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ECONOMIC GROWTH AND THE CONTRIBUTION OF AGRICULTURE: NOTES ON MEASUREMENT

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I

WE deal here with the economic growth of nations since the late eighteenth or early nineteenth century. This limitation allows us to specify most clearly the distinctive aspects of modern economic growth that should be measured.

The aspect most easily perceived and most commonly measured is the aggregative. In fact, the usual definition of economic growth—a sustained increase in a nation's total and *per caput* product, most often accompanied by a sustained and significant rise in population—stresses this aspect. 'Sustained' means persisting over a long period and not in the nature of a cyclical or otherwise short-term expansion. 'Increase' means more than a formal mathematical requirement, in that it could not be satisfied by a rate of one-millionth of 1 per cent. per century. In the eighteen to twenty-four nations that may be said to have experienced modern economic growth, product *per caput* grew at rates ranging from well above 10 to close to 30 per cent. per decade, and total product at rates ranging from 15 to over 40 per cent. per decade; and, with some striking exceptions, population grew at rates ranging from 8 to 20 per cent. per decade.¹ A rate of 10 per cent. per decade means doubling in somewhat over 70 years; of 20 per cent. in less than 40 years; of 30 per cent. in less than 30 years; of 40 per cent. in about 20 years. With modern economic growth extending over a century in many of the developed nations, the rise sustained in total and *per caput* product was of a magnitude rarely if ever reached in the past.

The second interesting aspect is the structural. The significant characteristics of the rises associated with modern growth are the large and rapid shifts that occur in the structure of an economy—in the relative importance of various industries, regions, classes of economic units distinguished by form of organization, economic

¹ See my *Six Lectures on Economic Growth* (The Free Press of Glencoe, Ill., 1959), pp. 19-28.

classes, commodity groups in final output, and so on. The frequent references to modern economic growth as 'industrialization' and to its important constituent elements in terms such as 'urbanization' and 'mechanization', clearly indicate these structural aspects; while even slight acquaintance with the literature on economic growth reveals that the main burden of the analysis is not on the aggregative but on the structural characteristics. The measures usually provided are the familiar distributions of product, capital, and labour among industrial sectors; among regions; between the private and the public sectors, and by further divisions within each; and among various socio-economic groups.

The third aspect is the international. We distinguish this aspect in order to stress the facts that, except for the single pioneer nation, all nations participating in modern economic growth view the prospects initially as the task of adopting (and adapting) potentials already demonstrated elsewhere in the world; that no nation can grow in an international vacuum; and that the process of a nation's growth involves a pattern of sequential interrelations with others—more developed and less developed. In a sense, then, the modern economic growth of any one nation is a process of shifting from the underdeveloped to the developed group, utilizing the appropriate channels of international trade, finance and communications in general. Although this whole process of borrowing the knowledge and resources that are indispensable in a nation's modern economic growth cannot be measured, a wide variety of statistical data on foreign trade, foreign capital movements, and international migrations have been assembled. Hence the view of the changing *domestic* structure of a nation's economy in its process of growth can be supplemented by a view of the sequential pattern of the economic flows between it and the rest of the world.¹

The three aspects are clearly interrelated. The rise in *per caput* product, essential to the aggregative view of economic growth, in and of itself means a shift in consumption and savings patterns and thus contributes to the shift in the industrial and other structures of the economy. On the other hand, it is the utilization of the technological potential of modern times through the development of new industries

¹ The importance of this aspect is not denied by the experience of the Communist countries. Initially they also borrowed extensively and imported considerably from abroad—which is natural, since they were follower nations. That these ties with other nations have not continued to grow as they did with the more freely organized societies is but another case of changes in the pattern of economic growth as we move from the pioneer nation to the first and then the more removed (in time and in character of historical antecedents) follower nations.

and new methods of production—which means structural shifts—that permits a rise in product *per caput*. And the aggregative growth and certain structural shifts provide the surpluses for international trade and capital movements; while the latter, bringing the benefits of international division of labour, are in turn conducive to the greater aggregative growth of the participating nations and thus to greater structural shifts within them. This close association is hardly surprising, since a nation's modern economic growth may be described as the utilization of domestic and international division of labour, under conditions of changing technology, to increase *per caput* product of a growing population.

Given this interrelation, it is often impossible to specify the contribution of a single industrial sector, say agriculture, to each aspect of economic growth. Nor is it particularly illuminating to do so. For if a sector contributes directly to the growth of product per worker, it indirectly contributes to structural shifts and greater international division of labour; if a sector contributes directly to foreign trade, it indirectly contributes to growth of product *per caput* and to structural shifts within the country. It would seem preferable to consider the contribution of agriculture to economic growth jointly in all three aspects of the process, and then examine the various ways in which such a contribution may be rendered. Some of these ways bear more directly on aggregative aspects of growth than on the structural; others bear more directly upon the structural or international than upon the aggregative. But each has some bearing on all three related aspects of economic growth.

II

In considering the contribution of agriculture, or for that matter of any sector, to the economic growth of a country, we must first recognize an element of ambiguity. Since any sector is part of an interdependent system represented by the country's economy, what a sector does is not fully attributable or credited to it but is contingent upon what happens in the other sectors (and perhaps also outside the country). Thus, even if we deal with net product originating in, or contributed by, a sector, deducting the purchases or contributions from others and limiting the total to the product of the factors attached to that sector, the magnitude and movement of the net product so measured still depend upon the rest of the economy; and its product may perhaps be more correctly described as the result of the activities of the economy whose particular *locus* is the given

sector—rather than as a contribution of the given sector fully creditable to it as if it were outside the economy and offering something to the latter. But so long as we keep the semantic caution in mind, and remember that the capacity of a sector to ‘contribute’ depends not upon the sector alone, no harm is done by retaining this familiar expression.

The first type of contribution of agriculture to the economic growth of a nation is that constituted by growth of product within the sector itself. An increase in the net output of agriculture, in and of itself, represents a rise in the product of the country—since the latter is the sum of the increases in the net products of the several sectors. This type, which we may call the product contribution, can be briefly examined—as a contribution first to the growth of *total* net or gross product, and second to the growth of product *per caput*.

We begin with a simple algebraic notation and refer to ‘product’, since the formal conclusions are the same for product gross of capital consumption (gross national product, and corresponding gross product originating in the sector) or net of it (net national product, and corresponding net product originating in the sector).

Designate:

P_a = product of agriculture (*A* sector).

P_b = product of all other sectors (non-*A* sector).

P = total product = $P_a + P_b$

δP = increment in total product—aggregate growth.

r_a = rate of growth of P_a so that $P_a^1 = P_a^0(1+r_a)$, the superscripts referring to time.

r_b = rate of growth of P_b so that $P_b^1 = P_b^0(1+r_b)$.

Then,
$$\delta P = P_a r_a + P_b r_b. \quad (1)$$

And the equation for the share of the growth of agricultural product in the growth of total product is

$$\frac{P_a r_a}{\delta P} = \frac{1}{1 + \left(\frac{P_b}{P_a} \times \frac{r_b}{r_a} \right)}. \quad (2)$$

Thus, if at the initial point of time, the share of agriculture in countrywide product is 60 per cent.—which is about the highest for an under-developed country¹—and if over the next decade the rate of growth of the non-*A* sector (r_b) is four times as high as that of the *A* sector (r_a), the product contribution of agriculture to the growth of

¹ See my paper on ‘Industrial distribution on national product and labor force’, *Economic Development and Cultural Change*, vol. v, no. 4, supplement, July 1957, table 3, p. 10.

total product will be 1 divided by $(1 + 0.67 \times 4)$, or about a quarter. At the end of that decade the initial share of agriculture in total product will be less than 60 per cent., and if r_b/r_a remains four, the following decade will witness a product contribution of agriculture to growth of total product smaller than a quarter.¹

Several conclusions can be derived from equation (2). Firstly, so long as the rate of growth of the non-*A* sector is higher than that of agriculture, all other conditions being equal, the proportional contribution of agriculture to the growth of total product will decline. The only component in equation (2) that might prevent such a decline is the ratio r_b/r_a : a decline in it might counteract the effect of the rise in P_b/P_a . Secondly, if r_b/r_a rises, i.e. if the rate of growth of the non-agricultural sector is increasingly higher than that of agriculture, the decline in the share of agriculture in the growth of total product would be even greater. Thirdly, if we assume that the rate of growth of countrywide product is *constant* over time (only a few countries showed acceleration in the long-term movement), and if r_b/r_a is over 1, i.e. if the rate of growth of the non-agricultural sector is higher than the rate of growth of agriculture, then either r_b or r_a , or both, must decline over time. For if they remain constant, the increasing weight of P_b (enjoying a higher rate of growth) will make for an *acceleration* in the rate of growth of total product.

Let us turn now from the product contribution of agriculture to the growth of countrywide product *per caput*, or rather per worker—a more meaningful unit for sectoral analysis.

¹ There is a direct relation between the ratio of rates of growth of product in the non-*A* and *A* sectors (r_b/r_a) and the movement of the ratio of the product of the *A* sector to the total. This can be expressed by the following equation:

$$\frac{(1+r_b)}{(1+r_a)} = \frac{P_a^0}{P_b^0} \left(\frac{P_a^1}{P_a^0} - 1 \right). \quad (3)$$

Thus, if at time point 0, the first ratio in the right-hand side of equation (3) is 1.5, meaning that the shares of the *A* sector and the non-*A* sector in total product are 60 and 40 per cent. respectively; and if over the next decade the share of the *A* sector drops to 55 per cent., the value on the right-hand side becomes 1.5 $(1/0.55 - 1)$ or 1.23. Then, if the rate of growth for agriculture is 10 per cent. per decade, $(1+r_a)$ becomes 1.10; and $(1+r_b)$ becomes 1.35; and the rate of growth for the non-*A* sector 35 per cent. per decade, or 3.5 times as high as that for the *A* sector. When the share of agriculture drops from 30 to 25 per cent., the right-hand side of equation (3) becomes

$$\frac{0.30(4-1)}{0.70} \text{ or } 1.29;$$

and if $(1+r_a)$ is still 1.10, $(1+r_b)$ becomes 1.42, yielding a rate of growth 4.2 times as high as that for agriculture. Likewise, if we lower the rate of growth in agriculture, and set $(1+r_a)$, at, say, 1.05, under the conditions illustrated above, $(1+r_b)$ becomes 1.29 and 1.35 respectively, yielding rates of growth for the non-*A* sector six or seven times as high as those for the *A* sector.

Designate (in addition to the notation above):

L_a = workers in the A sector.

L_b = workers in all other sectors.

L = all workers = $L_a + L_b$.

R = rate of growth of product per worker (same in both the A and non- A sectors).

