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The indirect employment effects of multinational enterprises in developing countries

by

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1. **Introduction**

This paper deals with the conceptual issues in assessing the indirect effects of multinational enterprises in developing countries, and reviews some of the relevant evidence from existing studies on these effects. There is little doubt that indirect employment effects are particularly important to developing countries. It may even be the case that indirect effects of MNE investments outweigh their direct effects: certainly, a number of host governments seeking to cope with unemployment look to MNEs for the stimulation of indirect employment in related sectors of the economy.

Despite its practical significance, however, there are few studies of indirect employment effects of MNEs (or of enterprises in general). Even the concept of 'indirect' effects is not well defined, and its measurement is almost impossible to execute with any pretense of precision. Furthermore, if one is to distinguish the effects of one particular kind of investment, in this case by MNEs, one needs to stipulate some kind of 'alternative situation', what would have happened if that particular investment had not taken place. But it is not at all obvious what the alternative situation may be: we can provide certain general considerations about whether domestic enterprises would have come forward to replace the multinationals, but these remain suggestive rather than definitive.

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1. For a lengthier discussion of the definition of the 'alternative situation' and of the problems in specifying it see S. Lall and P. Streeten, *Foreign Investment, Transnationals and Developing Countries*, London: Macmillan, 1977.
Any discussion of indirect effects is, therefore, necessarily beset by a number of theoretical and practical difficulties. This does not mean that these effects should not be considered: on the contrary, precisely because they are undoubtedly extremely important, and because their nature is not well understood, it is imperative that anyone concerned with the employment problems of developing countries must devote some time to trying to clarify what the animal is. Thus, we need not apologize for the fact that this paper devotes much of its attention to rather general theoretical issues.

Part 2 below briefly describes the three different types of indirect effects that MNC activity may generate. Parts 3 to 5 treat each of these broad categories separately. Part 6 draws some conclusions.

2. A Broad Categorization of Indirect Employment Effects

The MNE affects the host economy in a variety of forms, and nearly of these can have some indirect repercussions on employment. We may place this rather diverse set of effects into three groups, following the analysis of an earlier ILO report on this subject:¹

- First, the indirect employment effects of MNEs by their impact, after accounting for the 'alternative situation' in which the MNE is assumed absent, ² on national income.

² Note that the ILO study did not take the 'alternative situation' into account.
government revenue, and foreign exchange availability. This may be termed the 'net macroeconomic' impact.

- Second, the indirect employment effect (again, allowing for the alternative situation) through their effects on other enterprises which compete with them or are otherwise linked to them through various market-structure mechanisms. This may be termed the 'horizontal' impact of MNEs.

- Finally, the net effect of MNEs on employment in other enterprises directly linked to them in the production chain, by selling to or buying from them. This may be termed 'vertical linkage' effects.

Let us consider each of these group of effects in turn.

3. **Net Macroeconomic Impact**

If the economic activities of MNEs in a developing country and, in net terms, to total income in the country, to the host government's revenue, or to the foreign exchange reserves, it will stimulate employment in several ways. The income effect will occur when the beneficiaries - local shareholders or wage and salary earners - spend their increased earnings on the market and so stimulate production. The exact impact of the spending will vary from case to case: the distribution of increased incomes among different groups will affect the additional employment created to the extent that their spending propensities have different 'employment intensities' (e.g. increased wages may lead to the consumption of more simple consumer goods which tend to be rather labour intensive,
while increased profits may lead to greater imports or the consumption of more sophisticated, capital-intensive goods).

Similarly, increased revenues in the hands of the government can permit it to create employment in any way it chooses. And increased export earnings can be a distinct positive factor if the country faces a foreign exchange gap which is greater than its savings gap: in this case, the imports of crucial items like capital or intermediate goods (especially spares) can relieve production bottlenecks in domestic industry and so stimulate a fairly large increase in employment.

By their very nature, such indirect employment effects are impossible to quantify and track down with any degree of certainty. The bigger problem is, however, to calculate the net contribution of MNEs in comparison to the alternative situation. If a particular foreign investment had not been made, would domestic investment have been able to substitute for it without reducing investment elsewhere - is, in other words, foreign capital a complement to or a substitute for domestic capital? And even if some part of the MNE activity is substitutable by domestic enterprises, is their efficiency the same, and are they equally proficient (where this is relevant) at exporting their output? And so on.

In a major study conducted for UNCTAD on the balance-of-payments and income effects of foreign investment which explored these questions at great length, Lall and Streeten (op.cit.) found that there were several different considerations which determined the net macroeconomic benefit derived from foreign investment. If production by MNEs were subjected
only to social cost-benefit analysis, using the 'alternative situation' of importing their product, over half of foreign investments in a sample of over 150 yielded negative effects. The fault, however, was not that of the investor: it lay with high effective protection accorded to all import substituting investments, local and foreign. The country would consequently have been better off, in these several cases, if it had merely imported the product instead of producing it locally with small scales, poor inputs and poor infrastructure.

If this social cost-benefit aspect were ignored, and a given activity was compared between an MNE and a potential local replacement, no clear answer was possible because it was impossible to evaluate whether local enterprises had the entrepreneurial, technical, financial and marketing capabilities to really replace the foreign enterprise. But the general thrust of the answer was obvious: the more complex the activity, the higher the levels of skill and technology required, the larger the scale and the more differentiated the product, the greater would the net contribution of the MNE be to local incomes, revenues and exports as compared to the local replacement. Conversely, the simpler the activity and the more dynamic, experienced and competent the local industrialists the less would be the net foreign contribution.

The positive income and foreign exchange impact of the MNE becomes more obvious if export-orientated rather than import substituting activities are considered. A great deal of MNE export activity, particularly of the 'offshore-processing' variety where the existence of an internationally
linked framework of production and marketing are crucial to exports, cannot be replaced by domestic firms acting on their own. Similarly, the growth of exports by international subcontracting, where a foreign buyer provides designs and marketing services (and sometimes the raw materials) to local firm, could not be sustained by local firms alone.¹ The foreign enterprises involved here are not multinational producing firms, but in a broad sense we may consider their activities as multinational. There is every sign that this sort of activity, which had led to a much faster growth of manufactured exports from the Third World than any other,² will continue to grow and assume greater significance in the future (though the continued, and currently deepening, recession may slow it down). Furthermore, while such export-orientated MNE activity has been granted large fiscal concessions and so has not yielded much tax revenue, it is likely that as tax holidays expire in the older centres like Singapore, export activity will continue and start to yield substantial official income.

One sector which has become a massive contributor of revenue and foreign exchange is the mineral/fuel extractive ore, where developing countries have been able to improve their position vis-à-vis MNEs dramatically in recent years. In some,  


of course, MNEs have been pushed out of extractive activity to a great extent (e.g. petroleum), but in others they have retained their hold while conceding large rises to host governments in terms of tax levies.

Even in manufacturing activity, there have been two tendencies in the past decade or so which gives rise to the belief that, offshore assembly aside, MNEs have become 'better' for developing host economies in response to pressures put on them by the respective governments. First, the most enthusiastic phase of import-substitution seems to be past, and all investors are required to be more internationally competitive. There are still exceptions, of course (like India), but by and large the switch to more outward looking policies suggests prima facie that MNEs operating in developing countries are making a greater contribution to them. Second, there has also been a tendency to 'tighten up' on MNE entry, restricting them to sectors of high technology and high marketing where local firms are at a disadvantage. Again, this suggests that the net foreign contribution has been increased.

Against these positive factors, we may put the possibility that MNEs are depriving host governments of income and foreign exchange by the manipulation of transfer prices.1 The evidence suggests that intra-firm trade by MNEs (i.e. trade between different affiliates of the same firm) is increasing over time, and this raises the potential scope of manipulating transfer prices. Governments are, on the other hand, also

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becoming more canny in checking such practices. The outcome is unclear, but it would take us too far afield to go into this debate here.

In sum, therefore, MNEs can yield large income benefits to host economies provided, first, that they are not enticed by very heavy protection to invest in socially inefficient activities, and, second, that they are not simply substituting for local enterprises which could equally well have undertaken their activity. If they operate in relatively competitive conditions and in activities in which they possess special talents, then we are safe in assuming that they make a positive net contribution on this score.

