LINKAGES IN DEVELOPMENT: A PHILIPPINE CASE STUDY

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by

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I. INTRODUCTION

In the early stages of economic development interactions between the agricultural sector and the rest of the economy form one of the most important facets of economic development.

Important policy implications flow from identification of the nature and effects of interactions between the sectors. Policies which promote such interactions, especially within the real economy, not only improve the regional balance of economic development, but may also help accelerate the

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The views expressed in this study are those of the authors and do not necessarily reflect those of the Institute.

role of growth, both in agriculture and non-agriculture, and lead to a more broadly based pattern of development.

The aim of this study is to provide an analysis of the interactions between the sectors, integrating macro and micro approaches to these interactions with special emphasis on the spatial dimension of development. Most of the empirical work in the study concerns the Philippines, but the conclusions are of much wider application, being relevant to many other countries in the early and intermediate stages of development.

In the early phase of development, the agricultural sector supplies food to the rest of the economy, and as agricultural productivity rises, releases labour to form the non-agricultural work-force. The agricultural sector also is generally the main earner of foreign exchange to finance imports, and provides savings to finance development efforts. The interaction is not just one way: the industrial and service sector supplies the agricultural sector with technology, modern inputs, essential infrastructure and markets for agricultural products. The two-way interaction between agriculture and non-agriculture can thus generate conditions which lead to high growth in both sectors. This study is concerned to elucidate the many interactions - or "linkages" as they are termed below - between the sectors, in order to identify the conditions which make for such a balanced growth pattern, and in particular, the policy framework in which linkages between the sectors will lead to rapid and balanced growth.

The interconnections between the sectors have been subject to considerable analysis at a macro-level (see Mellor for a review), considering the linkages in terms of the macro-aggregates - i.e., savings,

foreign exchange, labour and goods markets - and identifying the conditions necessary for balanced growth to occur. There have also been numerous micro-studies, examining the linkages between agriculture and non-agriculture in particular locations (see Fei, Ranis and Stewart for a review). But the macro and micro approaches to the question of agriculture/non-agriculture interactions have rarely been integrated. Such integration is necessary to understand how linkages between the sectors affect not only the growth of each sector, taken individually, but also the aggregate growth rate, the spatial pattern of such growth, and whether growth in incomes and employment is broadly based geographically and in terms of the participation of different classes.

The term "linkages" is used to describe the manifold interactions between agriculture and rural non-agricultural activities in a developing economy. It is our contention that linkages not only describe the connections between sectors which are a necessary aspect of economic growth and development - their nature and magnitude changing as development proceeds - but also that the extent and nature of these linkages materially affect the rate of growth of each sector individually and that of the economy as a whole. The strength and quality of this process of dynamic interaction, moreover, affects the regional pattern of development, the size and labor intensity of both agricultural and non-agricultural production and, through these mechanisms, the distribution of income. If all of this is true, it follows that linkages and the spatial dimension of development represent an important (and previously somewhat neglected) dimension of development.

It is necessary to distinguish between linkages at different levels of geographic aggregation - i.e., at a world, regional, national, provincial

and local level. Macro-analysis has been mainly concerned with national linkages and aggregates - e.g., how total production/surplus of the agricultural sector affects the total levels of output/investment in the non-agricultural sector. But the linkage effects with which we are especially concerned relate to 'lower' levels - i.e., those which may best be termed "rural linkages." Rural linkages concern the interactions between agriculture and non-agriculture within the rural economy.

This study - which focuses primarily on the Philippines but also draws on evidence from other Asian countries - brings together the diverse elements in rural linkages, categorizes different types of linkage, and draws on relevant micro-studies of linkages and their effects, so as to improve our understanding of how linkages affect patterns of development, and to identify some policy implications that follow.

The paper is organized as follows. Section II presents an analytic categorization of linkages, with a discussion of the nature and direction of causality between linkages and sectoral and aggregate growth. Sections III - VII present some empirical evidence: Section III focuses on the magnitude of non-agricultural income and employment in a number of Asian countries; Section IV presents some evidence on the significance of linkages based on micro-studies outside the Philippines, focusing separately on two different directions of causality - first, on the ways in which agricultural growth affects industry; and secondly, on the ways in which industrial growth affects agricultural development. Section V presents some aggregate evidence for the Philippines on the growth of the agricultural and non-agricultural sectors, development strategies and spatial developments. Section VI reviews and analyzes existing micro

evidence on linkages in the Philippines. Here too we categorize evidence into the two directions of causality noted above. Section VII presents some evidence of our own on linkages from industry to agriculture in the Bicol region of the Philippines. Section VIII contains our analytical and policy conclusions on the significance of linkages.

II. LINKAGES: AN ANALYTIC REVIEW

There are many dimensions to the linkages between agriculture and non-agriculture. Different aspects acquire prominence at different stages of development. There are two reasons why these relationships are of paramount significance in the course of development. First, agricultural products and non-agricultural products are different in kind and cannot substitute for each other. Food is an essential component of consumption in both sectors, while the industrial sector provides inputs for both sectors, and a part of consumption. Non-agricultural products account for an increasing proportion of total consumption as household incomes rise and constitute an essential incentive for rising agricultural production. Secondly, the agricultural sector dominates the economy at an early stage of development in terms of both employment and output. The performance of the agricultural sector thus conditions aggregate development possibilities, as a source of savings, foreign exchange earnings, labor and as a market for non-agricultural products. Industrialization represents an equally intrinsic part of development, feeding back on agriculture, increasing in importance as per capita incomes rise. Moreover, while non-substitution between the sectors remains, foreign trade increasingly permits industrial production to be converted into agricultural consumption, and the agricultural sector ultimately becomes of lesser

significance to the economy as a whole as countries develop and industrialize. Many of the major early linkage functions of the agricultural sector - savings, foreign exchange, markets - are later increasingly fulfilled by the industrial sector itself. While the aggregate significance of agriculture diminishes at later stages of development, the nature of linkages in earlier stages is of considerable importance in determining the pattern of industrial and agricultural development, in terms of economic and spatial balance, choice of technology, employment, and the distribution of income.

II.1 Strategies of Development

In the early stages of development, there may be limited strategic options. All countries have to rely on their agricultural (or mineral) sectors for foreign exchange to finance the early stages of import substituting industrialization. But later, a wider choice emerges. Countries have options with respect to trade, and with respect to internal development. Moreover, there are connections between the two. The strategic choices with respect both to internal developments and to international trade affect the magnitude of linkages and the spatial pattern of economic development.

The trade options have been thoroughly explored in the literature; in particular, the distinction has been drawn between an industrial strategy of continued, or secondary, import substitution, and one of emphasis on labor-intensive exports at the end of early, or primary, import substitution. Secondary import substitution involves expansion of industrial production into capital and intermediate goods production and into 'elite' consumption. Both tend to involve rather capital-intensive

production methods. Because of the continued protection required, this option often means that the domestic terms of trade for the agricultural sector continue to worsen. In contrast, a labor intensive export strategy may be associated with improved domestic terms of trade for agriculture, and because of the greater employment associated with the strategy, higher demand for agricultural products.

On the internal side, the major options consist in a balanced growth strategy, in which agricultural and non-agricultural growth are mutually supportive and linkages are significant, or a more lopsided development in which industrialization becomes self-supporting, with limited links to the agricultural sector. The first option may constitute a 'virtuous circle' type of development pattern in which increased agricultural output is associated with patterns of consumption for non-agriculture involving labor intensive technologies in both urban and rural areas, thus leading to a mutually reinforcing growth in employment, incomes and consumption in both sectors with spatial dispersion in the pattern of industrialization. By contrast, industrialization involving expansion of the capital intensive production of capital goods and elite consumption goods may occur with little interaction with the agricultural sector, and little regional dispersion of industry.

There are some natural links between the trade options and the internal options. A secondary import substitution strategy involves reduced links between industry and agriculture. It tends, in the long run, to lead to problems both internally and externally. Internally, it is generally associated with enclave development, concentrating the benefits of development rather narrowly, leading to inadequate employment opportunities, maldistribution of income and extensive poverty.

Externally, it tends to require heavy borrowing with subsequent debt problems.

A balanced growth strategy is designed to avoid the internal 'enclave' phenomenon by spreading participation in development more widely, geographically, and across classes. Balanced growth is liable to generate a more self-reliant form of development, with internal sources of savings and markets. However, to maximize its benefits, the strategy also requires international trade to make efficient use of the available opportunities. The emphasis on export of labor intensive commodities and of processed primary products is a natural adjunct to this strategy, since the linkages involved in these types of exports will reinforce the internal balanced growth linkages.

The nature and implications of alternative strategies will be elucidated more below, as we analyse linkages in greater depth.

II.2 An Aggregate Operational Perspective

Diagram II.1 shows the interrelationships between the agricultural and non-agricultural sectors in a closed economy. These have each been divided into a production sector and households. Intersectoral linkages at this level of aggregation may be classified into four types, as shown by the four circles in the middle of the diagram: i) intersectoral commodity exchange; ii) intersectoral finance, iii) intersectoral labor migration and iv) intersectoral exchange of information. The arrows indicate the direction of the flow of monetary payments - with flows in the opposite direction implying the movement of real goods and services.

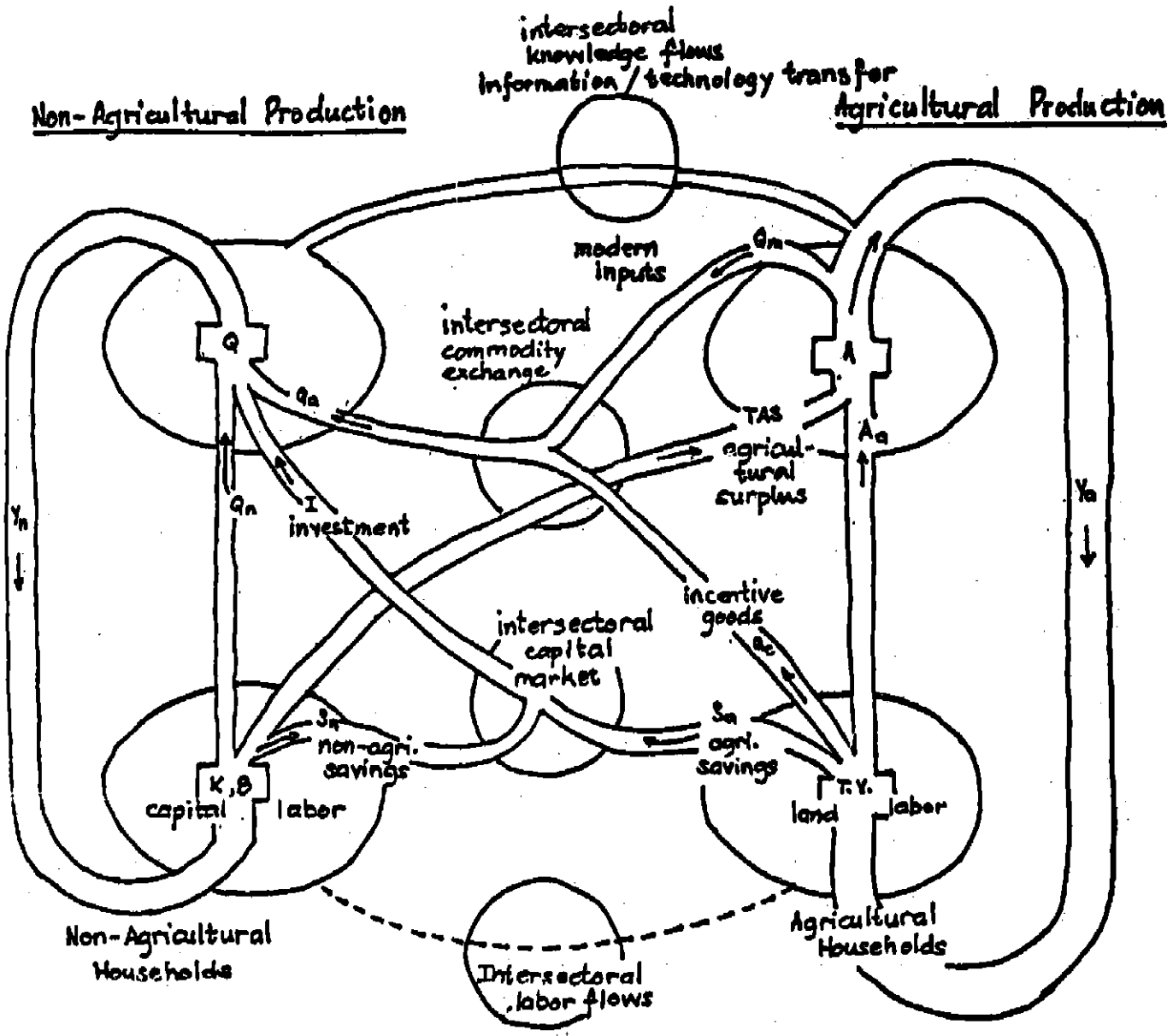


Diagram II.1 Operation of Dualism

In intersectoral commodity exchange, part of the total output of the agricultural sector (A) goes to the agricultural households for self-consumption (A_a) and a part is bought by non-agricultural households. This flow is labelled as TAS, or total agricultural surplus. This, it is important to note, is a commodity surplus (i.e., the excess of production of agricultural commodities over consumption of agricultural commodities in the agricultural sector) and is not equivalent to agricultural savings (or the excess of agricultural production over total consumption of agricultural and non-agricultural commodities in the agricultural sector). Similarly, total output (Q) of the non-agricultural sector is partly consumed by the non-agricultural households (Q_q) while the rest of the non-agricultural output takes the form of investment goods (I), agricultural and non-agricultural, or of goods bought by the agricultural sector Q_a. This component, Q_a, is further divided into a modern intermediate inputs for agriculture (Q_m) and consumer goods (Q_c) for agricultural households.

The agricultural production sector makes factor payments for land and labor (Y_a) as well as payments for modern inputs (Q_m). The income received by agricultural households is either spent on consumption ($A_a + Q_c$) or saved S_a, flowing into the finance sector. Similarly, for the non-agricultural household sector, factor payments (Y_q) are either consumed (Q_q plus TAS) or saved (S_q). S_q and S_a together constitute the total savings funds of the economy that "finance" investment in a closed economy.

In addition to commodity and financial flows, intersectoral labor movement occurs, i.e., the reallocation, over time, of a portion of the agricultural labor force to the non-agricultural sector, as non-agricultural labor, through the intersectoral labor market. Analysis of

intersectoral linkages or interactions at the aggregate level is concerned with the way these economic functions are carried out.

A further linkage is the technology information/education flow from non-agriculture to the agricultural sector, a flow which enhances agricultural productivity, both via the achievement of literacy (see Tang) and the effects of agricultural R and D and extension (see Evenson and Kislev).

At an early stage of development, the size of the total agricultural surplus (TAS) - i.e., the excess of production of agricultural commodities over consumption of agricultural commodities within the agricultural sector - is critical to the development of the whole economy, since the development of an agricultural surplus constitutes an essential prerequisite for the growth of the non-agricultural economy. In a closed economy, this surplus is required to permit the reallocation of labor from agriculture to non-agriculture. In an open economy, there is a possibility of exporting food from the non-agricultural sector, but the agricultural sector often provides the source of foreign exchange through the export of commodities.

The main determinant of the agricultural surplus is the level of agricultural labor productivity, P. The surplus of production over self-consumption is directly related to P, since the proportion of income spent on food declines as incomes per head rise. Consequently, the growth of agricultural productivity is a critical determinant of the development potential of non-agriculture and of the economy as a whole.

II.3 Classification of Rural Linkages

Direct linkages may take the form of consumption linkages, i.e., where incomes generated by activities in one sector lead to demand for output of another sector. These, clearly, may operate both from agriculture to non-agriculture and conversely. Secondly, there are production linkages, which may be backward or forward. Backward production linkages occur where productive activity in one sector requires inputs from another, e.g., machinery or fertilizer. Forward linkages occur where production of a commodity provides supplies for productive activities in other sectors. Formally, the forward linkage of one sector may be regarded as the backward linkage of another - i.e., the use of domestically grown cotton in spinning represents a forward linkage from the point of view of agriculture and a backward linkage from the point of view of the textile industry. What is emphasized is in part a matter of which industry is the main focus of the study, and in part which sector is thought to be the initiating or causal agent of the linkage.

The magnitude of these linkages are all dependent on the level and type of agricultural production: they impose demands on the non-agricultural sector. Such demands may be met by local industries, by national industries or by international industries, depending on the nature of demand and the supply response at the various levels. Clearly, the dynamic interaction between agriculture and non-agriculture within the rural economy depends on how rural non-agriculture responds to these demands and, conversely, on the extent of leakages out of the local economy. Consequently, maximization of the stimulus to rural industry depends on maximizing agricultural demands (by affecting the level and type of agricultural output) and minimizing leakages out of the rural economy.

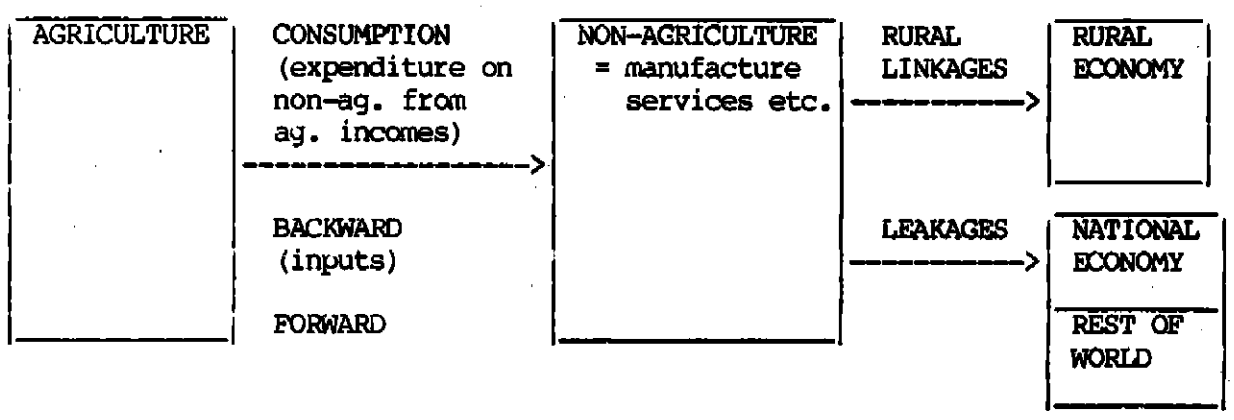
There are also linkages which operate in the opposite direction i.e., from non-agriculture (henceforth referred to as 'industry') to agriculture. Broadly these are of three types: (i) demand-related, consisting of demand for agricultural products by the industrial sector; (ii) supply-related, consisting of the supply of items which will help promote agricultural output; (iii) motivation-related, dealing with the perception of investment opportunities outside agriculture and the acquisition of non-agricultural incentive goods. Supply-related linkages include privately supplied inputs (already dealt with above as backward linkages of the agricultural sector), publicly supplied goods and services such as electricity, roads, education and extension, and a more amorphous set of influences encompassing the development of a network for the exchange of information on both formal and informal technology transfers - including appropriate technology, (both processes and goods), and the expansion of modernizing influences which tend to be associated with industry and urbanization within the rural economy.

Diagram II.2 summarizes these various relationships, which, together, constitute what is meant by "rural linkages."

As is clear from the two parts of this diagram, there exists a two-way interaction between the two sectors both at a macro-level and within the rural economy: that is, an increase in agricultural productivity generates demands on the non-agricultural sector while growth in this sector in turn raises demand for the output of the agricultural sector. In addition, informal technology information networks and modernizing influences increase with the development of non-agricultural activities in the rural economy.