Then we have the following expression for the change in total product per worker:

$$\frac{P^1}{L^1} - \frac{P^0}{L^0} = \left(\frac{P_a^1}{L_a} - \frac{P_a^0}{L_a^0} \right) \left(\frac{L_a^1}{L^1} \right) + \left(\frac{P_b^1}{L_b} - \frac{P_b^0}{L_b^0} \right) \left(\frac{L_b^1}{L^1} \right) + \left(\frac{P_b^0}{L_b^0} - \frac{P_a^0}{L_a^0} \right) \left(\frac{L_b^1}{L^1} - \frac{L_b^0}{L^0} \right). \quad (4)$$

Equation (4) tells us that the increment in a country's aggregate product per worker is the sum of: (a) the increment in product per worker in the A sector, weighted by the share of the A sector in labour force *at the end* of the period; (b) the increment in product per worker in the non- A sector, weighted by the share of the non- A sector in labour force *at the end* of the period; (c) the *change* in the share of the non- A sector in the labour force (usually a rise) during the period, weighted by the difference between product per worker in the non- A and A sectors at the beginning of the period.

If we assume that P_b/L_b is larger than P_a/L_a , which is usually the case, and set the ratio for time 0 at 2; and if we assume further that products per worker in the A sector and in the non- A sector grow at about the same rate—not an unreasonable assumption in the light of records for the developed countries—equation (4) can be simplified to

$$\frac{P^1}{L^1} - \frac{P^0}{L^0} = \frac{P_a^0}{L_a^0} [(L_a^1/L^1)R + (L_b^1/L^1)2R + (L_b^1/L^1 - L_b^0/L^0)]. \quad (5)$$

Thus, if the initial share of the labour force in agriculture is as high as 75 per cent., product per worker in agriculture only half of that in the non-agricultural sectors, the rate of growth in product per worker per decade (for both sectors) 20 per cent., and the share of labour force in the non-agricultural sector increases 5 percentage points per decade—a not unreasonable figure—the right-hand side of equation (5) for the first decade becomes

$$\frac{P_a^0}{L_a^0} [(0.70)0.20 + (0.30)0.40 + 0.50].$$

The first component (a) of the right-hand side of both equations (4) and (5) is clearly a measure of the contribution of agriculture to the growth of countrywide product per worker; while the second

component (*b*) is clearly a measure of the contribution of the non-*A* sector. But what about the third component (*c*), the effect of the shift in the percentage distribution of the labour force from the *A* to the non-*A* sector? It is in this connexion that the ambiguity of the term 'contribution' emerges. In one sense it is a contribution of the *A* sector, since the latter provides additional labour force to the non-*A* sector; and as will be seen below, the internal migration involved in this shift must be quite large in the process of modern economic growth. In another sense the shift is a contribution of the non-*A* sector, since the latter provides the essential employment opportunities to the labour moving from the *A* sector. The allocation of this joint contribution to the *A* and non-*A* sectors is clearly a matter of judgement. If we divide it equally between the two, the proportional contribution of agriculture to the countrywide growth of *per caput* product becomes in the example above $(0.14 + 0.025)/0.31$, or somewhat over one-half.

On the assumptions underlying equation (5), and however we allocate the third component, some general statements can be made as to the level and movements of the proportional contribution of agriculture to additions to countrywide product per worker. Firstly, this proportional contribution will be larger, the larger the terminal share of agriculture in the country's labour force, and the higher the ratio of product per worker in agriculture to that in the non-*A* sector. And, if we permit the rate of growth of product per worker in the *A* and non-*A* sectors to differ, the proportional contribution of the *A* sector will be larger, the higher the ratio of the rate of growth of product per worker in the *A* sector to that in the non-*A* sector. Secondly, in so far as in the course of economic growth the share of agriculture in the labour force declines, there will be a continuous decline in the proportional contribution of agriculture to the growth in countrywide product per worker—unless the rate of growth of product per worker in the non-*A* sector falls behind the rate of growth of product in the *A* sector—which is unlikely. Thirdly, if we assume that the countrywide product per worker grows at a constant percentage rate, the continuous shift of the labour force from the *A* sector with its lower product per worker to the non-*A* sector with its higher product per worker *must* be accompanied by a decline in the rate of growth of product per worker in the *A* sector, or in the non-*A* sector, or in both. The slight damping influence of the third component—the absolute rise in the share of the non-*A* sector in the labour force—may be disregarded, since its weight is likely to be small. The parallelism of these conclusions to those derived for the

proportional contribution of agriculture to growth of total product is obvious.

These rather simple schemes could be applied to the empirical long-term records on product, labour force and product per worker—in total and for the two sectors separately—for a number of countries, and with the product valued at constant prices to eliminate the effect of price changes. Such statistical analysis would probably show in countries with a high rate of economic growth, with respect to overall aggregates and consequent structural shifts, a rapid decline in the proportional contribution of agriculture—from a quarter or more of the growth of total product and a half or more of the growth of *per caput* product, to a few percentage points. It must be remembered that currently the share of agriculture in both product and labour force in many developed countries is well below 20 per cent. The analysis of the statistical evidence might also reveal more about the time pattern of the movements. But to present such an analysis in adequate detail would transcend the limits of the paper; and we prefer to devote the rest of the discussion to other somewhat less obvious and perhaps less familiar types of contribution of agriculture to a country's modern economic growth.

III

A given sector makes a contribution to an economy when it provides opportunities for other sectors to emerge, or for the economy as a whole to participate in international trade and other international economic flows. We designate this contribution the market type because the given sector provides such opportunities by offering part of its product on either domestic or foreign markets in exchange for goods produced by the other sectors, at home or abroad.

Thus in the case of agriculture, we can envisage two contrasting situations. In one, agriculture engages 100 units of labour force to turn out 1,000 units of product without any purchases from other sectors, and thus in complete independence of the country's production processes. In another, agriculture engages 80 units of labour force and still turns out 1,000 units of product—but does so by purchasing 200 units of fertilizers, &c., provided by 20 units of the country's labour force. In both cases, the net output of the economy, with the same labour force, is the same—1,000 units of final goods. But in the second case we have market transactions and diversification of the structure of production.

The example is unrealistic, for the division of labour in the second

case would result, usually, in an appreciably higher product per worker. Indeed, this rise is the very reason for the reduction in the economic independence of a sector and its engagement in trade with other sectors at home or abroad. But the illustration does emphasize the contribution of changes in a sector to the significant element in economic growth of diversification of structure—the intensification of the internal and international division of labour. These changes are important in and of themselves—apart from the contribution that they make to growth in total or *per caput* product.

Thus agriculture makes a market contribution to economic growth by (a) purchasing some production items from other sectors at home or abroad; (b) selling some of its product, not only to pay for the purchases listed under (a) but also to purchase consumer goods from other sectors or from abroad, or to dispose of the product in any way other than consumption within the sector. In all these ways, agriculture makes it feasible for other sectors in the economy to emerge and grow and for international flows to develop; just as these other sectors and the international flows make it feasible for the agricultural sector to operate more efficiently as a producing unit and use its product more effectively as a consuming unit.

In this connexion, some familiar trends in agriculture in countries that have experienced modern economic growth come easily to mind. There is first the spread of modern technology to agriculture proper: chemical fertilizers, machinery and mechanical power replaced extensively means of production originating within agriculture itself (such as natural fertilizers, draught animals, and hand-made tools). The need to purchase these new production goods from other sectors meant an increasing 'marketization' of the production process within agriculture; and it is reflected in the increasing proportion that purchases from other sectors constitute of the product of agriculture—gross of all production expenses. To cite an easily available statistical example: in the United States of America the *net* farm income in 1910 amounted to slightly less than 80 per cent. of *gross* farm income; whereas in 1950 it was less than 70 per cent. (both totals are in constant prices, and are five-year averages centred on the years cited).¹ Thus the proportion of outside purchases (including capital consumption) rose over the forty years from about 20 to about 30 per cent. of the gross product.

The proportion of gross income accounted for by purchases from other sectors is clearly a crude and incomplete measure of the

¹ See Alvin Tostlebe, *Capital in Agriculture: its formation and financing since 1870*, National Bureau of Economic Research, New York, 1957, table 20, p. 101.

marketization of the production process in agriculture. We treat all agriculture here as one sector, disregarding the network of market transactions within agriculture—transactions which presumably grow in absolute and *proportional* volume as agriculture becomes more specialized and diversified in the course of economic growth. A more complete measure would be based on records of outside purchases at each farm—making it independent of arbitrary definitions of a sector. But so long as we understand what is involved in the marketization of the production process in agriculture, we need not dwell upon its measurement.

There is another question, however, viz. how to measure the 'contribution' to economic growth. The measure just discussed is a gauge of relative importance of purchases from outside to the gross product of a sector—not of their proportional contribution to a country's economic growth. We need here to define the aspect of the latter to which we think marketization contributes—over and above its indirect contribution to total and *per caput* product.

The aspect is clearly development of sectors other than agriculture; and this could be measured by comparing the non-agricultural sectors in the country providing production goods to agriculture with all the non-agricultural sectors. In other words, the percentage of the growth in output of all non-agricultural sectors (including the transportation and other facilities involved), accounted for by the fertilizer, agricultural machinery and other plants that provide the production goods to agriculture, would measure the proportional contribution which marketization of the production process in agriculture made to the industrialization aspects of economic growth within the country. What the facts in the situation are I am in no position to state, but a realistic illustration may suggest the order of magnitude. Assume that the proportion of purchases from other sectors to *gross* product of agriculture increased in the process of growth from 10 to 30 per cent., which, in percentages of *net* product, meant a shift from 11 to 43 per cent. Assume further that at the initial point of time the proportion of net income from agriculture to net national product was 60 per cent; and declined to 15 per cent. at the end. Purchases by agriculture from other sectors (gross) were therefore 6.6 per cent. of net national product at the initial point of time and less than 6.5 per cent. at the end point; and if we reduce this proportion by a fifth to allow for the difference between gross and net content ('net' representing returns to factors), we have roughly 5.3 per cent. of net national product represented by industries whose only function is to supply producers' goods to agriculture. The percentage works out at

13 and 6 per cent. respectively ($5.3/40$ and $5.3/85$) of the net product of all non-agricultural industries. Marketization of the agricultural production process thus accounted for a significant but declining fraction of the 'industrialized' sectors and of the structural aspect of economic growth.

We turn now to the increase in the proportion of agricultural *net* product which is not consumed within the producing farm or agriculture proper but is sold on the markets in which agriculture trades with other sectors of the economy or abroad. This trend is largely due to a rise in net product per worker within agriculture combined with the low secular income elasticity of the demand for agricultural consumer goods, but it may also reflect technical progress that reduces cost and facilitates transportation and trade over wide areas. The contribution to economic growth here is the release of a larger proportion of the *net* product of agriculture as a basis for demand for consumer goods (or, to a more limited extent, of producer goods) from other sectors in the economy and from foreign countries.