4. 'Horizontal' Indirect Employment Effects

The term 'horizontal' effects is used broadly to denote all relevant effects on other enterprises in the economy excluding those via income (as above) or via direct production linkages (below). These horizontal effects are of two kinds: narrow horizontal effects, on other enterprises directly competing with the MNE in its own industry (or set of industries); and broad horizontal effects, on other enterprises not directly competitive with the MNE.

The narrow horizontal effects of MNEs (in terms of standard industrial economics depiction of structure, conduct and performance) can be quite powerful.¹ In terms of industrial

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¹ For a review of the literature on the impact of MNEs by what was termed 'indirect linkages' (corresponding to narrow horizontal effects) see S. Lall, 'Transnationals, Domestic Enterprises and Industrial Structure in Host LDCs: A Survey', Oxford Economic Papers, July 1978.
structure, the entry of MNEs has a sort of cycle effect: initially, competition is increased by the new entrants and the challenging of the existing 'rules of the game', but, 'as the structure settles down again, the introduction of new techniques of production and promotion lead to an increase of concentration.' This is not to suggest that this is undesirable for host countries. To the extent that the introduction of such techniques leads to greater efficiency and a wider range of products, the economic effects are clearly desirable. Given the small market size of most developing economies, a shift towards modern, efficient methods of production is almost bound to increase concentration. However, to the extent that it reflects anti-competitive behaviour on the part of financially powerful MNEs (which, after all, lead in conglomerate diversification and take over activity in their home countries) it may lead to a lessening of desirable competition and to greater monopolistic slack in the industry concerned.

In terms of conduct, therefore, the impact of MNE activity may be two fold. On the one hand, it may be to force greater efficiency, more technical upgrading and innovative activity, better marketing and a more outward-looking attitude on the part of its local competitors. On the other, it may be to force local firms out of business, or to increase their size and monopoly power.

What are the likely effects of such conduct on performance as far as indirect employment effects are concerned?

Clearly, any argument here must be largely speculative

1 For further exposition and econometric testing of this hypothesis see S. Lall, 'Multinationals and Market Structure in an Open Developing Economy: The Case of Malaysia', Weltwirtschaftliches Archiv, 1979.
because of the paucity of appropriate empirical studies, but *a priori* reasoning suggests that a mixture of effects is likely. Local competitors of MNEs are likely to *increase* their employment if they are induced to become more efficient, and so are able to grow faster and export more; if they are induced to undertake greater technological effort to use more 'appropriate' (i.e. labour intensive) techniques; if they are shown the way to a more efficient allocation of work and resources by subcontracting out to a greater extent, thus relying more on small, relatively labour-intensive enterprises to perform simpler tasks (we return to this in the next section). On the other hand, it is likely to *decrease* their employment if local competitors are forced to adopt more capital intensive techniques; if small, traditional producers are forced into bankruptcy and overtaken by large scale, mass producers; or if a strong, dominant multinational presence scares local enterprises from investing in research and development.

The balance between the employment and efficiency stimulating and retarding effects cannot be predicted with the data at hand. Existing studies have tended to confine themselves mainly to comparing the relative capital/labour intensities of foreign and local firms at fairly high levels of aggregation. This does not permit us to assess whether the two sets of firms have different technological biases in producing the same good with different techniques, whether they produce different goods, whether the results are caused by different scales of operation (larger scale is generally associated with greater capital intensity), or whether they
are caused by differences in managerial efficiency. More important for our purposes; these studies make no attempt to assess the impact of MNC activity on the performance of local enterprises so that it is impossible to draw any inferences for policy purposes. And, finally, as with other calculations of indirect effects, the 'alternative situation' is ignored: but surely some technical progress, increasing concentration etc. would have occurred in the absence of MNE entry, by the import of modern technology and by the natural working out of local market forces.

Despite these deficiencies, it may be useful to review briefly some of the relevant studies carried out on MNEs and local enterprises. The following survey relies heavily on the author's earlier paper. (Oxford Economic Papers, 1978, op.cit.) on this subject, but some new references have been added.

Let us start with comparisons of the relative productivity of local and foreign enterprises:

Vaitsos has collected estimates for labour and capital productivity for a large sample (about 3,200) of firms in Peru.¹ He has allowed for different sizes of firms, but his measures of productivity (total output over balance-sheet figures for fixed assets and total employment) leave much to be desired. Since he does not distinguish between different industries, his general findings² that foreign firms seem to be more


² Vaitsos finds that foreign controlled firms (20 per cent or more foreign equity) have higher labour productivity for all sizes of firm than locally controlled ones, the differential being highest for intermediate-sized firms and fairly low for the smallest and largest ones. Foreign firms have lower capital productivity for small sizes, slightly higher for the intermediate, and much higher for the largest firms.
efficient than local ones, particularly in their use of labour, need to be carefully interpreted. Average productivity differences may be caused mainly by the industrial composition of the two groups of firms, a presumption which is supported by figures given in the appendix tables to the report. The absence of statistical tests makes it difficult to say how significant industrial differences are, but it appears from the figures given that in low-technology sectors foreign firms have similar capital productivity but much higher labour productivity, perhaps indicating a more efficient use of similar technology; in high technology sectors foreign firms have much higher capital as well as labour productivity (sometimes with less capital/worker), indicating the use of more advanced technology, scale economies, or better management.

Fajnzylber's study of Mexico groups firms into light consumer goods, consumer durables, intermediates, and capital goods.\(^1\) Measuring productivity by value-added over employment and capital, he finds that foreign firms have higher labour productivity overall than local firms (2.0 times), with the difference being greatest in light consumer goods (2.5) and least in consumer durables (1.4). Somewhat surprisingly, he finds that the capital productivity of foreign firms is uniformly lower, being 0.8 of that of local firms on average, highest in light consumer goods (0.9), and least in intermediate goods (0.6). Whether this is due to the nature of the technology, the distribution of firms within these broad groups, their

\(^1\) Fajnzylber, 'Las Empresas Transnacionales y el Sistema Industrial de Mexico', El Trimestre Economico, 1975.
size, the existence of excess capacity, or poor management is impossible to say.

On Argentina, Sourrouille provides information on labour productivity of foreign and local enterprises (measured by output per employee) by industry groups.\(^1\) For 1967, foreign firms' productivity was 2.1 times that of local firms on average, with the difference being highest in transport equipment (5.1), electrical appliances (5.0), machinery (2.6) and petroleum products (2.6), and lowest in chemicals (1.4), textiles and rubber (1.3), and food (0.9). Again, the figures do not enable us to trace the sources of these differences, since data on size, technology, capacity utilization, and so on are not given.

Jo compares the capital intensity and labour productivity of foreign and local firms in different industries in South Korea.\(^2\) He finds that on average foreign firms have labour productivity 1.8 times that of local firms, lower than local firms in sectors like clay, metal products, food, wood, and electrical machinery, and higher in textiles, chemicals, machinery, and transport equipment. As this pattern is closely related to differences in capital intensity between the two groups (more capital intensity being associated with higher productivity), we may infer that differences in productivity are explained more by the sort of technology used (and perhaps size) than by efficiency in the running of operations.

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None of these studies allows us to say whether MNEs as such are more efficient in their use of capital and labour than domestic firms. Differences between them certainly seem to exist, but whether this is due to industrial distribution, size, technology, market conditions, x-efficiency, or other factors cannot be determined from the evidence presented. Lall and Streeten (op.cit.) examine labour and capital productivity of different groups of firms in their Colombian and Indian samples, but fail to find statistically significant differences between MNEs and other firms. Industry groupings turn out highly significant, as may be expected, but the sample is too small to test for differences within industry groups.

Balasubramanyam compares productivities and capital-intensities within industries for a sample of 85 Indian firms of which 28 are local without foreign licensing, and 15 foreign. He finds such a diversity of experience across different industries for different measures of productivity that foreign licensing or ownership as such does not seem to exercise an independent influence; in any case, the smallness of the sample of foreign firms does not permit any general inference about their performance.

In his study of Central America, Willmore finds that capital output ratios of foreign firms is significantly lower than that of local firms, but is unable to explain whether this is because of differences in labour-output or capital-labour

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ratios.  