CLASSIFICATION OF RURAL LINKAGES

I. Agriculture to industry (initiated by agricultural growth)



II. Industry to agriculture (initiated by non-agricultural development)

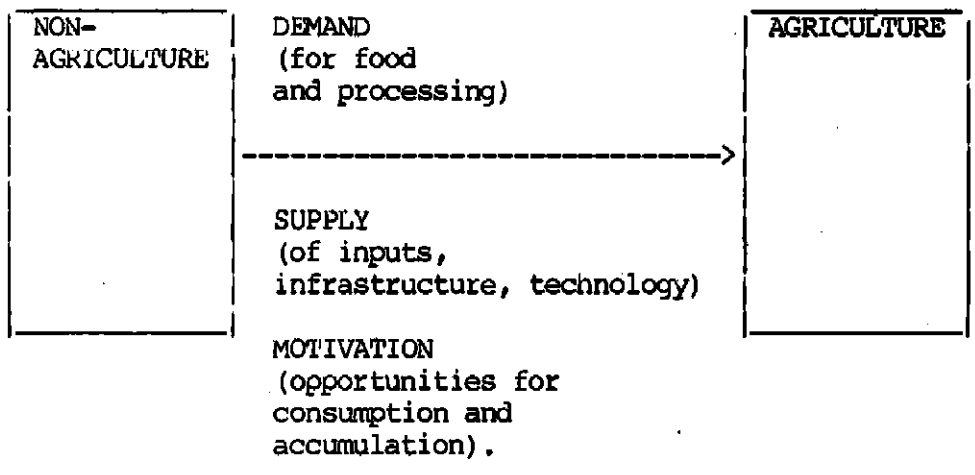


DIAGRAM II.2

Linkages themselves therefore represent one important factor affecting agricultural growth - not only because the non-agricultural sector supplies the essential non-labor inputs, but also because it is the source of much technology transfer, incentive goods for consumers and technology transfers. As noted, the size of the agricultural surplus which is critical to the determination of the potential growth of non-agriculture, is itself largely dependent on growth in agricultural productivity.

The existence of this two-way interaction gives rise to the possibility of a process of cumulative growth, or to that of a cycle of stagnation. The magnitude of the potential growth-promoting processes, in other words, depends on the magnitude of the linkages in each direction. The next section considers some factors determining the magnitude of the linkages and of their effects.

II.4 Factors Affecting the Magnitude of Rural Linkages

(a) Income Distribution

Income distribution in the agricultural sector is related, among other factors, to asset distribution, a more equal distribution of land being associated with a more equal distribution of rents (or imputed rents) and also with a more labor-intensive pattern of production and therefore larger incomes from employment.

For any given level of agricultural output, income distribution in agriculture is important to the determination of the magnitude and nature of consumption linkages. In general, a more equal distribution of income tends to be associated with a higher propensity to consume, a higher propensity to consume food and a lower propensity to consume non-foods. A

more equal income distribution will also tend to be associated with a greater propensity to consume goods produced locally in the rural economy, and to consume labor-intensive and appropriate goods from the rest of the economy.

Suppose s, f, z, t_L, t_K, i represent the marginal propensity to save out of income (s); the propensity to consume the unprocessed element in food (f); locally produced non-food items (z); goods produced in the urban centers outside the local economy (t), of which some are appropriate labor-intensive items (t_L) and some are more elite, capital-intensive goods (t_K); and the propensity to spend on goods imported from the rest of the world (i). Then $s + f + z + t_L + t_K + i = 1$. Local consumption linkages will be stronger the higher z, and may also be positively related to f since extra consumption of local foods raises agricultural incomes further and also generally involves some local processing. National consumption linkages will be stronger the higher $z + t_L + t_K$.

These propensities are affected by income distribution in agriculture. A more equal income distribution may be associated with a lower s, which would tend to increase local consumption linkages, although it would reduce TAS. But this could be offset by a tendency for a more equal income distribution to be associated with a higher f. More equal income distribution is also likely to be associated with a higher z in relation to t and i, and within t to a higher t_L in relation to t_K.

The net result obviously depends on the combined strength of these effects. It seems likely that z will tend to rise (i.e., local consumption linkages to rise) and t_L to rise (i.e., linkages with appropriate labor-

intensive goods produced nationally to rise) as income distribution becomes more equal. But this is an area where more empirical evidence is needed.

The higher z and t_L the greater local and national employment opportunities, respectively, while the additional employment gives rise to further linkage effects. If z and t_L rise, the wage-bill will rise, and consequently the demand for food (along with the demand for non-foods produced locally and for appropriate consumption items produced elsewhere). The second round effects therefore include an expansion of demand for these items. There is a general presumption that locally produced goods are more labor-intensive (and produced on a smaller scale) than goods produced nationally.

It follows that dynamic mutually reinforcing patterns of consumption and production may occur. For example, suppose there is an increase in agricultural output which is fairly equally distributed, in terms of extra incomes, among rural households. This would be associated with extra demand for the products of rural industry as well as for mass produced urban goods. The extra rural non-agricultural activity will further raise rural incomes and therefore consumption, while additional labor incomes generated by the expansion of demand for mass produced appropriate urban goods will increase the demand for agricultural products and also for some mass produced urban products. Hence, a virtuous circle may develop of increasing demand and supply of agricultural products, rural non-agricultural products and mass produced appropriate urban products. This would be associated with increased participation of the underemployed in both production and consumption and an improvement in the distribution of income.

This virtuous circle can proceed only so long as it is not interrupted by supply bottlenecks. One such potential bottleneck would be a limit on the supply of food. This was noted earlier, in focusing on the existence and expansion of TAS and therefore on the need to achieve sustained growth in agricultural productivity for sustained balanced growth. Another potential bottleneck, which would limit the supply response, would be limited capacity in rural industries, perhaps caused by inadequate infrastructure and human capital. A third possible bottleneck would be caused by the limited supply response of the urban industrial sector. At a national level, a dynamic balanced interaction can occur only in the presence of reasonably good transport links between rural and urban areas, permitting the efficient movement of goods in each direction.

A virtuous circle of the type described here does not need to be initiated in the agricultural sector. It could be initiated by an increase in industrial production, which would be associated with extra demand for agricultural products (for food and/or food processing) and extra demand for mass-produced labor-intensive commodities; or it might be initiated by improvements in the quality of transport and communications linking the sectors.

In contrast to the process of dynamic interaction we have described, an increase in agricultural production that is associated with an initially heavily skewed asset and income distribution (e.g., one involving the additional payment of rents to urban landlords and for industrial inputs, but no increase in payments to labor) would raise expenditures on elite consumer goods, t_K, but would have little effect on the demand for agricultural products, appropriate rural industrial or mass-produced urban products. Consequently any further dynamic interactions would be limited.

Moreover, the extra industrial output associated with capital-intensive production, involving extra profits and some extra income for highly paid skilled workers, would involve much less extra demand for the agricultural sector or for appropriate products produced either in the rural or urban areas.

(b) Asset Distribution and Backward Linkages

The extent of backward linkages (quality and type of demand for inputs of the agricultural sector) also partly depends on the distribution of assets (and credit). More equal distribution of land tends to be associated with greater use of labor and less use of other purchased inputs, including capital. Consequently, more equal land distribution will tend to be associated with higher local consumption linkages, but lower backward linkages. However, the inputs that are used by smaller farmers may involve a larger element of local production than those of larger farmers, so local backward linkages might be high.

(c) Crop Composition:

Crop composition is a further factor determining input use, with some crops requiring more labor (and therefore leading to higher consumption linkages), while others use more capital or other inputs. Crop composition also affects the potential for forward linkages. Crop composition itself depends on the local policy and resource environment, domestic demand patterns, and the extent of export specialization. The development of labor intensive crops and those suitable for local processing affects potential for increasing consumption and forward linkages.

(d) "Supply" factors:

Linkages between agriculture and industry may be enhanced by the provision of various facilities, including electricity, roads, research and development and extension. Some of these can increase the strength of some linkages and reduce that of others. For example, improved roads to major urban centers may increase the extent of national linkages, but reduce local linkages since it becomes easier for rural consumers to obtain their consumption from national centers and to have their produce processed centrally. Similarly, information about new technologies and new products may reduce the use of local goods. These infrastructural items are an important area for government policies to promote rural linkages.

II.5 Spatial Dimensions of Development

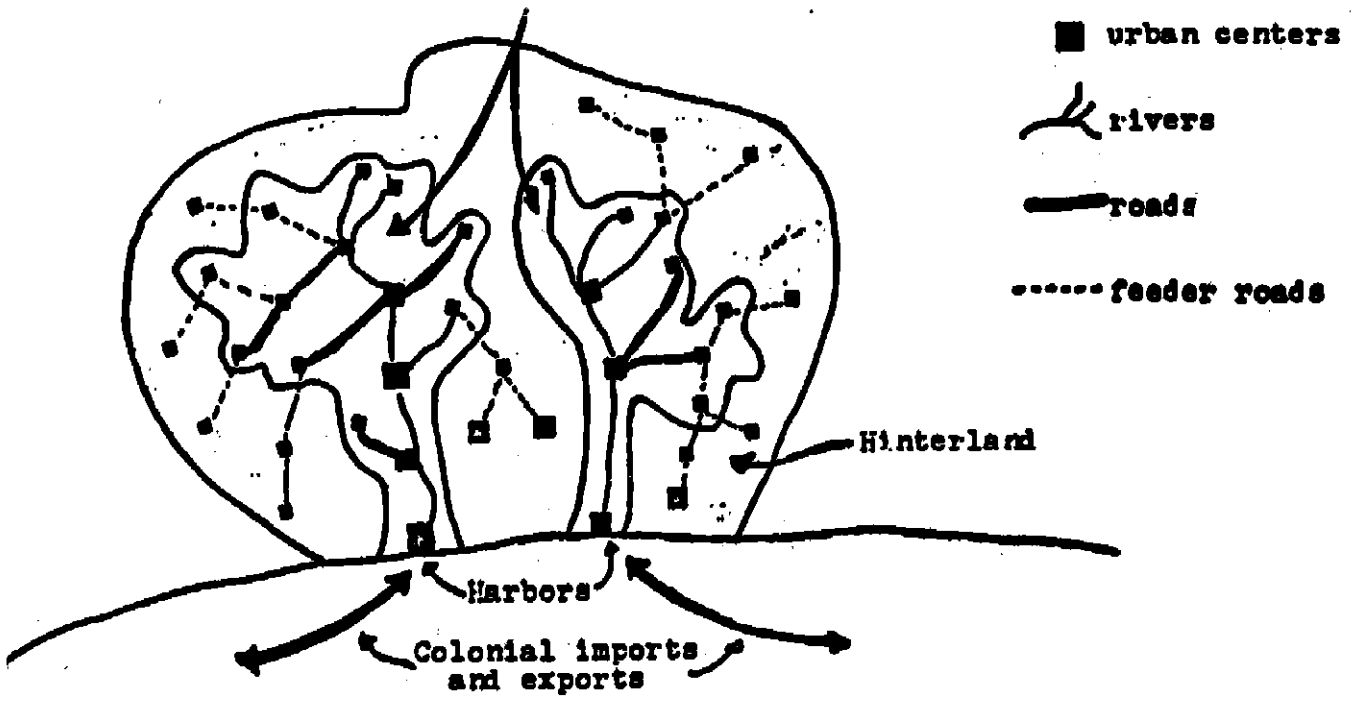
The spatial dimensions of development are of critical importance, if economic growth is to extend throughout the population and the benefits of dynamic interaction between the two sectors are to be maximized. Yet this dimension is often neglected in focusing on economic aggregates. The issue of agricultural/non-agricultural linkages has an intrinsic spatial aspect because, by its nature, the agricultural sector is geographically dispersed. This section focuses on this spatial dimension, indicating the mutually positive effects that the agricultural and non-agricultural sectors may have on each other, where there is close physical proximity between the two types of activities.

Most less developed countries inherited a colonial system (political and/or economic) which involved certain spatial aspects. A colonial economic system typically includes two distinct types of economic regions (see Diagram II.3), with an enclave region and a hinterland. The enclave

region is formed by the linking of a hierarchy of urban centers through railways, roads, and/or rivers. As a rule, these enclaves represent those regions of the system which were initially most affluent because of their well developed irrigation and transport networks. The major harbor in capital cities like Manila and Bangkok becomes the center of urban activities and links the country to the rest of the world.

Colonial economies were typically based on the export of a particular primary product (e.g., fibers or minerals) produced in the enclave, collected through the transport network, and exported through the major harbors to world markets. In return, the imports from the industrially advanced countries, consisting of manufactured consumption goods (e.g., textiles) and producer goods, entered through the same harbors, and were distributed to the country's primary producers. At later stages of colonial development, foreign capital inflows supported the establishment of foreign owned factories (e.g., textile mills) and service establishments (e.g., wholesale and retail distribution, warehousing, banks, etc.) to supply consumer goods.

Two major weaknesses of the colonial economic system - which many developing countries inherited on independence - were its extreme sensitivity to the external terms of trade and its compartmentalization. Typically the economy was divided spatially into two more-or-less unintegrated parts - the enclave and the hinterland (Diagram II.3). The enclave was relatively advanced, encompassing modern industries characterized by economies of scale, capital intensity, and the incorporation of modern science, in large urban centers. In contrast, small scale industries and specialized handicrafts were located in the



Spatial Perspective of Economic Colonialism

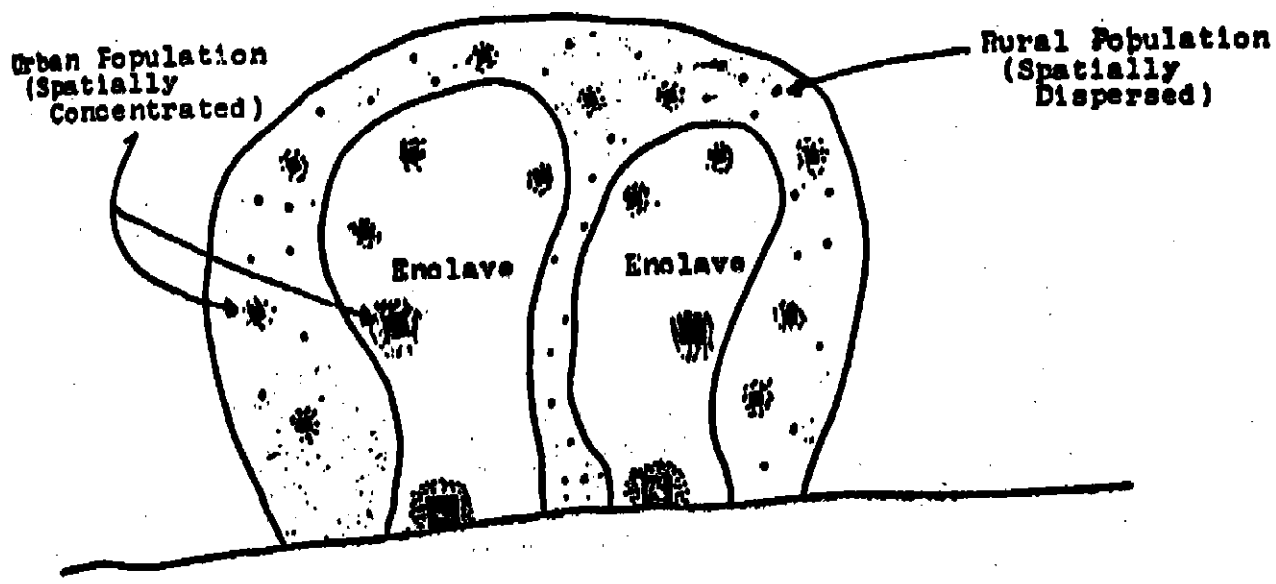


Diagram II-3 Location of Population in a Dualistic Economy

smaller urban centers of the hinterland, characterized by traditional technologies in terms both of the labor-intensity of the processes and the product characteristics.

There was also a sharp contrast from a cultural or attitudinal point of view. While the enclave was generally characterized by a commercialized attitude, the traditional region was often more conservative in outlook. Traditional objectives of family and community survival and security were gradually converted, over many years of colonialism, into more individualistic attitudes, characterized by a desire for new goods and asset accumulation. In summary, the traditional hinterland had greater community orientation in contrast with the relatively greater market orientation of the enclave.

When a country of this type began to try to attain modern growth (as occurred widely after 1950), actions, of economists as well as government officials, usually concentrated overwhelmingly on the enclave, where colonial-type profits continued to be made. While the enclave gradually changed its character from being largely raw materials-oriented to largely industry-oriented, the relative situation of the hinterland was often not profoundly affected.

In such a context, there is a strong spatial aspect to linkages. The way to mobilize the traditional hinterland and involve it in development is to break the compartmentalization left by colonialism, through economic interaction with the relatively advanced enclave. The spatial spread of the forces of modernization, from the point of view of technology, organization and attitudes involves increased integration or linkage between the two regions as well as between the sectors, through which

modern inputs, attitudes and organizational methods can be gradually transmitted from the "modern" sector of the enclave to the traditional hinterland.

Skinner emphasised the spatial dimension of development, and hypothesized that:

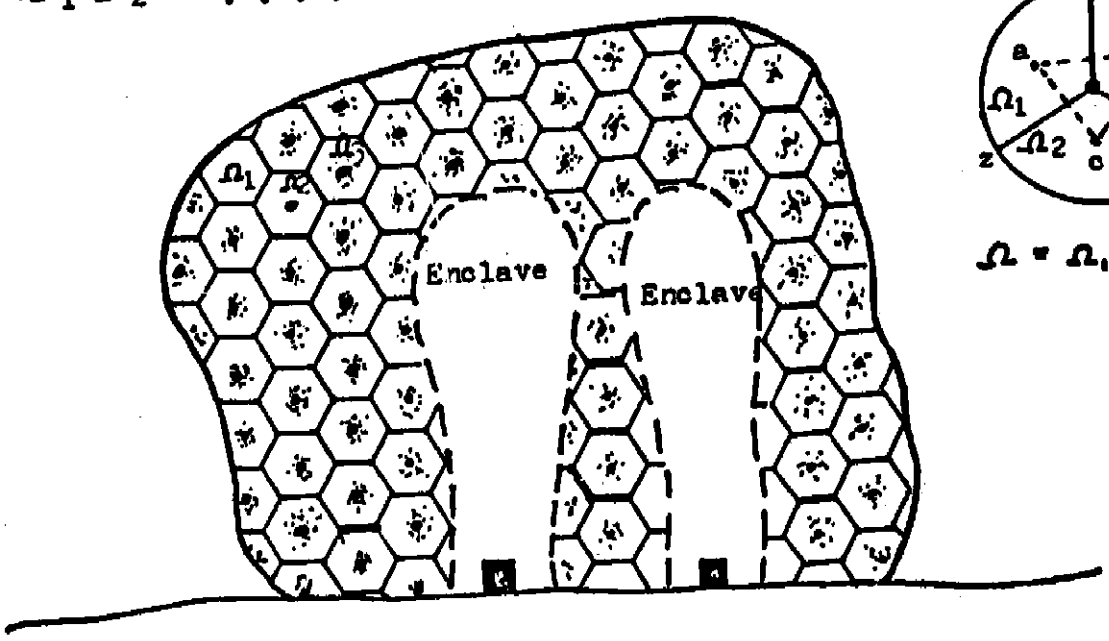
> (1) Economic development occurs in a specific locational matrix, there may be one or more such matrices in a particular economy.
>
> (2) The locational matrices are primarily industrial-urban in composition; as centers in which development occurs, they are not mainly out in rural farming areas, although some farming areas are situated more favourably than others in relation to such a center.
>
> (3) The existing economic organization works best at or near the center of a particular matrix of economic development and it also works best in those parts of agriculture which are situated favourably in relation to such a center; and it works most satisfactorily in those part of agriculture which are situated at the periphery of such a matrix. (Skinner, p. 147)

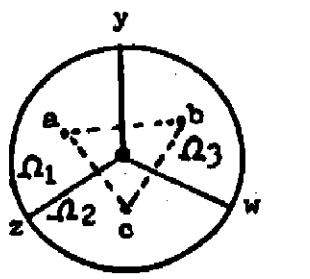
II.6 The Dualistic Standard Market and the Local Rural Community

In the analysis which follows, a dual standard market is used to define a rural community (see Skinner). In diagram II.4, the urban and rural populations of diagram II.3 are partitioned into a number of localized "market areas," each of which contains a single urban center (with its urban population) and its share of the rural population.