Some suggestion of the magnitude of such marketization of the net product of agriculture can be made on two alternative assumptions, both disregarding the minor fraction of the net product that may be saved (rather than consumed). On the first assumption, the per worker (or *per caput*) consumption of agricultural net product is the same in both the *A* and non-*A* sectors, despite the large difference in their total income *per caput*. On this assumption, if we begin with a share of the *A* sector in net national product of 60 per cent. and in the labour force of 75 per cent., per worker or *per caput* consumption of agricultural net product throughout the economy will be 0.6 (in percentages of net national product); the consumption by the agricultural population of its own product will be 75 per cent. multiplied by 0.6, or 45 per cent. of net national product; and their consumption of other goods will be 15 per cent. (i.e. 60 per cent. of total net product minus 45 per cent. represented by agricultural product). If we also assume that all the non-agricultural final product goes through the market, the total marketed net product is 55 per cent. of net national product, of which 15 per cent. is agricultural final product. The contribution of agriculture to total marketed net product is then slightly over a quarter; and it is clear that as the shares of agriculture in national product and in labour force decline, its proportional contribution to the growing marketed net product will decline. Thus when the share of agriculture in the national product is down to 15 per cent., and in the labour force correspondingly down to 26.1 per cent. (to preserve a ratio of product per worker in the

non-*A* sector to that in the *A* sector of 2 to 1), the marketed portion of agricultural net product will, on the assumptions stated, be 11.1 per cent. of national product; the total marketed portion will be 96.1 per cent. (i.e. 85 per cent. non-agricultural output plus 11.1 per cent. agricultural); and the proportional contribution of agricultural marketings to total will be about a ninth rather than over a quarter.

An alternative assumption would be that the distribution of final consumption (which, disregarding savings or capital formation, we equate to net national product) between agricultural and non-agricultural products—for both agricultural and non-agricultural populations—is the same and in fact is shown by the shares of agriculture and of other sectors in the countrywide total of net product. Thus, at the initial point of time, with the share of agriculture in the net national product of 60 per cent., the agricultural population would consume only 60 per cent. of its net income in the form of agricultural products; and trade the remainder, i.e. 24 per cent. of net national product, to the people dependent upon the non-agricultural sectors. The total marketed product would be 64 per cent. of net national product (40 per cent. represented by non-agricultural output, all marketed; and 24 per cent. by the marketed, agricultural output); and agriculture's contribution to it will be 24 out of 64, or close to four-tenths. On this assumption, when the share of agriculture in national product drops to 50 per cent., half of the agricultural output, would be traded, i.e. 25 per cent. of total product—a slightly higher percentage than in the first instance, but a lower share of the total marketed output (which will be 75 per cent.).

Which assumption is the more realistic would have to be determined by empirical study; and the actual behaviour of agricultural and non-agricultural producers and consumers may fall within the range suggested by the two assumptions. However, the main points to be noted are suggested under either assumption. Firstly, at the initial point of time, when agriculture accounts for a large share of the net output of the economy, the extent to which such product is traded with the other sectors has a major bearing upon the width of the economic base which these other sectors may enjoy. If, for simplicity's sake, we think of a closed economy, any difficulty in increasing the marketable surplus of agricultural product will restrict the growth base of the other sectors. Secondly, once growth occurs and is accompanied by a decline in the shares of agriculture in both product and labour force, the increased productivity per worker in agriculture reflected in these trends assures an increasing proportion of marketed agricultural net product and at the same time a decreas-

ing proportional contribution of such marketings to the total product of the economy. In short, the market contribution of agriculture to a country's economic growth, strategic in the early periods of growth, must, in the nature of the case, diminish in relative weight once growth has proceeded apace.

The same conclusion is suggested by the third aspect of the market contribution of agriculture: that bearing upon the type of trading partner with whom market relations are established. The market contribution to economic growth will be the greater the higher the growth-inducing power of the trading partners whose co-operation via the market is being secured. The same volume of purchases by agriculture from a host of village carpenters, blacksmiths, &c., and from a factory that produces agricultural machinery by advanced methods, will have different impacts on the growth not only of the non-agricultural sectors of the economy but also of agriculture itself.

It is in this connexion that the contribution of agriculture to exports assumes strategic importance, since in most countries modern economic growth is a matter of following the pattern set by the nations that have already experienced this process; and it is exceedingly important for a follower nation to trade with the more advanced countries which can provide it with the tools of modern technology. Even with allowance for capital imports, a country in the early stages of economic growth that cannot itself produce, even at high cost, the tools of modern technology, must be able to offer the more advanced countries a *quid pro quo*. It can do this only with products in which it has a comparative advantage; and in the nature of the case this advantage is likely to lie in natural resources rather than in skills. Since agriculture, after mining, is the sector in which natural endowments have greatest weight, it is hardly a surprise that in the initial stages of growth of many presently developed countries, agriculture was a major source of exports and that the resulting command over the resources of the more developed countries played a strategic role in facilitating modern economic growth. It is also apparent that, as economic growth continued, the advantage with respect to products affected by natural resource endowments might recede relative to that resulting from economies of scale and accumulation of skills in other sectors. Consequently, in addition to the reduction in the weight of agriculture in the total output of a country, there may be an even greater reduction in its share of exports. Thus the market contribution of agriculture, this time in specific connexion with the capacity of a country through international trade to tap the resources of the more advanced units, is likely to be large in the

initial stages of growth (unless the mineral resources are sufficiently great to make agricultural exports less strategic) and bound to decline as economic growth takes hold in a country. While any detailed analysis of the relations touched upon here would raise difficult questions concerning the phasing of this process of building economic growth on trade with the more advanced countries, the substance of the contribution is clear and the measures, in terms of shares of exports and feasible imports of capital goods, are obvious without further discussion.

IV

The third type of contribution by a sector to economic growth occurs when there is a transfer or loan of resources from the given sector to others. Thus if agriculture itself grows, it makes a product contribution; if it trades with others, it renders a market contribution; if it transfers resources to other sectors, these resources being productive factors, it makes a *factor* contribution.

The resources being transferred are either capital, or rather funds for financing acquisition of material capital, or labour. In the case of the former, two different types of transfer may occur. In the first there is a compulsory transfer from agriculture for the benefit of other sectors; and this is ordinarily done through taxation of a kind in which the burden on agriculture is far greater than the services rendered by government to agriculture (including an adequate share of overhead government expenses), the residue being spent by government for the benefit of other sectors. To illustrate, the government may use a tax on agriculture as its only revenue, and expend it all either on a subsidy to some manufacturing industry (thus in fact providing capital funds for the latter), or use it all in the construction of some public utility. To be sure, both the factory and the public utility contribute to growth within agriculture proper; but the direct contribution to economic growth is to the non-agricultural sectors, and this flow, originating in the agricultural sector, is not covered in its product or market contribution.

The measurement of such forced contributions of agriculture to economic growth is not easy; the incidence of some indirect taxes is difficult to ascertain and the allocation of government expenditures in terms of benefits to agriculture and to economic growth elsewhere is far from simple. But this factor contribution by agriculture was clearly quite large in the early phases of economic growth in some countries. Thus in Japan in the last two decades of the nineteenth

century the land tax was over 80 per cent. of central government taxation, and the direct tax ratio to income produced was between 12 and 22 per cent. in agriculture, compared with from 2 to 3 per cent. in the non-agricultural sectors.¹ Forced extraction of surplus from agriculture by taxation, confiscation and other measures also probably financed a considerable part of industrialization in the Soviet Union. Indeed, one of the crucial problems of modern economic growth is how to extract from the product of agriculture a surplus for the financing of capital formation necessary for industrial growth without at the same time blighting the growth of agriculture, under conditions where no easy *quid pro quo* for such surplus is available within the country. It is only the open economy, with access to the markets of the more highly developed countries, both for goods and for capital loans, that can minimize this painful task of initial capital accumulation.

The other form of capital transfer is, of course, lending, or the utilization of savings originating in the agricultural sector in financing the growth of the non-agricultural sectors. Provided that we have data both on savings and capital formation, both in agriculture and in other sectors of the economy, there is no problem in measuring the extent to which savings originating in agriculture contribute to the financing of capital formation elsewhere in the economy. But no such data are at hand for my purposes, and we are forced to speculate on the magnitudes involved.

In such speculation the following general points must be taken into account. In the initial phases of growth the share of agriculture in total national product is large, but the *per caput* income in the *A* sector is distinctly lower than that in the non-*A* sector. Hence the share of domestic savings originating in agriculture is a function of the share of agriculture in total income, the lower level of real income in agriculture than in the other sectors, and the relative propensity to save of the agricultural population and of other groups in the economy. To assay these three variables would necessitate much empirical study. But to make the discussion more meaningful let us begin with a share of the *A* sector in income of 60 per cent., in labour force of 75 per cent.; and assume that savings amount to 5 per cent. of the *A* sector income, which on a *per caput* basis is only half of the income in the non-*A* sector, compared with a 10 per cent. savings rate for the non-*A* sector. Total domestic savings would then amount to 7 per

¹ See Kazushi Okhawa and Henry Rosovsky, 'The role of agriculture in modern Japanese economic development, in city and village in Japan', *Economic Development and Cultural Change*, vol. ix, no. 1, part ii, October 1960, tables 14 and 15, pp. 61 and 62.

cent. of national income, 4 per cent. originating in the non- A sector and 3 per cent. in the A sector.

The flow of savings out of the A sector to finance capital formation elsewhere would depend largely upon the relative needs of these sectors for capital, which needs are reflected in differential rates of return (all other conditions being abstracted from). Perhaps the incremental capital-output ratios might suggest how much capital is needed to secure additional output. The data for recent years indicate that in all but the most fully developed countries the incremental capital-output ratios for the A sector, while higher than those for manufacturing, are not too different from the countrywide ratios and hence from those for the non- A sector as a whole.¹ If this situation can be assumed to hold for the early phases of economic growth, the allocation of savings depends largely upon the relative rates of growth of the A and non- A sectors, reflecting differences in long-term demand for additions to their product. Hence, whether or not there will be a flow of savings from the A sector to finance capital formation in the non- A sector will be revealed by a comparison of two fractions: the first is the ratio of additions to product of the A sector to additions to the total product of the economy—already discussed under the product contribution of agriculture, and expressible as $P_a r_a / (P_a r_a + P_b r_b)$; the other fraction is the ratio of savings originating in agriculture to all savings originating in the economy, which can be written as $s_a / (s_a + s_b)$. Now if we assume, in addition, that the net savings rate is 7 per cent., that national product grows at a rate of 3 per cent. per year (or 34.4 per cent. per decade), implying an incremental capital-output ratio of 2.3 to 1; and that the rate of growth of the product of the non- A sector is four times that of the product of the A sector, the *needed* capital formation in the A sector will be only 27 per cent. of total capital formation needed;² whereas savings originating in agriculture are 43 per cent. of total savings. There will therefore be a flow of savings originating in the A sector into capital formation in the non- A sector, accounting for 16 out of 73, or somewhat less than a quarter of the latter.

