crops such as cocoa or coffee is not significantly different from Latin American productivity. But productivity in arable crops, and especially in domestic food, is lower in Africa than in, say, Brazil. This is partly due to the African farmer cultivating smaller acreages with inferior tools. But there is also a difference in yields per acre, due to superior technical practices. Thus the yield of maize averages only about 6cwt. per acre in West Africa (20, p. 126), as against about 11 cwt. in Brazil (32, p. 169).

Thus the entry of Africa into the world market tends to bring down the price of commercials, not because African productivity is higher, all round, but because, having a relatively lower food productivity, the Africans find a lower commercial price profitable for them.

Let us now return to the two-country world, and to the effects of changes in the relative productivity of "steel" and "coffee."

Despite the factors we have noted which have increased the productivity of "coffee," it remains the case that the increase in the productivity of steel has far outdistanced increases in the productivity of coffee. Industrial productivity in temperate countries has risen much faster than productivity in tropical commercials, taken as a whole. Hence the historical movements in productivity, as between manufactures and commercials, have favoured the tropical countries.

The historical movements in food productivity have had the opposite effect. A rise in German food productivity relatively to Brazil raises German wages relatively to Brazilian: this is probably the main reason for the ever widening gap between standards of living in temperate and in tropical countries. Food productivity has remained practically constant in the tropical world over the last hundred years. However a rise in German food productivity not only widens the factorial gap: it also changes the terms of trade for steel unfavourably to the tropics. For example, if Germany food productivity doubles, while all other productivities remain the same, the terms of trade become

$$1 \text{ steel} = 2 \text{ food} = 2 \text{ coffee}$$

and the price of steel has doubled in terms of coffee.

It may be observed that we have said nothing about the income elasticity of demand for tropical products, on which other writers rely so heavily. The mere fact that income elasticity of demand is lower for one commodity than for another tells us nothing about the terms of trade. If relative productivities are constant the terms of trade will also be constant if relative growth rates are the same as relative income elasticities of demand. Therefore, to explain a persistent tendency for the terms of trade to move against one of the commodities one would have to appeal either to a persistent change in relative productivities, or to a persistent tendency for the supply of one of the commodities to grow faster than the demand for it. As Marshall emphasised ages ago, in studying the long term behaviour of price we learn more from examining the conditions of supply than from studying demand.

To sum up, historically the changes in relative productivity in manufactures and tropical commercials have favoured the tropics, while the changes in relative productivity in food have worked against the tropical terms of trade. If we assume that tropical productivity has been constant both in food and commercials, then the changes in the tropical terms of trade are determined entirely by two factors:

- (a) changes in relative productivity between German manufactures and German food
- (b) changes in prices divergent from the changes in productivity, whether in Germany or in Brazil.

As to the first factor, changes in relative productivities between agriculture and industry in the temperate world, it is difficult to dogmatise, especially since industrial productivity alters fairly constantly from decade to decade, while agricultural productivity alters

in long spurts. The relative price of food probably depends more than anything else on changes in American output. According to Kendrick (24) manhour productivity rose faster in manufacturing (146 per cent) than in agriculture (34 per cent) between 1890 and 1929, but rose faster in agriculture (166 per cent) than in manufacturing (87 per cent) between 1929 and 1957. For the whole period 1890-1957 we get average growth rates of 2.3 per cent per annum in manufacturing and 1.9 per cent per annum in agriculture, which would have moved the terms of trade against manufactures if changes in productivity per head were the only element in relative prices.

There are, however, divergencies from relative productivity which our model does not take into account. These we may list briefly as follows:

- (i) Other factors than labour are used to raise productivity per head. Insofar as one sector has been absorbing more man-made factors than the other, that sector's price per head will not fall as much as relative productivities may indicate.
- (ii) Agriculture uses a scarce factor, land. Insofar as any particular product comes up against a relative shortage of specially suitable land, the price of that product will rise faster than productivity would indicate. This element has probably not been significant in the temperate world since the transport revolutions of the mid-nineteenth century opened up new lands and reduced agricultural prices. In the tropics, taken as a whole, limitation of natural resources affects mineral rather than commercial crop production.
- (iii) Prices may diverge from relative productivities temporarily. There are marked cyclical changes in the terms of trade associated with cyclical swings in industrial production. Besides, supply takes some time to adjust to changes in demand, so we must not expect the long-term supply price to prevail in every year.