We are, therefore, led to adopt an agnostic position about the relative productivities of MNEs and local firms, at least as far as 'efficiency' is concerned. It is likely that MNEs achieve greater output or value-added per worker because they are concentrated in industries which are capital-intensive, they use more modern technology or are able to reap economies of scale. Depending on the nature of the technology, they may or may not achieve higher capital productivity. Not much more can be said about their performance with the evidence that we possess.

Another important question which is relevant to this enquiry is whether local firms adapt technology to the labour-surplus, capital- and skill-scarce conditions facing them better or worse than MNE affiliates. Again, while the comparisons that exist do not answer the question of how MNE behaviour affected the local firm, it may be useful to briefly and critically review the existing evidence:

The findings are extremely mixed and based on shaky evidence and methodology. The ideal procedure would be to compare matched sets of foreign and local firms, making similar products, with equal access to the relevant technology and facing identical market conditions. While existing studies cannot, for obvious reasons, live up to this ideal, most of them have contented themselves with comparing large and diverse groups of local and foreign firms. Only two studies have, in my knowledge,

tried to compare matched pairs: Cohen¹ and Mason² both fail to find consistent patterns of factory intensity in their samples of local and foreign firms once industry differences are accounted for, and are, therefore, unable to conclude whether or not MNEs are better or worse at adapting technologies.

There are several more general comparisons of the factor intensity of foreign and local firms, some using data aggregated over different sectors, others differentiating between industries. For all of these, we may bear in mind the conceptual and practical problems mentioned previously.

Balasubramanyam (op.cit.) compares factor intensities of Indian firms without foreign technology or capital with those of Indian firms with foreign licensing and those with foreign capital. He finds, within given industries, that the first and third groups are less capital-intensive than the second, but does not provide any clear evidence on the performance of foreign investors as such.

Reidel finds for Taiwanese export-based industries that there is no consistent pattern of difference between the factor-intensities of foreign and local firms within specific sectors, especially when multivariate analysis is used.³

Lall and Streeten (op.cit.) do not find that multinationality makes a statistically significant difference to

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capital-intensity for their aggregated sample of 109 Indian and Colombian firms, but that the industry grouping does.

Vaitsos (op.cit.) finds that foreign firms are more capital-intensive in Peru for all sizes except the largest ones, where local firms are more capital-intensive. The value of this finding is much reduced by its aggregation over industries.

Fajnzylber (op.cit.) finds in Mexico that foreign firms use 2.5 times more capital per employee on average than local firms. He differentiates between light consumer, durable, intermediate, and capital goods, but the degree of aggregation is still high.

Jo (op.cit.) reports for South Korea that relative capital-intensities vary markedly over industries with no consistent pattern emerging for TNCs, though on average foreign firms are more capital-intensive. Import-substituting firms are far more capital-intensive than export-based ones.

Agarwal1 finds for thirty-four Indian industries (at the three-digit level) that TNCs are more capital-intensive than local firms. This is contradicted by Leipziger's2 comparison of U.S. and local Indian firms. Using Cobb-Douglas production functions, which has drawbacks of its own, Leipziger finds that U.S. firms import less capital-intensive technology ex ante, but use more fixed capital per man ex post because they


have to pay higher wages.

Solomon and Forsyth find for Ghana that foreign firms are more capital-intensive than local firms within given sectors, but that they are markedly less skill-intensive. The usefulness of this finding is limited by that fact that they cover industries (furniture, bread, footwear, shirts, etc.) where large MNEs hardly exist.

Wells notes that MNEs may be better at adaptation than local firms in Indonesia, especially when put under competitive pressure.

Pack finds that in Kenya engineering-trained managers (of whom more are possessed by MNEs, are better at adapting technology than commercially trained ones. Pack's study, unfortunately, focuses on 'traditional' sectors not much frequented by MNEs; in any case, his findings are challenged by Solomon and Forsyth above and by Gershenberg for Uganda. Gershenberg argues that TNCs use more capital-intensive techniques than local firms.

On the whole, therefore, the mass of conflicting evidence does not support any clear conclusion about the relative


abilities of MNEs and local firms to increase their employment in local conditions of developing countries. If we infer from this and the present author would be inclined to do so - that both sets of firms are equally good (or bad) at technological adaptation, we may conclude, as far as the effect of MNEs or other firms is concerned, that it is not very large in net terms. If the MNE affiliate had, in other words, been replaced by a local firm, the difference in terms of technological 'demonstration effects' would not have been very great.

As far as technological and innovative effort in developing countries is concerned (which has important implications for the longer-term ability of these countries to adapt technology and so increase employment) the evidence is also mixed. Jorge Katz in various detailed studies of technical progress in foreign and local firms in Argentina, finds that both 'innovate' (in a minor form) by adapting foreign technologies and improving their productivity. He does not look at some major innovative activity, and does not investigate the effect of one on the other. Fairchild looks at R & D spending and innovations by local and foreign firms in Mexico, and finds that the former spend more than the latter: foreign affiliates tend to rely rather passively on their parents for new technology. A similar finding is reported for the Andean countries by Mytelka, who argues that a passive dependence


on foreign technology reduces the incentive to innovate locally. Lall\(^1\) goes further, and argues, on the basis of technological achievements of various developing countries as shown in their exports of technology (i.e. turnkey projects, direct investments, engineering consultancy and licensing abroad) that a strong foreign presence in industry reduces local technological learning in two ways: foreign affiliates do not indulge in basic R & D activity, and local firms are inhibited from starting such R & D because of the great risks associated in competing with established foreign technologies. If these arguments are valid — and certainly at the movement they are very tentative hypotheses that need considerable verification — then the long-term employment effects of MNEs may not be beneficial.

Let us now come to the broad horizontal effects of MNEs. These are even more difficult to evaluate than the narrow effects, but we can try to identify them in general terms. They are of sorts:

- First, MNEs can influence government industrial, trade and fiscal policy by virtue of their stronger bargaining position, or because of their association with large home countries. This will affect the general industrial climate, and may improve efficiency and growth if the MNEs have a clearer sense of economic rationality than the host government.

- Second, MNEs can improve the infrastructure of the host country by their activity. Thus they can themselves build,

or have built for them, better communication and transport systems; they can improve the financial system; they can affect the functioning of the science and technology system, and so on.

- Third, MNEs may influence attitudes and management systems in unrelated industries, by imparting a more progressive and outward-looking outlook, a more professional method of training managerial staff, a more up-to-date financial and accounting system, and so on.

- Finally, MNEs may influence consumption patterns in the direction of more sophisticated, differentiated products.

Not all these influences will necessarily benefit employment: the last two effects may well work towards greater capital intensity in production. However, to the extent that MNE presence improves the general functioning of an economy and its government's policy, the beneficial effects may be quite substantial.

As far as these various 'horizontal' effects are concerned, therefore, no clear conclusions can be drawn on a priori grounds. The empirical literature on these aspects of MNE performance is also sadly deficient in clearly defined, well specified and rigorously tested models, so that we cannot make any progress on that front. For the time being, we must remain agnostic.

5. **Vertical Linkages Effects**

Much of the existing literature on indirect employment effects has concentrated on vertical linkages as the main source of such employment. There are two strands to this
literature. The first, and empirically most often employed, is the input-output approach which traces the various implications (investment, employment, production and import of physical inputs) of increasing the output of a given industry through the whole production system. The second is the 'linkage' concept developed by Hirschman, which focused specifically on the externalities of exceptionally strong price signals created by imbalances in supply or demand. The Hirschman concept of linkages is sometimes (and this was started by Hirschman himself) reduced to the application of the input-output methodology, but in fact its essence was, as we argue below, quite different.

Before we come to review the literature on these two types of vertical linkages, it may be useful to discuss briefly their strengths and weaknesses. The Leontieff input-output matrix provides a useful and empirically manageable tool for predicting how a particular investment will affect the other productive sectors all along the chain of linked activity. If a vector exports and imports are included - as it is in most comprehensive input-output computations - the total national employment increase implied by the increased output of any one industry can be worked out fairly easily. By comparing the total backward and forward linkages of different

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sectors, it is possible to work out 'key' activities which generate the maximum possible impact on total national employment: these key sectors then become special targets for official policy.¹

Despite its simplicity and practical attractions, however, there are several drawbacks to this technique as a means of predicting and evaluating the indirect employment effects of investments (a) in general and (b) by MNEs in particular. Let us start with general considerations:

- First, the technique is static and oversimplified. It does not take into account the continuously shifting inter-relationships between different industrial activities that is the lifeblood of growth and diversification. It cannot cope easily with joint products, relative price changes, preference changes and so on; nor can it deal with changes generated by the related sectors setting up direct technical linkages.

