THE ROLE OF TECHNOLOGY IN EMPLOYMENT AND GROWTH

Probably the aspect of technology which most requires emphasis is that it is constantly changing and must be treated in a dynamic context. At first glance this may seem like a rather simple-minded statement, for there is certainly adequate recognition of the wonders of modern science and the apparently increasing speed of the technological revolution. But when technology is discussed in the restricted context of its impact on employment in the developing countries, and the possibilities of using more labour intensive techniques to increase employment levels, the discussion is often implicitly in static terms. It is of fundamental importance to explicitly consider not only the technological alternatives of today, but also probable technological advance. Technology, employment, and growth must be kept carefully linked. When this is done, some problems are clearer and some appear in a somewhat different light.

A. The level of technology in aggregate terms

It is useful to begin by looking at the problem in global terms. At first this may not appear to be closely linked to the question of choosing among different possible techniques; but it will be argued that the choice of technology has at least as much to do with the type of product to be made, and the pattern of development to be followed, as with choosing among different possible ways of producing a specific item.

What is feasible in terms of growth and technological advance? A numerical example is interesting. It of course does not illuminate in any way any of the difficulties involved in achieving growth - it is only a simple play with numbers. Nevertheless, it does indicate some of the aggregate possibilities and limitations involved. Suppose we begin with a "typical" Latin American and industrial country, and project what might happen to per capita incomes in these countries to the end of the century.

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These figures are fairly realistic, with growth rates on the optimistic side for the Latin American country. The figures for current per capita income approximately correspond to a comparison between an "average" Latin American country and an "average" country of northern Europe. Comparisons with one of the richer industrial countries (the United States, Canada, etc.) would be less favorable. A per capita growth rate of 3% for the industrial country implies a total growth rate of about 4%, as population growth is less than 1% in most of these countries. It is generally predicted that the industrial countries can grow more or less steadily at this sort of rate without too much difficulty. Predictions, especially for some countries, are often higher than 4%. A projected per capita increase of 4% for a Latin American country implies a total growth of around 7% given current rates of population increase. To achieve a steady growth of this magnitude over a thirty year period would be a very considerable achievement, and the projection is probably optimistic.

With all their simplicity, there is a clear conclusion to be drawn from these figures: it is not possible to "catch up" with the industrial countries in the foreseeable future, and any policy aimed at that end is illusory. Even with rather favorable assumptions the per capita income in the industrial country will still be triple that of the "average" Latin American country at the end of the century. That is, the over-all level of technology - in the broadest sense of this term - is not likely, in most of Latin America, to be more than about one-third of the then existing level in an "average" advanced industrial country at the end of the century. By that date the present industrial countries will have become what is already being referred to as "post-industrial" societies.
Under these assumptions the year 2000 per capita income of the "average" Latin American country would, however, be fairly close to the income level of the "average" advanced industrial country of today. This would represent an enormous advance, and a realistic policy goal could be to aim at achieving current Western European levels of technology and living standards by around end of the century.

But although over-all levels of technology and living standards are (and are likely to remain) far below Western European levels, it would still be possible to pursue a policy of trying to catch up to the European level. This is in fact the policy which has been pursued, and which has generally led to a limited proportion of the labour force being incorporated into the system and to consequent concern with the problem of employment. Modern type products and production methods are taken over more or less intact from the industrial countries; these are generally designed for use by populations with high income levels, and advanced techniques are available for their production; those who produce and consume these goods (and their associated services) become something of a closed and limited group in the developing countries. The analysis of this process is by now fairly familiar. All that needs to be pointed out here is that the continuation of such a policy is a possibility.

The present situation, and the future possibilities, can be depicted in very simple terms by continuing the above numerical example. The over-all average income of $500 in the "average" Latin American country combines the high income group associated with the high technology activities, and the much larger group engaged in other activities. In approximate terms the total can be broken down as follows:

(1) The top 20% of the population receives about 60% of total income and so has an average per capita income of $1,500.

(2) The rest of the population receives about 40% of total income and so has an average per capita income of $250.
There is thus in the "average" country an important but minority group with incomes and associated levels of technology fairly close to the European level; while the bulk of the population is at much lower levels. The possibilities for the orientation of future growth revolve, in this sense, around the extent to which the minority group is to advance in line with developments in the industrial countries (and the incorporation of the rest of the population is therefore restricted); or, on the other hand, the extent to which those outside the system are to be incorporated (and the advance of the minority group restricted). The possibilities can be easily illustrated with the numerical example.

1st alternative: At one extreme, suppose the minority group advances in line with developments in the industrial countries; that is, technology and income levels rise at 3% per annum. This is still less than the assumed average advance of 4%, so that incomes of the rest of the population would rise at a faster rate (over 5%). By the end of the century the top group would have an average income of $3,640, and the rest of the population $1,250, if the increase were generalized throughout this unincorporated group. Another possibility would be that the growth is concentrated on expanding the size of the incorporated group. In this case about another 20% of the population could be incorporated by the end of the century so that the total would comprise 40% of the population with an average income of $3,640. The remaining 60% would continue to have an average income of $250. This latter possibility (gradual expansion and rising incomes of the incorporated group and stagnation outside) is probably closer to what in practice has tended to occur.

2nd alternative: At the other extreme, suppose absolute levels of income and technology of the top group are held constant. This group would then fall progressively, and rapidly, behind the advancing levels in the industrial countries. Other incomes could then increase very rapidly, however,
and by the end of the century would rise to the level of the top group; or, in terms of
the other version, the entire population would be incorporated, although of course at
a level well below that of the industrial countries. Note that even here it would require
nearly 30 years of rapid growth to achieve a fully integrated system.

3rd alternative: Any number of other assumptions could be made. If, for example,
income and technology of the top group increased at 1% per annum this group would fall
steadily further behind the industrial countries, but less rapidly than in the preceding
example; by the end of the century they would have an average income of slightly
more than $2,000. The rest of the population could experience rapid increases and
reach an average income of more than $1,500; or, alternatively, the bulk of this
group could be incorporated. By the end of the century three-quarters of the population
could be integrated with incomes of around $2,000, while nearly one-quarter
would remain outside at the $250 level.

It should be stressed that these examples assume the achievement of
per capita growth rates nearly double what the region has averaged during
the past decade. A less rapid rate of growth would mean less favorable
results in each case: specifically, a smaller proportion of the population
could be incorporated by the end of the century.

The same kind of alternative possible choices can be seen, perhaps
more meaningfully, by considering the types of production which might be
increased, in terms of technology levels. At one extreme, it would be possible
to hold technology levels constant in the advanced sectors of the economy,
and put all available resources into an effort to bring the rest of the
economy up to those levels. This is the counterpart of the second alternative
in the above numerical examples.