¹ See my paper 'Capital formation proportions: International comparisons for recent years', *Economic Development and Cultural Change*, vol. viii, no. 4, part ii, July 1960, table 15, p. 64.

² This can be calculated from the equation: $(0.60)r + (0.40)4r = 3.0$. r , the rate of growth for the A sector, is then 1.364 per cent., that for the non- A sector four times as high, or 5.456 per cent. Multiplying the former by 0.60 yields the increment of the product of the A sector, or 0.818; multiplying the latter by 0.40 yields the increment of the product of the non- A sector, or 2.182; and the ratio of the increment in the A sector to increment in total product, and, on the assumption used, of the capital needs of the A sector to total capital needs, is then 0.818/3, or 27 per cent.

The example is purely illustrative; and the discussion is designed only to bring out the variables that would have to be measured in empirical study. The rate of growth of the product of the non-*A* sector might well be more than four times that of the *A* sector. The incremental capital-output ratio for the *A* sector might well be distinctly lower than, rather than equal to, the capital-output ratio for the non-*A* sector—in some countries in some periods agricultural output could be increased significantly with little or no capital investment. If these two contingencies were to materialize, the flow of savings from agriculture to finance capital formation elsewhere would be relatively larger than is suggested in the illustration. On the other hand, we are dealing with domestic savings alone, disregarding financing from abroad—capital imports that were quite important in the early phases of growth of several countries, such as Canada, Australia, and Scandinavia. But this is a matter with which Professor Cairncross's paper is to deal at length.

We may now turn to the third type of factor contribution made by agriculture to the economic growth of a country—the provision of labour. While this shift of labour from the *A* to the non-*A* sectors in the process of modern economic growth has become quite familiar, the magnitude of the migration and of the factor contribution involved may not have been given the attention that it deserves.

To begin with, we must stress the fact that through the periods under discussion and in almost all the countries, the crude (and refined) birth-rates of the agricultural populations were distinctly higher than those of the non-agricultural; whereas the death-rates were at least equal, if not lower, for the agricultural.¹ This means that the rate of natural increase was very much higher for the agricultural than for the non-agricultural population; and consequently for the agricultural than for the non-agricultural labour force.

The orders of magnitude can now be suggested. At the initial point of time, when the share of the *A* sector in the labour force was 75 per cent., we may set the crude birth-rate for the agricultural population at about 40 per 1,000, with that for the non-agricultural at about 27 (the ratio of the former to the latter being roughly 1.5).

¹ See a summary discussion in United Nations, *The Determinants and Consequences of Population Trends*, New York, 1953, p. 62, on urban-rural differentials in mortality, and pp. 85-86 on urban-rural differentials in fertility. For more recent discussion of these differentials in fertility see the papers by Gwendolyn Johnson (pp. 36-72) and by Clyde Kiser (pp. 77-113), in Universities-National Bureau Committee on Economic Research, *Demographic and Economic Change in Developed Countries*, Princeton University Press, 1960; and the paper by T. Lynn Smith, 'The reproduction rate in Latin America: Levels, differentials and trends', *Population Studies*, vol. xii, no. 1, July 1958, pp. 1-17.

If we set the crude death-rates at 20 per 1,000 for both groups, the rate of natural increase for the two sectors, for population and hence for the labour force (with some lag), will be 20 and 7 per 1,000, respectively. Thus the rate of growth of the agricultural labour force, owing to its rate of natural increase, is almost three times that of the non-agricultural. Incidentally, on these assumptions the rate of natural increase for total population, i.e. the countrywide rate, works out at 16.75 per thousand.

Consider now the internal migration of the labour force that would be required over a decade for the share of the *A* sector in the labour force to decline from 75 to 70 per cent., under the assumption of a closed population (i.e. no international migration). Over that decade, total labour force would rise from 100 to 118.23, labour force in the *A* sector would rise from 75 to 91.425, and that in the non-*A* sector from 25 to 26.805. To secure a 70-30 apportionment, the 91.425 in the *A* sector would have to be reduced by internal migration to 82.761—a migration out of the *A* sector of roughly 8.7 per cent. of the countrywide initial labour force, or over 9 per cent. of the labour force that *would* have been in the *A* sector at the end of the decade if not for internal migration.

This transfer of workers from the *A* to the non-*A* sector means a sizeable capital contribution because each migrant is of working age and represents some investment in past rearing and training to maturity. What is the magnitude of this investment in human beings? Let us assume that every worker migrating from the *A* sector embodies outlays on rearing, education, and training equal to ten times the current product per worker in the *A* sector (this is a rough ratio, based on an average prior year's outlay of about six-tenths of the current *per caput* income multiplied by 17, the age assumed at transfer). If, then, in each year of the decade something like 1.01 per cent. of the labour force in the *A* sector moves to the non-*A* sector (the difference between a rate of natural increase of 2 per cent. and 0.89 per cent. required by the conditions of the illustrative example), we have a transfer embodying outlays equal to 10.1 per cent. of the total income of the *A* sector. This, in the first interval, would be 10.1 per cent. of 60, or over 6 per cent. of total national product; but the addition to the factor endowment of the non-*A* sector is over 25 per cent. of its current product (10.1 as a percentage of 40).

The figures in the illustration could be modified in the light of empirical data, but they are realistic enough for us to draw some plausible conclusions. Firstly, if we accept the interpretation of internal migration as a transfer of capital invested in human beings, this

factor contribution of the *A* sector to the growth of the non-*A* sectors must have been quite large in the early and even later phases of modern economic growth—since internal migration of the labour force was from the *A* to the non-*A* sectors and sizeable. In the illustration, the value of the transfer was estimated at over 6 per cent. of total current income; and it would have been easier, without violating the rules of plausibility, to raise this percentage significantly than to lower it. Yet under the assumptions of the illustration, total net savings in the economy were not more than 7 per cent. of national income. And, granting that the 'contribution' in question depends upon the employment capacity of the non-*A* sector, we could still argue that the internal migration of labour from agriculture represents a large transfer of valuable resources to the non-*A* sectors and a large contribution to the country's economic growth. This conclusion has several implications, not the least of which is that the kind of investment in human beings that is, and can be, made in the *A* sector determines the quality of an important part of the labour force in, and hence of its contribution to the growth of, the non-*A* sector.

Secondly, if the share of the *A* sector in the labour force and the relative magnitude of labour transfers from it decline, there is bound to be a decline even in the absolute value of the factor transfers thus made; and most certainly in its proportion to the stock of labour already available in the non-*A* sector. After a while, although it may be fairly late in the course of modern economic development, the absolute numbers of workers in the *A* sector decline; and transfers that may be a large fraction of the current labour force in agriculture would mean only minor fractional additions to the labour force outside the agriculture, and for the country as a whole.

Finally, it need hardly be pointed out that what is true of internal migration applies to the international movement of labour which through the nineteenth and early twentieth centuries assisted a number of rapidly developing countries. This migration was most often from the agricultural sector in one country to the non-*A* sector in another, and in that sense was similar to what we have been discussing—except that the factor contribution was to the economic growth of another country. At some time this may have had a curious effect on internal migration within the recipient country, impeding internal migration from at least some parts of the domestic *A* sector. But these aspects of the factor contribution of the *A* sector, while of great interest, would take us into an analysis of the growth process for different groups of countries that would be too detailed for treatment here.

Note: In presenting his paper to the Conference, Professor Kuznets made the following statement.

Being an optimist I am assuming that the paper has been read and that there is no need to summarize it. Instead, I would rather supplement the paper by a few reflections on some major problems in the interplay between agriculture and economic growth, particularly in the early phases of growth.

Let me begin with two propositions. The first relates to what is generally held to be a basic characteristic of modern economic growth—a substantial, sustained rise of real product *per caput*, usually accompanying a high rate of population growth.

I am mindful of the various limitations besetting the measurement of national and *per caput* product, and have sympathy with Professor Svernilson's strictures. Clearly, national accounts and national product estimates, especially when cast into a standard mould for intertemporal and international comparisons, fail to reflect the full spectrum of relations between economic activity and life in general. Without wishing to enter upon a long discussion, I would note that many of the questions raised by Professor Svernilson have been long standing topics in the national income literature going back to the end of the seventeenth century.

But I would also add, and I am sure that Professor Svernilson would agree with me, that the recognition of the limitations is no ground for rejecting the aggregative and articulated measures, and certainly no ground for not trying to make the best use of them. We can recognize, for example, that modern economic growth consists partly, but only partly, of the transfer of household activities to the market place; or stress the perennial index number problem, the question of what prices to use as weights. But it can be said, without straining one's sense of the real, that after one allows for the transfer of household activities to the market place; after one allows for the additional costs of urban life; and whether one uses recent or early price weights, it still remains true that the rise in material product *per caput* that characterizes modern economic growth is at high levels; and the combination with the growth of population is a characteristic of the modern economic epoch for which it would be difficult to find parallels in the past.

We may start, then, with the first proposition, that there is no economic growth unless there is a sustained rise in *per caput* product at the rates usually found in modern experience, i.e. roughly at least 15 per cent. per decade; and accompanied by growth of population well above 5 per cent. per decade.

The second proposition is that when modern economic growth begins, agriculture is the major sector in the economy. And by major I mean a dominant one, so that it accounts for between about 70 and 80 per cent. of the labour force and for between 50 and 60 per cent. of gross national product.

The juxtaposition of the two propositions—that economic growth involves a substantial rise in *per caput* product combined with substantial population growth; and that such growth starts in a situation in which the agricultural sector is dominant in the economy—yields directly one conclusion, fundamental for the analysis and understanding of the early periods of economic growth. These are the periods during which the share of agriculture in the labour force declines from above 70 to below 40 per cent., and the share in income declines from between 50 and 60 to between 25 and 20 per cent.

The conclusion is as follows: economic growth is impossible unless there is a substantial rise in product per worker in the agricultural sector. It can be shown algebraically that in a situation in which the proportion of the economy accounted for by the agricultural sector is as high as that suggested above and in which output per worker in agriculture is substantially lower than in the non-agricultural sector (which is usually the case), any growth that begins, any increase in productivity in the non-agricultural sector that may be initiated, will not go far unless, and within a short time, there is a substantial rise in output per worker in agriculture.