- Second, it assumes fixed technological coefficients and a single technology. Thus, it rules out the possibility of choosing between different techniques of production and of improving any given technology over time. This violates to an even greater extent the inherent dynamic properties of economic growth, and renders its application for prediction highly suspect.²

¹ For such an attempt see S. Schultz and D. Schumacher, 'Interindustrial Linkages in Developing Countries: A Comparative Analysis of Backward and Forward Linkages', Konjunkturpolitik, 1977, pp.363-90.

² For a consideration of methods of getting around these problems, and the practical difficulties which render solutions very difficult, see Krishnamurty, op.cit.
Third, it is merely a mechanical depiction of certain observed technical relationships at a point of view, and does not show whether a particular sector will in fact grow in response to increased demand a supply of related outputs or inputs. Furthermore, it says nothing about the economic desirability of any productive activity in the chain: some may be totally inefficient, given the constraints of skill, scale, technology and so on. As a guide to policy, therefore, input-output methods are useful as a consistency check rather than as tools to carry out a full and independent evaluation.

These are severe and important limitations. The rather mechanistic nature of the tool severely limits its practical usefulness for the purpose of this paper. The main handicaps is the complete absence of the concept of opportunity cost or alternative situations: what would have happened if a particular investment had not taken place? How would the linked industries have adapted? Would they have changed their techniques and products in response to different relative prices or absolute scarcities? Could they have maintained output and simply exported their surplus? Would the economy have been better off by reallocating its resources in a different way? These are all important and relevant questions which this method is not equipped to answer.

When it comes to tracing the indirect employment effects of foreign investments, the difficulties are compounded. Even assuming that all the cells in the table clearly identified local and foreign ownership, a mechanical application of
input-output coefficients could not tell us what the net effect of foreign investment was i.e. what would have happened in the alternative situation. As noted previously, however, some such calculation is necessary.

It was partly because investment decisions in vertically related industries were not automatically linked to each other that Hirschman developed his own theories of unbalanced growth. He argued that developing countries possessed all the factors they needed for industrial growth: investible resources, skills, technology, manpower, etc. What was lacking was the 'binding element' to bring them all together: entrepreneurship in the broadest sense. Entrepreneurship was latent, and needed to be stimulated by exceptionally strong profit signals set up by obvious imbalances in the economy. Thus the exceptional scarcity or surplus of some product would compel latent entrepreneurs to invest in linked activities, and so create indirect employment.

It is important to note that Hirschman made various strong assumptions about the 'missing factor' in investment: everything but entrepreneurship was available. Thus, a price signal would suffice, no other linkages between the enterprises were envisaged. Further, he put all his emphasis on externalities created by prices: the motivation of potential investors was his prime concern, rather than the mechanics of input-output relationships. He also excluded from consideration linkages set up by foreign demand: domestic entrepreneurs were probably too far removed, or too risk averse, to set up production facilities to serve export markets.

These are all points on which Hirschman may be criticized.
Entrepreneurship may not be the only missing element: indeed, this author would argue that there is plenty of active entrepreneurship, but it is the lack of technology and marketing expertise that holds back industrial growth. Price signals may not be sufficient to provoke investment; a lot of other linkages may be necessary. Exports could provide the required stimulus, as the growth of many export-orientated industries in developing countries testifies. And the sort of protected, import substituting industrialisation which Hirschman contemplated may lead to inefficient industries.

Besides these theoretical problems, Hirschman's linkages were almost impossible to test empirically or to apply in practical terms. Since he was mainly concerned with the motivation of entrepreneurs, it was essential to know how much demand had to be created to raise prices to the extent that called forth a backward linkage. If the complementary investment was forthcoming anyway, there would be no backward linkage in Hirschman's sense. To make his theories operational, therefore, Hirschman assumed away these problems and settled on the input-output table as the means of identifying 'key sectors'. Since then, all practical applications of his method have simply used input-output tables, despite the fact that the difficulties mentioned above make them quite irrelevant to the underlying hypothesis of Hirschman.

This is not to say that Hirschman linkages do not exist. Clearly particular investments stimulate others. But in practice, and especially in developing countries, it is impossible to identify precisely how and when this occurs.
When one large firm sets up a number of smaller suppliers, provides them technology, finance and managerial assistance, and buys most of their output, the linkage is obvious: the direct employment created is caused by the large enterprise. But when it buys a small amount of an input from another large enterprise which produces a large number of products and sells to a large number of firms, can we say that the first firm has 'caused' the second to invest and create employment. Perhaps, and perhaps not.

There are thus several theoretical conundrums in any available measure of indirect employment effects applied generally. Any quantitative estimates yielded may be misleading, especially when the alternative situation is not taken into account. Yet, indirect effects do exist, and we believe strongly that they are very important. Perhaps they are best studied, especially for the case of a particular kind of investment (by MNEs), on a case-by-case basis, on informed judgement and without attempting a quantitative general conclusion. We shall come to this sort of approach later. Let us first quickly review the existing empirical work using input-output methods.

In an unpublished survey prepared for the U.N. Centre on Transnational Corporations, Waldorf mentions two kinds of studies of the indirect employment impact of MNEs. The first uses input-output matrices to trace indirect effects in the manner discussed here. The second simply compares the local purchasing propensities of MNEs with domestic enterprises. This

is a crude and oversimplified version of what is already a crude tool, but it serves as a first cut at this complex phenomenon.

Waldorf finds only one study using the input-output method, by Jo on South Korea. Jo's methodology to isolate the effect of MNEs was as follows: he first computed the ratio of total direct and indirect unit labor requirements to direct unit labor requirements by industry, using inter-industry results for all firms in Korea. He next applied this ratio for all firms to the industrial breakdown of direct employment created by MNEs in order to estimate total employment generated by MNEs. Finally, he subtracted TNC direct employment from his estimates of TNC total employment in order to obtain estimates of MNEs' indirect employment. His results are shown in Table 1.

According to Jo's estimates, the total employment created by MNEs in South Korea in 1974 was about 264 thousand; 162 thousand direct employment and 102 thousand indirect. Thus, in 1974, the contribution of TNC's to Korean employment based on MNEs' total (direct plus indirect) employment creation was nearly two-thirds larger than the number directly employed. Jo estimates that MNEs created about 244 thousand jobs directly and indirectly in manufacturing compared with 151 thousand directly. Note that this only covers backward linkages. Forward linkages, which may be rather weak in any case, are excluded. Note also that crucial assumptions that MNEs'

Table 1. Korea: Input-output analysis of MNEs' indirect impact on employment.