At the other extreme, an effort could be made in the advanced sectors of
the economy to keep up with advancing levels of technology in the industrial
countries — the counterpart of the first alternative above. In part this
would involve new techniques for producing the same or only moderately improved products; but a major aspect would be the introduction of qualitatively different goods. It is not difficult to draw up a list of this sort of thing, and some of the implications become immediately apparent when one looks at such a list. There are first of all a number of important items which are already established in the industrial countries but which have not yet been widely introduced in the region. These include things such as the following:

(1) Modern military equipment. It is said that so-called "central war" technology has undergone a real revolution about every 5 years since the end of the Second World War. To the extent this resolves around nuclear weapons and rocketry, no Latin American country has as yet become involved, but some of the other developments (modern aircraft) have begun to be introduced. It is important to recognize that this is not a question of an arms race in the simple sense of increasing the size of the military establishment. It is a question of keeping up with advancing levels of technology - a more subtle and potentially more dangerous situation.

(2) Improved road networks, particularly urban complexes, to cope with the increasing use of automobiles.

(3) Color television.

(4) Computers.

(5) Synthetic fibres as a basic factor in the textile and clothing industries.

(6) Improved building, packaging, and other materials, mostly produced by continuous flow chemical plants.

And research is already sufficiently far advanced to predict any number of developments in the near future. For example:¹

¹ This listing is taken from Kahn & Wiener, The Year 2000.
(1) Developments in nuclear power, both for generating electricity and for such purposes as desalination plants producing fresh water from the sea. Among other things this would make available the elements required for manufacturing nuclear weapons at relatively low cost.

(2) The rapid advance in military technology will probably continue and may spread to other than central war techniques - in particular to techniques for counter-insurgency wars.

(3) Electronics, computers, automation, and information processing. This area is seen as the center of the "post-industrial" society, and changes is occurring so rapidly that it seems unprofitable to even try to guess at developments beyond perhaps a decade.

(4) Lasers. A new technique but which is expected to have wide ranging applications, from military through communications and data processing to medical.

(5) Holography (3 dimensional photography).

(6) Medical advance, including substantial progress in the treatment of such diseases as cancer and heart disease; in transplants and the development of artificial organs; decrease in the debilitating effects of age; in birth control and controlling birth defects; in influencing thought processes and genetic constitutions; etc.

Such a list could easily be extended (see, for example, pp. 51-57 in Kahn & Wiener for a more extensive and specific listing).

In part of course developments of this sort will rationally be utilized in any type of progressive economic policy. But it will be immediately obvious from any such list that a major part of these developments (a) presuppose a high income level on the part of those who would benefit from them, and/or (b) would require large amounts of capital and probably also foreign exchange to put into practice. The extensive use of unskilled or moderately skilled labour is clearly not implied in such a list.
The dilemma involved is perhaps seen in more meaningful terms when presented in this form. There are already in use in the industrial countries various attractive new products and new ways of living which could be copied in the region; and the number of these new goods can be expected to increase steadily with the passing of time. But if the available capital, foreign exchange, and talent is spent on trying to provide such things, there is likely to be little left over to devote to incorporating a larger proportion of the population into the system.

The discussion of levels of technology up to this point has been in very general terms and aimed at providing an aggregate framework for the problem. It is useful here to summarize the essential points before shifting to look at the problem at the micro level.

(1) The major, and most obvious, point is that since it will not be possible to catch up with the advanced industrial countries it will continue to be necessary to choose the general type of development to be followed. One type would involve an effort to maintain an important modern sector, with a level of technology and pattern of production fairly similar to those which will prevail in the advanced industrial countries - and which would of necessity be restricted to a minority of the population. Or, alternatively, effort could be concentrated on incorporating the rest of the population into the existing modern sectors of the economy - and this would necessitate holding technology levels in the modern sectors relatively constant, so that they would fall increasingly behind the advancing levels in the industrial countries. This is a real and painful choice. There are already large and increasing pressures from those not incorporated in the system for some sort of action which would bring about their incorporation. But there are also, and will continue to be, pressures for the adoption of products and processes which are seen to be in use in the industrial countries. That these two desires are to a considerable extent mutually exclusive, and the resources available too limited to make it possible to satisfy both at the same time, is the nature of the dilemma.
(2) A second important point which is clear in this context is that it is not "employment" in the abstract which is required. It is a certain type of employment: that which provides incorporation into the advanced sectors of the economy with the benefits which this is generally seen to yield. Some implications of this will be discussed later.

(3) One important reason for viewing technology in dynamic rather than static terms is also apparent. Research and technological advance can be of two fundamentally different types. On the one hand, there is research which leads to greater efficiency (lower costs) in the production of a particular item, with probably some improvement in the quality of the item as well. On the other hand, there is research which leads to completely new products, or new ways of achieving a particular task. More will be said about the first type of change later; but it is primarily the second type of technological advance which produces pressures for the adoption of new goods and makes more difficult the incorporation of a larger proportion of the labour force.1/ When alternative techniques are viewed in static terms, this sort of problem, with its major implications for employment, never presents itself.

1/ There is also a third important type of research, which presents problems of the same sort, but which is not really concerned with levels of technology. This is the effort to differentiate a product by devising novel ways of packaging, special ingredients which can be trademarked, etc. It is essentially advertising.
The conventional treatment tended to imply that there was considerable scope for varying the amount of capital or labour employed in the production of most goods, and that therefore full employment could readily be achieved if factor prices were flexible and there was an adequate level of aggregate demand. Faced with the general failure to achieve adequate employment in the more modern sectors in the developing countries, it has been increasingly pointed out that (a) in economic terms there is often not much scope for variation in the choice of techniques and (b) such scope as exists is often obscured by factors which reduce the money cost of investment and/or increase the cost of labour, thus leading to a general adoption of relatively capital intensive techniques. As a consequence there has been a truly remarkable shift of opinion in recent years: there is now a very widespread view that there is little hope of absorbing a major part of the growth of the labour force in the industrial sector, or perhaps even in the more modern areas of the urban economy as a whole.

The conventional view followed from the use of the simple factor proportions diagram which permeates most of economic theory, and is introduced to students in the beginning textbooks. This view and the criticisms of it, can be best presented through use of such a diagram (figure 1).

**Figure 1**

![Diagram](image)
The two axes show amounts of capital and of labour used. The curve shows the different combinations of capital and labour which can be used to produce a fixed amount of a particular item (that is, it represents the different production techniques available). If the relative prices of capital and labour are as shown by $l_1$, then it is most economic to use the technique represented by point A on the curve; if relative prices are as shown by $l_2$, then it is most economic to use the technique represented by point B. $l_1$ represents a situation where labour is relatively expensive (scarce), and so technique A is adopted, using relatively large amounts of capital and little labour. If labour is relatively cheap (abundant) then technique B is used, and with a smaller amount of capital a much larger amount of labour is used. Although a very simplified concept, this is the essential idea which, at least implicitly, lies behind the expectations of a large-scale and relatively easy absorption of the labour force in the process of industrialization.

There are a number of assumptions involved in this concept which might be criticised, but the most important ones from the present point of view relate to the different production techniques available. First, a curve such as that shown in figure 1 implies that there are a large number of different techniques to choose from, and that they use widely varying proportions of capital and labour. Less obviously, it also assumes that these different techniques are all more or less equally modern and effective, and that they were developed basically to make it possible to vary the proportions of capital and labour used.