Assume that modern economic growth begins with a rise in productivity in the non-agricultural sector. This usually means first an acceleration in the rate of growth of population and second a rise in income per worker in the non-agricultural sector of the economy. There follows a rise in the demand for products of agriculture, occasioned by both rise in population numbers and increase in *per caput* income of part of the population. How does agriculture respond to this increase in domestic demand?

If we deal with a closed economy, and thus disregard the possibility of agricultural imports, or of reduction in agricultural exports, we may envisage one of two possible cases. The first assumes surplus labour on land, in line with the familiar contention of the existence of surplus labour in densely populated pre-industrial countries. In this case, given surplus of labour already existing, additions to population and to the agricultural labour force are not likely to increase total supply of agricultural products; and even if new industries draw the excessive labour supply off the land, the problem still remains as to

how the additional agricultural products needed or demanded will be supplied. If productivity of labour in agriculture does not rise, the result will be price inflation; a shift of some of the gains of the non-agricultural sector to the agricultural sector; and the disappearance of incentives to any further growth in the non-agricultural sector. In the other case, of the less densely settled countries, there may be no surplus labour on the land; and here increased demand for agricultural products can be satisfied, in the absence of increased productivity in agriculture, by shifting a larger *proportion* of the labour force to agriculture. But this will mean restriction in supply of labour to the more productive non-agricultural sector; and thus a lowering of countrywide product per worker. To put it briefly: *if* output per worker in agriculture does not rise substantially, economic growth in the first case will be stopped by scarcity of agricultural products, and in the second case by scarcity of labour. And, clearly, *imports* of agricultural products provide no real solution of the dilemma.

The second problem in the relation between agriculture and economic growth is quite different. We must remember that modern economic growth began in one country (England) and spread to others, so that all but the pioneer were followers, and most faced the situation where they could learn from and take advantage of the experience of the pioneer or early followers. This was done largely through the network of international trade and other international flows. In these the follower countries had some comparative advantage, some surplus product which they could offer in return for the industrial goods and experience of the more advanced countries. Practically every country at some point in history had comparative advantage *vis-à-vis* the more highly developed countries, usually in a mining or most frequently an agricultural product. It was therefore in a position to command the resources of the more highly developed countries and, presumably, could command them so as to provide a basis for its own economic development.

The question that would merit the most comprehensive comparative study is why some countries managed to utilize this advantage in such a way as to provide a sound basis for subsequent industrialization and economic growth and why others, which had similar or even greater advantages, failed to exploit them effectively. In particular, it may be asked whether the technological peculiarities of the commodities with respect to which comparative advantage existed had a bearing upon whether or not the advantage could be used for subsequent industrialization and economic growth; whether

the reasons lay in the institutional structure of the country; or whether other factors must be examined to explain the difference between relative success and relative failure.

The two major problems I suggested—of the response of the agricultural sector to the increased domestic demand for products of agriculture accompanying economic growth, and of the conversion of the usually temporary situation of comparative advantage with respect to agricultural products into a sound basis for sustained industrialization and growth—are two major topics on which discussion in this conference could well concentrate. I would like to stress that these two problems seem particularly crucial in those early decades of transition from a pre-industrial to an industrial society, that begin with agriculture's accounting for about three-quarters of the country's labour force and end when the share of agriculture in the labour force falls to 40 per cent. or somewhat less.

Let me conclude with a remark that would link these comments with the earlier discussion this morning. I am an optimist also in believing that a much closer examination of the quantitative record of comparative economic growth than we have had so far would provide a basis for deriving a more intelligent scale of preference, despite the limitations of the data and of our analytical tools. We should not think of the scales of preference of politicians, or even of economists, as fixed and given—and not amenable to being modified in the light of properly understood historical experience, experience checked, tested, and analysed within a proper quantitative framework. There have been quite a number of successful transitions from pre-industrial, agricultural economies to industrial economies; and there have been some abortive cases. There have been a number of these crucial early periods in which the economy began by being dominated by low productivity in agriculture and reached successfully a structure in which it could profit from the potentials of modern economic performance. The analysis, on a comparative basis, of these periods of transition, if properly carried out, would yield a stock of understood experience which, despite the ever-changing situation in the world, might permit us to formulate more intelligent scales of preference than we possess today.

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In dealing with what we usually call the contribution of agriculture to economic growth, Professor Kuznets has paid particular attention to problems of measurement. He has accumulated a lot of findings through his long sustained studies which have contributed

enormously to this particular field. But in this paper, not only the problems of measurements, but also the changing role of agriculture in the long-run process of economic growth has been clarified in a systematic way. I agree with his main conclusion in a broad sense that modern economic growth is impossible without agricultural development, and that it is particularly crucial in the early periods of economic development. My comments therefore only concern the details of our thinking on the subject.

Professor Kuznets's concept of sectoral contribution seems to me a very broad one, and I should like to treat it in a more narrowly specified form. He himself recognizes an element of ambiguity in this concept of sectoral contribution and has asked us to apply a 'semantic caution' to the fact of interdependence of the economic growth process. I would like to try to make a much stronger reservation in this respect. For example, among the three types of contribution, the product type, the market type, and the factor type, the market type seems to be least worth while to be dealt with separately from the product type, because so far as an equilibrium growth process is concerned, the inter-industrial relationship of input-output is the relevant fact. The increase in marketization of agricultural produce must at the same time mean the increase in using intermediate goods in this sector. If we say one phase of this phenomenon is the contribution of agriculture, then we have to say that industry contributes at the same time.

Professor Kuznets has given a more or less complete list of various contributions, but I am afraid that it can rarely reveal the nature and magnitude of the various contributions of agriculture as a whole within a network of interdependence. The case of labour transfer, the importance of which Professor Kuznets has particularly stressed, may be a good example. It is true that the labour force which migrated from agriculture to the non-agricultural sector gave the impetus for this sector and thus made it possible to increase the rate of growth. But it may be desirable to draw attention more strongly than Professor Kuznets did to the fact that this is the *result* of the increase in employment opportunity caused by the development of the non-agricultural sector. The so-called agricultural contribution is merely the production of these people of working age. Let us appreciate that if the rate of increase in rural population is too high, it acts as a great check on agricultural development and, accordingly, on the rate of economic growth. It is rather risky, therefore, to consider each type of contribution separately.

Such an example also leads to the *ex post* concept of a contribution.

I admit that it is unavoidable to make quantitative measurements as Professor Kuznets did this morning, but it may be desirable to be able to treat a contribution in an incremental and *ex ante* way in order to specify the real significance of a sectoral contribution to economic growth. This is particularly important when the determinants of economic growth differ from stage to stage of economic development, as Professor Kuznets rightly stated. However, as it is extremely difficult to do this in a vigorous way I shall suggest a simple alternative concept and its way of application.

First, let us consider the output contribution. A balanced growth in terms of output of domestic agriculture in a country's economy is defined as a growth process in which the demand/supply relations of, say, food (or agricultural products in general) maintain a sustained balance. If under the given conditions a balanced growth of this kind is maintained, we can say that domestic agriculture is *neutral* to the economic growth of that country. Here the term neutral means that domestic agriculture is neither acting as a brake on economic growth by causing a supply deficit of food, nor is it acting positively in exporting its surplus. On the one side of this neutral case, we can see a negative contribution or dis-contribution, and on the other side we can see a positive contribution (call it simply a contribution). In the former case, the unbalanced growth in terms of food output would lead to domestic inflation or foreign payment deficit. Other things being equal, the country's rate of economic growth will be checked to that extent. In the latter case, the export of agricultural produce will enable the importation of more capital goods (as is often the case). Thus it will lead to a corresponding increase in the rate of growth.

We can approach a contribution of factor type in a similar way. At this stage of economic growth, as is commonly recognized, the crucial limiting factor is capital or rate of investment. The contribution of agriculture, therefore, should best be considered from the investment-savings relationship. In a growth process which maintains an aggregate balance of investment and savings (and which we assume here for the sake both of simplicity and of the desirability of the sectoral balance (or unbalance) of investment), savings can be easily defined. If investment is equal to savings within a sector, say agriculture, this sector is defined as being in a process of balanced growth with regard to investment savings. If the agricultural sector maintains such a balanced growth process, we would like to define the contribution of agriculture again as neutral with regard to investment savings. A situation of investment over savings is

defined as 'discontributing', that of savings over investment as 'contributing' to economic growth. Professor Kuznets has elaborated the latter case.

I should like to draw your attention to a combination of the contributions of the output type and the factor type. Schematically we can distinguish nine cases as a simple matrix. Of course one extreme is the case of double contributions, while another extreme is the case of double discontributions. Between the two we have seven intermediate combinations including the case of double neutral. In the case of a combination of contribution and discontribution, we cannot tell whether agriculture's total contribution as a whole is plus or minus. Japan's case, which Professor Kuznets cited, is a remarkable example of the case of double contribution. It may be interesting and useful to specify the situation of each country (past, present and, in particular from the viewpoint of planning, future), according to this classification in order to specify each country's real problem.

The next problem is to identify the factors which are responsible for determining such combinations of contribution and/or discontribution. I cannot elaborate a comprehensive description here. It may suffice to present some remarkable examples in order to clarify the nature of the problem. To begin with the output type. Let us simply assume that the demand equation for food is composed of three factors: the rate of increase in total population, the income elasticity of food demand, and the rate of increase in income per head. Let us again simply assume that the production function is composed of four factors: the rate of increase in land (natural resources), that of capital investment, that of labour input, and the rate of technical progress in agriculture. Thus, it must be recognized that the number of factors responsible for determining the so-called 'contributing possibility' of agriculture even in this simple process are seven in sum, and that the shape of contribution and/or discontribution must be different from country to country according to the different values of these variables. Therefore, without singling out the significance of these given factors, it may be risky to make international comparisons of agriculture's contribution. However, particular attention should be paid to a high income elasticity of food demand and to an extremely high rate of natural increase of population in most countries in South-east Asia. The shape of the production function also depends much upon the unfavourable man-land ratio so that, in brief, the possibility of the agricultural contribution to economic growth seems to be very limited. This is one of the main reasons why

the rate of economic growth in terms of income per head has not been so promising in these countries.

I have two points which I should like to add. One, the possibility that agriculture's contribution to economic growth in such a situation can best be increased by speeding up the rate of technical progress, in particular that of the capital-saving type, suitable for the small-size farm system. Japan's historical experience is an example. To my knowledge technical progress of this type is the only factor which can contribute to three kinds of agriculture's contribution (output, savings, and labour) at the same time.

Two, it is highly desirable to develop the use of social accounts to measure such *sectoral* problems of economic growth, because only in this way can the measurements and analysis of this problem be fully developed in an integrated form; and this is the way which Professor Kuznets has paved for us for many years.