Diagram II.5 presents a microscopic view of a typical standard market area. At the center is an urban center with its spatial concentration of population. This urban population engages in non-agricultural production

$(\Omega_1\ \Omega_2 \quad : \ldots \Omega_n)$ 72





$\Omega = \Omega_1 \cup \Omega_2 \cup \Omega_3$

Diagram II-4 Standard Market Areas

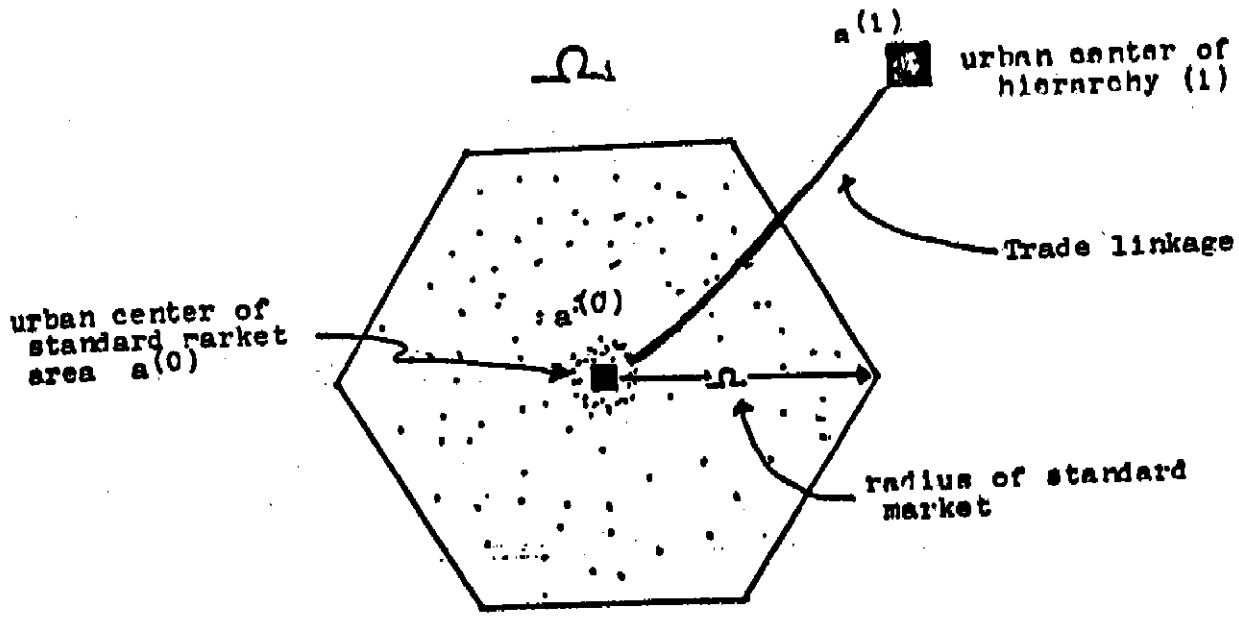


Diagram II-5 Standard Market as a Dualistic Community

(e.g., rural handicrafts, food processing, Z goods, retail trade), while it also serves as the center of educational and spiritual life (schools, recreation, religion) as well as political administration (justice, police, tax collection, and government services). The urban center is the focal point for contact among all the economic agents living within the standard market area, including the more dispersed farmers. In the presence of a relatively primitive means of transport and communication, the only way farmers can communicate with members other than their own immediate family and neighbors, is by going to these urban centers.

It is now possible to add a spatial dimension to the account of intersectoral linkages of Section II.2: while agricultural production is carried out by the spatially dispersed farmers, non-agricultural activities are partly carried out in the household and partly in urban centers at different levels of the hierarchy. Dualistic exchange, i.e., the exchange of agricultural for non-agricultural goods, takes place; farmers take their produce for sale to the market place at the urban centers and buy most of their non-agricultural requirements in the same marketing centers. While carrying out these economic functions, the farmers also have other contacts which permit them to acquire modern products and ideas: they learn about incentive goods like bicycles, sewing machines, factory printed cloth and radios as well as about modern producer goods such as chemical fertilizers, agricultural machinery and new seeds. Formal education and extension help spread improved agricultural methods but informal contacts also play an important role in enabling farmers to learn about the world of the enclave and beyond.

The existence of numerous small urban centers (or standard market centers) is basically due to the need to economize on transport time and

costs. Other things being equal, a smaller standard market is favorable to the modernization of agriculture. This is due to the fact tnat a smaller market area involves a much more close-knit community in the sense that it is easier and cheaper for farmers, especially those located near the market boundary, to engage in more frequent contact with the urban centers.

Agricultural stagnation in the hinterland can be explained in the context of a vicious circle paradigm. For a traditional society, the fact that agricultural productivity is relatively low leads to a relatively large market area and a relatively low volume of dualistic exchange; this, in turn, reinforces agricultural stagnation because it is not conducive to rural-urban interaction. As in all vicious circle arguments, such pessimism also implies the possibility of optimism, that is, once agricultural productivity increases, it will lead to more rural-urban interaction and linkages that will further the expansion of both industrial and agricultural productivity through the promotion of rural/urban interaction. At the same time, all vicious circle arguments suggest that it is not always easy to say for sure what is the best way to "shake things loose" because everything is related in a dead-locked as well as in a dynamic system.

While we have portrayed the standard market as a locally self-sufficient economic unit as a first approximation, this is, of course, not true. The higher the level of agricultural productivity (i.e., the more affluent the rural community), the greater the links with towns of higher hierarchy. Higher hierarchy urban centers contain industries and other establishments with greater economies of scale and higher level administrative, cultural and social units.

These relationships are likely to vary according to the stage of development and the size of the relevant urban center. For example, at the early stages of development, the effect on farmer attitudes through contacts may be of paramount importance. However, in many countries it seems that most farmers already have a capitalist-type orientation towards incomes, consumption goods and accumulation, making proximity more important for its effects on supplies and markets than motivation.

Similarly, these proximity effects would tend to be greater, the bigger the size of the urban center. Urban centers of higher hierarchies offer a wider range of services and consumer goods, and greater contact with the enclave and the rest of the world. Greater proximity to these (also a function of distance and transport) is also likely to be a positive factor in agricultural modernization, especially at a later stage of development.

Assuming proximity does contribute to balanced growth in the ways enumerated above, certain policy implications follow: policies which increase the degree of contact would contribute to raising both agricultural and non-agricultural productivity. Such policies include those affecting industrial location, i.e., decentralized industrialization would ceteris paribus, have positive effects on agricultural modernization which, in turn, feed back on further industrialization. Moreover, policies relating to the improvement of transport and other infrastructural links between the agricultural and non-agricultural populations at different levels of urban hierarchy would remove a bottleneck to various kinds of linkage playing themselves out, with a dynamic mutual interaction between agriculture and non-agriculture as a consequence.

The analysis suggests the importance of proximity between farmers and urban centers for agricultural and industrial modernization. This concept of proximity has two dimensions: first, it is a function of the average distance between the individual farmer and the relevant urban industrial center; secondly, of the available means and cost of transport.

The degree of such proximity has a number of effects on farmers' and rural industrialists' activities:

i) by increased contact with modern activities and consumer goods it may change their attitudes towards a more capitalist orientation;

ii) the more immediate proximity of the various services (e.g., technical advice, credit, fertilizer, seed supply, raw materials) may lead to greater use of modern inputs, through decreasing their price (including transport costs), increasing their accessibility and enhancing knowledge about improved technologies, both through the formal network and through informal contact with other farmers;

iii) greater opportunities arise for farm family members to participate in non-agricultural activities for part of the year; and there may be a greater incentive to accumulate in agriculture in order to finance non-agricultural activities;

iv) markets for both agricultural and non-agricultural products will be widened which may rise the price received by farmers and provide markets for more diverse products (e.g., vegetables and fruits);

(v) the price of consumer goods (allowing for transport costs) is likely to be reduced with greater proximity and their availability increased.

III. THE SIGNIFICANCE OF NON-AGRICULTURAL ACTIVITY IN ASIA

Non-agricultural employment in rural Asia plays a critical role in:

- sustaining employment and incomes in the face of rising population;
- providing seasonal occupations for farm workers during less busy times of the year;
- contributing to equality and poverty alleviation, by increasing the incomes of the poor;
- performing the "linkage" functions (described in II) thereby contributing to a dynamic and equitable growth cycle.

In the words of Oshima "There is no way that a densely populated agriculture can manage to sustain the growth of its income over long periods and keep up with the growth of urban incomes without a rise in income from off-farm sources" (Oshima 1984).

III.1 Income and employment generated by rural non-agricultural activity

The experience of Asian countries in generating non-agricultural income has been varied, as Table III.1 and III.2 show.

Table III.1 provides estimates of non-agricultural incomes among farming families. For every country except Bangladesh the proportion of household income arising from non-agricultural sources has been rising over time, against a background of rising household income both from agriculture and non-agriculture.

With the exception of China (where definitions may not be comparable), non-agricultural services account for a significant proportion of farm household incomes in every country, but there are very large variations between countries with proportions under a quarter in the Philippines,

South Korea, Malaysia (1971) and Bangladesh; and proportions over a quarter in Malaysia (1979), Sri Lanka, Nepal, and Taiwan.

Table III.1: NON-AGRICULTURAL INCOME AS A PROPORTION OF TOTAL HOUSEHOLD INCOME OF FARM FAMILIES

East Asia		Total income per agricultural household (RBM)	$	% non-agricultural income
China	1978	133		2.6
	1979	160		2.4
	1980	191		4.8
	1981	224		7.4
		(1000 won)		
South Korea	1970	228	611	14.5
	1975	797	1,647	12.2
	1980	2250	3,409	24.4
		(1,000 NT$)		
Taiwan	1970	31	775	45.2
	1975	76	2,000	47.3
	1980	166	4,611	65.1
South-East Asia		Pesos		
Philippines	1965	3103		11.5
	1971	4566	710	17.0
	1975	3010	401	16.2
Malaysia		m M $		
	1973	269	110	13.6
	1979	590	269	28.1
Thailand	1971	16,000	765	37.5
	1978/79	17,807	873	38.0
South Asia				
Bangladesh	1963/64	876		17.8
	1973/74	1041	122	22.0
Sri Lanka	1963	2,400		27.5
Nepal	1977	5569	445	35.6

Source: Oshima (1985)

The Taiwan experience is exceptional with a proportion of 45 percent in 1970 rising to 65 percent in 1980 - reflecting the dispersed pattern of industrialization in that country.

Table III.2 shows proportions of rural employment in non-farm activities. It differs from Table III.1 in including non-farm households and excluding those who are primarily farmers and do other things as a secondary occupation. Since estimates suggest 10-20 percent of the rural male force participate in non-farm work as a secondary occupation (Chuta

Table III.2: PERCENTAGE OF RURAL LABOR FORCE WITH PRIMARY EMPLOYMENT ACTIVITIES, ASIA

Country or area	Year	Percentage In Rural nonfarm activities
Rural		
Bangladesh	1951	14
	1961	14
Thailand	1972	18
India	1961	18
	1966-67	20
South Korea	1970	19
Pakistan	1951	27
	1961	31
Indonesia	1971	28
Philippines	1970	28
West Malaysia	1970	32
China*	1982	12
Rural, including rural towns		
India	1966-67	24
South Korea	1970	25
West Malaysia	1970	37
Philippines	1970	40
Taiwan	1966	46

*
Rural is defined to exclude shi (cities) and zhen (statutory towns but include "towns" not formally organized as zhen. Some of the non-statutory "towns" may have sizeable populations.

Sources: Ho (1986)

and Liedholm), it considerably understates the total significance of rural non-agricultural employment. In general it is to be expected that non-agricultural incomes per occupied person will be at least as great as agricultural incomes per farm worker. It follows that the proportion of income accounted for by rural non-agricultural employment is considerably greater than the figures presented in Table III.2 show. Nonetheless, the table shows non-agricultural employment to be an important source of rural employment for each country, especially if rural towns are included.

In West Malaysia, the Philippines and Taiwan it accounts for over a third of employment if rural towns are included. Again Taiwan is exceptional, with nearly half rural employment in 1966 accounted for by non-agricultural activities.

It should be noted that sectoral employment estimates as such do not give full information about the extent of linkages from the perspective of dynamic growth - for this information is also needed on the nature of non-agricultural activities, since some non-agricultural activities in traditional areas have low productivity and are associated with limited industry to agriculture linkages.

III.2 Effects on Income Distribution

Non-agricultural employment opportunities generally improve rural income distribution, either directly or indirectly. For Taiwan, income from outside agriculture has had a marked direct equalizing effect, forming a larger proportion of the incomes of low-income households than of high (Ho 1979), and it has also been shown to be equalising in Japan, South Korea and the Punjab (see Islam 1986b and Chadha). However, elsewhere (e.g., in a village study in Malaysia and the Philippines) non-agricultural

employment opportunities and incomes have been less equally distributed than agricultural incomes (Shand, Kikuchi).

However, irrespective of the direct effects, the indirect effects tend to be equalising, since non-agricultural employment opportunities raise the demand for labour and thereby support the real wage in agriculture as well as non-agriculture. Studies in Indonesia and the Philippines showed a positive relationship between the level of real wages and non-agricultural employment (Kasryno, Kikuchi). Shand and Chew found that although off-farm income was more unequal than farm income in Malaysia, it reduced the urban/rural income gap.

III.3 Rural Non-agricultural Activities

Non-agricultural activities in Asia comprise a variety of activities. These include food processing, especially of foods for local consumption; handicrafts and cottage industries; a range of services for local use, including retail shops; and "modern" decentralized industries which provide consumer and producer goods mainly for local use.

Most rural activities are considerably more small-scale and labor-intensive than substitute products produced in the urban centres (for evidence from India, Nepal, Sri Lanka and Bangladesh see Islam 1986a). This is true both for rural cottage and handicraft industries and for small-scale modern industries. However, the latter involve more capital per worker and lead to higher labor productivity than the former.

As growth and development proceed, the handicrafts/cottage industry which at an earlier stage form the most important element in rural non-agricultural employment, tend to be displaced by more modern products.

Whether this diminishes rural non-agricultural employment depends on the extent to which modern small-scale rural industries develop, as against centralized large scale industrialization. Countries or regions which expanded rural non-agricultural activities in a sustained way over time, as incomes per head rose, have also transformed the nature of their rural industries from cottage industries: there was an expansion of repairs then production of farm machinery, supplies of modern appropriate consumer products (sometimes on a factory basis), and extensive processing of agricultural commodities. This transformation - which also generates a demand for ancilliary services - permits the non-agricultural sector to be associated with rising capital accumulation, productivity and incomes. The transformation is essential if rural industrialization and agriculture are to form a mutually supportive dynamic interaction over the medium term.

Among developing countries in Asia, Taiwan has gone furthest in modernizing its rural industry; the Punjab, especially in the 1960s, exhibited rapid growth in agricultural machinery and tube wells repairs and then production; South Korea in the mid-sixties, and more recently Thailand, were successful in upgrading traditional activities and expanding more modern, yet small-scale and labor-intensive, rural non-agricultural activities. Malaysia has also had a fairly decentralized pattern of manufacturing, and supporting investment (and employment), in decentralized infrastructure - roads etc. - and in other services (Oshima 1985).

Elsewhere - e.g., much of India, Bangladesh, Sri Lanka, and the Philippines - there have been pockets of modernized rural industry, but the bulk of rural non-agricultural employment remains traditional in nature

(see Allah and Chuta for estimates of employment in rural handicrafts and cottage industries in a number of Asian countries).

It follows that the nature of non-rural activities may be at least as important as the total employment provided - in terms of its linkage effects on agriculture, and in raising rural incomes. As far as linkage effects are concerned, their magnitude depends on the increase in markets for agricultural products, in improved supplies of modern inputs and technology, and in modernizing influences on attitudes to accumulation in agriculture. For each, upgraded traditional technologies or 'new' small-scale rural industries embodying modern technologies, will have a much greater effect than extension of traditional non-agricultural activities. Consequently, estimates of incomes generated by the rural non-agricultural sector are more relevant to an estimate of the size of linkage effects than employment estimates.

III.4 Urbanization

The spatial dimension of industrialization is reflected in the spatial distribution and size of cities. While urbanization is an inevitable concomitant of industrialization, there is not a unique relationship: a fast rate of urbanization in relation to the pace of industrialization indicates a high degree of urban, as against rural, industrialization. Rapid growth in the capital city, in relation to total urbanization, indicates a centralized pattern of industrialization (generally involving relatively large scale production units). More decentralized industrialization would be associated with a higher proportion of the population in small and medium size cities. Consequently, we can identify

four ratios, related to urbanization, which indicate the extent of linkage effects:

(1) the urbanization ratio, which is a ratio of the proportion of the population living in towns as a ratio of the proportion of GDP devoted to industry; and

(2) the primacy ratio, which represents the ratio of population in the capital to total urban population.

The higher these two ratios, the more concentrated industrialization and the less the linkage effects.

(3) The intermediate town ratio or the proportion of the urban population in small and medium cities.

(4) The intermediate urbanization ratio or the proportion of the total population in medium and small towns.

The higher these two ratios, the greater linkage effects.

Table III.3 shows these four ratios for some Asian countries. For the most part, country ranking varies according to the indicator chosen, although Indonesia performs consistently poorly (from a linkage perspective) on each indicator, while Taiwan (for which full data is lacking) is estimated to perform consistently well. For the other countries, there is varied performance with Burma and Indonesia having particularly high urbanization ratios, and Sri Lanka and Thailand particularly low ones; Thailand and the Philippines have significantly the highest primacy ratios and India (probably mainly because of her large size) significantly the lowest ratio; Thailand and South Korea have the lowest proportion of the urban-population in medium and small towns while Sri Lanka and the Philippines have relatively high proportions; Bangladesh and Thailand have very low proportions of total population in medium and

Table III.3: URBANIZATION AND SPATIAL DISTRIBUTION

	(1) Urbanization ratio	(2) Primacy ratio	(3) Intermediate ratio	(4) Int. urban. ratio
Bangladesh	1.4	1.20	49	5.5
Burma	2.7	1.89	71	19.4
India	1.3	0.46	53	11.8
Sri Lanka	1.1	1.92	84	22.3
Pakistan	1.8	0.99	48	13.4
Indonesia	2.2	1.48	51	10.3
Thailand	0.8	infinite*	32	4.6
Philippines	1.4	3.71	64	22.2
Malaysia	1.7	1.17	73	21.4
S. Korea	1.5	1.49	23	12.6
Taiwan	1.5			
Average	1.6	1.37+	55	14.3

Source: derived from Tables in Pernia and Paderanga

Notes:

(1) Urbanization ratio = ratio of proportion of total population in cities (1980) to proportion of industry in GDP (1978).

(2) Primacy ratio = ratio of population in largest city to population in next three cities over 500,000 population in 1980.

(3) Intermediate ratio = ratio of population in intermediate and small towns to total population, 1980.

(4) Intermediate urbanization ratio = ratio of population in intermediate and small towns to total urban population, 1980.

*Tnailand has only one city over 500,000 population

+Excluding Thailand and Taiwan.

small towns, while Sri Lanka, the Philippines and Malaysia have relatively high proportions.

Table III.4 presents a composite index of the linkage ratios, with a higher value indicating more favourable linkages - i.e., with on average more rural industrialization, less industrial concentration, more small and medium cities as a percentage of urbanization and of total population.

According to this index, India, Sri Lanka, Malaysia and Taiwan have a high composite linkage index, while Burma, Indonesia, Thailand, the Philippines and South Korea have a relatively low ratio. Bangladesh and Pakistan are average.

Table III.4: COMPOSITE LINKAGE INDEX AND INCOME DISTRIBUTION

	Linkage Index[a] Approx. 1980	Equality Index[b] mid-1970s
Bangladesh	1.00	1.06
Burma	0.78	n.a.
India	1.19	0.99
Sri Lanka	1.19	1.17
Pakistan	1.00	n.a.
Indonesia	0.87	0.89
Thailand	< 1	0.95
Philippines	0.75	0.86
Malaysia	1.16	0.81
South Korea	0.86	1.06
Taiwan	> 1	1.47

Source: Table III.3 & III.5

Note:

a. The composite linkage index is the average of the four ratios, where each ratio has been expressed as an index of the average, in such a way that a higher value indicateshigher linkages.

b. The equality index is calculated by taking the index of inequality (Table III.5) and dividing the average for all countries by the value for each country. A higher value indicates more equality.

Table III.5 presents estimates of income distribution for most of these countries. It can be seen that the more egalitarian countries tend to have higher linkage indices. Comparing the two columns in Table III.4, Sri Lanka and Taiwan both have higher linkage and higher equality indices, while Indonesia, Thailand and the Philippines have low indices on both counts. The major exceptions are South Korea (low linkage, high equality) and Malaysia (high linkage, low equality).

Table III.5: INCOME DISTRIBUTION IN ASIAN COUNTRIES

Country	Year	Q1 [a]	Q1/Q5 [b]	Inequality Index [c]
Bangladesh	76.77	6.2	0.13	55.8
India	75.76	7.0	0.14	59.8
Sri Lanka	69.70	7.5	0.17	50.2
Indonesia	76	6.6	0.13	66.0
Thailand	75.6	5.6	0.11	61.8
Philippines	70.71	5.2	0.10	68.0
Malaysia	73	3.5	0.06	72.8
S. Korea	76	5.7	0.13	55.4
Taiwan	76	8.9	0.24	40.0

a) Q1 = share of income of bottom 20% of population
b) Q1/Q5 = ratio of share of income of bottom 20% to share of income of top 20%
c) Inequality Index = $\sum (1Qi - 20i)$ where i is Q1 ....Q5

Source: World Bank, Development Reports

IV. SOME INTERNATIONAL EVIDENCE ON LINKAGES

At an aggregate level there is a positive relationship between agricultural growth and non-agricultural growth, as indicated by the scatter diagrams relating growth rates (1983-1984) in agriculture and industry for all low and middle income countries (Chart IV.I), and

value-added in agriculture and non-agriculture by region in the Philippines (IV.2). These relationships partly reflect the strength of rural linkages.