The number of techniques available is no doubt exaggerated by a simple curve of this sort. Still, there probably are numerous techniques for producing most goods (particularly traditional goods), and they may use quite different proportions of capital and labour. It is highly unlikely, however, that these different techniques are equally modern or effective. A basic fault with a diagram such as that in figure 1 is that it is essentially static, and does not consider how the different techniques became available. Here, again, it is of fundamental importance to view technology in a dynamic context.
The different known techniques were in most cases developed through time (and were developed largely in the now industrialized countries). Since the amount of capital per member of the labour force has been steadily growing in these countries, the typical path of evolution has been from relatively labour intensive techniques to increasingly capital intensive techniques. If the different techniques happen to fall on a curve of the simple sort used, the situation would be like that shown in figure 2. The different techniques \( (A, B, C, D, E) \) are not only increasingly capital intensive, they are also increasingly modern. \( A \) was the earliest technology, then \( B \), then \( C \), etc.

![Figure 2](image)

This has very important implications for an economy with large supplies of labour where it would be convenient to use a labour intensive technique. The more capital intensive techniques, since they are the newest, are also likely to have lower costs in other respects (reduced material costs) and to produce a product of higher quality — or at least a quality which has come to be preferred by consumers. The choice of a more labour intensive technology will therefore very often involve higher non-labour production costs and an inferior end product.

But the situation in practice is even less favourable. Curves such as those shown in figures 1 and 2 imply that the relatively capital intensive techniques use larger amounts of capital not only per worker, but also per unit of end product. For example, in figure 2, technique \( E \) uses more capital and less labour (in absolute as well as relative terms)
than technique A to produce a given volume of the product; that is, the absolute amount of capital per unit of output is greater. This, however, appears to be contrary to the typical course of development of technology.

Estimates for the USA indicate a rather steady decline in the aggregate capital/output ratio for a long period (since at least the end of the last century). That is, although the average production technique has involved steadily more capital per member of the labour force, it has required steadily less capital per unit of output. The curve showing the way in which the "typical" technology has advanced (the different production techniques) would therefore look very different from the curves drawn in figures 1 and 2. It might look something like the curve shown in figure 3.

Figure 3

"A" would again be the oldest technique and E the most recent. "A" would still be the most labour intensive and "E" the least labour intensive (the most capital intensive). But technological advance from technique A to B ..., to E would require steadily less of both capital and labour inputs to produce

\[1/\] This is associated with a large shift in the composition of fixed investment: the share of equipment rises and that of plant declines. The ratio of investment in equipment alone to output has remained nearly constant. For some purposes this distinction between the trend in plant and in equipment investment may be of considerable importance for the developing countries as the proportion of foreign exchange costs in equipment investment is often much higher than in plant investment; but the distinction does not change the point being made here.
a unit of output. In addition it would probably involve a reduction of other costs and an improvement in the final product. In this sort of situation it is obvious that relative prices of capital and labour have nothing whatever to do with the choice of techniques. The most modern technique will always be chosen, as it minimizes costs of all inputs and produces the "best" final product.

At the conceptual level it is possible to raise doubts about this "typical" curve of technological advance. But it is not difficult to find specific examples of this sort of trend - in an area where there is still not much numerical information - and there seems little question but that this is of real importance in any consideration of technological choice.

The specific examples which can be given are of two different types. First, it appears that some handicraft type methods have higher capital costs than more modern techniques. The evidence comes from India, where the severity of the unemployment problem has lead to various measures to encourage handicraft production. Two important activities of this sort have been hand spinning and hand milling of rice, both of which absorb relatively large quantities of labour. Studies indicate that in both of these cases the capital cost per unit of output is higher with the handicraft methods than with modern machine techniques.

But the more common and important examples of falling capital costs are found in the highly capital intensive industries, and here the declines appear to have been very rapid in recent years. For example, the capital cost per ton of steel ingot capacity has been reduced by about half over the past 15 years, and the latest Japanese deep water plants are said to cut the latter figure by a further 50 per cent. In the process material costs have been reduced (in particular there have been substantial economies in the use of coking coal), and the quality of the finished product has been improved. The reduction in labour requirements has been almost incidental to these other changes.

For example, the decline in the average capital/output ratio might result in part from a shift in the composition of the gross product. A rise in the relative importance of a sector with a low capital/output ratio (services) could reduce the average even though there were no change in the ratio within each sector.
The cost of chemical plant capacity, particularly in the petrochemical areas, has been rather generally reduced by a substantial amount. The capital cost of a nitrogen fertilizer plant, for example, declined by half during the 1960's. A wide range of rather exotically named petrochemicals have declined from 25-50 per cent in price during the decade (despite rising general price levels) and this has occurred largely because of falling capital costs.¹

As noted, specific information of this sort is still rather limited, but indirect data and qualitative type judgements indicate that the above examples are probably typical of what has occurred in a wide range of activities.

It is then possible to speculate in reasonable terms how technological advance is affecting the availability of labour versus capital intensive techniques in the modern type production of goods and services. Here again it is useful to distinguish between the two types of technological advance: that which results in a new or radically improved product, and that which reduces the cost of production while the product itself remains basically the same.

One might conjecture that the first type of technological change is conceptually neutral with respect to capital or labour intensive methods of production, for the objective is to devise a better end product, and is not primarily concerned with production methods. And there is, in practice, a rather wide range of capital intensity to be found in the production of different sorts of today's newer products. The electronics industry, for example, is not particularly capital intensive, and some items have been produced by such labour intensive methods that facilities have been established in developing countries specifically to take advantage of the lower labour costs, with the output largely exported. At the other extreme, the continuous flow production methods typical of the many new chemical products are highly capital intensive and have only very limited and specialized labour requirements.

¹ See the survey of petrochemicals in The Economist of October 3, 1970.
But the development of new products is in fact likely to involve a bias towards the use of capital or labour intensive techniques, depending upon factor proportions and relative prices in the economy where the technology is developed. If the technology is developed in an economy where capital is scarce and there is abundant and cheap labour, then labour intensive production methods may be utilized, and even the nature of the new products developed is likely to be determined in part by this fact. This may well have been a factor, for example, in the relatively large proportion of industrial employment in the earlier stages of development of the Western European economies.

But the current situation is one where this sort of technology is developed very largely in the advanced industrial countries, where capital is relatively abundant and labour costs are high, and it is therefore likely to have a bias toward the use of labour saving techniques. From the point of view of the developing countries, the principal disadvantage of this concentration of technological research in the industrial countries is in relation to the broader aspects of technological change: the new products are designed for economies with high income levels, and are unlikely to be the sort of things which would be most useful to the developing economies themselves. But there is also a pressure toward the use of labour saving techniques in producing a new product. This would often occur simply because the engineers who develop the product are accustomed to working with capital intensive processes. But there are economic pressures as well. Since the product must generally be marketed its production cost must not be too high, and in a labour scarce economy this means avoiding the use of much labour. If the product cannot be machine produced it will generally be regarded as not viable, and will not be developed. Only in the case of products with a very high commercial value—such as some electronic items—can labour intensive methods be tolerated, and even in these cases the search is immediately begun for ways of mechanizing production.
So it is to be expected that the first type of technological change, the development of new products, will, in present day conditions, generally involve the use of capital intensive and labour saving methods. These techniques will be used from the beginning of production of the new product, and so there will not even exist any older, perhaps more labour intensive, alternative choice. This type of technological change is therefore not likely to provide much in the way of new activities capable of absorbing large amounts of labour. This was already pointed out in general terms in the preceding section where a listing of new products already available or anticipated in the near future showed these to be designed for high income societies and to be unlikely to involve the use of much unskilled or semi-skilled labour.