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Without trying to enter into the discussion already opened by Professor Ohkawa (whose observations I accept on the whole) on our colleague Simon Kuznets's paper, I shall confine myself to offering a few remarks on the proposed formulas. I think it necessary, however, to raise a question of vocabulary in order to warn some of our colleagues and future readers who may be tempted to put objections based on what I would consider a mistake in translation.

The word *growth* in Kuznets's paper—as in other authors—should not be rendered by the French word *croissance*, because in a long-term perspective like his ('economic growth of nations since the late eighteenth or early nineteenth century . . .') it is evident that there could not be *croissance* only but also *development*. As in the life of an individual, if it is considered from birth to adult age—say, to forty years—Kuznets's *growth* includes structure transformations which are indicative of *development*. Without this, there would be no point in insisting, as he has rightly done, on the *structural aspect*. The structural changes which have taken place in the period have been important.

Without the technological revolutions, both agrarian and industrial, which took place at the beginning of that period, it is likely that the capital, mainly accumulated through the international trade of primary products from countries still under-developed, could not have become development *investments*. This 'colonial' trade would have ruined the primary industries, including agriculture, of the

trading countries, as happened in Italy under the Roman Empire and at the time of the Spanish and Portuguese colonization of the sixteenth century. Even in the United States of America, the pioneer economy could not have led to a modern economy without the technical revolution, because, in the inter-regional competition, the 'frontier' would have constituted a permanent threat to the stabilization and economic growth of the eastern States. Instead of being a challenge, it would have been a handicap. No doubt, agriculture in the old European countries had to meet very serious competition, especially at the end of the nineteenth century.

The answers to this challenge have been different. It would be easy to contrast the Danish and the French answers. Agriculture played a primordial part. It suffered serious losses and enjoyed some success; both had their importance in economic development. It would be difficult to define clearly and assess properly this aspect of the contribution of agriculture. Still, it seems clear that nineteenth- and early twentieth-century methods should not be taken as models for the economies being developed now. Thus, other parameters will have to be introduced into the formulas suggested by Kuznets, if we are going to utilize them for the present or future development of this or that economy.

The external source of capital could not have either the same extent or the same character as before. In the present world the countries in course of development are faced by a difficult problem of balance which was unknown to the European countries, and cannot be solved, as in the U.S.A. in the nineteenth century, by making themselves into a 'nasse' which men and capitals could enter but not leave in the first phase of development. In fact, when development starts, the external balance of the country deteriorates in such a way that a G.A.T.T. expert such as J. Royer himself is able to ask whether the economic structure of industrial countries is compatible with the development needs of new countries (*L'Economie appliquée*, 1959); and his answer is that the deficit cannot but increase and reach a high level. In such an economy, of course, people think that mining industries and agriculture are the only ones which can contribute to solve this problem because they are the pre-existent sectors.

But we see that food products constitute an important part of imports in economies with external deficits, particularly in Africa. While it would be natural to expect that these countries should provide their own food and also export agricultural products, one has to realize that this is in fact so in only a few cases. Some people would also think that things would work better if an abundant flow of

agricultural products left those countries in exchange for the capital necessary for the purchase of development equipment; they would think that it would be enough to admit more agricultural imports into the markets of economically developed countries which insist on keeping agrarian sectors. An analysis of the depressive effects of agricultural exports on the economies of countries in course of development should lead to useful distinctions. Agricultural products, and above all basic foodstuffs, are more advantageously used at home than exported by a country beginning to develop. Alimentary consumption at this stage is an essential factor of production; the production multiplier function of this production is important; and the terms of exchange of agriculture, especially on external markets, are not good enough for such exports to be generally beneficial.

There is another aspect of the contribution of agriculture to economic development and its beginnings: productivity increases in this sector do not translate themselves completely into increases of agricultural revenue. The State whose finances present a difficult problem of balance may well take away in taxation an important part of the results of increased agricultural productivity. The same can be said of non-agricultural sectors (caterers for clients of agriculture) as soon as an important part of their products is commercialized and purchases are made by an agriculture which is entering upon an exchange economy. The non-agricultural consumer himself may benefit from the increased agricultural production through a decrease in prices. Important differences can be noticed between calculations of agricultural production based on physical quantities and others based on value. Even in France, physical quantities of agricultural production have increased by 8 per cent. per annum in the last fifteen years, while their values have increased only by about 4 per cent. I think that the contribution of agriculture to economic development can be better estimated, if not measured, by considering the differences between results obtained by different methods than by taking measurements according to any one method.

Another remark which I must make is this. It is rarely possible to take away labour from agriculture and pass it on to other sectors without some previous progress in agricultural productivity. I am not under-estimating agricultural under-employment; but this under-employment is seasonal, and if manpower is taken away from agriculture at this stage, a serious diminution in production would follow because agriculture in general has not enough manpower at its disposal at seasonal peak times.

Luckily, it is almost always possible to introduce structural changes

into agriculture, which make it possible to increase productivity per worker, if not per human working hour, and to start a development process which ensures better employment of available manpower. The example given by Egbert de Vries and Oscar Zaglitz in their inquiry presented at the World Congress on Population in Rome on the employment of buffaloes in Indonesia seems to me to demonstrate that sufficiently. Thus, I think it would be better to emphasize the essential contribution of increased agrarian productivity to economic development when it first gets into gear than its contribution to later economic growth and development.

MARCO RAMIREZ, *Guatemala*

An increase in agricultural productivity should be reflected in an increase in the agricultural section of the community, and that cannot be achieved without previous structural modification. If the relationship of the factors involved in national production is not modified so that a better distribution of income is achieved, even an increase in *per caput* income will not reflect the progress of expansion, since the causes of backwardness still remain. The results of increased activity may have accrued to one section of the community only, thus increasing the disproportion of the participation in the fruits of national production.

In developed countries industry constitutes the dynamic factor which stimulates agricultural productivity, but in less developed countries agriculture is the dynamic factor which provides the raw materials for industrial development and the food required by the urban industrial worker. Consequently, expansion in this case should be reflected in increased income accruing to agricultural labour, and this should be measured in terms of the extent to which the peasant classes, owning little or no land, are incorporated into agriculture.

ALI ASGHAR KHAN, *Agricultural Development Corporation, Lahore, West Pakistan*

Dr. Kuznets has asserted that economic growth proceeding from a pre-industrial to an industrial economy together with a simultaneous increase in population may require a larger labour force, for the production of more food for the population and perhaps more raw materials for industry. This is one aspect of the picture. On the other side, we are sometimes told that mechanization and the utilization of improved technology in agriculture might reduce the labour force. I would suggest, therefore, that we try to establish what would be the appropriate relation between the agricultural labour force on the one hand and improved technology with mechanization on the other.

H. DE FARCY, *Vanves, France*

I should like to take up Dr. Kuznets's third point, the *factor* contribution of agriculture in so far as there is difficulty in extracting the necessary taxes from an agriculture which has hardly begun to develop. I would stress the flexibility as well as the importance of this contribution once it is known how certain factors latent in the economic and psychological spheres can be used. First, the importance of mobilizing some of the latent *economic* factors. I shall take a single example. During the development of France 200 years ago, when the peasantry was very much under-developed and the reward of a peasant's work did not amount to more than 3 kg. of cereals a day, and when the whole country was based on a cereal culture and there were many days of unemployment, the peasant had to work thirty days or more a year to make roads and bridges.

Secondly, the possibility of using *psychological* factors. Here I would cite an observation of Dr. Raup of Minnesota which showed that in the United States of America a hundred years ago in the poor rural communities of the West and Middle West, the farmers incurred considerable sacrifices in order to instal school teachers and to establish primary education for their children.

Arising from this one would suppose that peasants who hesitate to pay the higher taxes which are necessary for general economic development may be willing nevertheless to pay an extra tax if it is to be used for a purpose which concerns them very closely, namely the education of their children. In this kind of way it may be possible to increase the peasants' contribution to the general economy by proposing taxes for definite purposes which can be seen by them to yield immediate results.

LOUIS H. BEAN, *Food for Peace Office, White House, Washington, D.C., U.S.A.*

I would like to supplement the question raised by Ali Asghar Khan, but in a slightly different form. About fifteen years ago, I had an occasion to raise the question and attempt to answer what is the relation of industrialization to the *per caput* income of a country. I brought together the available data on the percentage of the working force in agriculture for as many countries for which we then had data and correlated them with the *per caput* income, using for the most part Colin Clark's tabulations.

Those of you who are interested will find this analysis in a paper entitled *International Industrialization and Per Capita Income* in U.S.

Studies of Income and Wealth, 1946, National Bureau of Economic Research (N.Y.).

That paper gives a very simple answer to the question that our friend from Pakistan asked. It is something like this: Given a country that has for example 60 per cent. of its labour force in agriculture and another country which has only 40 per cent. of its labour force in agriculture, the second will have a *per caput* income twice as great as the first. And this generalization, that a difference of 20 points in the stage of industrialization shows up in a doubling of the *per caput* income, was fairly common to all the countries for which we had data then, when these countries were grouped geographically. Whether the countries were the Mediterranean countries of Europe, or the northern and southern countries of Europe, South American countries, Asiatic countries, and even the 48 subdivisions of the United States, the generalization seemed to hold.

I would like to ask Dr. Kuznets to comment on this finding if he cares to and to tell us if any new data have been put together in the last fifteen years on this question which would lead me to alter this general conclusion, namely, that a country that can bring about, through the necessary interrelated processes, a reduction of the share of the work force in agriculture of about 20 points from 70 to 50, or 60 to 40, or 50 to 30, would experience a doubling of its *per caput* income.

RICARDO A. LETTS, *Lima, Peru*

Let us take the established view that the starting-point of any development must be the development of agriculture. In underdeveloped countries in general, and in Latin America in particular, this may be summed up in the two words agrarian reform. In the most advanced sense we understand by this, not only the redistribution of the land and the modification of the laws governing the holding of land, but also loans for its improvement, extension, technical aid, market development, mechanization, labour legislation, and so on. This in fact obliges us to reject the idea that there are alternative courses of action and programmes which economists can offer to politicians and leave them to choose what they want for the development of their countries. In Latin America, and especially Peru, with figures very similar to those given by Professor Kuznets—namely, 60 per cent. of the population occupied in agriculture, an occupation contributing 30 per cent. of the gross national product—we have no alternative but to proceed at once to a complete agrarian reform. Then, after the first sudden rise in revenue following the reform, one

can turn one's attention to industrial development and then to parallel development of the different parts of the economy. There is another interesting figure, which is that between 40 and 50 per cent. of the population in Peru takes no part in the national consumption; its economy is entirely self-supporting. When agrarian reform has been carried out, it will receive an increase in income allowing it to share in the national consumption, a factor which, in turn, will let industry develop, since industry's resulting products can be consumed by an internal market. In this way, starting with the development of agriculture stemming from agrarian reform, one can expect to see the remaining sections of the economy develop, and indeed the country as a whole.