This section reviews some evidence on rural linkages. It is not intended to provide a comprehensive survey, but rather to illuminate the type of linkage found in different areas. First, agriculture to industry linkages are discussed, and then industry to agriculture.

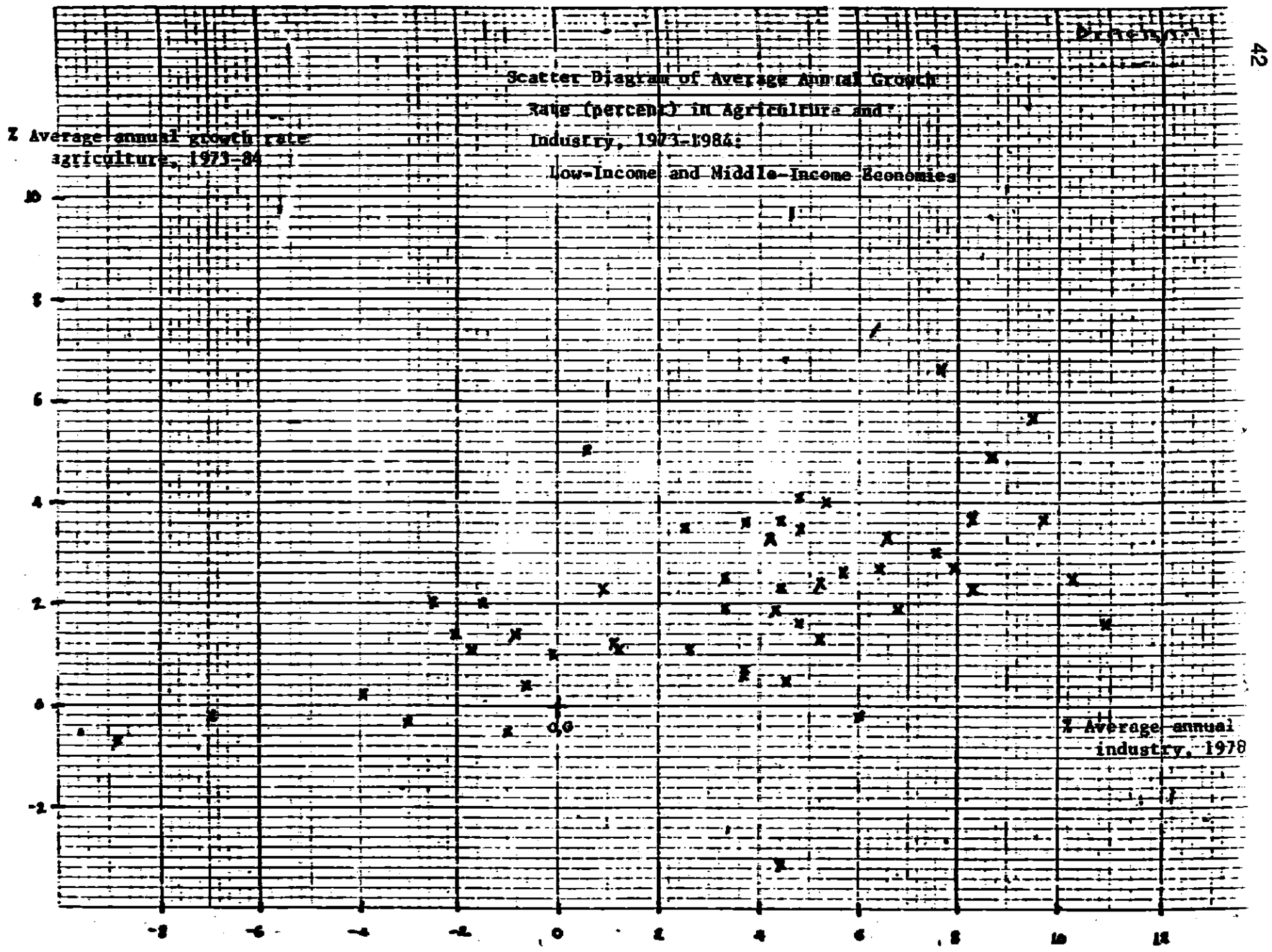
IV.1 Agriculture to Industry Linkages

These linkages may be classified into consumption, backward and forward linkages, as defined in II. A broad association (including all types of linkage) has been shown for many areas between growth in agricultural income and non-agricultural employment and income, e.g., for West Bengal (Bose), Taiwan (Ho 1979), Kelentan in Malaysia (Shand and Chew) and Indonesia (Kasryno). In most studies rural non-agricultural incomes grow faster than agricultural output.

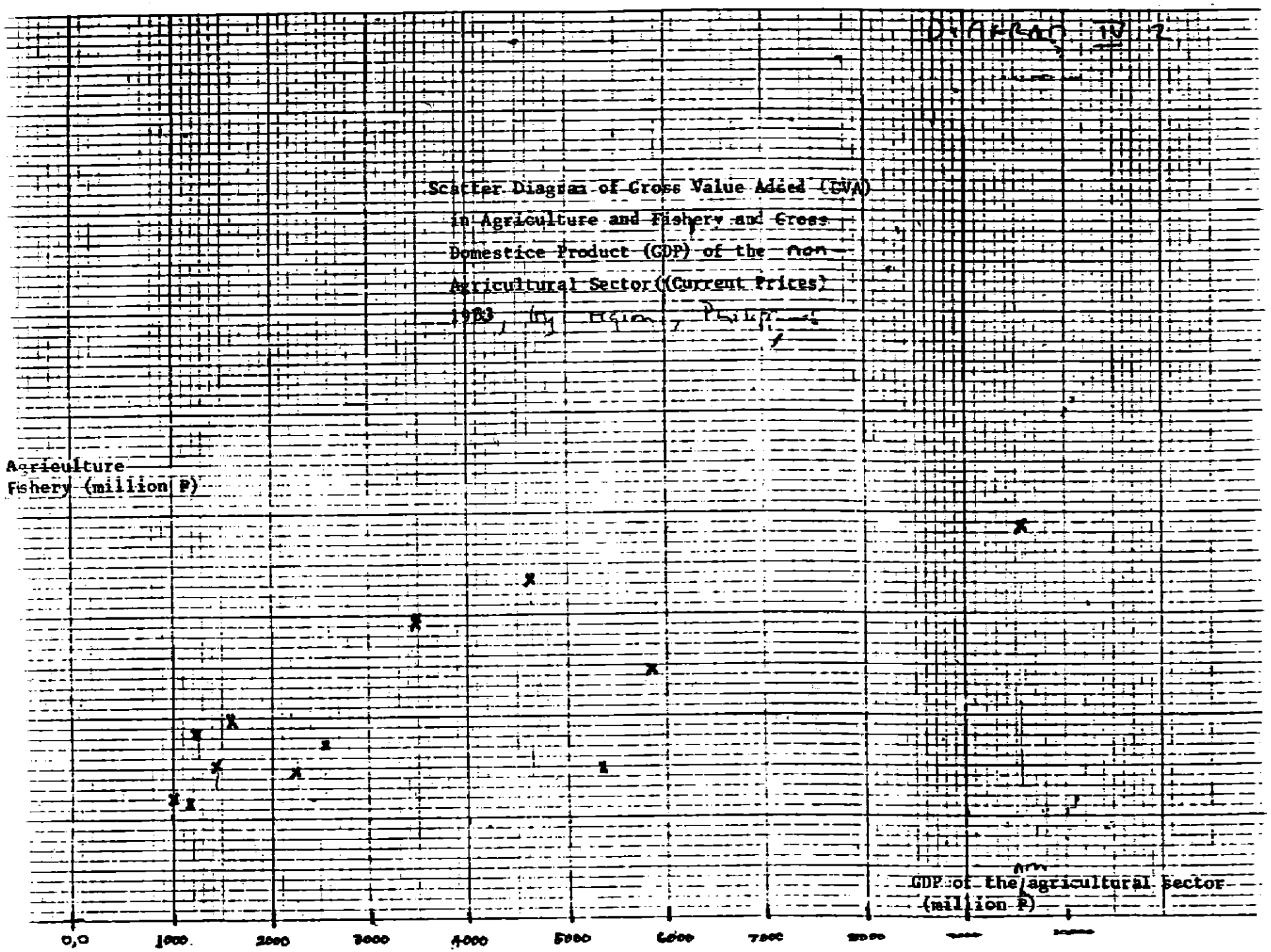
Consumption Linkages:

From historical case studies, especially those connected with the "staple" theory of growth, it has long been recognized that the linkages generated by agricultural activity are crucial to whether that activity will lead to sustained economic growth of the country as a whole or whether the activity will remain in an enclave within a generally stagnant economy. A broad generalization, put forward by North, was that family farms stimulate domestic industry, while plantations do not. This difference was attributed to the income distribution associated with the two regimes; while rich plantation owners demanded luxury imported goods, plantation

Scatter Diagram of Average Annual Growth Rate (percent) in Agriculture and Industry, 1973-1984: Low-Income and Middle-Income Economies



Scatter Diagram of Gross Value Added (GVA)
in Agriculture and Fishery and Gross
Domestice Product (GDP) of the non-
Agricultural Sector((Current Prices)
1983



workers could afford little more than subsistence; family farmers demanded goods that could be produced by domestic industry.

An analysis of consumption linkages in Sierra Leone (King and Byerlee) found that low income families tended to spend extra income on more labor intensive commodities, relatively to higher income families, while rural consumers spent a larger proportion of their incomes of goods produced in the rural areas.

In contrast, Mellor and Lele showed that upper income farmers in rural India have a lower propensity to consume food out of additional income than lower income groups, and concluded that new technologies, associated with higher income shares for land and capital and a lower labor share, would generate more consumption linkages than traditional agriculture. However, the study ignored varying propensities to save and also the proportion of income spent on consumption foods produced outside the locality. Allowing for these would radically alter the results.

Backward Linkages:

An early study of backward linkages was that of Baldwin, who argued that when the export industry required large amounts of complex capital equipment, as in the case of mineral extraction, domestic production linkages were very small because domestic factor endowments did not permit efficient domestic production. But if the export industry required a lot of construction outlays, for example, the likelihood of creation of local industries was much greater. Transport costs on such items as bricks, cement, and timber are high, while their production uses materials which are normally available locally, and relatively little skilled labor.

Recent studies of backward linkages have focused on areas where the green revolution led to rapid growth in agricultural output and high demands for inputs. Child and Kaneda showed that the rapid agricultural growth in the Punjab in the 1960s resulted in the development of local industries producing agricultural inputs, including tube wells, and diesel pumps. Most firms raised capital from family savings, and there was some adaptation of products to local needs. Aftal and Rahim noted that the development of these industries was facilitated by the existence of a great deal of labor that was skilled in metal-working. Large scale firms produced slow speed diesel engines and centrifugal pumps using imported technology, which were then diffused to their skilled workers who established small firms when demand exploded at the end of the 1950s. Falcon suggests that these developments were only possible because of an increase in commodity aid and a change in import procedures which permitted small firms to get access to the necessary materials.

A more recent study of the Punjab (Chadha 1986a) covering developments from 1960 to 1980 finds that "the Punjab developments model shows that a fast-growing agriculture is capable of generating (i) high and rising levels of on-farm employment and income, (ii) new and expanding avenues of off-farm employment and income especially for the weaker sections of the rural society, (iii) rising demands for purchased inputs to meet the requirements of technological changes, and for non-farm consumption goods arising out of higher income levels and structural changes in rural consumption patterns, and (iv) considerable industrial growth, heavily biased towards agro-industrialization which, by its nature, is very widely dispersed in space and strengthens the rural-urban economic relationships."

Between 1960 and 1980, agricultural production in the Punjab rose threefold; purchased farm inputs as a percentage of total non-labor inputs rose from 30 to 87 percent. Increasing demand for irrigation equipment, farm machines and implements were met mainly by local production. Industries for production of agricultural equipment which developed to meet local demand now have begun to export their products to other parts of India and elsewhere.

Forward Linkages:

These were an important part of the very rapid growth in non-agricultural incomes in the rural areas in Taiwan (Ho 1979). Canning of perishable fruit and vegetables for export formed an important element. Ho finds that the very fast growth in rural non-agricultural employment (which exceed growtn in urban employment) was made possible by the presence of high levels of rural infrastructure.

A study of marketing and processing of soybean in a village in Java (Hayami et al.) showed that one-third of the total local income generated by soybean was from marketing and processing, compared with two-thirds on the farm. The share of labor income and employment from marketing and processing was even greater at 50 and 60 percent of the total. This study focuses on a product that is marketed and processed locally. The magnitudes involved suggest the potential gains from forward linkages from local processing.

Numerical analysis of the different types of linkage suggests that consumption linkages are the largest in absolute magnitude, in generation of non-agricultural employment and incomes, but backward linkages often

grow more rapidly, and exhibit higher productivity and incomes (see e.g., Mellor and Lele, Bell et al., Chadha).

IV.2 Industry to Agriculture Linkages

A number of studies have been designed to test the hypothesis (first suggested by Schultz) that nearby industrial and urban growth reduces the imperfections in both factor and product markets faced by agriculture, and thereby raises farm income per worker. This hypothesis has much in common with that advanced here with respect to industry to agriculture linkages, although it does not explicitly include changing attitudes and incentives for saving and accumulation, through which urban industrial proximity may affect traditional agriculture. However, the tests of the Schultz hypothesis throw light on the linkage relationship hypothesized here.

Two studies, one of Brazil (Nicholls) and one of Southern Piedmont (Tang) found that industrial-urban development (1) led to better roads and more efficient marketing facilities; (2) created a demand for highly perishable commodities such as fluid milk and fresh vegetables that were more profitable than traditional products; (3) improved credit access for rural areas, resulting in increased short-term farm loans and capital per worker in agriculture; (4) raised the opportunity cost of labor and ultimately precipitated farm reorganization. A major policy recommendation was that there should be more geographic decentralization of industrial-urban development in developing countries to raise rural incomes (Tang).

Tests of the industrial to agricultural linkage for the U.S. have not in general found much support for the hypothesis (see Sisler; Hathaway; Bryant; Ruttan). However, these results are not relevant to less developed countries, where transport, communication and attitudes are very different.

For the State of Goias in Brazil, 1940-1970, Katzman showed that the prices of rice and raw meat (export staples) were inversely proportional to distance from the state capital. Industrial-urbanism (measured by manufacturing wage bill per capita) was found to have a consistent positive effect on the capital-labor and capital-land ratio in agriculture, while distance from the state capital had a consistent negative effect.

From this evidence it appears that industry to agriculture linkages are more evident at earlier stages of development and diminish and may even disappear as development proceeds.

V. DEVELOPMENT STRATEGIES AND LINKAGE EFFECTS IN THE PHILIPPINES

Major changes have occurred in the Philippine economy during the twentieth century. The first half century (colonial period) saw the development of primary product (agricultural) exports - with some early import substitution, but also some displacement of individual handicraft products by imports (Resnick). In the years since 1947, economic strategy has been mainly focused on import substitution industrialization, together with efforts to sustain exports of primary products (mainly through plantation production) and raise rice output to ensure adequate food supplies for the cities.

The pattern of industrialization has been influenced by the stage of development, the structure of the agricultural sector and trade policies. Land ownership and income distribution in the agricultural sector has been highly (and probably increasingly) inegalitarian despite some half-hearted attempts to introduce land reform. This, together with the artificial encouragement of mechanization and rapid population increase, has led to

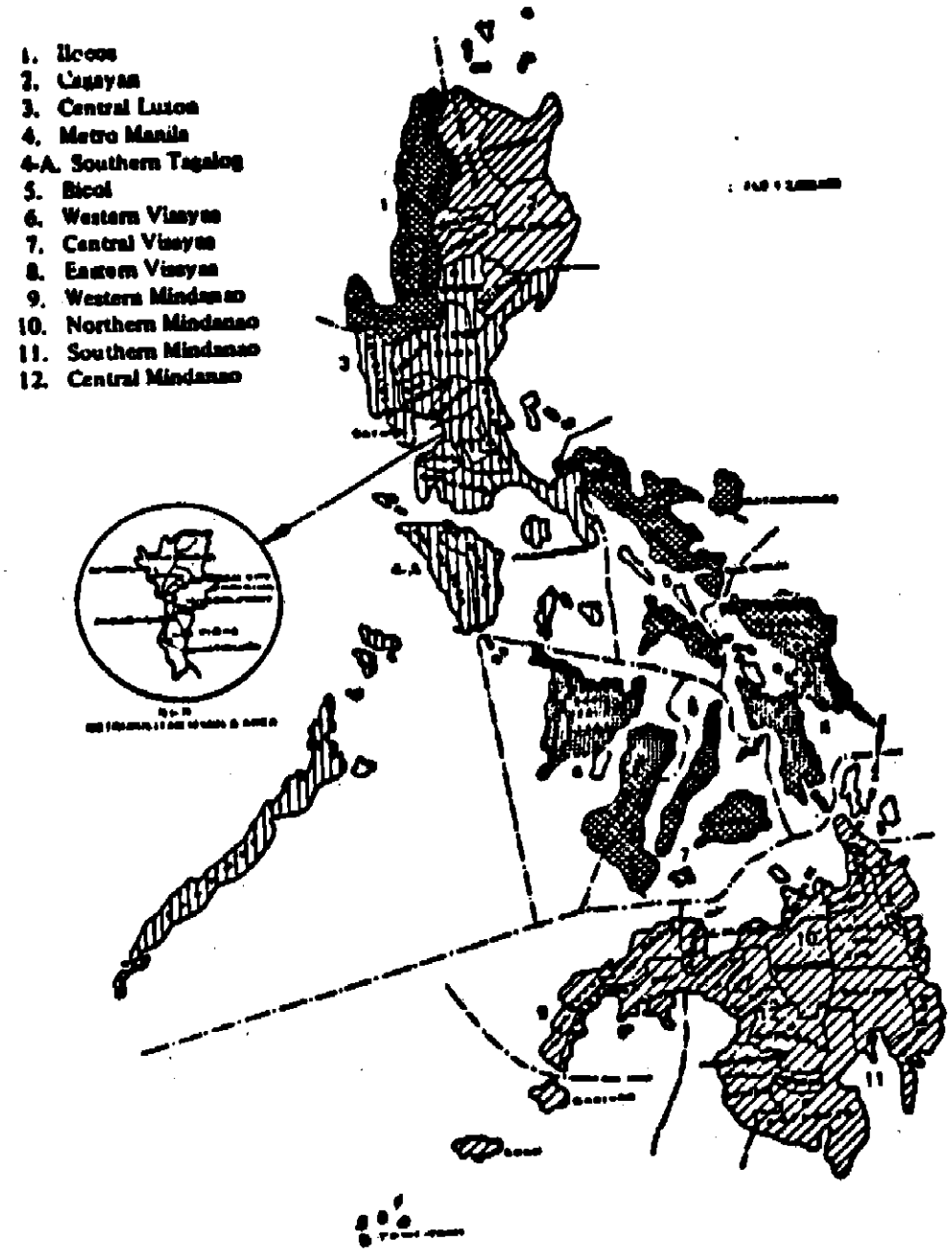
low and generally falling agricultural real wages and real incomes of poor farmers. As a result there was a limited market for appropriate products, while the market for elite goods has been relatively large (for the stage of development) and growing.

Consequently, import-substituting industrialization has been more tilted towards capital-intensive products than in more egalitarian societies and the emphasis on import-substitution has meant that employment expansion in labor-intensive manufactured exports has been small. The economy remains dependent on primary products for about half its foreign exchange.

Between 1903 and 1975, population increased five-fold in the Philippines. There was substantial structural transformation. The share in gross value added of the primary (agricultural) sector was halved from 55 percent in 1903 to 27 percent in 1975: on the other hand, the share of the secondary sector (industry) more than doubled from 13 percent (1903) to 33 percent (1975), while the services sector increased from 32 percent to 40 percent.

The economic developments just sketched were, moreover, accompanied by changes in the spatial distribution of the population. As shown in Table V.1 the share of the National Capital Region in population rose from 4.9 percent to 12.4 percent, but its share of industrial employment rose much more sharply, from 6.5 percent to nearly half the total. In contrast, Traditional Agriculture and the Frontier Region's share of population fell (from nearly three-quarters to two-thirds), but the drop in share of industrial employment was much more dramatic, from 70 percent in 1903 to 36 percent in 1975.