<table>
<thead>
<tr>
<th></th>
<th>(a) Total Direct and Indirect Labor Coefficient</th>
<th>(b) Direct Labor Coefficient</th>
<th>(c) Direct Employment Created (persons)</th>
<th>(d) Indirect Employment Created (persons)</th>
<th>(e) Total Employment Created (persons)</th>
<th>(f) Implied Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture Forestry &amp; Fishery</td>
<td>5,342</td>
<td>2,6207</td>
<td>1,9996</td>
<td>4,771</td>
<td>6,769</td>
<td>9,540</td>
</tr>
<tr>
<td>Livestock</td>
<td>1,4714</td>
<td>1,0001</td>
<td>1,4699</td>
<td>571</td>
<td>268</td>
<td>819</td>
</tr>
<tr>
<td>Fishing</td>
<td>1,8003</td>
<td>1,3947</td>
<td>1,3338</td>
<td>419</td>
<td>106</td>
<td>425</td>
</tr>
<tr>
<td>Manufacturing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poultry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>.5321</td>
<td>.2948</td>
<td>1.8728</td>
<td>4.132</td>
<td>3.606</td>
<td>7.338</td>
</tr>
<tr>
<td>Textile &amp; Apparel</td>
<td>.2716</td>
<td>.5696</td>
<td>1.2619</td>
<td>25.694</td>
<td>6.867</td>
<td>32.556</td>
</tr>
<tr>
<td>Lumber &amp; wood products</td>
<td>1.7361</td>
<td>1.1667</td>
<td>1.0780</td>
<td>1.190</td>
<td>87</td>
<td>1.917</td>
</tr>
<tr>
<td>Chemicals &amp; products</td>
<td>.1796</td>
<td>.1509</td>
<td>1.1902</td>
<td>15.239</td>
<td>2.898</td>
<td>18.137</td>
</tr>
<tr>
<td>Petroleum</td>
<td>.0691</td>
<td>.0212</td>
<td>3.2594</td>
<td>7.544</td>
<td>17.054</td>
<td>24.389</td>
</tr>
<tr>
<td>Clay &amp; products</td>
<td>.7978</td>
<td>.4744</td>
<td>1.6817</td>
<td>5.889</td>
<td>6.015</td>
<td>9.904</td>
</tr>
<tr>
<td>Stone &amp; metal products</td>
<td>.7393</td>
<td>.5439</td>
<td>1.3593</td>
<td>10.819</td>
<td>3.084</td>
<td>13.448</td>
</tr>
<tr>
<td>Machinery &amp; machine parts</td>
<td>.6593</td>
<td>.5478</td>
<td>1.2035</td>
<td>12.022</td>
<td>2.546</td>
<td>14.569</td>
</tr>
<tr>
<td>Electrical &amp; electronic machinery</td>
<td>.6135</td>
<td>.3642</td>
<td>1.7024</td>
<td>63.065</td>
<td>49.358</td>
<td>112.445</td>
</tr>
<tr>
<td>Transportation equipment</td>
<td>.5205</td>
<td>.3933</td>
<td>1.3234</td>
<td>1.507</td>
<td>516</td>
<td>2.113</td>
</tr>
<tr>
<td>Others</td>
<td>1.1812</td>
<td>.0815</td>
<td>1.3577</td>
<td>4.321</td>
<td>1.366</td>
<td>5.687</td>
</tr>
<tr>
<td>Social overhead capital</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Money &amp; banking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction &amp; related services</td>
<td>1.1807</td>
<td>.6142</td>
<td>1.9223</td>
<td>15</td>
<td>14</td>
<td>29</td>
</tr>
<tr>
<td>Electric power</td>
<td>.6428</td>
<td>.6428</td>
<td>1.000</td>
<td>2.532</td>
<td>0</td>
<td>2.532</td>
</tr>
<tr>
<td>Transportation &amp; storage</td>
<td>.2762</td>
<td>.1104</td>
<td>2.3018</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hotels &amp; tourism</td>
<td>1.9103</td>
<td>.6647</td>
<td>2.8779</td>
<td>2.154</td>
<td>4.036</td>
<td>6.190</td>
</tr>
<tr>
<td>Total</td>
<td>162,060</td>
<td>101,623</td>
<td>263,603</td>
<td></td>
<td></td>
<td>1.63</td>
</tr>
</tbody>
</table>

Source: This table is Table III-7 in Jo, pp. 50-51 except for the computation of the implied multipliers in column (f), which is taken from Waldford, Op.Cit.
backward linkage propensities are taken to be equal to the national average. In the absence of separate data, Jo has had to make this simplification, but it is possible that the relative import propensities of foreign and domestic firms are quite different.

Another attempt to estimate the indirect employment effects of MNEs relates to the Philippines. The author of this paper mentions input-output linkages but does not attempt to calculate them. Instead, she works out a Keynesian multiplier for the net increase in income (and by further deduction employment) caused by foreign investment. Using a GNP multiplier of 1.89, she applied very broad sectoral labour-output coefficients to arrive at the rough estimate that 900 enterprises in 1970 generated 103 thousand direct jobs and 346 thousand indirect jobs (the estimate of indirect job creation rises to 713 thousand in 1976). The drawbacks of this calculation, in particular the use of a Keynesian multiplier in a developing country and the complete exclusion of any 'alternative situation' are so many that little faith can be placed on any of the estimates.

Yet another attempt at estimating indirect effects, using input-output methods but not separating the effect of MNEs from the total, is for Brazil. The data did not provide coefficients for exports and imports, and cover only output, not employment. To quote,

"It was found that scatter coefficients (direct and

indirect effects) are higher in the industries of construction and durable consumer goods; coefficient for capital goods sector is lower, although still above average. Construction industry, besides its importance in total industry output - nearly 18 per cent - and its well-known labour intensive, especially unskilled, characteristics, is thus revealing important backward linkages .... As to durable consumer goods, however, a very distinct situation concerning direct effects - relatively small participation in output reinforced by low labour coefficients per unit of output, strong presence of multinationals, etc. - is counterbalanced by very important backward linkages."

In this vein it may be useful to glance at the comprehensive study of interindustry linkages (again of output, not employment) conducted by Schultz and Schumacher (op.cit.). Appendix 1 reproduces their overall estimates for both backward and forward linkages for 20 different industries in 18 developing countries. It shows that in terms of backward linkages, the most powerful sectors on average are processed foods, leather products, non-metallic mineral products and construction; in terms of forward linkages, the most powerful sectors are non-metallic mineral products, wood and paper products, basic metals and metal products and electricity, gas and water. Readers are referred to the original article for detailed explanations and assessment.

Besides these studies using the input-output framework, a number of researchers have tried to assess indirect employment effects by an even simpler measure of backward linkages: the proportion of inputs procured locally. Higher local
procurement is *prima facie* evidence of higher indirect employment and output stimulating effects, though, in view of the remarks made earlier, such a measure should be treated with extreme caution if very precise figures are produced. One important reservation which may be borne in mind is that one enterprise (say, an MNE affiliate) can only be said to create more indirect employment by this criterion than another (a local firm) if both are engaged in comparable activity: the technologies, scales, product range, etc. must be similar, otherwise differences in local procurement may reflect, not the willingness of the firms to set up local linkages, but simply differences in their activity. Of course, since the further repercussions of buying inputs are not traced through, the total indirect effects are also not captured.

Several studies have remarked on the propensities of MNEs and local firms to use local inputs. Thus, Girvan, in a study of the Jamaican bauxite industry, and Fonou-Technigoua, in a study of Senegal, find (not surprisingly) that extractive activities create relatively few linkages locally. Daftary and Borghey, in a study of Iran, note that "only some of the multinational enterprises which undertake all or the major stages of production in Iran, make significant contributions in terms of purchases of raw materials and other inputs from local suppliers .... It should be added that in certain instances, particularly in the case of transport equipment, the operations of the multinational enterprises have resulted in the growth and development of the services sector in Iran" (p.76).

There are several other studies of this sort, such as Lall and Streeten (op.cit.) on 6 developing countries, Mason (op.cit.) on developing countries in general, Vaitis (op.cit.) on Peru, Thoburn on Malaysia, and so on, which have produced data on domestic purchasing, but these really do not add much to our understanding of the issue at hand: how much indirect employment is really stimulated by the activities of MNEs. The general findings are that MNEs buy relatively more local inputs in relatively advanced or larger host countries, on simpler activities or where pressurised to do so by the host government, are in accordance with expectations, and will be further discussed below.

There are, however, 5 other studies which bear on this problem, and may be mentioned separately.

(1) Reuber and associates, relying on data provided by the MNEs themselves, noted that import-substituting investments created far more local linkages than export-orientated ones, and found, for sixty-four sample firms, that 45 per cent of inputs in 1970 came from local sources. Parent companies were asked whether their operations had given rise to local suppliers or distributors, and their answers indicated that some one-third of the investments had directly given rise to such local activity. Reuber made no attempt to assess the costs and benefits of such linkages, and also qualified the estimates by noting that 'such figures must be viewed with some

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suspicion both because of the many conceptual and practical difficulties in deriving estimates of this kind and because of the vested interest of respondents in presenting the spin-off effects of their activities in as favourable a light as possible' (p.156).