The second type of technological advance is that which reduces the cost of producing an established item, and here the possibilities are of somewhat greater interest from the present point of view. The essential point to emphasize is that the orientation of research and resulting technological change of this sort will depend on the product and the stage of development of production techniques.

The possibilities for economic use of labour intensive techniques are likely to be largely concentrated in traditional type products and activities. Goods and services which have been available for a reasonably long period of time (at least several decades) were probably originally produced with techniques which used substantial amounts of labour. For the really traditional activities — food, clothing, housing, personal services, etc. — there are certain to be known techniques which are highly labour intensive.

The pattern of technological advance in activities of this sort can reasonably be expected to be as follows. When the production techniques are at a highly labour intensive stage, advance will largely involve a straight substitution of capital for labour: machines are devised which will perform an operation cheaper than it can be done by hand. In this type of technological advance capital per unit of output will increase
(perhaps sharply) and there will be possibilities of economically using the older, more labour intensive, techniques if relative factor prices dictate (the different production techniques will be as shown in figures 1 and 2).

At some point in this process, however, the amount of capital involved in the production technique will become sufficiently large so that capital costs become a major factor, and the possibilities of technological changes which involve savings in capital costs will increase. The substitution of capital for labour will continue, but the increase in capital per unit of output will slow down and in some cases stop entirely. The possibilities of economically using the older, more labour intensive, techniques will therefore become fewer, and the advantages smaller, even with very different relative factor prices.

Finally, the stage will be reached where the production techniques have become quite capital intensive. In this stage the possibilities of reducing costs will lie more in devising techniques which economize on the use of capital. Technological advance will still substitute capital for labour, but the amount of capital per unit of output will begin to decline (the different production techniques will be as shown in figure 3). In this stage the most modern technique will always be more economic than the technique it replaces, regardless of relative factor prices.²

In impressionistic terms it is not difficult to observe this pattern of technological advance in a number of major industries. Wide areas of textiles, clothing, and food processing have probably been in the first two stages during most of this century. One would therefore expect to find different techniques with substantial variations in capital intensity, so that relative factor prices might make it economic to use an older, more

² It is worth noting that technological changes which reduce capital costs per unit of output often achieve these economies through an increase in the scale of production. In some cases the required scale is larger than the total market in many developing countries and the most efficient technique cannot be economically used to supply the internal market alone. This can of course introduce a limiting factor in the choice of techniques. The older, and more labour intensive, technique may have to be chosen even though it is not competitive in international terms. This problem has been widely discussed in other contexts.
labour intensive technique. The specific examples found in the literature are very largely drawn from these areas. At the same time it is important to recognize that the latest technology for most processes in these industries is now rather capital intensive, so that future advance is likely to involve only small increases, or more often declines, in the amount of capital per unit of output. The possibilities for economic use of an older, more labour intensive, technique will consequently decline, and the margin of advantage will decline even for those possibilities which remain. A broad area where the mechanization process has begun more recently and the gains from using older, more labour intensive, techniques may therefore still be larger, more common, and expected to continue further into the future, is in personal services and white collar type activities. Important parts of the construction industry probably also fit into this category.

A major aspect to emphasize from the above discussion is that in considering the possibility of economic use of a more labour intensive technique the present stage of technological advance, and the probable future direction and speed of change, must be taken into account. The use of more labour intensive techniques will only be economic in an activity where recent technological change has meant an increase in capital per unit of output; and the advantage will only last if future change is likely to continue to be of the same sort.

This can easily be shown in the simple diagram used before. Suppose there are two alternative techniques, B relatively capital intensive and A, an older technique, relatively labour intensive (figure 4).

Figure 4
Suppose relative factor prices are as shown by \( l \), so that technique A is economically preferable. The initial advantage only exists because technique B involves a substantial increase in capital (per unit of output) in order to reduce the use of labour; and the advantage will be retained only so long as subsequent change is of the same sort — or very slow. If subsequent change is in the direction of \( X \) (a continuing increase in capital to save labour) the advantage will be retained. If the next technique is \( C \), it will still be economic to use the older technique A with the relative factor prices shown by \( l \). But if technological change is beginning to save on the cost of capital per unit of output and is therefore moving toward \( y \), then the advantage will be lost. If the next technique is \( C' \), then the older technique A will no longer be economic, even with relatively low labour costs.

Here again the importance of viewing technological change in dynamic terms is apparent. Even though at the moment an older, more labour intensive, technique is economic, how long it will remain so, depends upon the speed and direction of technological advance in the industry. If technology is moving in the direction of reducing capital costs per unit of output, the older technique may soon become uncompetitive, and the advantage and the greater absorption of labour only transitory. No new undertaking could be economically begun on the basis of the older, labour intensive, technique; and even existing operations would at some point close down unless protected in one way or another from the competition of the more modern techniques.

If the use of labour intensive techniques is to contribute to employment on a lasting basis, this must be undertaken in activities where the further scope for the substitution of capital for labour appears to be large and/or where technological change is relatively slow. Otherwise the greater employment must be regarded as only a short-term palliative, and will not contribute to the longer term solution of the employment problem.

There are, then, good reasons to doubt the traditional approach with its implication that there are widespread opportunities to economically use labour intensive methods in economies where labour is abundant and
capital is scarce. But although the opportunities are probably limited, there is the further question whether those which do exist are being taken advantage of. There is first the possibility that capital intensive methods are used for irrational reasons; and second that though rational from the point of view of the individual, there are not rational from the point of view of the society as a whole.

A reading of the literature relating to the possibilities of using more labour intensive methods gives the strong impression that the first possibility - irrationality - is seldom important. There are many and important examples of the waste of capital; and a more efficient use of the capital available could, among other things, make a substantial contribution to increasing employment via an increase in the level of modern type activities. But a waste of capital in the form of setting up a capital intensive operation when a more labour intensive one would produce the same product at lower money costs appears to be rare. On the contrary, it is relatively easy to find examples where the reverse is true: money costs could be reduced by economizing further on the use of labour.

The examples that can be found indicating situations where it would be advantageous to use relatively labour intensive methods almost always interpret costs in social terms. Given the excess labour available and the scarcity of capital, it would be preferable to use a method economizing on capital and using more labour; but the prevailing money costs of capital and labour make it cheaper to use a more capital intensive method. The problem is that, at least in the more modern sectors, a variety of factors lead to money wage rates well above the social cost (alternative marginal value), while capital goods are available on artificially favourable terms.