N. B. TABLANTE, *Agricultural Credit and Co-operatives Institute, University of the Philippines, College, Laguna, Philippines*

Professor Kuznets has painted a picture of the relationship existing between industrial and agricultural development. This relationship is such that industrial development and agricultural development reinforce and complement each other. Industrial development provides the necessary outlets for the increased production of agricultural products and absorbs the excess labour force from the agricultural sector as agriculture is developed and becomes more efficient. On the other hand, the agricultural sector provides the necessary raw materials for the development of industries, and a market for the products of industry. It was not made clear, however, whether industrial or agricultural development should come first. In other words, should we give greater emphasis during the transition stage to agricultural development or to industrial development?

Even if it is agricultural, it still remains to be decided whether food production for local needs or agricultural products for export to earn foreign exchange would make the greater contribution to a country's economic development.

HOSSEIN M. NOORI, *Department of Agricultural Economics, University of Connecticut, U.S.A.*

Professor Kuznets defined economic growth as the sustained increase in a nation's product, both total and *per caput*, and stated that it is often accompanied by a rise in population. In under-developed countries, increased aggregate product *per caput* requires technological advance and the mechanization of agriculture. I would ask him first what solution he can suggest for the problem of unemployed

agricultural workers, if industrialization has not reached the stage where it can give employment to the workers who have been put out of work by the use of machinery, and secondly whether institutional progress is not the first and most important factor leading to agricultural development.

G. R. ALLEN, *Institute for Research in Agricultural Economics, University of Oxford, England*

Agricultural investment is still inadequate in many under-developed countries. For example, even allowing for the increased funds allocated to it under the third Five-year Plan, Indian agriculture seems to be still neglected. We recognize the possible need for big pushes in the non-agricultural sector and that there may be discontinuities in the functional relationships between inputs and outputs at the macro-level. May it not be the case that something similar exists in agriculture, given the various political constraints which may determine the pattern of agricultural investments?

Certain Mediterranean countries—Turkey, Greece, and Yugoslavia—at various times in the last twelve or so years seem to have achieved a rapid rate of agricultural progress after periods when they have been prepared to devote about 3 per cent. of their gross national product to one form or another of agricultural investment, whereas these same countries have not made much progress in the agricultural sector when it received a lower rate of investment. May there not be, even in agriculture, a threshold level of investment necessary before an appreciable rate of progress occurs, at least in some countries and some political situations? If this is so, and if the required rate of investment in agriculture is some 3 per cent. of gross national product as a minimum, the agricultural development programmes of many under-developed countries are certainly inadequate at the present time.

T. G. WATANABE, *Sapporo, Japan*

Dr. Kuznets may care to consider some of the experiences of my country. During the war of the 1940's Japan closed her economy so that it was autonomous or self-sufficing, and agriculture was comparatively prosperous while the economy as a whole was very poor. Everyone looked to the land for food and clothing. It was like a return to the old feudal state in which agriculture was comparatively important and high rents were collected by the landlords. Happily Japan has twice had land reform, the first time, at the break-up of

feudalism in the 1870's, and the second after the Second World War, by the land reform of 1948.

Since moving out of the closed condition cheap materials have been imported, giving rise to a need to export. The export industries have been privately financed and there have been considerable changes in standards of living and more class differentiation as the open economy has grown. One of the very important matters in the economy, whether it is closed or open, is the problem of dividing the national income between farmers and landlords and between labourers and *entrepreneurs*. It is this rather than growth that should be studied by indexes!

O. SCHILLER, *Bonn, Federal Republic of Germany*

I should like to ask Professor Kuznets whether it would be possible to make clearer the connexion between economic growth and the rise in population. I understood him to say that a rise in population is a factor of economic growth. On the other hand, a too rapid rise in population may slow down economic growth. While an increase in population is an incentive, it can also be a deterrent in this context. The transfer of labour from agriculture to other branches of the economy is one of the prerequisites for rapid economic growth, as has been rightly pointed out. But the bulk of surplus population usually remains in the agricultural sector, and if the increase in population is too rapid, the decrease of the ratio of agricultural to total population is delayed. And it is the reduction of the proportion of the rural population which is also one of the prerequisites for economic growth, as Louis Bean brought out. If the population increase is too rapid, the agricultural proportion does not decrease even when some of it is steadily shifting to other sectors of the economy.

RENÉ BENALCAZAR, *The National Development Bank, Ecuador*

In Latin America the part played by agricultural exports in economic development is very different from the part played by agriculture concerned entirely with home consumption. An increase in agricultural productivity eventually means a lowering of prices. In the case of agriculture operating for home consumption, the lower prices are passed on to our own consumers. But a lowering of the prices of products intended for export means that our savings are being transferred to the developed countries. By means of export revenue we can import capital goods, a strategic factor in our economic development. The difference is quite clear.

D. A. MAULIT, *Department of Agriculture and Natural Resources, Diliman, Quezon City, Philippines*

We have heard of a number of factors bearing on economic growth, but we have yet to hear any mention of organization at the political level as having an influence on it. I wonder if any student of economic growth or any authority on the subject has taken this into consideration.

S. KUZNETS (*in reply*)

I am indebted to the discussants of the paper, particularly Professors Ohkawa and Cépède, for enriching the brief treatment in my paper and introduction by critical comments, pointed questions, and supplementary observations. Rather than reply to the individual comments in the sequence in which they were presented, I find it more useful to organize my concluding remarks around broad topics that have arisen in the discussion and may have been touched upon by more than one speaker. These topics are: (1) definition of economic growth; (2) problems in defining the contribution of a sector; (3) other analytical and policy problems.

First, then, in defining modern economic growth in the paper, I referred to its aggregative (growth in population and in product *per caput*), structural (shifts in identity and relative weight of significant sectors within a nation's economy), and international aspects (its occurrence in nations living in a concert of others). Clearly, Professor Cépède is right in indicating that the term 'development' not merely 'growth', is appropriate. But, to the best of my knowledge, the distinction between the two has not been widely accepted and strictly followed in the English language literature in the field; and I am using the two interchangeably.

It also follows that no claim is made that the simple aggregative indexes, such as total or *per caput* income, are themselves fully adequate guides in the study of economic growth—since structural shifts and international aspects must also be emphasized. Mr. Ramirez and Mr. Watanabe are quite right in stressing sectoral and distributive aspects; but this should not make us overlook the importance of aggregative measures as simple, unitary indexes summarizing the results and giving us rough gauges of complex growth processes at different times and places.

A more important question arises as to the inclusion of increase in population—in addition to sustained rise in product *per caput*—in the definition of the aggregative aspects of economic growth. Mr. Schiller's questions are quite appropriate here. And Mr. Noori's

comment interpreting the rise of population as a *condition* of economic growth indicates need for clarification of what the definition was intended for.

The clarification requires a sharp distinction between the definition of economic growth as a *desirable* process—for various types of countries with different relations of population to resources; and the definition of economic growth *as it has actually been observed*—for various countries within the modern epoch. It would seem clearly desirable for many under-developed countries today to minimize the increase in population and to strive for a marked rise in product *per caput*. It may prove desirable in the long run for many presently developed countries to minimize the increase in both population and *per caput* product, and try to confine economic growth to an increase in product per man hour or, even more, to changes in the structure of output and use of resources that would better satisfy certain needs—without necessarily raising the level of income *per caput* or per worker very much. But what may be desirable is different from what in fact occurred in the past—although it may change the actual path of economic growth in some, as yet undisclosed, future.

By contrast, our definition is intended to formulate the constitutive characteristics of economic growth as it was actually observed in the past. And it is a fact that, by and large, those nations which exhibited economic growth of the dimensions associated with modern times showed not only a sustained and marked rise in product *per caput* but also a large and sustained rise in population numbers. In a definition of economic growth, intended to summarize its basic characteristics as a guide for analysis, inclusion of increase in both population and *per caput* product is indispensable. And since the paper dealt with problems of measurement, which are realistic only in terms of analysis of the past, the definition under discussion was adopted. This, naturally, raises the question as to how results of such analysis of *past* economic growth are to be used in gauging the policies to be used to encourage *desirable* economic growth. I shall return briefly to this question toward the end.

Secondly, the problems in defining the contribution of a sector were touched upon most extensively in the discussion. They can best be dealt with under four heads: (a) the relation between a sector's contribution and the character of its role; (b) the possibility of distinguishing among neutral (zero), positive, and negative contributions; (c) the importance of changing terms of intersectoral trade in measuring the sector's contribution; (d) the possible *international* consequence of a sector's contribution to its own economy.

(a) In the paper I made a brief comment on the ambiguity of the concept of the contribution of a sector. This may be supplemented by saying that it takes two to make a contribution—the contributor and the recipient. For unless the recipient can use the transfer, there is no contribution. This is particularly true when the contribution is not a sale (thus automatically qualifying as something useful to the buyer for otherwise he would not pay for it) but a free transfer. Hence, Mr. Ohkawa's question whether the shift of labour from agriculture to industry is a contribution by the agricultural sector—since decisions on employment, and hence use of the contribution, are in the non-agricultural sectors. And for under-developed countries this question is made all the more significant by the excessive supply of labour and the scarcity of capital. My answer would be that because no contribution can be classified as such unless use were made of it, there is no reason to refuse to credit it to the contributing sector when it is used; nor should we neglect the possibility that the selection of capital-labour combinations is influenced by relative availabilities. And in the specific case of under-developed countries, we should not overlook the advantages that a plentiful supply of labour from the countryside, raised and trained by the agricultural sector, may have for selection of cadres of skilled labour that are in as short as, or shorter, supply than capital.

Nor does it seem to me that identification of the *internal* origin of a rise in product or productivity of a sector as the condition for crediting it with a contribution is a sound approach. Common references to the 'fact' that industry is more 'dynamic' than agriculture, and that the latter grows only by responding to stimulus from the former, easily lead to a denial that agriculture as such can make a contribution to economic growth. To begin with, the implications of such a position are that the non-agricultural sectors of a country are always the initial loci of introduction of modern technology—not a valid generalization, considering that in many follower countries (and all countries but the pioneer are followers) the impact of modern economic technology came *via* demand for some agricultural (or mining) product with respect to which these follower countries had marked comparative advantages. While the impulse here may have come from industry, it was *another country's* industry; and in the countries under consideration the stimulus came from agriculture (or mining). Second, once there occurred technological and organizational revolutions in the agricultural sector of some countries, the impulse in others could well begin in agriculture—in the obvious desire to take advantage of the potential of such changes. Finally,

there have been cases where initial growth in the non-agricultural, 'dynamic' sectors was stifled by failure of traditional sectors, particularly agriculture, to respond; and if this was possible, should we credit the rise in productivity and product of agriculture, even if occurring apparently under the stimulus of a growing industry, completely to the latter rather than mostly to the capacity of the agricultural sector to take advantage of the opportunities, whatever they may have been? It would seem to me far more defensible to credit each contribution to the sector within which it occurred—rather than attempt the nigh-impossible task of linking it with some 'ultimate' causes (even the growth of a 'modern' industry would likewise have to be traced further back).