Figure : Philippines: Broad Economic Regions - NCR, CIR, TAR and FR



Legend:

- Central Industrial Regions
  NCR, Central Luzon, Southern Tagalog
- Traditional Agricultural Regions
  Ilocos, Bicol, Visayas
- Frontier Regions
  Cagayan Valley, Mindanao

Table V.1: POPULATION AND EMPLOYMENT IN THE PHILIPPINES

	1903		1975	
	Industrial Employment	Population	Industrial Employment	Population
Broad Region				
National Capital*	6.5	4.9	47.4	12.4
Metropolitan Periphery	23.1	22.2	16.2	21.8
Traditional Agricultural	67.1	59.6	22.2	39.5
Frontier	3.3	13.3	14.2	26.3

* Includes the rest of Rizal province

Source: Pernia and Paderanga, derived from Hooley (1966) - for 1903 output: NEDA, The National Income Accounts, CY 1946-75, 1978 - for 1975 output: 1903 Population and Economic Census - for 1903 industrial employment and population; 1975 Census of Establishments - for 1975 industrial employment; 1975 Population Census - for 1975 population.

These spatial developments are in line with what one would expect from colonial and import-substitution stages of development (see section II above), with the development of a colonial port city whose main function was to facilitate trade with the overseas power, exporting primary products and importing consumer goods. The capital city also constitutes the colonial administrative center. Transport to the interior is improved as necessary, mainly for the transport of agricultural exports. Development of the economy is focused on areas providing primary exports, and on the provision of food to the capital city. The rest of the country (the hinterland) is relatively neglected in terms of infrastructure and other development activities.

The post-colonial import-substitution phase of development often involves even more spatial concentration of development. Since the import-substituting industries depend heavily on the import of technology and imports from outside the country, while their markets are mainly in the region of the capital city, they have few connections with the remainder of the economy, apart from securing food supplies. Moreover, import-substitution generally requires government protection from foreign competition in the form of the allocation of licenses, the provision of import quotas, of tariffs, etc. This creates an additional incentive to industrialists to locate in or near the administrative capital.

In the Philippines, the reduced share of population in the Traditional Agricultural Region and the much more significantly reduced share of the industrial population shown in Table V.1 between 1903 and 1975 suggest these patterns were followed.

Spanish colonialism (pre-1900) had left the Philippines rather underdeveloped and with a dispersed population, with parts of agriculture oriented towards exports and some traditional non-agricultural manufactory activities. The US then introduced free trade with its colony which reinforced Philippine primary product specialization and reduced traditional manufacturing. However, in the latter years of the 1930s some 'natural' import substituting industries emerged. The Traditional Agricultural Region maintained its share of industry and population over this period.

With independence in 1947, the Philippines adopted a package of exchange controls, tariffs, subsidies to capital, tax incentives, and provision of infrastructure to induce further import substitution.

Selective credit policies discriminated in favor of "preferred" industries. These policies all reduced links with the agricultural sector, and increased the advantages of proximity to the capital. Consequently, the relatively dispersed industrialization pattern of colonial times was replaced by heavy geographic concentration.

These trends are shown in the relative performance of different regions over the period - see Table V.2. The share of manufacturing employment in the Central Industrial Region changed little between 1903 and 1948 and much more sharply between 1948 and 1961. Since 1961, there has been little change in shares.

The same pattern of spatial development is indicated by indices of urban concentration (Table V.3) which show a slowly rising concentration between 1903 and 1939, a further rise in the war years, and little change since 1960. Population of large cities (Table V.4) has grown faster than that of other towns in every period since 1903.

Changing localization indices with respect to the three major industries, (Table V.5), show that increasing spatial concentration has been due to increasing spatial concentration in manufacturing. Manufacturing was very dispersed in 1903 but has shown a progressive increase in concentration since, with a particularly sharp jump between 1948 and 1961 and a slight fall between 1961 and 1972. Agriculture remained highly dispersed over the whole period. The concentration index for services which remained low until 1948 increased from 1948 to 1961.

Table V.2: PERCENTAGE DISTRIBUTION OF MANUFACTURING EMPLOYMENT BY REGION

Region	1903	1939	1948	1961	1967	1975
Central Industrial	29.55	31.35	46.59	67.75	64.20	64.53
NCR and Rizal	6.48	16.19	29.39	53.66	51.25	46.84
Central Luzon	9.40	6.64	7.34	7.27	7.22	7.73
Southern Tagalog	13.67	8.52	9.86	6.82	5.73	9.96
Traditional Agricultural	67.13	55.72	41.47	20.49	18.68	20.72
Ilocos	15.12	14.74	6.99	3.75	2.89	3.69
Bicol	8.38	9.88	4.85	2.34	2.15	3.62
Western Visayas	19.27	7.86	10.51	7.20	6.96	6.45
Central Visayas	14.29	10.65	11.89	5.61	5.28	5.76
Eastern Visayas	10.07	12.59	7.23	1.59	1.40	1.20
Frontier	3.32	12.93	11.94	11.76	17.12	14.75
Cagayan Valley	0.80	1.03	2.17	1.52	2.11	2.61
Western Mindanao	0.26	8.76	1.67	1.63	1.50	1.40
Northern Mindanao	2.13	2.04	4.93	3.44	4.06	3.49
Southern Mindanao	0.11	0.45	1.71	2.40	5.80	4.73
Central Mindanao	0.02	0.65	1.46	2.77	3.65	2.52
Philippines	100.00	100.00	100.00	100.00	100.00	100.00

Sources: Hermosa from Census of Population and Economic Activities 1903, 1939, 1948; Economic Census, 1961, 1967; Census of Establishments, 1975, Volume on Manufacturing.

Table V.3: INDICES OF URBAN CONCENTRATION

	1903	1918	1939	1948	1960	1970	1975	1980*
Index of Primacy	1.75	1.73	2.07	3.24	3.23	3.44	3.54	3.44
Pareto Coefficient	-0.85	-0.80	-0.70	-0.60	-0.59	-.58	-0.55	-0.56

*Preliminary

Source: Hermosa

Table V.4: ANNUAL PERCENT GROWTH RATES OF POPULATION OF DIFFERENT SIZE CITIES: PHILIPPINES, 1903-80

City Size	1903-39	1948-60	1960-70	1970-80
Small	1.79	2.00	2.05	2.17
Intermediate	2.57	3.11	2.11	2.57
Large	3.16	3.75	4.22	3.79
Total:	2.51	3.10	3.18	3.15

Source: Pernia

Table V.5: LOCALIZATION* INDICES: 1903 to 1972

	1903	1918	1939	1948	1961	1972
Manufacturing	0.076	0.115	0.213	0.235	0.482	0.408
Agriculture	0.122	0.081	0.057	0.061	0.069	0.059
Services	0.184	0.056	0.156	0.219	0.362	0.261

Source: Hermosa (1986), Table 3.3
*The localization index for a sector is calculated by the formula:

$$1/2 \left(\frac{Eij}{Eip} - \frac{ERj}{Ep} \right)$$

where:
Eij represents employment of sector i in region j; Eip represents employment of sector i in the Philippines as a whole;
ERj represents total employment in region j;
Ep represents total employment in the Philippines

From the late 1960s macro-policies shifted somewhat to greater emphasis on traditional exports and to correcting regional imbalances. These policies had some effects on the regional distribution of infrastructure, but there remains to this day a very high concentration of industrial projects supported by the B O I (see Pernia et al, p 160). There was no change in the high share of the Central Industrial Region in

manufacturing value added from 1961 to 1975 (74% in both years) but within the Central Industrial Region, the share of the National Capital Region has decreased since 1967 (when it was 54% of total manufactured value added to 47% in 1975).

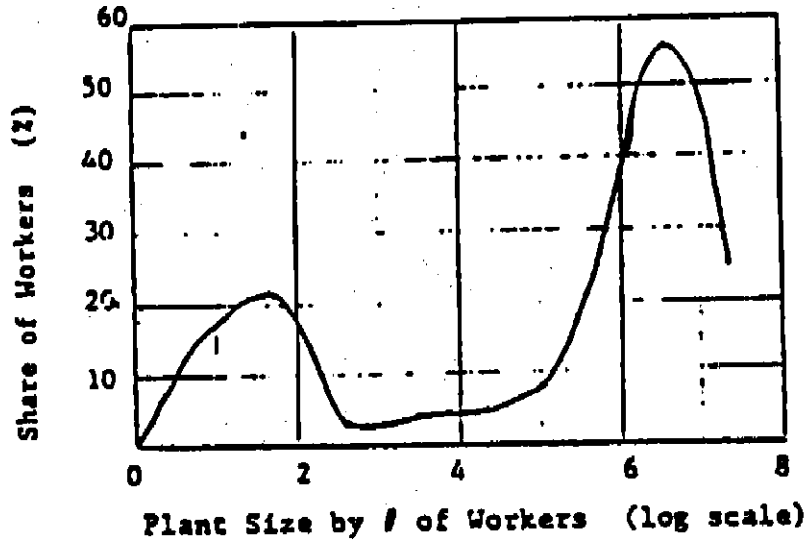
The very high concentration of industries in the Philippines is indicated by the fact that 2 percent of the firms produce 85 percent of industrial value-added: "for its level of per capita GNP, the Philippines was one of the most concentrated industrial sectors in the world" (HIIO). According to the HIIO investigation, "a troubling feature of industrial structure in the Philippines is the degree to which progressive small and medium enterprises are missing" (see Chart V.1). This 'excluded' middle means that most non-agricultural enterprises are primarily very small cottage industries with low productivity - not modern small-scale firms. The former tend to have much more limited linkage effects than the latter.

Some econometric analysis confirms the broad strategic causality sketched above. An analysis aimed at explaining concentration in the National Capital Region in 1975 found that major significant factors making for concentration were the effective protection of consumer goods, the fraction of material inputs imported, the fraction of industrial output going to other firms in Manila, the fraction of output exported and the size of establishment. The main negative factor was the fraction of material inputs from primary industries (Pernia and Paderanga, Chapter 4).

In another study, the presence of skilled labor in Manila and the capital-intensity of production were found to be additional factors positively related to location in Manila, as well as the factors discussed above (Hermosa, Chapter 4).

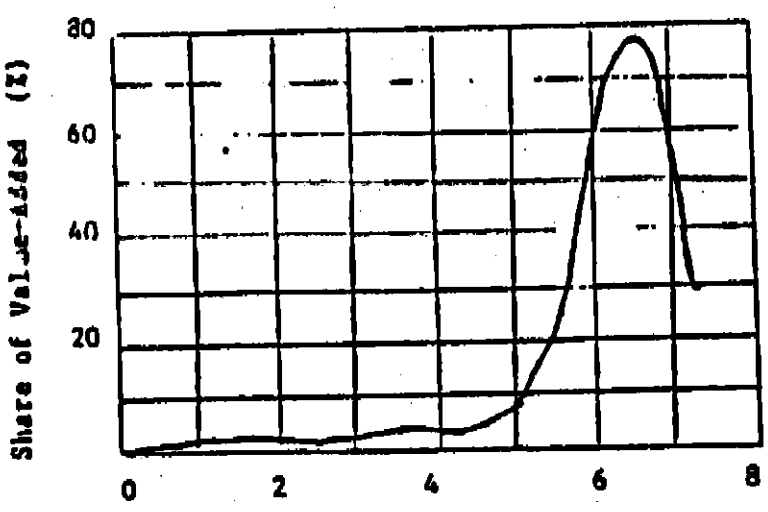
Chart V.1 Distribution of Employment by Plant Size: The Philippines

Total Manufacturing: 1983



Distribution of Value-Added by Plant Size: The Philippines

(Total Manufacturing 1983)



Source: HIID (1987) from Industrial Census 1983, NCSO.

In broad terms then, the strategy of development adopted in the Philippines over the past thirty-five years has resulted in a spatial concentration of development, thereby reducing the proximity of many rural dwellers to urban centers and thus limiting the positive linkage effects on agricultural and rural industrial development that proximity confers.

The main aspects of the development strategy responsible for this are:

(1) import-substituting industrialization leading to a pattern of industries which are capital and skill intensive and have their main input links with overseas supplies and not with the agrarian economy;

(2) policies which are often discretionary (e.g., subsidies, credit allocation) which provide an incentive for industrialists to locate close to decisionmakers;

(3) unequal regional provision of rural infrastructure (see Table VI.12 below);

(4) A highly unequal structure of income and asset ownership in agriculture, which has been associated with low (and recently decreasing) incomes of agricultural workers and small farmers, who therefore have not provided a buoyant market for rural industrialists or for labor-intensive mass-produced appropriate products. In contrast, incomes of the rural and industrial elite have grown, so that the market for capital-intensive products, based on imported inputs has been a dynamic one. The structure of industrial development reinforced trends in the pattern of demand.

VI. LINKAGES IN THE PHILIPPINES

VI.1 Agriculture to industry linkages

A number of micro-studies in the Philippines have indicated the magnitude, causes and nature of linkages from agriculture to industry.

Magnitude of Linkages

1. The linkage effects from additional agricultural output are very substantial, even where policies are not especially conducive to promoting them.

- In the Gapan area in the Philippines an annual increase in agricultural income of 5.5 percent per annum (from 1961 to 1967) was accompanied by an annual increase in non-agricultural employment of 8.2 percent, while between 1967 and 1971, an annual increase in agricultural income of 8.2 percent, was accompanied by an increase in non-employment of 9.0 percent per annum (Gibbs).
- An Upper Pampanga River project which roughly doubled net farm income was associated with an annual increase in non-farm employment of 7.0 percent per annum, 1975-79 (Sander).
- In Oton and Tigbauan between 1974-75 and 1979-80, agricultural production rose by 6.7 percent per annum, while output of non-agricultural activities grew by 8.4 percent per annum (Wangwacharakul).
- Between 1960 and 1975, there were high rates of growth in small rural establishments in those areas in the Philippines with rapid agricultural growth. In Luzon (excluding Manila and Rizal), small establishments grew by 8.3 percent per annum. There is a strong association between agricultural growth and the growth of manufacturing establishments by regions in the Philippines (Anderson and Khambata).

2. Rural non-agricultural employment is dominated by consumption-linkage activities - that is, activities which supply consumption goods and services to people in the area.

- A small survey we conducted found that over 80 percent of establishments were consumption-related (including barbers, furniture makers, general stores, and food processors).

- In the survey of the Gapan area, consumption-related activities accounted for 58.6 percent of total non-agricultural employment in 1971, with public services accounting for 24.4 percent, and forward and backward linkages for 18.1 percent. Table VI.1 provides a detailed breakdown, which is illuminating for showing the type of rural industries that are of significance.

- In the Upper Pampanga River area forward and backward linkage industries accounted for only 6.8 percent of employment in the two towns investigated in 1979, with consumption linked activities (including public sector) accounting for the remainder (Sander).

3. Increases in agricultural output are accompanied by high increases in all types of linked activities (backward, forward,

- In Gibbs's study, forward linkage industries (chiefly rice trading and milling) increased employment by 9.6 percent per annum, 1961-71; employment in industries supplying agricultural inputs increased by 7.9 percent per annum, and consumption-related industries employment increased by 8.4 percent per annum.

- In the Upper Pampanga project area from 1975 to 1979, employment in forward linkage activities rose by 17.1 percent per annum, in backward linkage industries by 6.7 percent per annum, and in consumption-related industries by 6.5 percent per annum.

Table VI.1: FORMAL SECTOR EMPLOYMENT, GAPAN AREA, PHILIPPINES, 1961-1971

	Employment 1961	1971		Employment 1961	1971
RETAIL TRADE-			CONSTRUCTION-		
C-goods	308	611	Contracting	48	196
Durable goods	14	89	Materials supply	30	61
SERVICES-			Cement prod.	-	84
Restaurants, refresh.	47	177	Gravel/sand	57	70
Barbers	51	120	SPECIALTY INDUSTRIES-		
Billiards	23	60	Sandals	80	346
Amenity shops	32	49	Rattan furniture	38	123
LIGHT TRANSPORT-			Needlework	43	125
Passenger jeepneys	71	164	Other	195	196
Servicing shops	24	79	PUBLIC SERVICES	914	1,560
Calesas/pedicabs	350	10	AGRO-INDUSTRIES PRIMARY-		
Tricycles (motorised)	-	900	Agric. input dealers	16	45
TRADES-			Rice mills, trucking	268	730
Tailoring	55	151	Rice dealers	56	140
Dressmaking	16	57	Other	40	80
Bakeries	37	101	SECONDARY-		
CRAFTS-			Service stations	23	78
Sash works	8	51	Transport shops	35	56
Iron works	6	20	Vehicle body builders	21	33
Furnishing	27	51	Equip. assembly	1	30
			TOTAL	2,934	6,643

Source: Gibb, Chapter VII.

- In Oton and Tigbauan, output of production linkage industries grew by 10.3 percent per annum from 1974-79, while output in consumption-related industries grew by 4.0 percent per annum.

4. The expansion of employment in absolute terms, however, was invariably significantly the highest in consumption-related activities. This occurred, despite the proportionately lower increase, because of the large proportion of non-agricultural employment accounted for by consumption-related activity, as described in 2. above.

- In the Gapan area, from 1961-71, consumption linked employment expansion accounted for 62.8 percent of the total expansion.
- In the Upper Pampanga, over 80 percent of additional jobs were in consumption-linked activities.
- In Oton and Tigbauan expansion in consumption-related activity accounted for over 70 percent of the total expansion in employment.

5. In general among production-related activities in the Philippines, forward linkages are of much greater significance for absolute employment and employment expansion than backward linkages.

- In Gapan, in 1971, employment in agricultural input supplies accounted for only 3.1 percent of total non-agricultural employment, while forward linkages accounted for 15 percent. Backward linkages constituted 3.2 percent of the employment expansion from 1961-71, and forward linkages for 16.6 percent.
- In Upper Pampanga backward linkages in 1979 formed only 1.9 percent of total employment, and forward linkages 4.9 percent. Backward linkages accounted for 1.8 percent of employment expansion from 1975-79, and forward linkages for 9.8 percent.

6. The ranking of linkages in terms of employment derives partly from labour-intensity of the different types of linkage. The study of Oton and Tigbauan found that production-related activities accounted for substantially the greatest share in output expansion, but the labor-intensity of production-related activities was low relative to consumption-related activities, so that the consumption activities dominated in terms of employment expansion.

Conclusion on Magnitudes of Linkages: The evidence therefore establishes that linkages of non-agricultural activity with agricultural production have been a substantial source of employment in the Philippines. Consumption linkages have dominated in terms of the absolute number of employment opportunities created, despite a tendency for production-related activities to show a greater proportionate growth in output.

Causes of Magnitude of Linkages

The three kinds of linkage involve different types of relationships, so that causes need to be discussed separately.

Consumption Linkages

The nature and extent of consumption linkages depend on how income generated in agriculture is allocated between consumption and savings and among different types of consumption expenditure. Household disposal patterns depend mainly on the level of household income. For the rural economy as a whole, disposal patterns then depend on the average level of household income and the distribution of income among households, (see discussion in II).

Agricultural households consist of landlords and tenants, owner-occupiers witn different size farms, and agricultural labourers, with some overlap between the categories. In general, the higher the share of high income households (landlords and large farmers) and the lower the share of low-income households (small land-holders, tenants and wage-earners) in additional income, the less local consumption linkages are likely to be. This is because:

(1) high-income households tend to have a higher propensity to save than wage-earners; sr > sp; where sr is the marginal savings propensity of rich households, sp of poor households.

(2) high-income households tend to consume more goods produced outside the area and less local goods: (t + i)r > (t + i)p.

(3) however, high-income households tend to consume less food as a proportion of income: fr<fp. Consequently, while total local linkages will tend to be greater where the share of low-income households (small farmers and wage-earners) is greater, expenditure on non-food items will not be so much greater and could even be lower, zr> or <zp.

The evidence on consumer behaviour and linkages from Oton and Tigbauan broadly supports these hypotheses. The study investigated non-agricultural households (which had a much higher income than the farming households) as well as farming households at three levels of income.

As can be seen in table VI.2, the stimulus to local production was greater the lower the income of the household, because of differences in propensity to save. Import behaviour did not differ substantially, according to this study. But the study assumed the same propensity to import from outside the area for each category of expenditure, irrespective of the income of the household.