There has been much discussion of this aspect of the problem, and there is general agreement that it is of considerable importance. If the problem of unemployment and under-employment is serious, this in itself indicates that the alternative possible uses of labour have a low value. But institutional factors generally tend to fix wage rates in the more
modern sectors at substantially higher levels, and this is especially true in the larger enterprises. Further, wage rates have risen rather steadily in real terms, and there is a general expectation that this will continue; and this makes it rational to use capital intensive methods in cases where present relative prices would indicate a more labour intensive technique.

In addition, total labour costs are generally much higher than the wage rate itself, mostly due to government policy. The major factor is the high rate of social security taxes imposed in most countries. Other factors are social requirements sometimes imposed on the larger enterprises (such as housing or education facilities), and labour legislation covering special bonuses, conditions of dismissal, etc. Factors of this sort are not only directly to wage costs, but also increase administrative costs and reduce the flexibility of the enterprise.

Investment, by contrast, is often subsidized in one way or another, so that the cost to the individual is less than the social value of the capital involved. The most general influence of this sort is the maintenance of interest rates at artificially low levels; it has not been uncommon for these to be negative in real terms during periods of rapid inflation. Another widespread practice has been to keep tariff rates on equipment imports at differentially low levels, and on occasion to apply especially favourable exchange rates to such imports. Finally, tax benefits have sometimes been granted in the form of special depreciation allowances or otherwise linked to the amount of physical capital.

Apart from deliberate policy measures, institutional factors sometimes operate in the same way. The possession of physical assets serves as a guarantee and makes it easier to obtain credit. Investment is often a factor in negotiations, particularly for foreign enterprises: when restrictions are imposed on foreign exchange, permits for profit transfers may be linked to the amount of investment; conditions under which the enterprise operates may be made dependent on the volume of investment; etc.
This situation, where money costs to the individual do not reflect the relative social value of the factors involved, is not entirely unjustifiable. Capital costs have been subsidized in an effort to encourage investment, which has been seen as the principal means of achieving higher growth rates. Higher labour costs have been promoted to protect and benefit workers. Nevertheless, the result has been a set of relative prices which encourage the use of capital intensive techniques. If more labour intensive methods are to be voluntarily adopted, relative factor prices and some institutional arrangements will probably have to be altered considerably; alternatively, the choice of techniques would have to be made on a basis other than that of money costs.

(The discussion of relative factor prices could be extended, as there is no doubt that this is of considerable importance in the region. It is very brief here primarily because there appears to be general recognition of its importance and more lengthy discussions are readily available elsewhere. An item for future investigation could be an attempt to quantify the impact of policy measures on labour and capital costs in a selection of countries.)
C. The orientation of technology and its role in growth and employment

Throughout the preceding discussion there has been an underlying assumption which now needs to be stated in order to examine some of the implications involved: It has been assumed that technological change originates almost entirely outside the region. This has of course been the case in the past, and it would be unrealistic to expect any major part of future technological research to be undertaken outside the advanced industrial countries. Such research is increasingly expensive and can only be financed on a large scale with the high income levels which already prevail in those countries.

But it needs to be clearly recognized that the orientation and speed of technological advance will consequently be determined by conditions elsewhere. These conditions - high and rising income levels, adequate supplies of capital, and a fully employed and only slowly increasing labour force - are very different from conditions prevailing in most of Latin America, so that the resulting technological change is unlikely to be very suitable to the needs of the region. The ways of living and techniques of production developed are likely to be very tempting, but if adopted do lead to major economic, social and political tensions.

With reference to the specific problem of employment, the large and rising volume of unemployment and underemployment in many countries is adequate evidence of the unsuitability of this technology for resolving the problems of the region. Further, it seems highly probable that with existing relative prices a "rational" application of available advanced techniques throughout the economy would, in most countries, result in a sharp increase in unemployment. This has been prevented by shortage of investment funds and foreign exchange, the conservatism of some sectors of the economy, etc.; but policies designed to stimulate growth have often encouraged the indiscriminate adoption of these modern techniques. If the present situation is difficult, the future is likely to be more so: technological advance, both in the development of new products and of new production techniques, is likely to aggravate the contradictions.
The question that arises then is: to what extent can technology be controlled and oriented so as to better serve the needs of the region? In trying to answer this it is useful to begin by listing, in very broad terms, the different possible sources of technology.

(1) There is a great deal of technology which is widely known and is freely available; and although its application may sometimes require technical help this too is relatively easy to obtain.

(2) Technology can be imported from abroad. This includes much of the most modern technology, and is often controlled by patent rights or involves such complex techniques that it tends to be implanted in the form of direct investment by an experienced firm from one of the advanced industrial countries.

(3) The region might develop its own technology.

To date technology has come from the first two sources, but although it is not realistic to expect the region to become a major source of new technology, a much greater internal effort will have to be made, and it will be argued that a future combination of the first and third sources offers the best prospects for a more integrated type of development.

This sort of problem can best be approached by referring back to the discussion of technology in aggregate terms at the beginning of this paper. There, long range prospects were discussed and alternative possible patterns of growth noted, and these now need to be examined somewhat more in the present context.

Past policy has often aimed at the establishment and expansion of a modern sector similar to the economies of the advanced industrial countries. In a number of countries this modern sector is now of substantial size, and one possibility would be to pursue a policy of advance in this sector in line with what is likely to occur in, say, Western Europe; and to continue the effort to expand the size of the sector as fast as possible. The general implications in terms of integration of the population and income distribution were already noted (p.4).
In the present context, it can be seen that such a policy would have to rely very largely on importing technology from abroad. There is no possibility of developing within the region research facilities comparable to those of Europe or North America. One variant of this would be a relatively passive but permissive policy. Modern activities would be encouraged by various tariff and exchange policies, by fiscal and monetary measures, and foreign investment would be permitted and on occasion encouraged. This would be, in very approximate terms, a continuation of much recent policy in the region.

The obstacles to continuing growth along these lines have become increasingly apparent, but only two general problems need to be noted here. First, foreign control of the economy would almost certainly increase substantially since the importation of increasingly advanced technology would rely heavily on the processes and experience of foreign firms. This has already become a major issue in some countries, and its importance could be expected to increase. Second, since the focus of growth would be on a basically external rather than internal process, it is doubtful that most countries would experience a sufficiently steady and rapid rate of growth over the next thirty years as a whole.

A second, and perhaps more promising, variant of this type of growth could be based on a major effort to increase the number of scientific, engineering and technical personnel in the region. Technology would still be developed abroad and imported, but the aim would be a scientific and technical establishment capable of modifying the technology where necessary to make it more suitable to national conditions, and able to apply it in national enterprises. The Japanese experience might be regarded as the successful prototype of this sort of approach.

The two problems noted for the earlier variant - alienation of the economy and insufficiently rapid growth - could be overcome if an effort of this sort was successful. There would of course remain a number of serious problems, and it is clear that this would be a relatively long term solution: training the required professional staff would require time.
But there is one intractable problem of this approach which is of particular importance in the present context. The technology and general pattern of growth would still be determined in the advanced industrial countries, and based on conditions of adequate supplies of capital and a fully employed and slowly growing labour force. When applied to a region characterized by limited supplies of capital, major existing problems of unemployment and underemployment, and a labour force which is increasing very rapidly, it must be doubted that this type of growth could achieve a reasonably integrated economy in the foreseeable future.