- (iv) Prices will diverge from those postulated if the price of food to the German farmer moves differently from the price to the Brazilian farmer, e.g., because of tariffs or local subsidies. The side which raises its food price relatively to the other's will improve the terms of trade for its product. What matters in our equations is not the world trade price, but the price received by the producer (this applies to steel and coffee as well as to food).

Finally, we must note the decisive limitation on the usefulness of this model which comes into play if the terms of trade between steel and coffee diverge too widely in either direction. This limitation is that there is some price at which Germany will produce "coffee" (synthetic rubber, detergents, etc.), and some price at which Brazil will produce steel. We have been able to ignore this possibility by assuming that initially the comparative cost margins are so wide that the terms of trade must be within the limits set by this possibility. This was roughly true up to about 1929, but as we shall see in a moment has ceased to be true.

To take account of this possibility we rewrite the original conditions as

	Steel	Food	Coffee
In Germany	3	3	1
In Brazil	0.5	1	1

We can then state the situation as follows.

- (1) As far as steel/coffee relative productivities are concerned, if taken alone, 1 coffee may buy anything from 0.5 steel to 3 steel.
- (2) But the possibility of trading food fixes the terms of trade at 1 coffee = 1 steel.
- (3) If German food productivity starts to rise, while all other productivities are constant, Brazil will start to make its own steel as German food productivity passes 6.

- (4) If Brazilian food productivity starts to rise, while all other productivities are constant, Germany will start to make synthetic coffee as Brazilian food productivity passes 3.

Economists have been discussing the three good comparative cost case for over a hundred years; the idea is not new. The "novel" point we are seeking to make is not theoretical but empirical, namely, that the supply conditions are such that, within fairly wide limits, the terms of trade are determined by the fact that both temperate and tropical countries produce food which is exchangeable at par. This gives determinate answers which have hitherto escaped attention.

To test the validity of our propositions we have made an index of the prices of tropical agricultural commercials from 1871 to 1965. Details will be given in another publication (our seminar book). In brief, the commodities are sugar, rice, coffee, tea, cocoa, palm oil, cotton, jute, rubber, timber and hides, weighted up to 1929 by the export values (from the tropics only) in 1913, and thereafter by export values in 1953. Prices are c.i.f. London, converted to dollars by the appropriate rates of exchange (except 1871 to 1879 which are in sterling). We have also an index of the price in London of wheat imported from America, which we use as the world price of food. (Since the tropical countries for most of this period imported flour rather than wheat, the price of flour would be more appropriate. However, there is very little difference between these two indexes except in the years immediately after the second world war, when the flour index is kept down by food subsidies and becomes unrepresentative.) We have also an index of the export price of manufactures, which from 1871 to 1880 is the average of British import and export prices, from 1880 to 1929

is the average of British, German and U.S. export prices (weighted by 1899, 1913 and 1929 values), and from 1929 to 1965 is the League of Nations and United Nations series for the average unit value of exported manufactures. (Breaks in these series are remedied by using Maizels's (30) price relatives for 1929 on 1913.)

We have divided the index of tropical prices first by the wheat index and then by the index of the price of manufactures. The results are shown in our graph in five-year moving averages. The average of 1899/1913 is taken as 100. In what follows this will be called the pre-war price.