Table VI.2

HOUSEHOLD TYPE	INCOME PER HOUSEHOLD pesos	SAVINGS PROPENSITY[a]	LOCAL PRODUCTS LINKAGE[b]	FOOD as % of consumption
Non-agricultural	17,930	0.28	0.435	42.5
Irrigated farm	7,876	0.19	0.655	54.6
Rainfed lowland	5,097	-0.01	0.744	58.7
Rainfed upland	3,408	-0.27	0.944	65.5

Source: Wangwacharakul, Table 7, A41, 8.

a Expenditure on consumer durables is not included in consumption.

b Local production linkage is % increase in local production, including food, in response to 1% increase in household income.

A general equilibrium model from the Philippines estimating variations in consumption and income changes between landlords and wage-earners, shows a lower share of consumption and a higher share of goods imported from other countries as the share of the landlord rises (Ahammed and Herdt). The employment resulting from extra consumption is substantially lower the higher the share of extra income received by the landlord class. Since high-income households tend to have a higher propensity to consume urban-produced goods (for example, consumer durables) than low-income households, the same approach to a rural subsector would show a stronger relationship, with local linkages increasing as the share of low-income classes rises.

To summarize the evidence on consumer linkages:

(a) the more unequal the income distribution among agricultural households, the greater the leakages out of the local economy from agricultural income;

(b) similarly, the more unequally distributed any additional agricultural income, the lower is extra demand for locally produced goods (including food and non-food);

(c) local linkages with non-agricultural sectors tend to be greater the more equally distributed income is, since the tendency for low-income households to spend more proportionately on food is offset - in terms of local linkages - by the tendency for higher-income households to save more and spend more on goods produced outside the rural area. Moreover, expenditure on food also involves local non-agricultural services.

(d) as average farm household incomes rise, local linkages rise in absolute amounts. The change in relative significance of local linkages (as a proportion of total activity) as average incomes rise is the outcome of conflicting tendencies. On the one hand, there is a rising propensity

to spend on non-agricultural items; on the other, some tendency for a rising proportion of expenditures to go to items from outside the area. How strong this latter tendency is depends partly on supply factors - that is, whether local supplies of goods and services change in quality and quantity to keep pace with rising demands.

One major influence on the distribution of agricultural income is the distribution of land; this has a direct influence (determining the distribution of rent) and an indirect influence through the effects on labour-intensity of land use, since small farms generally use relatively more labour. The labour-intensity of land-use (and therefore the share of labour in agricultural income) is also strongly influenced by the extent of mechanization and by the crop composition of output. Because of the importance of distributional effects in determining consumption linkages, these both become important aspects of policies towards linkages.

Crop composition is one determinant of labour absorption in agriculture. The precise labour use for any crop depends on technology and organization of production and varies between countries and regions, across seasons, and over time.

Changing crop composition in the Philippines is shown in Table VI.3.

Crop composition become less labour-using over time with a fall in the proportion of the most labour using crops, and a rise in the proportion of the most labour using crops, between 1960 and 1983. Actual labour use also depends on the change in levels of output and changing technologies of crop production. There was a fairly steady growth in production of most crops over this time. In rice production, labour intensity seems to

Table VI.3: CROP COMPOSITION, PHILIPPINES

Metric tons as % of total of crops shown

	Philippines		
	1960	1978	1983
Rice	48.7	40.5	40.6
Rootcrops	18.4	16.9	14.0
Sugar	23.6	18.4	18.0
Bananas & pineapples	5.7	20.3	24.3
Citrus	0.6	0.7	0.7
Vegetables	3.0	3.2	2.5
TOTAL	100	100	100
Most labor-using[a]	3.0	3.1	2.5
Least labor-using[b]	24.7	39.5	39.0
Intermediate[c]	72.3	57.5	58.6

[a] Vegetables.

[b] Rootcrops, citrus fruits, bananas and pineapples.

[c] Rice and sugar.

Source: Philippine Statistical Yearbook

have increased initially with the green revolution, but to have fallen in recent years (since the late 1970s), especially with the greater use of chemical herbicides (Castillo et al). Sugar has been subject to mechanization over the past decade, so that there has been some decline in employment and consequently in consumption linkages for the two major crops.

Technology and Mechanization. A major influence on consumption linkages is the degree and nature of mechanisation, since this determines the direct employment associated with production and consequently consumption linkages.

There is strong evidence for the Philippines that mechanisation tends to be labour displacing, both with respect to family and hired labour. In rice production, labour displacement occurs in land preparation and in threshing (see Ahammed and Herdt; Gonzales et al.; Sison et al.). Labour displacement is significantly greater for large machines than for small (that is, for four-wheel tractors compared with power tillers and for large axial flow threshers than for portable threshers). In contrast, irrigation generally increases .pa labour use. The differences in direct employment effects of differing technologies are large. According to the study by Ahammed and Herdt, in rain-fed conditions one percent extra rice production would create 23,700 extra jobs in agriculture using animal horse-power, a four inch irrigation pump and a hand thresher, compared with only 5,300 using a four-wheel tractor, and a large axial flow thresher. The distribution of income tends to favour landlords, the more capital-intensive the methods. (More details of the estimated effects on direct employment and landlord share are shown in Table VI.4).

Table VI.4: DIRECT AND INDIRECT EMPLOYMENT EFFECTS OF INCREASING RICE PRODUCTION

Effects of 1% extra rice production

Power	Irrigation	Thresher	Direct emp. 000s	Indirect	Total	Share of income of landlord
1. Carabao	gravity	hand	14.5	27.5	42.0	0.44
2. Power tiller	gravity	hand	15.9	27.1	43.0	0.41
3. Power tiller	gravity	small portable	12.4	27.6	40.0	0.50
4. Tractor	gravity	large axial flow	11.2	24.8	36.0	0.49
5. Carabao	4" pump	hand	23.7	31.3	55.0	0.37
6. Power tiller	4" pump	hand	21.7	31.3	53.0	0.37
7. Power tiller	4" pump	small portable	17.4	31.6	49.0	0.46
8. Tractor	10" pump	large axial flow	9.0	28.0	37.0	0.58
9. Carabao	rainfed	hand	11.0	20.0	31.0	0.33
10. Power tiller	rainfed	hand	9.7	18.3	28.0	0.45
11. Power tiller	rainfed	small portable	7.3	19.7	27.0	0.51
12. Tractor	rainfed	large axial flow	5.3	17.7	23.0	0.54

Source: Ahammed and Herdt.

Direct employment effects - and therefore consumption linkages - are likely to be greatest with pump irrigation. Within each irrigation system, the least mechanized combinations tend to create most direct employment, while substantially less direct employment is associated with the most mechanized combinations (four-wheel tractors and large axial flow threshers).

While tractors and power tillers displace labour, they do not significantly affect yields. (See Duff, and Workshop passim, especially Gonzales et al.). However, irrigation does have marked positive effects on yields, and mechanized threshing also has positive effects.

Mechanization is even more dramatically labour-displacing in sugar cane cultivation where it is estimated that the reductions in labour requirements per hectare are 90 percent or more per task, with the greatest displacement in weeding. In sugar cultivation there are substantial economies of scale, such that full mechanization is only economic for farms over 25 hectares. Mechanization is yield increasing and permits large farms to remain economic in the face of adverse world prices. Consequently, there is strong trend towards reduced consumption linkages in sugar cultivation (see Aguilar).

Estimates of consumption linkage effects depend on the level of the real wage associated, with employment in agriculture. A lower real wage would have smaller linkage effects for any given increase in agricultural employment. The determinants of the real wage in agriculture are many and complex. They divide into factors affecting demand and those affecting supply of labour in the agricultural sector. Demand for labour is influenced by mechanization: other things being equal, higher

mechanization will tend to depress the real wage. Supply of labour depends on population growth and demand for labour elsewhere, especially in the urban centres.

In the Philippines, real wages in agriculture have been stagnant and at times declining, despite rising agricultural production per head. One contributory factor has been the labour displacement caused by mechanization (see David, p. 404). The supply of labour to agriculture has expanded fast with a population growth of 2.7 percent per annum while industrial growth has been comparatively slow and capital-intensive and absorbed little labour (see ILO, HIID 1974).

Consequently, in the context of the overall development strategy, mechanization in the Philippines has tended to have doubly negative effect on linkages - by reducing direct employment in agriculture and depressing the real wage through its effect on demand for labour.

Backward Production Linkages

As noted above, these are relatively small numerically in the Philippines but are increasing rapidly. In relation to employment, by far the most important are distribution outlets - for fertilizer, seeds, and machinery. For example, these accounted for 196 employees in Cabanatuan and Talavera, while only 21 people were employed in actual equipment manufacturing. However, equipment servicing and manufacture generally develop fast as mechanization proceeds, as is indicated by their greater role in the Punjab and Taiwan. Employment in these areas is likely to depend on the extent of use of modern inputs (fertilizers, seeds, machinery) and the machinery used. Small pumps, hand tillers and threshers, and power tillers can be produced in small workshops in the

rural areas, while large tractors and axial flow threshers are almost invariably produced in the urban areas, with much of their parts imported.

The production of tools used in association with carabaos is almost entirely local (that is, ploughs, harrows, and hand implements) (Lantin). Modern mechanical methods involve varying degrees of rural, urban, and imported content. Table VI.5 shows how labour content varied as a proportion of the selling price.

For the Philippines as a whole (urban and rural) backward linkages are substantially greater for power-tillers than for tractors, while there is not much difference between portable and large threshers. Rural production occurs only for the smaller machines (power tillers and portable threshers) (See Mikkelson and Langam). Consequently, small and medium sized farms which use small machines generate greater backward linkages than large farms which use four-wheel tractors.

Using a general equilibrium approach, Ahammed and Herdt put production and consumption linkages togetner to estimate the total indirect employment created by different types of water regime and mechanization. They found that total indirect employment created was very large, outweighing the direct employment (see table VI.4). In general, direct and indirect employment effects are closely related. Taking production and consumption linkages together, the linkage effects are similar for the most labour-intensive techniques and the intermediate techniques, and smaller for the most mechanized techniques.

Policies towards Mechanization. The evidence summarized above shows that large-scale mechanization has had negative effects on linkages in the

Philippines, mainly because of the labour displacing effects of these technologies. Moreover, for tractorization in rice cultivation, there does not appear to be a consequential rise in yields which could justify the mechanization from the point of view of maximizing output. Despite these conclusions, mechanization in agriculture in the Philippines has been proceeding quite rapidly over the past few decades, as table VI.6 shows.

Three types of policy have influenced the rate and nature of mechanization - policies towards land distribution; policies towards prices and credit; and policies towards research and development.

1. Land distribution: The size of landholding influences the rate of mechanization, with larger farms more likely to mechanize, and, when they do so, to adopt tractors rather than power-tillers. The land reform in the Philippines, which occurred from 1972 and involved dividing some large-scale rice farms into smaller units, led to a greater proportion of tillers in the total. Power-tillers accounted for 46 percent of the total number of tractors and power-tillers in the years 1960 to 1971, and 83 percent of the total from 1972-1980. Another reason for this switch towards power-tillers was the growing use of machinery in rice farming. Early mechanization was almost entirely in large sugar estates, where tractors predominate.

The size of farm is the major determinant of mechanization in sugar. Large estates (50 hectares and over), which account for the bulk of land devoted to sugar, were the first to introduce tractors in the Philippines, and have recently begun to introduce many other mechanized techniques, including mechanical harvesting. Small sugar farms continue to use labour-intensive techniques (Aguilar).

Table VI.5: AGRICULTURAL MACHINERY

Type	H.P.	Phil. value added as selling price	Labour cost as % selling price
Power tiller	6-8	43.9	7.3
Tractor	35	41.0	2.2
Irrigation pump	5	52.6	15.8
Portable Thresher	7	49.8	6.8
Large axial flow thresher	12	45.7	7.8

Source: Ahammed and Herdt, Appendix B.

Table VI.6: SALES OF AGRICULTURAL MACHINERY, PHILIPPINES

Year	Four-wheel tractor	Power tiller
1960	588	n.a.
1964	950	1,505[a]
1968	1,630	1,873
1972	1,120	1,408
1976	1,074	8,937
1980[b]	433	2,298

[a] Cumulative total, 1960-65.

[b] Includes sales from January to August only.

2. Prices and credit: These include policies towards interest rates, tariffs, the exchange rate, and fuel prices. Since 1966 four credit programmes involving subsidized credit have been agreed upon between the Central Bank of the Philippines and the World Bank (the implicit subsidy is estimated to be 12 percent). Studies show that this programme was the major factor affecting sales of tractors and power-tillers (Duff 1987; Sanvictores; Sycip et al.). The programmes tended to favour tractors over power-tillers, financing a much higher proportion of total tractor sales (30 percent) than power-tiller sales (7 percent) between 1966-1979.

Tariff policy in the Philippines has been designed to promote domestic production of power-tillers and has thereby increased the price of power-tillers relative to tractors. In the 1970s, the net implicit tariff on power-tillers (including the effect of exchange rate overvaluation) was 19 percent, while there was a zero tariff on tractors.

The overall combined impact of the interest rate subsidy, exchange rate overvaluation, tariffs and fuel tax has been estimated to have resulted in a subsidy on use of power-tillers and water pumps in the mid-1970s of 32 percent, and one on tractors of 47 percent (see David). Factor price distortions were the main cause of tractorization, according to David. The main element in these distortions was the subsidized credit programme.

3. Research and Development: The main effort in the Philippines has been that of IRRI in developing small-scale methods. They were especially successful in the development of a small-scale portable thresher, which has begun to replace the large-scale axial flow thresher on small farms. In

Central Luzon it is estimated that 92 percent of farms are using mechanical threshers.

There has also been some success in the development of hand tractors. Since 1966, increased use of hand tractors for land preparation has been in evidence. This was made possible by the increase in farm incomes and the greater availability of credit.

Domestic production of hand tractors started in the early 1970s with an important stimulus arising from the introduction of a simple prototype designed by IRRI. During the 1970s there was an increase in the use of hand tractors and increased share produced domestically. Growth of domestic sales from 1972-1978 was 5.7 percent pa, with IRRI-designed machines accounting for nearly half of the 1975 domestic production.

In a sample survey of Philippine agricultural machinery manufacturers (Mikkelson), 37 percent of the firms sampled had less than 10 employees, averaging five employees per firm. The survey respondents considered that IRRI machinery designs and technical assistance were significant sources of new technology.

Forward Linkages

Many features influence the degree of local processing: One is the type of commodities grown and the sort of processing required. Another is the location of consumption. In general, processing for local consumption takes place locally; the main choice of location arises for commodities which supply urban or export markets. In this context, the technological facts that are relevant to the location of processing are perishability of the product, economies of scale, and considerations of product quality.

For example, the rapid growth of exports of canned mushrooms and asparagus in Taiwan were naturally associated with dispersed processing because of perishability and difficulties in transporting the raw vegetables. The insignificance of these commodities as major exports in the Philippines partly accounts for the smaller degree of rural processing. However, deficient processing facilities might be one cause of the weaker performance in exports of this kind.

There are, however, a number of commodities where there appears to be a genuine choice of processing technology and of location. Below we discuss three examples. In pineapple processing and canning, and in preparation of bananas for export, the choice is illustrated by a comparison between developments in the Philippines and Taiwan, since the two countries have made different choices. In rice processing, the range and determinants of choice are illustrated by Philippine developments where mechanized methods are being actively promoted and are likely to displace more decentralized and labor-intensive methods.

Example: Pineapples. In both the Philippines and Taiwan exports of canned pineapples are substantial. In 1970, the Philippines exported 100,000 metric tons, while Taiwan exported 81,000 metric tons.

There is a sharp contrast between pineapple canneries in the two countries (see Armas 1973; 1975). Two companies account for pineapple canning in the Philippines, both subsidiaries of multinationals, Dolephil (Dole) and Philpack (Del Monte). In contrast, in Taiwan there are 23 different (national) companies (Armas 1975, table 3).

The processing and canning technology adopted in the Philippines is more integrated than in Taiwan, while the plants are more capital intensive

and of larger scale. The two producers in the Philippines have all their processing facilities on one site, while the Taiwanese operations are dispersed, not only because of the large number of companies, but also because operations are often dispersed within a company. For example, the Taiwan Pineapple Corporation uses five different plants. Differences in technology are illustrated in table VI.7. As this table indicates, there are significant differences between the two plants in the Philippines as well as between each of the Philippine plants and typical Taiwanese plants.

The differences in plant characteristics between the Philippines and Taiwan lead to differences in product quality. Taiwanese canned pineapples supply a lower quality segment of the market, both because of a lack of well-recognized brand names and because of less even quality. Nonetheless, there is a large market for this quality, as indicated by Taiwan's sustained share of the market. From 1969-73 both the Philippines and Taiwan accounted for the same share of the market of leading importers (19.3 percent each of the exports of main exporting countries). However, over the 1960s, the growth in Philippine exports, starting from a lower level, was greater than that of Taiwan.

Differences in technology choice and concentration of processing facilities can be accounted for by several factors:

(i) Minimum wage legislation in the Philippines was such that average wages in pineapple canneries in the Philippines were above those in Taiwan, especially in the early 1960s.

(ii) Infrastructure: Infrastructural deficiencies in the Philippines (see below) meant that canneries in the Philippines had to provide some of their

Table VI.7: TECHNOLOGY IN PINEAPPLE CANNING: PHILIPPINES AND TAIWAN

	Philippines (i)	Philippines (ii)	Taiwan
Capital* cost: 1972 prices, $	141,348	56,555	23,382
Labor requirements	26-33	25-37	25-33
Capacity per minute (cans)	75	60	32
H.P.	24	13	12.5
Capital per worker, $	4,283-5,436	1,529-2,262	709-935

(i) Dolefil
(ii) Philpack
*All operations, including pineapple corers, cutters, and canning.

Source: Armas, 1975, Table 1.

"own" infrastructure, encouraging concentration of facilities (Dolephil supplied some social investments).

(iii) Organizational differences in processing: The many local companies in Taiwan naturally led to a smaller scale and more dispersed processing, in contrast to the situation in the Philippines with only two companies. But as noted there was also more dispersal within companies. This was in part due to differences in wages and infrastructure, etc. It was also due to the differences between multinational subsidiaries and local companies. Multinational companies tend to concentrate facilities, thus economizing on local knowledge and contacts and decision-making, and making use of their familiarity with larger scale techniques from other parts of the world. In contrast, local companies have more dispersed local knowledge and contacts.

(iv) Organizational differences in farming: The Philippine plants were largely supplied by plantations, which could provide uniformity of quality and large-scale supplies, suitable for large-scale and automated processing. In Taiwan, each of the plants were supplied by small holder farms, with a number of farms supplying each plant. This reduces the uniformity of product and therefore the relative efficiency of large-scale and automated processing plants. Smaller scale and less automatic plants can cope better with less uniform commodities for processing.

Example: Bananas. In Taiwan, bananas have been grown by small holders in two provinces, Taochung and Kaohsiung, at a low level of capital and technology, but with considerable government assistance with fertilizers, pest control, irrigation, and erosion control. Exports are organized by three groups of exporters - two producer groups and representatives of Japanese importers. Before 1963, the Japanese market

was entirely served by Taiwan, with homogeneous fruit "subject to little quality control, no branding and produced as low-scale, low yield, low technological input enterprise" (Read).

In 1963, the Japanese liberalized the market for banana imports. From 1963-1966, Taiwanese production and exports grew very rapidly, from 3.4 million to 20.4 million 40 pound boxes. After 1966, the major multinational companies entered the market, and after a short period in which they procured supplies from Ecuador, they adopted the Philippines as their main source of supplies. Three companies developed facilities in the Philippines: the Standard Philippine Fruit Company (Castle and Cooke), Philpack (Del Monte) and United Brands. The three companies had varied arrangements to secure supplies. Stanfilco and Philpack contracted local businessmen to acquire land and provide supplies. United Brands entered into an agreement with the Tagum Agricultural Development Company, a large Filipino company which operates plantations. Each provided technical assistance, fertilizers, pesticides and financial assistance to local suppliers. Each operated on a large-scale and with expensive and sophisticated equipment for branding, packing, transport, and refrigeration.

The effects of multinational companies' production in the Philippines was to reduce the Taiwanese share of the Japanese market sharply. Taiwan's share of the market fell because Taiwanese exporters could not compete with high quality, pleasant looking, differentiated (by branding) and advertized bananas. Tie-ups between the MNCs and Japanese retailers were largely responsible.

In some ways, the comparison is similar to the pineapple case, with dispersed smallholder production and decentralized processing facilities with low levels of capital and technology in Taiwan, and multinational dominated organization in the Philippines, using sophisticated and expensive equipment, and securing supplies mainly from large scale farmers or plantations. In Taiwan, the government provided various facilities - advice, fertilizer, pesticides, etc. - which made smallholder production possible. In the Philippines, there was less government assistance and the MNCs provided these facilities.