There would no doubt be an occasional exception, a country which began with a relatively favorable situation, and was unusually successful. But for most countries of the region this approach, even if successful, would mean a continuation of an unintegrated economy: a modern sector with high levels of income and productivity, but with large elements of the population participating only marginally in the growth process. A minimum requirement if this sort of growth is ever to succeed in incorporating all of the population would appear to be a sharp reduction in the rate of population growth in most of the region. An even the immediate beginning of a substantial decline in the birth rate would only make itself felt in an easing of the pressure for employment toward the end of the century; so that at best this type of growth could be expected to involve a prolonged period of economic, social and political pressures in most countries, even if the growth process was successful on its own terms.

A very different possible pattern of growth can be envisioned if the emphasis on the advance of the modern sector and "keeping up" with the industrialized countries is dropped, and the central objective becomes the integration of the economy. This is the second alternative listed on page 4.

In terms of sources of technology, the importing of the latest techniques would be much less important, so that the problem of alienation of the economy would be less severe and/or the same type effort to acquire a scientific and technical staff familiar with handling the most advanced technology would not be required. A major effort to increase the technological
capacity of the region would still be essential, but it would be of a somewhat different sort. The major source of technology would be the first of those listed above: that which is already rather widely known and freely available. Increased regional technological capacity would be required to orient and develop these techniques, and also to select from the advancing technology in the industrialized countries that, probably small, part which proves suitable to the needs and capacity of the region.

The general growth strategy would be to select a level of technology (and income) at which it is reasonable to expect that the economy could be fully integrated within the foreseeable future, and then plan the best growth pattern, in the short and medium term, for moving toward that long term goal. For the "typical" country considered before this long term goal could be the technological (or income) level which now characterizes the relatively modern sectors of the economy; as noted, a rapid growth rate could achieve a fully integrated economy at this level by about the end of the century.

The larger Latin American countries are in a favorable position for adopting a growth strategy of this sort. There are relatively large modern sectors already in existence, so that the technology involved is widely known within the region and there is a basic technical staff on which to build. What would be involved be a gradual extention of this presently limited modern sector until it encompassed the entire economy - while the level of technology within the modern sector itself remains relatively unchanged. The capacity for producing reasonably modern equipment for a wide range of traditional type activities also exists, so that dependence on the importation of technology, even in the form of equipment, would be much less than for other possible patterns of growth.

One major advantage of this pattern of growth is that the long term goal does not need to be built up entirely from hypotheses. For the "typical" country the technological level at the end of the century could be close to the present Western European level, so that Western European consumption patterns, sectoral distributions, etc., could be reasonably taken as a first approximation of these aspects of the projected goal. These would be changed
of course where the desired goal is to be different, but the existence of a real economy at approximately the aggregate level to be aimed at would be extremely useful as a starting point and would provide a check with reality for numerous details as planning progressed.

The technological effort would involve creating the capacity to change existing production processes where these were not well suited to the needs of the region, and to directing change in a way appropriate to the region’s goals and resources. The latter would partly involve a selective introduction of new goods and techniques from the industrialized countries, and partly autonomous research designed to produce technological advance in areas and of a sort especially called for by evolving conditions.

It is possible to illustrate in a very general way some of the things which this technological approach might involve. As noted, the beginning would be the relatively modern sector as it now exists, but with some changes where these would clearly result in a product or production process more suited to the income level or the factor endowment. The best way to locate desirable type changes is to begin with final products and work back, both to intermediate products and to production processes.

Here, as with some other problems, the case of automobile production in the region provides a striking example. The autos produced, or assembled, are models which have been designed for use and sale in the advanced industrial countries. For many years these models have evolved in the general direction of increasing “luxury” (more power, convenience, and better styling) and are consequently not very appropriate for the income level in the “typical” Latin American country. Further, some of these features carry other implications for the economy. High powered engines require highly refined gasoline and sophisticated equipment for adjustment and repair; low suspensions require good road networks; many styling features require production techniques which are relatively new and complex. Familiarity with the engineering of current models could easily provide a long list of factors of this sort.

The technological effort here would involve designing an automobile more appropriate to the needs of the region. This would not be such a difficult task as might at first be thought, for cars have been produced on
a large scale in the industrialized countries for several decades, and the basic technology is widely known. What might be done, for example, would be to select for a basis a model produced in, say, the 1930's, and then modify this, in the light of more recent technology, to make it as appropriate as possible to the needs of the region. Even without modification such an earlier model would be more appropriate, for it was produced when income levels were lower in the industrial countries and techniques were simpler. The cost of such a car would be much lower, the basic transportation provided would be very much the same, and a greater proportion of the finished product could be produced within the region without undue difficulty. This would be a more genuine type of import substitution. Further, this could have favorable effects on employment. The techniques used in producing the car itself would probably be more labour intensive, but perhaps of more importance, the secondary effects could be greater. More simple techniques, especially with respect to the mechanical parts, would facilitate maintenance and repair by skilled labour alone rather than the use of electronic and other equipment.

It should not be thought that a technological approach of this sort is impractical. The Ford Motor Co. recently formed a company which aims at producing a low cost car for Asia. The car would be a modern version of the historic Model-T and would sell for about US$ 750. It would be simple and suitable for Asian condition, capable of being built and maintained by low-cost labour, and would aim at 100 per cent local content to avoid foreign exchange problems.

This then would be one aspect of the technological effort: to examine the range of modern products and techniques now in use with the aim of making changes (or substituting modified earlier models) so that these would better correspond to the requirements of the region. It is probable that this could be of great importance.

A second aspect of the technological effort would be to monitor research and the introduction of new products and techniques in the industrialized countries in order to select those elements which would be advantageous to
introduce into the region. This would be a difficult task, and conflicts between different objectives would no doubt be frequent. These conflicts could be minimized, or at least the type of choice involved kept clear, by specifying possibilities in terms of final products whenever possible. For example, a new, low cost, material can best be evaluated by specifying the end products in which it would be used. If these presuppose high income levels the material would probably not be adopted. But in cases where the final product was widely used at low or moderate income levels conflicts would still occur. A new material might, on the one hand, provide shoes at a lower cost, while on the other hand the process might displace labour and so worsen the employment problem. This sort of conflict involves a political choice and it need only be stressed that "costs" in such instances should not be calculated simply at prevailing money prices.

The final aspect of the technological effort would be autonomous research to guide advance in directions advantageous to the region. There would be two obvious general goals: to achieve greater efficiency by capital saving rather than labour saving improvements, and to achieve a production process better adjusted to the region's natural resource endowment. Much of this type of research would be closely linked to the first aspect discussed above.