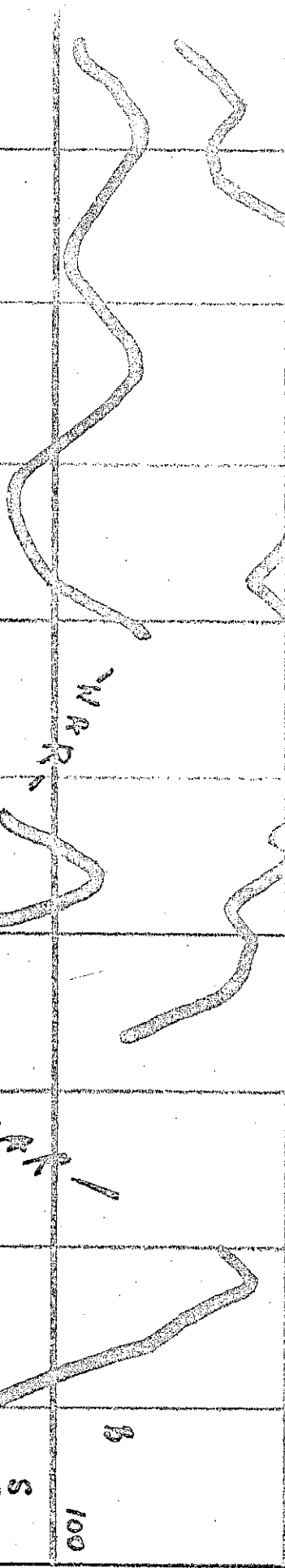
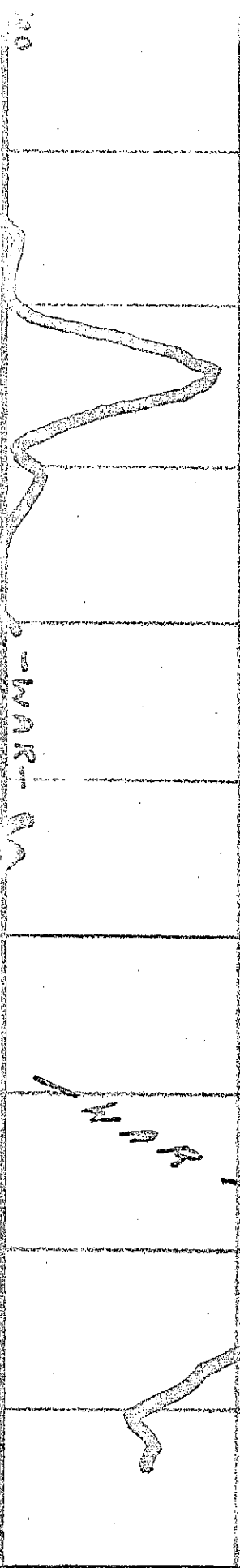
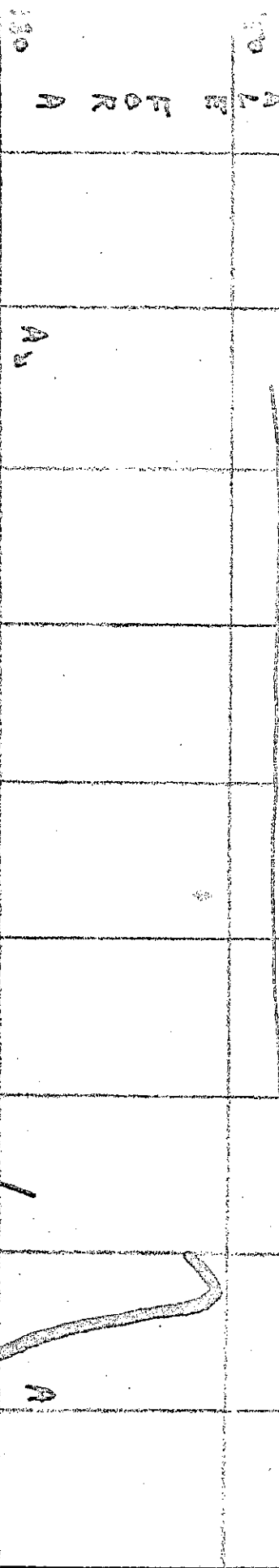
The upper curve shows the price of tropicals in terms of wheat. It rises in the seventies, and then more or less stabilises until the first world war, much as our theory would expect it to do. The bulge in the nineties is due to a sharp fall in the price of wheat in 1893/5, which the moving average then spreads over the whole decade. If we take the average for the 1890's without 1893/5, the result is only 3 per cent above the pre-war average.

To continue, the curve shows that the price of tropicals fell below the price of food (speaking relatively) in the second half of the twenties, and fell even more drastically during the thirties. The explanation in the twenties was that the war had dislocated the industrial countries more than the tropical countries; in the thirties the great depression pushed tropical prices down more than the price of wheat.