The major difference between the two examples is that the MNC product quality in bananas combined with restrictive marketing arrangements (achieved through a combination of high quality control, branding, and advertising) successfully ousted the lower-quality and unadvertised Taiwanese product. The Taiwanese did not find a sufficient market for the lower quality product, as they succeeded in doing with pineapples.

Example: Rice Processing. One of the most significant forward linkages in rice-growing areas is rice processing. This includes threshing, drying, handling (described below as "pre-milling" activities), and milling. The implications of this forward linkage - in terms of income distribution and employment - depend critically on the choice of technique for these activities. There are a great variety of methods for post-harvest rice processing, ranging from traditional methods which are very labour-intensive, to large-scale mechanized techniques, for both pre-milling (threshing and drying) and milling activities. Most of the technology used in this area in the Philippines is highly labor-intensive, but more capital-using techniques are being introduced, while government policy is accelerating mechanization.

It is helpful to analyse the implications of technology choice in pre-milling and milling separately.

1. Pre-milling. In the Philippines, there are two areas where machinery is being introduced - for threshing and for solar drying. In both, traditional methods use no power, and very simple tools. For example, a stick may be used for threshing and rice may be dried by laying it out in the sun. Labor requirements fall sharply with mechanization; mechanical threshing reduces labor used by about three-quarters, while drying machines use about half (or less) the labor of solar drying (see IRRI 1978, and table VI.8). In absolute terms labor requirements per ton are much greater for threshing than for drying and the labour saving from mechanization is much greater in threshing (roughly 32 hours per ton) than drying (with a saving of four to eight hours per ton). Grain losses during processing are about 1 percent greater than milled rice with traditional techniques (IRRI). More mechanized techniques lead to slightly higher quality.

A survey in the Bicol area showed that sun-drying was substantially cheaper than mechanical drying, but mechanical threshing was significantly cheaper than manual methods, when labor costs were calculated at the market wage rate. However, these labour costs for manual methods were all in kind rather than in cash since family or other labor were paid in kind, whereas over half the costs of mechanical threshers were in cash. For farmers with limited access to cash (that is, subsistence farmers), manual methods would be preferred. Family labor may have a much lower real (opportunity) cost than the market wage rate in those cases where family members would not seek outside work at all, or where they might but only at a much higher wage than they are prepared to work for on the family farm.

Thus the cost estimates (shown in table VI.9) suggest that mechanical threshing is likely to be the most profitable choice for commercial farmers who have to hire labour for threshing, but manual methods may be the appropriate choice for family farms. The solar method of drying is unambiguously the best method for all types of farmer, according to this survey. These calculations are at market prices. But there is no reason to believe that in this context social prices would differ substantially from market prices, except for family labour which has already been discussed.

The evidence on costs, reported above, concerns axial flow threshers. Portable threshers have substantially lower capital costs (one quarter or less) than axial flow threshers. They are also more suited to areas with poor roads. Their breakeven output levels are substantially less, and they are simpler to produce and maintain. However, they also displace labor and tend to reduce the wage share (see Duff 1987).

To summarize: In post-production pre-milling activities, a combination of hand threshing or low cost portable machines and sun-drying methods seems to be the most appropriate choice for small farmers in the Philippines, and involve more employment than more mechanized techniques. A survey of 137 farmers in three villages in the Bicol region in 1976-77 showed 38 percent using mechanized threshers, with the rest adopting a variety of manual methods. Almost all farmers used sun-drying methods (IRRI).

2. Milling. There is a distinction between village mills which process locally produced rice for local consumption, and commercial mills which handle supplies for the urban areas. While most rice in the

Table VI.8: LABOR REQUIREMENTS: MAN HOURS, PER TON OF RICE DRIED

All traditional	56
Mechanical threshing, solar drying	23
Mechanical threshing, drying machine	18

Source: IRRI, 1978, Table 10a.

Table VI.9: COSTS OF ALTERNATIVE TECHNIQUES

	$ per ton	
	Manual	Mechanical
Threshing		
	-	2.08
Non-cash	7.91	2.21
TOTAL	7.91	4.31
Drying		
Cash	-	6.30
Non-Casn	1.61	0.65

Source: IRRI, 1978, Tables 19 and 21.

Philippines is milled in decentralized and fairly small-scale mills (compared with modern integrated plants), the commercial mills adopt a different technology from the village mills and are generally on a somewhat bigger scale (see table VI.10). The most commonly used village mill is a kiskisan type which consists of a steel huller, but some mills combine steel hullers with rubber-rolls. Commercial mills chiefly use cono type mills. Village mills are generally small, and need to be able to mill rice in small batches. While commercial mills tend to be larger, there is some overlap, the smaller commercial mills being no larger than medium size village mills.

Technical comparisons between the mills observed in the Bicol survey showed no marked differences in recovery rates. Steel hullers have a significantly higher proportion of broken rice than cono-type mills or mills combining rubber rolls with steel hullers. Total capital costs are lowest for the steel hullers and greatest for the cono mills. Labor costs and other variable costs are rather similar across mills, per ton milled.

The relative profitability of different mills depends critically on capacity utilization. A national survey showed that with equal capacity utilization, the village mills were the cheapest (see IRRI 1980). But the survey showed that the actual utilization rate was very low for the steel hullers (12 percent) and very high for the large cono mill (97 percent), and at these rates costs were lower for the cono mill. One village mill which combined a steel huller and a rubber roll had a fairly high utilization rate (77 percent) and its costs per ton were below those of the large cono.

Table VI.10: RICE MILLS IN THE PHILIPPINES*

	Labor cost per ton	Total cost per ton Utilization rate- Actual**	50%	100%	Capacity, KG/hour	Quality Recovery %	Head rice %	Capital cost $	K/L (approx.)
"VILLAGE" MILLS:									
Steel Huller	1.70	10.80 (12)	5.00	4.09	105-520	63.1-68.7	32.0-48.1	4,734	3,150
Rubber roll/steel huller	2.20	6.50 (77)	7.91	5.91	245	69.2	71.3	7,633	5,090
"COMMERCIAL" MILLS:									
Large Cone	1.80	6.80 (97)	10.91	6.69	830	70.63	76.75	42,700	17,080
Small Cone	1.80	16.04 (38)	13.50	9.30	240	66.25	75.55	13,301	8,870

*Selection from IRRI Survey.

**Bracketed figures show actual utilization rate in 1977 survey. Full capacity defined as 12 hours per day, 24 days per month.

Source: IRRI, 1978, Tables 25, 28, 51, 53, 54, 56.

In general, it is probable that village mills will have low capacity utilization because of the small lots involved in milling for local consumption. This is likely irrespective of the technology. The level of utilization of the commercial mills should be much higher - again irrespective of technology. Consequently, in analysing the net benefits from different technologies, equal capacity utilization should be assumed, within each category.

The cost analysis suggests that for rural consumption - where in principle a 50 percent capacity utilization is achievable - steel hullers are the most appropriate technology, with lower total costs and lower capital costs. But this conclusion only holds if the lower quality of rice is acceptable to rural consumers. As quality requirements rise, the combined steel hullers and rubber roll mills become the appropriate choice.

For commercial production (that is, for urban consumption), the rubber-roll/steel huller combination is preferred over the cono mills. The quality of rice produced is very similar, while the costs per ton are lower, given equal capacity utilization. Capital costs in total and per worker are much lower; the smaller scale and lower capital costs make the technology more accessible to small local entrepreneurs. It is possible that local manufacture of this technology could further reduce capital costs and increase linkage effects.

As rural per capita incomes rise, the marketable surplus consumed outside the area will rise, increasing the extent of commercial milling. With existing milling patterns, this would lead to a switch towards large-scale cono techniques which would both reduce opportunities for small-scale entrepreneurs as compared with smaller scale mills, and be associated with

lower local linkages costs since local production of the machinery is possible for the steel huller/rubber roll combination but not for the cono mills.

Therefore, to maintain the high forward linkage effects of rice production, it is important to encourage the use of the steel huller/rubber roll type mills for commercial supplies. Technological improvements in this type of mill (which are being investigated by IRRI) would help. Government and aid donor policy towards the industry is also of major importance.

3. Government Policy in the Philippines towards Rice-Processing.

Until recently small-scale decentralized techniques have dominated rice-milling in the Philippines. However, government policy was to encourage modernization and mechanization of post-production rice processing methods. The major objective appears to have been to maximize the supplies of high quality rice to the urban areas and eventually for export. Effects on rural employment and income distribution were not, it appears, taken into account in formulating this policy. For example, the government encouraged farmers' associations to acquire threshers by offering credit facilities on easy terms and by providing large-scale threshers for its grain centers. It has also provided mechanical dryers.

In milling, the National Food Authority decided to set up four integrated milling complexes in the major rice producing areas to produce a better quality of rice, and launched a modernization programme for private sector (cono-type) mills, making licensing dependent on milling efficiency and providing credit facilities for modernization.

Government policy was supported by some aid-donors. In the Cagayan Valley, the Asian Development Bank (ADB) helped finance a major integrated rice-processing complex, designed to process 100,000 tons of paddy annually. This compares with an annual capacity of 1,630 tons for the largest cono-mill in the Bicol survey, and 619 tons capacity of the steel huller/rubber roll combination, the technology identified above as most appropriate. The ADB project also provided a number of large threshers and mechanical driers. In addition, the ADB supported a modernization programme for cono-mills, providing relatively low-cost credit for approved modernization. Estimated costs per mill are five times the cost of a single steel huller/rubber roll combination.

Government policies (supported in this case by the ADB) has thus promoted mechanization of rice processing, with greater concentration of milling in a few large-scale centres. If the policy continues, the decentralized small-scale processes which have been prevalent in the Philippines, and have been reflected in the high forward linkage effects of rice production (illustrated above), will be displaced as rice production grows.

Infrastructure

The discussion above has focused on the factors leading to high local linkages from the perspective of demand. Favorable demand factors lead to a potential for rural linkages. But the actual development of non-agricultural activities depends on supply factors as well. A major influence here is the state of infrastructure. A study by province for 1975 (Fabella 1986a) showed positive effects of roads and electricity provision on non-agricultural employment levels.

Most indicators show that provision of rural infrastructure in the Philippines has been inadequate - much lower, for example, than in Taiwan as shown in Table VI.11. In 1950, Taiwan had five times the installed electricity capacity of the Philippines. In 1975, only 26.6 percent of households in the Philippines had electricity, compared with 99 percent in Taiwan (1979). Taiwan has 2.5 times the highways per square kilometer, compared with the Philippines.

The extensive coverage of rural electrification in Taiwan facilitated the rapid growth of decentralized industry, including those meeting local demands and those supplying urban and export markets. A study of the impact of rural electrification projects in the Philippines - covering 397,000 people - showed that within one year of the provision of energy, over one hundred new enterprises were established, including rice mills, welding shops, meat processing, ice plants, bakeries, and banana cracker plants (see Dumol), while the development of six new roads was associated with more than 100 percent increased in the number of non-agricultural enterprises (USAID).

A notable feature of infrastructure in the Philippines is its uneven distribution as table VI.12 indicates.

There have also been significant differences in credit distribution between the two countries. In the Philippines, credit has been distributed from the top downwards through a handful of major institutions (for example, the Philippine National Bank). In Taiwan, in contrast, credit institutions have been much more dispersed, with banking and credit facilities attached to farmers' associations.

Table VI.11: INFRASTRUCTURE, PHILIPPINES AND TAIWAN

UTILITIES		Philippines		Taiwan	
% households with electricity		1975 26.5		1952 33.0	1979 99.7
Installed electricity capacity: Kw per 1,000 people	1950 27.0		1970 95.8	1950 139.1	1970 719.3
% households with telephone		1975 1.1		1952 2.0	1979 71.3
% households with piped water	Urban 55.1	1975 Rural 10.1	Total 23.8	1952 14.4	1979 Total 63.8
TRANSPORT					
Highways, metres per sq. km.		1983 179			1974 458
Paved roads as %		26.3			51.7
Railways, metres per sq. km.		7			153

Sources: Statistical Abstracts of Transport and Communications 1974, Taipei, 1975;
Philippines, Ministry of Public Works and Highways;
Philippine Development Studies, Regional Development: Issues and Strategies on Infrastructure, NEDA, 1981;
Kuo, Ranis and Fei, Table 2.17;
Ranis in Stewart (ed.), Tables 4.1 and 4.2.

Table VI.12: REGIONAL DISTRIBUTION IN THE PHILIPPINES

	All Philippines	Luzon	(Metro Manila)	Visayas	Mindanao
% of population	100	54.0	(23.7)	24.1	21.9
% infrastructure expenditure, 71-71	100	73.8	(28.3)	13.5	12.7
% gross value added in utilities, 1974	100	84.3	(71.9)	11.8	3.9
Power capacity per 1,000 people, Kw. 1975	74	98		40	50
% of GVA in agriculture 1974	100	46.9	(17.8)	30.5	22.6
% of GVA in industry 1974	100	74.1	(45.4)	17.2	8.7

Source: Philippine Development Planning Studies, Regional Planning Series, No. Two, Three and Four, National Economic and Development Authority, Manila, 1981.

VI.2 Industry to Agriculture, Philippine evidence

There are fewer studies from the Philippines - as elsewhere - on the industry to agriculture linkage effects.

(1) An investigation from 1960 and 1971 related agricultural labor productivity by province to various conventional measures of agricultural inputs (land/labour ratio, irrigation, hectares), to two 'linkage' factors - roads per 10,000 hectares, and various measures of urbanization (Luna, Pernia and Hermosa). The study distinguished between urban centers of different hierarchies, with variables representing 'urbanization' (defined as tne proportion of urban population in the total population) for secondary, major, regional and national urban centers i.e., cities of increasing size and fulfilling a widening range of functions.

For 1960, the urbanization variables were not significant, although the lowest level 'urbanization' had a positive sign, while higher hierarchy cities had negative signs. The roads variable was significant and had a high positive coefficient.

For 1971, the roads variable was again significant and positive, and regional urban centers were significant and positive. However, the remaining 'urban' variables were not significant.

The study concludes that "at later stages of development, the impact of cities on nearby agriculture becomes increasingly beneficial." It should be noted that the linkage effect in this study is assumed to be added on to the conventional inputs, while (as noted above) linkages are likely to operate in part through their effects on the quantities of conventional inputs used.

(2) The impact of six new roads: an evaluation of six roads (four in Luzon, one in Panay and one in Mindanao) showed the linkage effects of roads in stimulating both agriculture and non-agriculture (USAID). The roads linked rural areas with model towns, and were of a total length of 43 km covering 26 barangays, over an area of 8,Ø86 hectares and with a population of 28,ØØØ. The roads were built between 1975 and 1978; the evaluation looked at changes between these years.

For each road, there was strong evidence of positive effects of the roads on contact with the towns, on costs of transport, and on agricultural output. In summary,

- costs of transport per passenger and kilo fell by 54 percent - transportation became more reliable, with the number of vehicles increasing from 63 to 243.
- waiting time for vehicles was reduced to almost nothing and travel time per trip was halved
- prices received by farmers increased for every agricultural product (17 to 27 percent for rice; 33 to 52 percent for vegetables; 52 to 62 percent for fruits). For the seven major crops, average farm gate prices increased by 59 percent (compared with an increase of 26 percent in market prices).
- for perishable products (some fruits and vegetables), farmers were able to produce for the urban market for the first time.
- before the roads, nearly 7Ø percent of farm products were sold at the farm gate, while after 6Ø percent were taken to market and only 4Ø percent sold at the farm.

- visits by extension workers increased, the number of government farm management · technicians doubled and the frequency of service increased by over 200 percent.
- the number of publications reaching the area increased by 267 percent, and the frequency of availability rose newly five fold.
- input prices (fertilizers, pesticides, etc.) rose less fast (12%) from farmers within the area than in the general increase of 20 percent.
- visits by extension workers increased

These positive effects on terms of trade, market access and knowledge were paralleled by increases in agricultural production:

- in aggregate, the production volume of the service major crops grew by nearly 40 percent, from 1976-1978;
- there were especially large increases in fruits (46%) and vegetables (62%).
- trips to the town increased by 114 percent.

There were also significant increases in the numbers and incomes arising from non-agricultural enterprises, with a total increase in the number of enterprises of 113 percent. This increase was partly due to rising agricultural output and incomes - farming income rose by 20 percent. The rise in local non-agricultural activity may have contributed to the improvement in terms of trade of local farmers.

Estimates of internal rates of return of expenditure on the roads (see Table VI.13) show returns ranging from 15.3 percent to 38 percent and benefit cost ratios ranging from 1.22 to 3.42 on the five roads for which calculations were made.

Table VI.13: IMPACT OF SIX ROADS
% Change 1975-1978

TRANSPORT & COMMUNICATION							
Transport costs	-50	-72	-45	-29	-39	-60	-54
No. of vehicles	+500	+490	+200	+187	+142	+160	+284
Frequency of trips	+75	+357	+40	+77	+60	+97	+114
Communications reaching area, no	+250	+600	+133	+500	+200	+200	+267
Frequency	+1,633	+2,500	+133	+900	+1,633	+300	+478
Extension-government Farm management, technicians, no	+200	+100	+150	0	+133	+80	+107
Frequency of visits	+500	+333	+200	+200	+300	+100	+212
FARM RATE PRICES							
rice, range	27/10	36/17	25/29	33/17	14/22	80/38	27/17
corn	-	40/30	-	38/17	60/50	-	52/33
vegetables	-	43/20	100/33	75/27	50/21	-	87/20
root crops	-	50/17	40/27	20/17	-	614	28/9
tobacco	-	133/88	150/25	-	-	-	62/52
fruit	-	-	-	39/23	-	-	150/23
coconuts	-	-	-	20/17	-	30/19	36/21
AGRICULTURAL OUTPUT							
rice	+14	+49	+11	+19	+10	-	+20
corn	-	+35	-	+22	+32	+29	+30
vegetables	-	+69	+125	+45	+71	-	+70/53
root crops	-	+21	-	+11	-	+39	+17
tobacco	-	+29	+19	-	-	-	+25
fruits	-	-	+12	+103	-	-	+46
coconuts	-	-	-	+67	-	+33	+47
FARMING INCOMES	+19	+37	+3	+21	+25	+16	
NO NON-AGRIC. EST.	+140	+167	+88	+127	+260	+131	+113
NON-FARMING INCOMES	+30	+105	+10	+21	+49	+17	
RATE OF RETURN (r.R.R.)	n.a.	38%	15.3%	24.8%	19.6%	n.a.	n.a.
BENEFIT/COST RATIO (15% discount)	3.42	2.59	1.02	1.7	1.22	n.a.	n.a.

Source: USAID (1978)

(3) An econometric investigation of the impact of infrastructure on employment in agriculture and non-agriculture across provinces for 1975 (Fabella) found fairly strong positive relationships between roads and electricity and non-agricultural employment, but not for agricultural employment. Average urban income per household was found to have a positive (although statistically insignificant) relationship with farming employment. Rural banks and levels of education had negative, and tractors a positive, (each statistically significant), relationship with labour absorption in farming. This study therefore gives rather mixed support to the linkage hypothesis, but the variables included do not provide for an adequate test, since farming output and incomes, not employment, is the relevant variable from the linkage point of view, while average income per urban household is not a good proxy for the significance of the non-agricultural sector - total value added or incomes in non-agriculture would be preferable.

(4) A comparison was undertaken between Nueva Ecija (which is in Luzon and "thus open to the modernizing influences of Manila") and Iloilo, "remote from these influences" (Young 1976). Land productivity in Nueva Ecija was 60 percent greater than in Iloilo, and labor productivity was over 90 percent greater. In Nueva Ecija the average distance from the capital city (Cabanatuan City) was 26 km, compared with 41 km. for Iloilo. The provincial capital of Iloilo was larger than Cabanatuan City but Nueva Ecija was also subject to the influence of Manila.

Analysis of determinants of labor and land productivity among the 30 barangays of Nueva Ecija and 39 of Iloilo (for 1760) show a strong and significant (at the 5% level) negative relationship between distance to the provincial capital and labor and land productivity; being in Nueva Ecija

(closer to Manila) was found to have an additional high positive effect. Among conventional variable irrigation had a positive effect as did rice area density.