(2) Watanabe (op.cit.), in his examination of subcontracting in LDCs, presents a general but useful analysis of this particular (and rather strong) form of linkage. Though he is not concerned exclusively with MNEs, he cites examples of foreign firms (like Singer in South East Asia) which have used subcontracting successfully, and concludes that such activity, 'by stimulating entrepreneurship and encouraging industrial efficiency, can help to promote the industrialisation of the less-developed countries and thus create the additional employment opportunities they badly need' (p.425). He analyses the conditions for success of such linkages (which he terms 'within-border industrial subcontracting'), briefly notes the contribution that MNEs may make by providing assistance with investment, technology and quality control, and recommends policies for increasing linkages; he does not, however, examine in detail any specific instances of subcontracting by foreign firms. In a larger paper he examines the problems of subcontracting in India (though without discussing the role of TNCs), and compares its experience to the highly successful one of Japan.1

(3) A more pessimistic view of the virtues of local purchasing emerges from Baranson's study of the Cummin's diesel-engine project in India and his analysis of the automotive

industry in LDCs generally. He comments at length on the problems raised by the high cost, poor quality, and unreliability of local suppliers in cases where the government has forced the pace of buying local inputs, and discusses the reasons for this state of affairs (protection, technological and skill shortages, lack of experience, small scale, and the like). We must not, however, draw unfavourable general conclusions about the desirability of linkages or the capabilities of local enterprises from this experience: there are several other industries (see below) where domestic linkages have been economically viable, and even for India the recent boom in exports of medium-to-high technology goods (including transport equipment, chemicals, and engineering goods) indicates that some of the problems described by Baranson for the 60s may have been the teething difficulties of launching new and complex industrial processes.

(4) Lim and Pang, who survey the electronic industry in Singapore, note that European firms buy a fair amount of their inputs (40-50 per cent) locally, while U.S. (under 10 per cent), and Japanese (about 20 per cent) buy much less. This is due to the fact that the U.S. firms in question are specialised in the semi-conductor sector and Japanese firms in high technology components, beyond the technological capabilities of domestic firms, while the European firms manufacture mainly consumer


electronics where the scope for local purchase is higher. However, local products tend to be rather costly, and are purchased chiefly in order to qualify for GSP\textsuperscript{1} privileges in selling to Europe (a minimum local content is required for these exports). Local firms face the usual problems of quality, technology, high costs, and so on, and are sometimes assisted by the local MNEs from whom they subcontract by free technology transfers. Firms which subcontract to foreign buying groups seem to face greater problems; their wage costs are higher than Hong Kong or Taiwan so that they are constantly threatened with losing their markets; they complain of little assistance from the government; and they are short of finance and new technology.

(5) A more careful study of employment linkages of MNEs is conducted by McAleese and McDonald for the Republic of Ireland.\textsuperscript{2} Not only are the authors careful to match their samples of foreign/domestic firms, they also trace the evolution of local purchasing by both sets over time. They also employ regression analysis to 'explain' the propensity of firms to buy local inputs. They find that foreign firms have a lower propensity to buy locally than national firms. This is, however, explained by two factors. To quote:

"First, within the same industry group, foreign-owned firms tend to be concentrated in more specialized activities than their domestic counterparts. These activities require highly specific inputs not available locally. Second, overseas

\textsuperscript{1} GSP = Generalised System of Preferences.

firms may have a higher import propensity than domestic firms
because of such factors as familiarity with foreign suppliers,
and real or imagined inadequacies of local producers" (p.326).

The authors also find a positive association between
the age of the local operation and its propensity to buy
locally. Clearly, as they note, "a learning process is at
work. The main task facing a new enterprise in its first
few years of operation is to establish credibility as a
producer. In practice, this means using the same materials
and component suppliers as the parent or affiliated companies.
Only after a few years of successful operation will the resident
manager be prepared to investigate local sources of supply"
(p.329). Furthermore, "as the manufacturing sector grows,
backward linkages tend to develop autonomously through the
establishment of indigenous supplying industries." In sum,
they find that new foreign firms have lower linkages than new
domestic firms, but that both increase markedly over time.

The discussion so far of vertical linkage effects of
MNEs has taken us only a limited distance. The use of inappropriate
methodology and a desire to quantify the indirect effects has
led to the oversimplification of a rather complex situation
and to a spurious impression of precision in presenting the
research findings. It is clear that given the nature of the
phenomenon, we probably cannot obtain exact quantitative
estimates of indirect employment created by MNE linkages:
The best we can hope for is broad orders of magnitude.

There is, however, a different way of approaching this
problem, which does not lend itself to the use of quantitative
techniques but which takes us a longer way in revealing the
underlying forces at work. This involves the application of
the theory of vertical integration to the analysis of linkages,
and has been developed and applied in a recent study prepared
for the U.N. Centre on Transnational Corporations by the
present author.¹

Linkages at the micro-economic level can be defined
as all the relationships established between buyers and sellers
on a vertical production chain which go beyond the 'pure'
market relationship. A 'pure' market relationship is one which
would obtain in an ideal competitive market: i.e. large numbers
of buyers and sellers meet and buy or sell as they like at
the going price. They do not need to exchange any direct
information or establish any sort of continuous contact with
each other.

This portrayal of the market relationship is clearly
inapplicable to much of inter-industry transactions: buyers
and sellers strike up all sorts of extra-market linkages to
learn about each others plans, exchange technical and product
information, ensure quality and delivery, negotiate prices
(which are not 'given to them), transfer finance and skills,
and so on. In fact, it is more appropriate, as far as industrial
transactions go, to think of a strong web of interrelationships
rather than isolated actors only meeting occasionally to buy
and sell.

The linkages that firms establish with their suppliers
(in our case, MNEs with local suppliers) are of a quite

¹ S. Lall, 'Linkages between TNCs and Local Suppliers: A Case
Study of Subcontracting in the Automotive Industry', U.N.
(forthcoming).
different nature from the purely price stimuli described as 'linkages' by Hirschman. As noted earlier, such price relationships may or may not be the crucial element in calling forth investment — at the enterprise level, their effect is practically impossible to detect. The other form of linkages looks at the deliberate relationships that firms set up to help each other — and themselves — beyond the requirements of a competitive price-setting negotiation. The existence of such linkages suggests that there are in fact a number of other 'missing factors' that hold back investment in related industries, and that without such linkages pure price signals would be ineffective.

The establishment of inter-firm linkages is undertaken in response to various defects of the market mechanism, which impede the flow of necessary information, technology, skills, and finance, and to various kinds of risk and uncertainty against which firms wish to hedge themselves. In the extreme case of total market failure, vertical integration results: the buyer takes over the supplier (or vice versa) and replaces the market completely by a system of internal control. However, there are various costs associated with extending the firm in such a way: costs of management, of taking over a technologically unfamiliar activity, of taking over an activity which acquires an optimum scale much larger than the original firm needs, of internalising a risk which was initially external, of inviting anti-trust action, and so on.

Because of these various problems, enterprises often prefer to establish linkages with their suppliers short of takeover. By retaining independent identities, different
firms can reap the benefits of specialization and scale, while by establishing linkages (to be discussed below) they can overcome certain shortcomings of the free market.

The decision to establish linkages is composed of three sub-sets of choices as far as the MNE is concerned:
- whether or not to import the component in question;
- whether to make the component itself or buy it out;
- what sort of linkages to establish, if it is decided to buy the component locally.

The import/procure locally decision is probably the most important one as far as developing countries are concerned. In the first stages of industrialisation, local supplier capabilities are by definition very underdeveloped. Even if it were the case that the component in question could ultimately be produced locally to international standard and at a competitive price - and this rules out a large number of products requiring high levels of skill/technology/scale for many developing countries - there would be an initial cost in terms of poor quality, unreliability, high prices, etc. which no private buyer would be willing to bear. Even if the long term social benefits of stimulating local supplier benefits outweighs the long term costs (both discounted at the appropriate rate), some sort of government intervention would be required to make the private benefits exceed the private costs.

The most common method of intervening is by forcing the MNE to buy locally, by putting tariffs or other restrictions on imports or by stipulating a minimum local content. This has been done widely in developing countries, and the larger ones have succeeded in the last few decades in achieving a
very large increase in the proportion of supplies manufactured locally. There is a vast literature on the costs and inefficiencies of such import-substitution policies,\(^1\) which need not detain us here. We need only note that if the pace of local manufacturing is pushed too far or too fast, there will certainly be inefficiencies; whether they are permanent or temporary depends on a host of factors, to which we shall allude below. We must also note, however, that a number of local suppliers which had been thought inefficient (e.g. in the Indian automotive industry, which my own linkages study was mainly concerned with later turned out to be extremely efficient and dynamic, exporting not only their products but also their technology.