There is one implication of this general approach to growth which it is well to be explicit about. If the effort to "keep up" with the advanced industrial countries is to be dropped, it will probably be necessary to devise a way of stopping the autonomous introduction of new goods and techniques into the area; that is, of severing some of the existing links with the rich countries. As noted before, these new goods will often be very attractive, but if they are not appropriate to the income level of the region they will simply have to be kept out in one way or another. This is implicit in the choice of this pattern of growth; if new goods are to be freely introduced, then in effect the growth pattern chosen is that of trying to "keep up" with the advanced industrial countries. Similarly, new production processes will have to be kept out if they are judged unsuitable. In terms of prevailing money prices these may well be cheaper, and it would probably not be possible to rely on the price mechanism alone to achieve the desired choice of techniques.
Earlier, with the simple numerical examples of possible patterns of growth in terms of income distribution, it was stated that the two extremes — "keeping up" with the advanced industrial countries, or integration of the economy at a relatively fixed level — could be combined on the basis of varying assumptions (pp. 4-5). When the discussion becomes more specific in terms of types of technology, however, it is clear that these two approaches are mutually exclusive in many respects. While it remains true that some elements of both approaches might be included, it is probable that any real programme would have to concentrate heavily on one, with such elements of the other as were present being of only marginal importance.

If the goal is integration of the economy at approximately the income level which now characterizes the limited modern sector, this is also approximately the present income level of the industrialized countries of Europe. Consequently, the structure of the labour force in these countries can be taken as an indication of the necessary direction of change; it can be assumed that full employment, when achieved, will mean a similar economic structure. The implications of this are interesting in view of some recent discussion of the possibilities for increased employment in the different sectors. The following figures show the general structure of the labour force in several European countries as compared with that in Latin America as a whole:

**PERCENTAGE DISTRIBUTION OF THE LABOUR FORCE**

<table>
<thead>
<tr>
<th>Country</th>
<th>Agriculture</th>
<th>Mining</th>
<th>Manufacturing</th>
<th>Construction</th>
<th>Basic services</th>
<th>Comm-b/ Other services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium (1968)</td>
<td>5.3</td>
<td>1.8</td>
<td>32.0</td>
<td>8.1</td>
<td>7.6</td>
<td>16.3</td>
</tr>
<tr>
<td>France (1962)</td>
<td>20.0</td>
<td>1.6</td>
<td>27.0</td>
<td>8.2</td>
<td>6.3</td>
<td>13.2</td>
</tr>
<tr>
<td>W. Germany (1968)</td>
<td>10.0</td>
<td>2.0</td>
<td>37.5</td>
<td>7.8</td>
<td>6.3</td>
<td>14.6</td>
</tr>
<tr>
<td>Italy (1968)</td>
<td>22.0</td>
<td>0.8</td>
<td>29.0</td>
<td>10.2</td>
<td>5.8</td>
<td>14.9</td>
</tr>
<tr>
<td>Netherlands (1960)</td>
<td>10.7</td>
<td>1.5</td>
<td>30.0</td>
<td>9.7</td>
<td>8.0</td>
<td>16.2</td>
</tr>
<tr>
<td>United Kingdom (1966)</td>
<td>3.1</td>
<td>2.3</td>
<td>35.0</td>
<td>7.8</td>
<td>8.3</td>
<td>16.0</td>
</tr>
<tr>
<td>Latin America (1965)</td>
<td>45.0</td>
<td>1.0</td>
<td>14.0</td>
<td>4.0</td>
<td>5.3</td>
<td>9.5</td>
</tr>
</tbody>
</table>

a/ Public utilities, transport and communications.

b/ Includes financial services.

**Note:** The percentage figures do not sum to 100 because the "non-specified" figure is not shown.
The most striking contrast of course is in the relative size of the agricultural sector. In the more industrialized countries agriculture accounts for around 10 per cent of the labour force (of the countries shown, the figure for France had declined to 15 per cent by 1968 and that of the Netherlands to 8 per cent). These countries as a whole are not large net importers of agricultural products, so that self-sufficiency, or even moderate net exports would not raise the importance of the agricultural labour force substantially. In countries like France, West Germany, or Italy, productivity and income levels in the agricultural sector are still half or less those in the rest of the economy. Only in countries such as Belgium, The Netherlands, and the United Kingdom is the income level in agriculture similar to that in the rest of the economy - and in those countries the agricultural labour force is closer to 5 than to 10 per cent of the total. Low income levels and an excessively large agricultural labour force (combined with over-production) are in fact still considered a major problem in most of these countries. To resolve such problems the Mansholt plan, for example, aims at reducing the agricultural labour force in the E.E.C. countries by 45 per cent, and taking about 7 per cent of total land out of production.

The implication for a Latin American growth pattern which aims at an integrated economy is obvious; the relative size of the agricultural labour force will have to be drastically reduced. What this would mean in terms of absolute numbers depends on the assumptions made. If the total labour force is assumed to grow at 3 per cent per annum, and the goal is to reduce the agricultural labour force to 20 per cent of the total by the end of the century (approximately the present Italian level) this would mean that the absolute number of workers in agriculture would remain about the same; that is, the agricultural sector would have little or no capacity to absorb additional labour. If the goal is to reduce the agricultural labour force to 15 per cent by the end of the century (the present French level), the number of workers would have to decline by about 20 per cent from the present level.
This situation is important to make clear as it is sometimes claimed that the agricultural sector can usefully absorb large additional quantities of labour in the course of development. Latin America undoubtedly has a better agricultural resource endowment than most of Western Europe, so that an integrated economy at approximately present Western European levels would logically imply a smaller proportion of the labour force in agriculture than that now found in those countries (and most of the Western European countries are still not fully integrated in this sense). The only way in which the agricultural labour force could grow within this context would be if there were a really large scale expansion of agricultural exports from the region, and this is not generally anticipated.

This does not mean that there would never be situations where an increase in agricultural employment would be justifiable. In the early stages it might be advisable to retain as much of the increase in the labour force as possible in agriculture (or at least the rural areas). Shortages of investment funds, or other limitations, might make it impossible, for a time, to absorb all of the increase in other sectors, and political and social tensions might be minimized by retaining the excess in the traditional setting of the agricultural (rural) sector. But such a policy should be recognized for what it is: a stopgap measure and not a solution. When the programme begins to generate more investment funds, etc., it would be

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In some respects it is useful to compare Latin America with the United States. In the latter country a favourable resource endowment and a relatively integrated agricultural sector result in a situation where less than 5 per cent of the labour force produces a significant net agricultural export surplus.
reversed and the absolute size of the agricultural labour force reduced. Over the longer term, if growth proceeds at a rapid rate, any continuing increase in the absolute size of the agricultural labour force can only mean that integration is not being achieved, that incomes in agriculture are remaining far below those in the rest of the economy.

The counterpart of the concentration of the labour force in agriculture in Latin America is of course that the proportion in all other sectors is less than in Western Europe, so that growth aiming at an integrated economy would mean increasing the relative size of all these sectors - including, it may be noted, commerce and other services. But the two sectors where the contrast is most striking and which should be expected to be key areas, are manufacturing and construction.