This conclusion is all the more compelling because, as I have already stressed, the sectors are interrelated; the growth of one has effects on the others, and often requires the growth of others if it is to continue in a sustained fashion. It is difficult, therefore, to answer Mr. Tablante's question as to which comes first, or which ought to be encouraged first—agriculture or industry: the cases, both with respect to the past and with respect to intelligent policy in the future, differ from country to country and from time to time. The important point to stress is that, with qualifications associated with size of country and possibility of reliance on international trade, all major sectors must develop in some balance with respect to each other. And hence a major lag in any one of them calls for stress on it, if the resulting bottleneck is not to strangle overall growth. The mechanism of economic growth may contain, and require, some stimulating sectoral disequilibria; but unless they are kept within bounds and shift their loci, the imbalance would cease to be a stimulus and become a brake.

(b) Mr. Ohkawa suggests that we describe the product contribution of agriculture to economic growth as neutral if its output (say of food) matches domestic demand, and positive only if there is a surplus for export; and likewise, characterize the factor contribution of agriculture as neutral if it contributes only the capital that it uses, and positive if it finances capital formation elsewhere in the economy. This suggestion seems to me intriguing, and I have no objection to drawing a distinction among the cases that he suggests. But it is difficult for me to accept the nomenclature, which would imply that if agriculture turns out more product, say food, and this increased output is absorbed in domestic consumption, *no* contribution is made to a country's economic growth. After all, much of the increase in total and *per caput* output in modern economic growth is absorbed

in the rise of total and *per caput* consumption; and to disregard contributions to the latter would seem to me to reduce the meaning of the term 'contribution' unduly.

The objection to Mr. Ohkawa's application of the distinction to capital transfer is somewhat different. I agree with him that in the case of capital, there is a factor contribution only if there is financing by agriculture of capital elsewhere in the economy (although, as already indicated, I disagree that there is no such contribution when there is transfer of labour). But it is difficult to accept the other part of his suggestion, viz. that when a sector absorbs capital from another sector, a dis- or negative contribution occurs to which, I assume, a negative sign must be attached. If we do this, and calculate factor contributions for all sectors, the sum will be zero; and in that sense there can never be a net factor contribution to a country's economic growth—except when there is a net inflow of capital from abroad. The result is a difficulty in operating with the concept of contribution, when we deal with more than one sector.

I would prefer, therefore, to keep the definition of contribution suggested in my paper, while considering Mr. Ohkawa's distinctions as supplementary rather than alternative. It should be emphasized that if we deal with net product originating in a sector, or with factor transfers out of a sector (whether it be labour or capital), the contribution is already net—in the sense that it is net product that is being considered and that it is net transfers out of the sector that we deal with. And I certainly would argue that we should not neglect the market contribution, although like all the others it requires the co-operation of the recipient sectors, the other partners whose participation is needed for any contribution to take place. For just as Mr. Ohkawa finds it important to distinguish a case where agriculture supplies all of domestic consumption from those in which they supply more, with the surplus available for export (or less, requiring import), so it is important to distinguish the case where agriculture supplies only the consumption needs of the agricultural sector from those in which it provides large supplies to other sectors.

(c) In the discussion in the paper, I paid little attention to shifts in terms of intersectoral trade. It is clear, however, that differential changes in prices of agricultural and of other products will have a direct effect on the measured product contribution of the agricultural sector; and indirect influences on both the market and factor contributions. The question is closely connected with the general index number problems encountered in attempts to measure aggregate product in constant prices; and particularly with the different results

that would be obtained if one were to use price weights relating either to different points of time or weights that assure constancy of the general price level alone or constancy also of sectoral price levels.

There is little to be said in general on this point except for the obvious observation that the magnitude of, for example, the product contribution of the agricultural sector will be different if we use one system of price weights rather than another; and so, of course, would be the magnitude of aggregate growth shown for the economy at large. The choice of the price base and the advisability of using alternative price bases for different variants of the measures of a sector's contribution depend largely upon the analytical purpose of the investigator. All one can say is that shifts in terms of intersectoral trade are of direct bearing both upon the measurement of a sector's contribution, and of much value in *explaining* the changes in the sector's contribution—whether product, market, or factor.

(d) Mr. Cépède is right in pointing out that an agricultural sector's contribution in its own country, say by providing a surplus for foreign trade, may have quite a different impact on other countries. And this suggests the more general observation that what happens in the way of growth in one country has effects, encouraging or retarding, on other countries—encouraging if the other countries succeed in making the proper adjustments to meet the challenge and exploit the opportunity provided by the growth of the given country; retarding if their response to the challenge is inadequate. This means that any contribution that a given sector in country A may make to the economic growth of country A, may have repercussions on the conditions and prospects of growth of countries B, C, D, &c. This impact is most clearly observed when we deal with foreign trade, which was referred to in Mr. Cépède's comment. But there would be an impact through other foreign flows: thus a brief comment in my paper referred to immigration into the United States as factor (labour) transfers from the agricultural sectors of other countries to the non-agricultural sectors in this country. And, clearly, capital transfers out of domestic agriculture have some impact on the opportunities for capital imports from abroad.

While we must be cognizant of these international implications of a sector's contribution within a given country, it is not easy to include them into a system of measurement—except possibly where its effects on international flows of productive factors are apparent. Even then the ways of measuring the contribution are not easily found. Could one measure the *contribution* to the economic growth of some European countries of the competition of agricultural

exports from the United States, or of the loss of labour through emigration from the former? We can observe the readjustments, the responses made to the challenge thus presented, but the contribution to the economic growth of these European countries would be made by the sectors within these countries. Here again, the initial causes may lie elsewhere—as in our discussion above, the initial causes of the rise in product and productivity of agriculture may lie outside that sector. But again it would hardly be sound to try to credit the contribution to these initial causes rather than to the sector within which the response to these initial causes was made. This, of course, need not prevent us, once having established the direct contribution of a sector, from trying to associate it, by testable evidence, with events elsewhere to which we can reasonably ascribe a causal role. But I would argue that we must draw a line clearly between measurement strictly controlled by our observational procedure and the assumption of the inter-relations within a given country (which is at the basis of our conception of sectors in a country's economy), and the *further* analysis that would be required to study the impacts of events which, from the standpoint of a given country, are exogenous (even though these events become endogenous when we study the economic system of the world, or of a large part of it).

Thirdly, there are a number of other questions and comments raised that bear more upon the theory and policy of economic growth than upon measurement. My paper was directed at problems of measurement, and, by design, omitted questions of analysis and policy. Some of these can be answered quite simply if they have not already been answered by what I have already said. Thus, in answer to Mr. Bean's question, I would say that recent studies have confirmed the close association between the level of income *per caput* and the share of income originating, and labour force engaged, in the non-agricultural sectors of the economy. But this does not mean, of course, that merely shifting people out of agriculture would, by itself, raise the country's *per caput* product. To the question raised by Mr. Maulit whether organization at the political level is a factor in economic growth, I would answer by an emphatic 'yes'. To others, such as the one raised by Mr. Allen, as to whether there is a minimum proportion of a country's capital formation that should be devoted to agriculture to do it any good, my answer would be that I do not know; and that the question could be answered only in terms of specific parameters for a given country at a given time. Nor is it clear to me how one would answer the broad questions raised by Mr. Noori as to the importance of institutional progress, or the problem

of unemployed agricultural labour. Nor do I know whether to agree with Mr. Ricardo Letts on the dominant importance of agrarian reform as the pre-condition of a proper contribution of agriculture to economic growth—although I am inclined to agree with him, provided agrarian reform means a variety of measures, not just changes in land tenure.

But it would hardly be possible for me to consider here a full variety of analytical and policy problems raised. Let me rather conclude, with apologies to those discussants whom I have failed to mention by name, by indicating briefly the relations between the quantitative analysis of past economic growth and present policy problems.

The first point to be noted is that the quantitative analysis of the past record of economic growth is designed to establish the common and divergent patterns of growth—for different countries and at different times, so that analytical hypotheses concerning internal patterns of growth under changing international conditions and under changing characteristics of modern technology could be tested, and some notion of their empirical parameters secured. This analysis will never be complete, but it should increasingly enrich our knowledge of economic growth attained in the past, and of the empirical constraints on its rate and structure under different conditions.

Second, all past is different from the present; and of course also from the proximate future. The purpose of the analysis is to elicit from it elements that could, upon consideration, be counted sufficiently stable to have some validity when transferred to the present and the proximate future. Whether in fact the conclusions claimed for the analysis of the past do have such properties is the basic question to bear in mind in considering its value for policy problems. The difficulties of analysis in our field, and the strong biases to which it is subject, must make us beware. And yet it should be remembered that unless the experience of the past is used, the distorting effect of biases of which, in our conditioning by our personal experience and that of our society, we may not be even aware, are likely to be even more damaging.

Third, while the application of lessons of the past involves a critical appraisal of what is still likely to hold as distinct from what may have been the effects of a vanished historical situation, it also requires a vast body of specific knowledge concerning the given country and the given time—if it is to be used for policy purposes within that country and at that time. There have been far too many

general statements, based on quite inadequate evidence, concerning the presumably prevailing situation in under-developed countries, the latter treated as if they were a homogenous category. And while search for data should not be made an excuse for delay in examination and policy action, there should be no failure to use, with critical discernment, the specific information that is available and the use of which can minimize the cost of policies aimed at fostering economic growth.

Finally, and perhaps most important, the patterns of the past do not indicate inevitable and inexorable trends; and while there are some constraints on costs and returns in economic growth, there are also choices. If desirable economic growth is different from the type that was in fact observed in the past, explorations of policy should be made in the light of what is desirable—provided that some approximation to it is proved feasible; rather than in terms of what economic growth in the past has been. This makes the task of critical analysis of past patterns all the greater, since what must be exploited is not only applicability of these past patterns to the given present but applicability of past relations to a pattern that is modified in accordance with what is more desirable. With such a task in prospect, the importance of quantitative checks on the analysis of the past, to minimize over-facile generalizations usually subject to bias, looms all the greater.