The make/buy decision is governed by the same sorts of considerations that affect the decision of whether or not to takeover a supplier i.e. the scales involved, the 'relatedness' of the component technology to the basic knowhow and skills of the enterprise, the cost of labour in a potential supplier, the potential quality and reliability of the supplier, and government policy. Thus, if the component requires large minimum scales, has a different technology from the buyer (e.g. tyres for automotive producers), is available from cheaper or very reliable suppliers, etc., it will tend to be bought out. Otherwise, the MNE may prefer to, or be forced to manufacture the component in-house.

In developing countries, the degree of vertical integration (making in-house) tends, at the start, to be higher than

in developed countries, because of poor supplier capabilities. However, MNEs tend to make a distinction between 'traditionally bought out' and 'traditionally made in-house' items: the former, especially highly specialized, high technology, high volume items, will not normally be made by the MNE. If necessary, it will even try to attract its original supplier to invest in a new country, or encourage a local firm to obtain the license. The latter, e.g. engines or transmissions for cars, will normally be made in-house whatever the MNE operates. In between the two, there will be a wide range of items which could be made or bought: and it is here that the level of local capabilities and government policies make a difference.

The importance of local capabilities is obvious enough. The importance of government policy needs to be stressed. The argument for protecting the 'learning period' of local suppliers comes up again: if the item can be efficiently subcontracted in the long run, some official intervention may be required to make it worthwhile for the MNE to undertake the costs of subcontracting. The costs will consist, not just of high prices and poor quality, but the direct ones of giving technical and other kinds of assistance to the subcontractor until it reaches acceptable levels of performance. The extent of subcontracting will increase naturally over time, of course, as was noted in a study for Ireland (McAleese and McDonald, op.cit.), but its pace may be very slow. In the Indian case, for instance, given the stringent policy of import substitution, it was a law specifying which items had to be subcontracted out that really gave an impetus to the development of local suppliers.
The decision of what sort of linkages to set up depends on the relative sizes, capabilities and technologies of the parties concerned. A large, technically advanced supplier with an unrelated technology will have the minimum of linkages, merely to exchange product specifications, information on current requirements and future plans, and to negotiate prices. A large, advanced supplier using a similar technology (e.g. pistons and automobiles) will exchange a great deal of technical information, giving and receiving advice, and even working together on new product design. Small, relatively backward suppliers in related technologies will have the maximum linkages: they will receive a lot of technical and managerial advice, and will be continuously assisted in upgrading the production methods and their products.

The study of linkages in the Indian automotive industry shows this very clearly. Small suppliers, especially in related industries, receive the greatest benefit from technical and informational linkages. Large suppliers have weaker and more balanced relationships which benefits flowing both ways. In terms of prices, however, the situation is reversed: small suppliers, having less bargaining power, do worse than large ones, which sometimes even set their own prices. This is not to say that the small suppliers are exploited - in the Indian sample, they all seemed to thrive and grow - but there is no doubt that they have little monopoly power to exploit.

A considerable number of small suppliers in India have been launched by their principals. Given the necessity of buying components out locally, enterprises have had to scout
around for potential entrepreneurs, provide them with technology and sometimes raw materials, help them over a long breaking-in period and sustain them in times of difficulty. Direct financial assistance has generally not been provided, but otherwise the buying enterprise has had to set them up practically from scratch. Here is a strong form of Hirschman-linkage, working not through the price mechanism, but through other direct linkages. In the context of indirect employment creation, this is the sort of linkage we should be concerned with.¹

What, however, of the 'alternative situation'? Do local enterprises show a greater or lesser ability to create linkages? The India study, which compared two very similar auto firms, one foreign controlled and the other local, came to the conclusion that there was no significant difference between the two. There were differences in the level of vertical integration, but this could be traced to their relative sizes and the different traditions of the foreign firms which had provided the initial technology. Thus, the local firm (TELCO) was more vertically integrated, both because, being much larger, it could economically internalize a greater amount of component production and because, from its original collaborator, it had inherited a tradition of greater vertical integration than the foreign affiliate (Ashok Leyland, 60% owned by British Leyland). When it came to the vigour with


² By the author, quoted on page 38.
which linkages were established, the quality standards imposed, the assistance given, the professionalism of management, there was not much to choose between them.

This case is, of course, a rather special one. There are not many developing countries with enterprises which can compete on equal terms with MNEs in their traditional strongholds. And even in India, there are a number of activities which are outside the reach of local firms. Let us, therefore, consider in more general terms the determinants of linkage creation by MNEs in developing countries.

We expect linkage creation to vary according to three sets of factors; the industry, the MNE and the host country concerned.

Industry-level determinants: This set of factors can be divided into two broad groups: those that affect the relative contribution of MNEs vis a vis domestic enterprises, and those that determine the extent of linkages that MNEs operating in developing countries will tend to establish.

The relative contribution of MNEs as compared to domestic firms depends on the so-called 'monopolistic advantages' of the former, which enable them to overcome the barriers and costs of operating over long distances and in unfamiliar conditions. ¹ Extensive analysis of the foreign investments

of various developed countries, particularly the U.S., suggests that these advantages lie in activities requiring advanced technology (generally associated with high levels of R & D expenditure), highly-developed marketing skills (promotion and product differentiation), high levels of skill and large minimum scale of operation. In such activities, therefore, local enterprises in the developing world will find it difficult to compete with MNEs, unless they can induce them to enter into joint ventures or to license them their special advantage.

The growth of joint ventures and licensing has proceeded apace in recent years, with the growing desire of the developing countries to build up their own capabilities, and it is no longer possible to draw a clear line between activities exclusive to foreign and local enterprises.

Nevertheless, the underlying reasoning remains valid: enterprises from the advanced countries, with large research resources, rich markets, extensive marketing outlets and highly organized managerial systems have obvious advantages in producing certain types of products and processes, and in these they retain an advantage over other enterprises. How they choose to exploit the advantage is a different matter, but as long as MNEs exist as a distinct form of business organisation, their main contribution will be in the high-technology, high-marketing end of the spectrum of economic activity. Their position relative to local enterprises will, of course, vary

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1 See the U.N. Centre on Transnational Corporations, Transnational Corporations in World Development: A Re-Examination, 1978.
over time: as the pace of innovation slows down, or as local competitors build up their own marketing expertise, the gap will narrow and ultimately disappear. In cases where the technology has been fully absorbed by local enterprises, their cost advantage may lead them to become multinationals in their own right, challenging the traditional MNEs internationally.¹ In other cases, where the production technology has been absorbed but marketing remains a barrier, retailing groups from the developed countries may fill the gap by subcontracting to them and taking care of promotion and selling.² These considerations should warn against generalizing too quickly, but they do not conflict with the fact that MNEs play a dominant role in very large areas of modern manufacturing industry.

In these activities, the linkages created by MNEs cannot be adequately substituted by local counterparts, and so may be regarded as not positing contributions to indirect employment in the host countries.

Let us now consider the industrial determinants of the extent to which local linkages are feasible. There are several industrial factors which can affect the propensities of TNCs to create local linkages: the nature of the industrial process, the complexity of the technology involved in component production, the minimum scale of efficient operations required of component

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¹ For an examination of this in the Indian case, see S. Lall, Developing Countries as Exporters of Technology: A First Look at the Indian Experience, London: Macmillan (forthcoming).
producers, the speed of technical change, and the evolution of market demand. There is a large and highly theoretical literature which deals with such factors in the context of the inducements to integrate vertically, with suppliers.\(^1\)

We cannot go into these issues; let us concentrate on the main implications of these factors for linkage creation in developing countries.

- **Nature of process:** Industries in which the main activity consists of several stages of assembly of many different components (e.g. mechanical or electrical engineering) would be more prone to buy components out than process industries where a relatively small number of inputs are subjected to transformation in a continuous, and usually automatic, series of operations (e.g. chemicals or paper). This is so for the former both because of the variety of components going into production (and so requiring different specialisations) and because of the 'separability' of different stages of production\(^2\) (and so being amenable to subcontracting). Thus, an activity like automotive manufacture is highly linkage intensive while one like synthetic fibre or fertilizer manufacture is not. This inherent characteristic would obtain equally in developed and developing countries.