The manufacturing sectors in Western Europe absorb around 30 per cent of the labour force - more than double the Latin American figure - so that a particularly sharp increase in manufacturing employment is to be expected if approximating the Western European structure is to be the goal. If the

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2/ In determining the evolution through time of the employment structure, agricultural employment, in this context, could well be regarded as a residual, after estimating the absorptive capacity of the other sectors. In Latin America agriculture now accounts for 45 per cent of the labour force, and if this proportion is to decline to 20 per cent toward the end of the century, employment in the non-agricultural sector as a whole would have to increase by about 3 1/3 times, or at an average rate of somewhat more than 4 per cent per annum. One assumption could be that the rate of increase of non-agricultural employment would be steady (at rather more than 4 per cent) during the next 30 years. This would mean that at the beginning non-agricultural employment would absorb about three-quarters of the total increase in the labour force, and as a residual, agricultural employment would have to expand at a rate of 1 2/3 per cent per annum to absorb the remainder. The rate of increase in agricultural employment would decline steadily (as the other sectors absorbed an even larger part of the growth of the labour force), but the absolute size of the agricultural labour force would continue to increase for about 20 years, after which it would begin to decline. In this sort of scheme the agricultural sector would be used to hold such labour as could not be efficiently absorbed elsewhere. One implication would be that the major technological effort in the agricultural sector would be required toward the end rather than at the beginning of the long-term plan.
share of the manufacturing sector is to be raised to 30 per cent by the end of the century (and the total labour force increases at the rate of 3 per cent), this would require an average increase in manufacturing employment of about 6 per cent per annum. This is more than double the rate of increase during the post-World War II period as a whole, and during the 1960’s alone the rate of increase was only 2.3 per cent. This discouraging past performance has increasingly led to the view that the manufacturing sector cannot be expected to absorb large quantities of labour in the course of development.

There are nevertheless reasons for believing the expansion of employment in the sector can be more rapid and the Western European structure eventually reached. First, the rate of growth during the post-war period was only about 5 per cent, while the projection of attaining European levels toward the end of the century assumes a future growth rate of 7 per cent, and if achieved this would of course increase the employment in industry. But perhaps more important reasons for optimism follow from a growth pattern which aims at an integrated economy. The growth of productivity in the manufacturing sector would be slower because growth would consist more of expanding the sector while maintaining productivity within the sector at a relatively constant level. During the post-war period productivity in manufacturing has risen at a rate of about 3 1/2 per cent per annum, so that a shift of this sort could have a major impact. Another factor that can be expected to change its effect with time is the displacement of artisan type employment (this could be included in the productivity concept, but its importance makes it worth specific mention). When factory type manufacturing begins it will displace substantial quantities of artisan type production, so that the net employment increase is likely to be small. But once factory type production becomes dominant, this transition will have been largely completed, and the net employment effect of an increase in production will be greater, as it will no longer be offset by any important decline in artisan type employment. During the post-war period the displacement of artisan type production was important in nearly all countries and net increases in manufacturing
employment were no doubt smaller for this reason. This is still a major factor in some countries, but it has already been largely overcome in a few, and if a successful growth pattern is achieved this sort of negative impact on manufacturing employment can be expected to gradually decline.

It is worth pointing out that the relative importance of the expansion of employment in the manufacturing sector is likely to change with time if the growth strategy is successful. If a steady 6 per cent per annum increase in industrial employment were achieved throughout the remaining years of the century, for example, this would absorb an even larger proportion of the total increase in the labour force. At first, with manufacturing employment 14 per cent of the total, new employment in the sector would account for about one-quarter of the increase in the labour force; but the relative size of the sector would increase, and by the end of the century new manufacturing employment alone would absorb about 60 per cent of the increase in the labour force. This same kind of shift will occur in other sectors which change their relative size, and growth rates through time of the different sectors must be coordinated to obtain a coherent total employment strategy. One major aspect of this was already pointed out in connection with the changing role of agricultural employment. Here it is only necessary to emphasize the obvious fact that in the early stages of growth, when the manufacturing sector is small, it will not absorb a major proportion of the increase in the labour force (much less excess labour from other sectors); but the absorptive capacity will steadily increase with the increase in the size of the sector itself.

Construction activity is of special interest because of the important role it might play in creating employment during the early years of the growth programme. In Western Europe employment in construction accounts for about the proportion of the labour force that is engaged in the sector in Latin America; along with manufacturing, this is the area where employment can be expected to increase most rapidly in relative terms. But as the absolute size of the sector is rather small (4 per cent of the labour force), over the long-term the absolute increase will of course be much less than that in manufacturing. It could, however, be of strategic importance toward the beginning of the programme.
From points of view other than employment an early and sharp increase in construction activity is likely to be important, so that a rapid increase in employment in the sector would fully coincide with other objectives. This may be more difficult to achieve than is sometimes implied, as a major proportion of construction work involves skills which require some time to learn; but a rapid increase would probably be feasible. A goal, for example, might be a 15 per cent per annum increase in construction employment, which if confirmed for an eight year period would raise total employment in the sector to nearly 10 per cent of the labour force. An increase of this sort, if achieved, would mean that construction work would absorb 20-40 per cent of the increase in the labour force during these early years, a major contribution to the solution of the problem. In later years, of course, construction would probably be maintained at approximately this level (around 10 per cent of the labour force), so that the employment creating role of the sector would be much smaller.

All of the above discussion has been in terms of regional aggregates, or the position of the "typical" country. Conditions of course vary markedly from one country to another, and any realistic development programme would have to be based on the specific conditions in the country concerned.

At one extreme would be Argentina, which already possesses a relatively well integrated economy. The principal exception is a regional problem, with income levels in the North lower than in the rest of the country. But even with this exception the degree of integration is high and is reflected, for example, in the sectoral structure of the labour force: agriculture accounts for only a little more than 15 per cent of the total, despite substantial production for export, and employment in manufacturing has for some time been close to one-quarter of the labour force. Here the problem is not so much to aim at integration, as to achieve a growth pattern which does not undermine the integration which already exists. This still does, however, involve the problems of technology discussed here. As the average level of productivity (and income) is still well below that of the advance industrial countries, there is much scope for the use of advanced technology involving labour saving techniques. The orientation in
this sort of context would aim at coordinating the introduction of
these techniques with the expansion of employment (probably in other
activities) so as to avoid the emergence of an unemployment problem.
Experience during the 1960's was not entirely satisfactory, and there
has been much discussion in Argentina, both of this problem and of the
problem of alienation of the economy.

At the other extreme, there are several small countries where the
modern sector is still quite restricted in size, and the goal of
integration at moderately high income levels is even further off than the
end of the century target used above. Here the conflict between modern
technology and an integrated economy is even sharper than indicated, and
the choices involved more painful. Further, some of the conclusions reached
would not hold: for example, it would probably be advisable in these
countries to aim at an increase in the agricultural labour force over a
relatively long period of time. External links would of course also be of
greater importance in these countries, even when aiming at an integrated
economy. The general orientation of development would therefore be rather
different from what has been outlined here.

But despite these great differences between extremes, many countries
of the region, including several of the major economies, are fairly close to
the "typical" country discussed. These countries largely determine the
regional aggregates and averages used, and it is this fact which justifies
a discussion of this sort. Even for these countries important specific
factors have to be incorporated to outline a development programme at full
employment; but the general concepts analyzed above are sufficiently close
to reality to provide a framework for the orientation of any such programme.