VII. AN INVESTIGATION OF LINKAGES AMONG BARANGAYS IN THE BICOL AREA

The data on which this study is based are for households residing in basically rural areas in three provinces in the Bicol region of the Philippines. This region is located on the southern tip of Luzon and is composed of 6 provinces, 3 chartered cities, 113 municipalities and 3,142 barangays. It is one of the poorest regions in the country with its aggregate production representing only about 3.3 percent of the country's GDP in 1979 while it accounted for 6.6 percent of the total population. In 1980, the population of the region was 3.47 million with 83 percent of the people residing in rural areas. The majority of the population are engaged in agriculture (60.2%), and based on a 1980 World Bank study, 48.8 percent of all occupation categories are considered impoverished, with the greatest incidence of poverty falling among those in agriculture.

In 1973, the Bicol River Basin Development Project was launched as a test case of the government's overall rural development strategy of integrated rural development. Major components of the project involved the construction of basic rural infrastructure like roads, drainage and flood control, and irrigation facilities in several areas of high growth potential in the region. This was also accompanied by support projects for health, nutrition and education.

In 1978, a multi-purpose survey was carried out to provide baseline information on the impact of components of the Bicol development projects.

In 1983, a follow-up survey was conducted to facilitate an evaluation of the long-term impact of these projects on income, employment and productivity, as well as the effectiveness of the organizational structure and implementation capacity.

The two surveys, referred to as BMS78 and BMS83, covered the three provinces of Albay, Camarines Sur and Sorsogon. These are the most heavily populated provinces of Bicol whose combined population comprises about 69 percent of Bicol's total population. The main component of the BMS consisted of a large household survey covering 1,903 households, with very detailed information gathered on the following items: agricultural production, level and distribution of income, time allocation, demographic change, health and nutrition status, consumption, wealth and investment patttern and the role of women. In addition to this major survey, three other surveys were conducted simultaneously, each covering information on barangay infrastructure, extension services, and nutrition and health status.

Table VII.1 summarizes some data from the two surveys. As is at once apparent there was a very marked decline in income from farming and net business income over the period, to a small extent compensated by rising income "from other sources" (i.e., remittances chiefly). The fall in farm income between 1978 and 1983, and the associated fall in net business income, are generally acknowledged to be due to the abnormally unfavorable weather conditions in 1983. Since 1983 was such an unusual year, it was not possible to make use of that data even on a cross-sectional basis since the normal behavioral relationships do not apply at such times, as our

Table VII.1: COMPOSITION OF NET RURAL HOUSEHOLD INCOME FOR 1978 AND 1983 (at current values)

	1978 (N = 1,631)[a]			1983			
	TOTAL	Average per Household	%	TOTAL	Average per Household	%	Average per Household 1983/1978
Net rural household income: total, of which	16,714,806	10,248	100	11,196,539	7,109	100	0.693
Net Farm Income	11,083,364	6,992	68.2	6,351,595	4,033	56.7	0.576
Net Labor Income (wage)	39,460	24	0.2	751,376	477	6.7	19.72
Net Business Income	4,266,103	2,615	25.5	2,120,437	1,346	18.9	0.514
Net Income from other sources[b]	1,004,870	616	6.0	1,973,131	1,253	17.6	2.033

[a] The sample sizes should ideally have been the same since the 1983 survey was supposed to be a follow-up survey and should cover the same households. However, due to missing values in certain variables which consequently precluded the computation of net income in some observations, certain households had to be dropped from the sample in each period.

[b] Other sources include the following: rental income from non-agricultural land, buildings, bed spaces, interest on loans, dividends on insurance, stocks and bonds received, pensions, retirement pay/workmen's compensation, gifts, support, assistance/relief received, income from gambling and lottery remittances.

statistical investigations showed. Consequently in the analysis below we have confined our attention to the 1978 data.

The distribution of farmers by tenure, location and main occupation of household head in the Bicol area for 1978 is shown in Table VII.2. About 10 percent of farm households were primarily engaged in non-agricultural activities, of which about half consisted in relatively high income activities, including professional and administrative jobs (Medalla).

Table VII.2: DISTRIBUTION OF FARMERS BY TENURE, LOCATION AND MAIN OCCUPATION BY HOUSEHOLD HEAD
(Bicol Survey: 1977)

Location/Tenure	Percentage Main Occupation/Line of Business			
	Non-Farm	Farm	No Response	TOTAL
Poblacion				
Owner-Operator	11	36	6	53
Tenant	10	34	1	45
Barrio				
Owner/Operator	47	321	33	401
Tenant	122	1,039	78	1,239

Source: Medalla (1987)

With respect to 1978, information was available for 67 barangays concerning the "conventional" input variables; including:

L A B = (annual wages paid for hired labor + imputed wages net ruling wage rate for family labour per hectare)

C A P = capital expenses per hectare (annual)

FERT = fertilizer expenditure per hectare (annual)

IRRIG = irrigation expenses per hectare (annual)

EXTENS = extension offices per hectare

For the 67 barangays information was also available on the following "linkage" variables:

E S T = number of non-agricultural establishments per person in each barangay

ROADS = Km of roads per hectare within each barangay

Table VII.3 presents the results of regressions in which rice output per hectare is the dependent variable, and the independent variables consists of conventional inputs plus linkage variables — i.e.,

RICE output per hectare = f (conventional inputs, linkages)

Of the conventional inputs, the variable which proved most meaningful was extension which had a strongly positive effect, significant at the 5 percent level, in every equation in which it was included. The second most significant variable was labor input (significant at the 5% level in seven of the ten equations, and at the 10% level in a further two). Irrigation was significant at the 5 percent level in two equations, of the six equations in which it was used. Fertilizer expenditure showed significance in two equations. Capital expenditure always proved insignificant, and often even carried the wrong sign, probably indicating a not uncommon data problem with respect to capital.

Turning to linkages, of the two linkage variables, roads turned out to be significant and strongly positive in most equations, while the total number of non-agricultural establishments per capita in the barangay was always insignificant and often of the wrong, i.e., negative, sign.

Table VII.3: DEPENDENT VARIABLE: RICE

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LAB	101.98	90.41	118.21	74.58	250.25	97.33	85.75	118.21	85.78	95.49
	(2.43)	(2.39)	(2.38)	(1.57)	(9.35)	(2.76)	(1.85)	(2.58)	(1.89)	(2.75)
OIP	-14.70	-16.42			24.77	-14.73	-16.49			
	(-0.63)	(-0.95)			(1.29)	(-0.82)	(-0.95)			
REN				324.38	-199.9	54.12	95.70		238.37	53.21
				(2.16)	(1.27)	(0.33)	(0.37)		(2.13)	(0.33)
IRRG	832.73	786.25			582.9	781.48	732.3			781.80
	(2.75)	(2.33)			(1.77)	(1.85)	(1.73)			(1.82)
ENT	203,775.39	212,108			240,424	180,481.1	197,855.8			191,734.31
	(2.97)	(3.08)			(2.51)	(2.39)	(2.47)			(2.41)
RST		-4,233.7		-4,494.7	1,574.2		-5,210.5			
		(-1.06)		(-0.93)	(0.27)		(-1.05)			
RYD	33,152.37	35,370.3	28,439.7	34,382.7		34,082.14	35,270.2	28,439.7	31,378.3	32,232.89
	(5.42)	(5.79)	(4.29)	(5.48)		(5.23)	(5.24)	(5.24)	(5.14)	(5.47)
CONSTANT	31,367.52	51,423.38	52,772.3	47,236.5	-77,033.3	30,338.4	45,334.7	52,772.32	21,574.55	
	(0.85)	(1.36)	(1.67)	(1.25)	(-2.12)	(0.79)	(1.25)	(1.67)	(0.56)	(0.37)
r^2	0.35	0.55	0.55	0.67	0.33	0.55	0.53	0.55	0.67	0.58
Adjusted r^2	0.28	0.52	0.55	0.65	0.32	0.57	0.57	0.55	0.65	0.57
DW	1.82	1.95	1.75	1.75	1.75	1.69	1.65	1.75	1.75	1.75
No. of Observations	67	67	67	67	67	67	67	67	67	67

From this evidence, it appears that roads within a barangay, which not only improve communication among the local inhabitants but also on average, with the outside world, have a positive effect on improved agricultural productivity.

Closer investigation of the non-agricultural establishments revealed that most of them were indeed traditional shops (e.g., Sari-sari shops, barbers, betting shops), which might not be expected to have linkage effects in terms of changing attitudes and incentives. Consequently, we tried to test for the proximity of specifically "modernizing" non-agricultural activity. We selected two additional variables, the average distance to the nearest urban center, termed DISTURB, and a subset of modernizing non-agricultural establishments within the barangay, termed NEWEST. The smaller the value for DISTURB, we hypothesized, the more likely that modernizing attitudes and incentives would be in evidence (i.e., we would expect an inverse relationship between DISTURB and agricultural productivity). For NEWEST, we classified non-agricultural establishments into modern establishments, including department stores, furniture shops, upholstery shops, appliance stores, agro-chemical, and agro-machinery stores. Over two-thirds of the barangays had no such establishments. We therefore used a dummy variable -NEWEST- which was positive if a barangay had any of these modern establishments and zero if it had none.

Only 58 barangays had data for DISTURB and NEWEST as well as the other variables cited; moreover, as can be seen from Table VII.3, reducing the sample weakened all the regressions in comparison to the full sample. This is most clearly illustrated by comparing equations (10) from Table VII.3 and (15) from Table VII.4, which use the same variables.

Table VII.4 summarizes some findings for the 58 barangays. In general, as just noted, the explanatory power of our regressions is much weaker than for the full sample. Of the conventional inputs, labor is no longer significant while irrigation and fertilizer are mostly significant. The "new" linkage variables operate in the expected direction, i.e., distance from the nearest town has a large negative impact, significant in every case but one (at 5% in 2 cases and 10% in five cases). The presence of modern establishments (NEWEST) was significantly positive in three of the four equations. However, in the presence of these new linkage variables, in this smaller sample, the "roads" variable loses its significance.

Conclusion

The Bicol Survey Data Set proved to be seriously deficient especially for 1983. While the data was better for 1978, they were still incomplete, so that we were not able to carry out many of the tests intended.

Given the necessary caution about the validity of the data, we nevertheless found that linkage variables had a positive effect on agricultural productivity.

- For the 67 barangays, roads per hectare were highly positively related to agricultural productivity;

- For the 58 barangays, distance from the nearest urban center (inversely), and the presence of modern establishments (positively) were found to be significantly related to the level of agricultural productivity.

Table VII.4: DEPENDENT VARIABLE: RICE

Independent Variables	(11)	(12)	(13)	(14)	(15)	(16)	(17)
LAB	20.27 (0.38)	10.35 (0.19)	73.71 (1.44)	20.33 (0.38)	78.7 (1.57)	10.36 (0.19)	36.05 (0.69)
FERT	385.78 (2.00)	389.82 (2.08)		380.05 (2.01)	168.3 (0.88)	390.0 (2.13)	340.88 (1.99)
IRRIG					460.34 (1.09)		260,867.08 (2.45)
EXT					327,712.93 (3.57)		
EST			269,733.87 (0.05)				
NEAREST		89,246.23 (2.25)				89,221.6 (2.08)	59,376.52 (1.39)
ROAD	3,015.29 (0.19)	-63.9 (-0.01)	-1,957.48 (-0.12)		7,674.39 (0.30)		
MOISTURE	-6,531,053.9 (-2.25)	-5,335,329.1 (-1.37)	-5,702,101.4 (-1.39)	6,326,992.7 (-2.26)		5,336,139.8 (-1.39)	3,460,356.15 (-1.23)
CONSTANT	136,155.89 (2.39)	117,731.73 (2.06)	142,919.79 (2.11)	139,840.41 (2.52)	38,277.12 (0.93)	117,625.27 (2.54)	82,579.15 (1.78)
R^2	0.30	0.25	0.13	0.30	0.30	0.25	0.23
Adjusted R^2	0.14	0.18	0.07	0.16	0.23	0.20	0.27
D.W.	2.10	2.05	2.09	2.10	1.84	2.05	1.91
No. of Observations	58	58	58	58	58	58	58

- This finding on new establishments, together with the result that the number of non-agricultural establishments per person are not related to agricultural productivity, supports the view, put forward earlier in this paper, that the positive linkage effects on agricultural productivity do not come from traditional non-agricultural activities, but from more modern activities associated with "modern" establishments.

VIII. SUMMARY AND CONCLUSIONS

In a developing economy balanced growth of the agricultural and non-agricultural sectors can give rise to a mutually supportive process of dynamic interaction, in which the rate of growth of output and productivity in both sectors, and thus for the system as a whole, is faster than in unbalanced or compartmentalized development. Moreover, such balanced growth is typically associated with a more egalitarian and employment creating pattern of development, than in the case of compartmentalized growth.

The macro or aggregate connections between the two sectors underlying this phenomenon have been well established as a crucial aspect of the development process. Less attention has been paid to the importance of rural linkages between the sectors, with the spatial distribution (and nature) of both agriculture and industry influencing the extent of local linkages, the dynamic interaction between the sectors, the regional pattern of development and the evolution of income distribution over time.

Spatially concentrated patterns of development reduce the extent of rural linkages and consequently the mutually beneficial process of interaction between the sectors at the local level, while the absence of

such dynamic interaction in large parts of the country reinforces the spatial concentration in the economy. Spatial concentration of industry is typically associated with the adoption of large scale, capital intensive technologies and with a high degree of inequality in income distribution.

This study has analysed the strategic context in which growth takes place, identifying development strategies likely to be conducive to rural linkages and balanced growth and reviewing the spatial dimensions of development patterns in the Philippines since 1903.

The study also explored how rural linkages operate, with emphasis on the two-way direction of the process - from agriculture to industry and from industry to agriculture. Evidence was presented on the strength and causes of rural linkages in both directions, with particular focus on the Philippines.

Major Findings and Policy Implications

1. The Strategy of Development

Development in the Philippines - especially since 1947 - has been highly concentrated spatially. In 1975 the Central Industrial Region accounted for three-quarters of the country's manufacturing output, and two-thirds of manufacturing employment. This spatial concentration has been associated with one of the highest rates of industrial concentration in the world: 2 percent of the Philippines' industrial firms account for 85 percent of the output. Much of industry has used relatively capital-intensive technology to produce products for an elite market. While there remain large numbers of very small enterprises - many of which are dispersed throughout the country - these enterprises are mainly carrying

on traditional activities (e.g., handicrafts, and traditional services). There are very few 'modern' small and intermediate scale firms.

The high concentration of non-agricultural production in the National Capital Region and in large scale enterprises is both a reflection and a cause of the weak rural linkages in evidence.

The two types of concentration are mainly due to three mutually reinforcing factors - the inegalitarian nature of income and land distribution, the import-substitution strategy and associated industrial policies, and regional imbalances in the provision of infrastructure.

The inegalitarian distribution of income in agriculture stems largely from the inegalitarian distribution of land. This in turn created patterns of demand for inappropriate products which could only be imported or produced in a capital intensive way in urban areas. The market for appropriate products, suitable for decentralized production, was weak. The urban concentration of industrial production in capital intensive industries further reinforced these patterns of demand. The import-substitution strategy supported these industrial developments and encouraged industrial location near the administrative centers, which became the source of credit, tax relief, import licenses, etc. Inadequate regional infrastructure supported these locational decisions. Consequently, the strategy of development adopted - in agriculture, towards trade and towards the allocation of infrastructure - have led to weak rural linkages. Only 16 percent of the income of farm households in the Philippines in 1975 was off-farm in origin.

2. The Strength and Value of Rural Linkages

We found considerable evidence - in the Philippines as elsewhere - of strong rural linkages in both directions: increasing agricultural output increases rural non-agricultural employment (a 1% increase in agricultural output being associated with a more than 1% increase in non-agricultural employment in the Philippines); while increasing the extent and modernization of rural non-agricultural activity raises agricultural productivity by changing attitudes and incentives, and improving markets and the supplies of inputs.

The empirical findings of this study show that for linkages in both directions, the extent of linkage effects depends not only on the quantity of employment and production in each sector, but also the nature of sectoral output. In the case of agriculture to industry linkages, the extent of rural non-agricultural activity is influenced by the income distribution arising in agriculture. A more egalitarian agriculture generally absorbs more labor into agriculture and consequently increases the total level of consumption linkages and also the extent to which consumption expenditure is met by local production of appropriate goods, as against imports or the centralized production of elite goods. Labor absorption in agriculture also depends on the extent of agricultural mechanization and the crop-composition of output. Backward linkages (demand for inputs) depend on the extent and type of mechanization; for example, large scale tractors are generally produced in large urban centers, while smaller tools, vehicles and tractors are more frequently produced in rural industries.

While consumption linkages account for the largest proportion of rural non-agricultural employment, forward linkages are also of substantial significance and often increase in importance. These consist mainly of food processing, both for domestic consumption and for the urban or export markets. Food processing for domestic consumption typically occurs locally; however, whether other types of processing for outside markets takes place locally or centrally depends on the nature of the crop, on technological alternatives, the organization of processing units, and the availability of infrastructure. As production for outside markets increases more than proportionately with growth in agricultural productivity, the location of its processing is of importance to the dynamics of rural industrial development.

For industry to agriculture linkages, the evidence presented in this study shows that it is necessary to differentiate between types of non-agricultural activity. Traditional non-agricultural activities - which use traditional technologies and exhibit very low productivity - do not appear to have significant linkage effects in raising agricultural productivity. However, the presence of 'modern' non-agricultural activities in rural areas in the Philippines, as well as improved roads and greater proximity to urban centers, are associated with increases in agricultural productivity.

Some factors - particularly the development of improved roads in the rural areas - of a type which improves the contact of farm households with local market towns - promote linkages in both directions. So does the expansion of infrastructure for local market towns - to encourage the location there of small and medium-sized modern enterprises. Proximity to small towns has been shown to raise agricultural productivity, while the

new enterprises would provide consumption and produce goods to meet rural needs, thereby increasing the linkages running from agriculture to industry.

3. Some Policy Conclusions

The spatial concentration of industrialization in the Philippines, as a consequence of the weak rural linkages, has reduced the rate of growth of both agriculture and industry compared with a more dispersed pattern of industrialization. The pattern of growth, moreover, has been regionally imbalanced, with some areas, especially outside Manila, showing considerable poverty and lack of development; labor absorption has been limited in both agriculture and industry, and the inegalitarian distribution of income has been accentuated, making the Philippines today among the most unequal societies in the world.

There exists, therefore, a very strong case for trying to reverse this situation, and for changing the pattern of development towards a more equitable and balanced path.

This would require major, and politically difficult, changes in development strategy, including:

(1) More equality in the distribution of agricultural assets which would increase agricultural labor absorption, raise the consumption of appropriate products, and consequently, employment in small and medium sized dispersed enterprises;

(2) A radical revision of the import-substitution strategy, reducing the protection for the production of elite products, and systems of import licensing which create local monopolies. Policies for the promotion of

agri-based exports, and labor intensive manufacture, would encourage greater decentralization and more labor absorption in industry;

(3) Revision of the credit allocation system, which favors investment in large scale and capital-intensive industries;

(4) Revision of the tax system (see HIID) towards more progressive taxation on incomes and assets, with indirect taxes used to discourage the consumption of elite products;

(5) Revision of taxes and tariffs (e.g., on electricity) which currently favor urban areas and discriminate against rural areas;

(6) Reallocation of expenditures on infrastructure towards the rural areas, especially in the form of roads and electricity of a type which promotes links between farm households and local market towns;

(7) Decentralization so that decisions on economic planning, infrastructural priorities etc. are taken by local bodies in the light of local needs;

(8) A technology policy to assist in the development of efficient small and medium sized enterprises. The policy should include assistance for upgrading both traditional techniques, and new technologies for small and medium sized modern enterprises. An information network and technical assistance (a sort of non-agricultural extension service similar to the agricultural extension service) is needed to help diffuse knowledge concerning the many efficient small and medium scale technologies already in existence within the Philippines and elsewhere. The present science and technology system is often directed towards inappropriate technologies and goods.

(9) Improved credit institutions for financing small scale activities in the smaller towns and rural areas. As noted, although the case study

focused on the Philippines, the conclusions are applicable to a wide range of developing countries, both in Latin America and sub-Saharan Africa.

The evidence presented here has shown that rural linkages are of considerable significance for successful growth. In general, more work has been done on the agriculture to industry directional linkages than the industry to agriculture direction. On the latter, more empirical work would be useful, to obtain a firmer idea of orders of magnitude and of the nature of the processes at work. There is a need for more comparative studies among different countries exhibiting differential success in their attempted transition to modern growth.

A better understanding of the industry to agriculture linkage is necessary for fully analyzing the sources of agricultural growth in the early and intermediate stages of development. The absence of sufficient emphasis or understanding of this linkage factor may help shed light on the problem of stagnant agriculture, as in some sub-Saharan African countries, and in turn, because of linkages running from agriculture to industry, the slow overall growth of some of these countries.

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