The result of this was to check the expansion of tropical commercial production. The second world war did this to an even greater extent, while food production had to be maintained. As a consequence, the early fifties found the prices of tropical commercials, relatively

THE TERMS OF TRADE.

SCALE FOR A



A. TROPICAL CROPS ÷ WHEAT

B. TROPICAL CROPS ÷ MANUFACTURES

1850 1860 1870 1880 1890 1900 1910 1920 1930 1940 1950

SCALE FOR B

100

1850 A.D.

to food, some 60 per cent above the pre-war level. The consequence is as we would expect. The output of tropical commercials has been expanding rapidly (especially rapidly in Africa) and their prices have been tumbling down. Their price in 1965 was down to 12 per cent above the pre-war tropicals/wheat ratio.

Can we expect it to fall some more, or has it now reached its "natural" level, given the infinite elasticity of supply? There are two conflicting factors. On the one hand, productivity has risen more in commercials than in food, so we should expect the price of commercials to continue to fall until it is significantly below the pre-war rates. On the other hand, export taxes and Marketing Boards reduce the price to the tropical producer significantly below the export price, and this force tends in the opposite direction, by checking the growth of supplies.

We do not know enough to say what the equilibrium ratio now is, but our theory that supply will keep the price of commercials moving pretty closely to that of wheat seems very well borne out by the historical data.

The nub of our analysis is that to understand the terms of trade between tropicals and manufactures one must break the problem into two parts (a) the tropicals/wheat ratio, and (b) the wheat/manufactures ratio. The first is determined by events in the tropical countries, whereas the second is determined by events in the temperate countries.

The lower curve on our graph shows the price of tropicals in terms of manufactures. Differences between this curve and the upper curve are due to changes in the relative prices of wheat and manufactures. The two curves behave in roughly the same way, except in three periods.

- (a) The price of wheat was rather high in the 1870's. It fell in the first half of the 80's. Thereafter wheat, tropicals and manufactures moved at roughly the same levels until the first world war.

- (b) The price of wheat fell more than the price of manufactures in the 1930's. So the price of tropical commercials, already depressed in terms of wheat, was even more depressed in terms of manufactures.
- (c) The price of wheat did not rise as much as the price of manufactures after the second world war. We have already seen the reason for this: in the U.S.A. agricultural productivity has risen by twice as much as manufacturing productivity. So tropical prices, which were 60 per cent above the pre-war level relatively to wheat in the first half of the 50's, were only 25 per cent above relatively to the price of manufactures. Wheat and manufactures then stayed more or less constant in terms of each other, but rising supply brought tropical prices down in terms of agriculture, and therefore of manufactures. In 1965 they were already 11 per cent below the pre-war level in terms of manufactures.

Fundamentally, therefore, the reason for the currently unfavourable terms of trade which the tropical countries are experiencing is the fact that, compared with the situation before the first world war, the price of wheat has risen less than the price of manufactures. And the fundamental reasons for that are the tremendous revolution in agricultural productivity in the United States (biological, chemical and mechanical), coupled with the relative immobility of farm populations, which keeps supply ahead of demand.

The moral remains the same as was reached in the original article. The tropical countries do not benefit themselves by raising their productivity in commercials (individual countries may do this, acting alone, but not the group as a whole). The solutions open to them are

- (a) to concentrate their agricultural efforts on raising productivity in domestic foodstuffs. This would improve both their factoral and their commodity terms of trade simultaneously.
- (b) to raise their food prices relatively to world food prices, and so raise the supply price of commercials. Apart from the difficulty of doing this on a world-wide basis, it would raise the urban cost of living, and so damage industrialisation.
- (c) to industrialise as the terms of trade continue to move in favour of manufactures. This is the solution now being most widely adopted.

REFERENCES

1. W. Allan, The African Husbandman. Edinburgh, 1965.
2. R.L. Bennett, "Surplus Agricultural Labour and Development: Comment", American Economic Review, March 1967.
3. R.A. Berry and R. Soligo, "Rural-Urban Migration, Agricultural Output, and the Supply Price of Labour in a Labour-Surplus Economy", Oxford Economic Papers, July 1968.
4. J. Bhagwati, "International Trade and Economic Expansion", American Economic Review, December 1958.
5. E.H. Phelps Brown and S.V. Hopkins, "Seven Centuries of the Prices of Consumables, Compared with Builders' Wage Rates". Economica, November 1956.
6. H.B. Chenery, "Comparative Advantage and Development Policy", American Economic Review, March 1961.
7. J.H. Clapham, The Economic Development of France and Germany 1815-1914, Cambridge, 1951.
8. G.E. Cumper, "Lewis's Two-Sector Model of Development and the Theory of Wages", Social and Economic Studies, March 1963.
9. Phyllis Deane and W.A. Cole, British Economic Growth 1688-1959. Cambridge 1964.
10. A.K. Dixit, "Optimal Development in the Labour Surplus Economy", Review of Economic Studies, January 1968.
11. J.C. Fei and G. Ranis, The Development of the Labour Surplus Economy. Homewood, 1964.
12. C.R. Frank, Jr., "Urban Unemployment and Economic Growth in Africa", Oxford Economic Papers, July 1968.
13. R.E. Gallman, "Gross National Product in the United States 1834-1909" in N.B.E.R., Studies in Income and Wealth, Vol. 30. New York, 1966.
14. E.E. Hagen, The Economics of Development. Homewood, 1968.
15. Bent Hansen and G.A. Marzouk, Development and Economic Policy in the U.A.R. London, 1965.
16. R.M. Hartwell, "The Rising Standard of Living in England, 1800-1850", Economic History Review, April 1961. Also rejoinder to Hobsbawn in EHR, August 1963.

35. L.G. Reynolds, "Wages and Employment in a Labour Surplus Economy", American Economic Review, January 1965.
36. T.W. Schultz, Transforming Traditional Agriculture. New Haven, 1964.
37. A.R. Thatcher, "The Distribution of Earnings of Employees in Great Britain", Journal of the Royal Statistical Society, Part 2, 1968.
38. United Nations, The Growth of World Industry 1953-1965. New York, 1967.
39. S. Wellisz, "Dual Economies, Disguised Unemployment and the Unlimited Supply of Labor", Economica, February 1968.

17. E.J. Hobsbawm, "The Standard of Living During the Industrial Revolution", Economic History Review, August 1963.
18. H.S. Houthakker, "On Some Determinants of Saving in Developed and Underdeveloped Countries", in Problems in Economic Development, Ed. E.A.G. Robinson. London, 1965.
19. H.G. Johnson, International Trade and Economic Growth. London, 1958.
20. B.F. Johnston, The Staple Food Economies of Western Tropical Africa. Stanford, 1958.
21. D.W. Jorgensen, "The Development of a Dual Economy", Economic Journal, June 1961.
22. _____ "Testing Alternative Theories of the Development of a Dual Economy", in The Theory and Design of Economic Development, Ed. I. Adelman and E. Thorbecke. Baltimore, 1966.
23. _____ "Surplus Agricultural Labour and a Dual Economy", Oxford Economic Papers, November 1967.
24. J.W. Kendrick, Productivity Trends in the United States. N.B.E.R. 1961.
25. C.P. Kindleberger, Europe's Postwar Growth. Cambridge, Mass., 1967.
26. L. Lefebvre, "Planning in a Surplus Labor Economy", American Economic Review, June 1968.
27. W.A. Lewis, "Economic Development with Unlimited Supplies of Labor", Manchester School, May 1954.
28. _____ "Unlimited Labor: Further Notes", Manchester School, January 1958.
29. _____ Development Planning. London and New York, 1966.
30. A. Maizels, Industrial Growth and World Trade. Cambridge, 1963.
31. R. Minami, "The Turning Point in the Japanese Economy", Quarterly Journal of Economics, August 1968.
32. W.H. Nicholls and R.M. Paiva, Ninety nine Fazendas, Chapter IV. (Mimeographed). Vanderbilt University, 1967.
33. K. Okhawa, The Growth Rate of the Japanese Economy since 1878. Tokyo, 1957.
34. M. Paglin, "Surplus Agricultural Labour and Development", American Economic Review, September 1965.