As far as the import/buy locally decision is concerned,

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2 By 'separability' is meant the economic viability of locating particular sub-processes of manufacturing in different plants (even in different countries) to take advantage of differences in costs of production (mainly of labour).
there is no a priori reason to distinguish between the final user industries. Given their propensity to buy out, the choice of supplier would depend on several other factors, which are considered separately below.

- **Complexity of technology of component manufacture:**

  In most industries, especially in the engineering sector, which rely on bought-out components, there will be a range of different technologies involved in the manufacture of the different items. For component technologies which are basically dissimilar to the user industry (e.g. tyres in relation to automobiles), the tendency will be to buy out rather than internalise, as also for technologies which are related but very complex and specialized (pistons and automobiles). For technologies which are related but not specialized, the user will have the choice of making the component in-house or not: in developing countries, as noted above, the typical sequence will be to start with in-house manufacture and to increase subcontracting as local capabilities develop. For technologies which are very advanced and crucial to the final product (automobile engines and gears), production will be kept in-house. Thus, the balance between these different characteristics of components will determine the extent of buying out.

In most developing countries, the nature of component

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1 The dividing line here will not be very clear or firm, and much will depend on the size of the market, the technological prowess of the parties concerned, company strategy and the degree of monopoly power exercised by buyer and seller.
technology will also crucially determine the decision to procure locally. Very complex components requiring advanced technology will tend to be imported, while simpler ones may be locally purchased. In the electronics industry, for instance, local suppliers have been able to establish linkages with MNEs in such places as Singapore, Taiwan and Korea for the supply of simple components, while the more sophisticated ones are purchased abroad.¹

Of course, in industries (like garment making) where the entire production technology is simple, the whole work may be subcontracted out with little difficulty. However, it should be noted that in these activities, the foreign firms that are most active are not transnational manufacturers but developed country retailers and buyers. This does not, however, constitute local linkage creation by MNEs operating in developing countries, and so will not be considered further here.

- **Minimum efficient scale**: The existence of large economies of scale in component production would tend to operate in parallel fashion to the requirement of complex technology. User industries will tend not to internalize component production subject to high scale economies, and small developing countries will not afford the opportunity (unless very high levels of protection are given) to set up such component production. Thus, industries which rely heavily on such components will tend to buy out more, but in developing countries.

¹ See UNCTAD, International Subcontracting Arrangements in Electronics Between Developed Market Economy Countries and Developing Countries, Geneva, 1975, Watanabe (various), op.cit., and Lim and Pang op.cit.
they will tend to maintain international rather than local linkages.

- **Speed of technical change**: Industries with rapidly changing products and processes would tend to internalise component production more, *ceteris paribus*, than those with stable technologies. Whatever they do buy out, however, would tend to be purchased from equally innovative suppliers in developed countries than technically relatively backward ones in developing ones. In this case, both sets of decisions would tend to reduce the scope for local linkage creation.

- **Evolution of demand**: Industries facing rapidly growing or very unstable markets would in general tend to internalise to a greater extent than those facing slower growing or safer markets. In developing countries, unstable market conditions would also tend to favour importing rather than new local suppliers. Thus, instability or rapid growth would reduce linkages.

Thus, this complex of factors would operate in different ways in different industries, and the outcome is difficult to generalize. Only a detailed knowledge of the scales, technologies and market conditions involved in each case permit one to assess how far linkages will be established in developing economies.

**First Level Determinants**: Different TNCs in the same industry may have different attitudes to linkage establishment in developing countries, depending on their country of origin, their corporate philosophy, market orientation and sourcing strategy.
- **Country of origin**: Every developed country has a slightly different experience in terms of the evolution of supplier industries, and its MNEs will naturally tend to export their home-grown policies to other areas of their operation. Thus, countries with highly developed component suppliers or particularly close ties between buyers and suppliers will have a greater degree of buying-out, and its MNEs will tend to create more linkages, as compared to MNEs from areas where high degrees of vertical integration are the norm.1

- **Corporate Philosophy**: Different firms from the same environment may have different attitudes to buying out and sourcing, depending on historical accident, risk aversion or the perception of future benefit. Thus, a very risk averse firm may prefer to internalize to the greatest extent possible, and, in developing countries, to stick to its traditional sources of supply in developed countries.

- **Market orientation**: An MNE which had geared its operations to a protected domestic market in a developing country will be prepared to set up more local linkages than one which is geared mainly to exporting. The initial costs of developing local subcontractors, in terms both of low quality of components and of their high price, will deter local linkages by the latter set of MNEs, at least until such times as local capabilities have developed to international standards. However, [This is strikingly illustrated by the auto industry, where Japan has the highest degree of subcontracting (70% of sales) because of 'famility relations' between the two sets of firms; U.K. comes next (60%) because of its early development of supplier industries, followed by U.S. (50%) and continental countries (30-40%). Thus the traditions of different MNEs will be very different.]
not all export-orientated MNEs are the same, and it would be useful to start by distinguishing four types of export-orientated MNEs which have different implications for the creation of domestic linkages.

First, there are MNEs which started by substituting for imports and have grown internationally competitive enterprises with substantial export interests (VW in Brazil or Singer in Asia may be good examples). Such activities usually involve technologies which are stable and not very sophisticated, and they are based in areas with a cheap but relatively skilled labour force and an experienced indigenous sector. The use of the MNEs' marketing networks and established brandnames are important in such export activity. These MNEs may have established considerable domestic linkages in the early phases, though, of course, the extent and nature of these linkages may change as they gear themselves for world markets.

Second, there may be foreign firms which produce and export 'traditional' products like footwear, textiles, processed foods, or sports goods. For those industries (like textiles) where technology is easily available and product differentiation is insignificant, the foreign firms involved may be buying groups, retailers, or small manufacturers (sometimes from other LDCs, like Hong Kong firms in Malaysia) rather than MNEs proper. For those (like food processing) where product differentiation, marketing, or product innovation are important, however, large MNEs may predominate in production and export activity. In both cases, there exists a vast potential for

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linkages with domestic producers, who may manufacture components or whole products for foreign firms.

Third, there are new MNE investments in 'modern' industries in LDCs undertaken specifically for export, transferring fairly complex technologies to LDCs to service established world markets. A constellation of factors (labour and transport costs, the nature of the technology, need for short production-runs, managerial requirements, and, of course, political stability)\(^1\) influences the decision to locate such investments, good examples of which are the Philips and General Electric complexes in Singapore, or some 'border industries' in Mexico; the availability of local components is not, however, one of the important factors attracting them. In most cases, such investments are tightly controlled from abroad, the components and processes may be quite advanced, and there may not be much scope for local linkages. It is possible, nevertheless, that local enterprises may be able to provide some products at the right price and quality, and a few linkages may develop in the more advanced of the host economies.\(^2\)

Fourth, there are 'sourcing' investments where only a particular (labour-intensive) process is transferred to LDCs, the more capital-intensive processes being retained in the home countries where the requisite equipment, skills, and R & D facilities exist. The best-known example of this is the

\(^1\) See Sharpston, op.cit., and Watanabe, 1978, op.cit.

\(^2\) As UNCTAD, 1975, op.cit., notes, this is happening increasingly in the more industrialised S.E. Asian countries.
electronics industry, especially the semiconductor sector, where the demanding specifications, the rapidly changing technology, and requirements of cost minimisation reduce the scope for domestic linkages to little.1

Of these four types of MNE investment, therefore, the first two are likely to create the most linkages, the third rather less, and the fourth least of all. The extent of linkages created in particular LDCs depends upon the stage of development of indigenous industry, the availability of local skills and technology, institutions and government policies, changes in demand and technology in world markets and on political factors which are considered hereafter.

Host Country Determinants: Given the two sets of factors discussed above, the size and level of skill and industrial development of the host economy will clearly have important effects on the extent of local linkage creation. A larger and more developed economy will, for reasons given above, be able to undertake the production of more capital-intensive and complex components. An industrially developed, but not necessarily large, host economy can also successfully undertake the production of components directly for sale to MNEs abroad (i.e. international subcontracting). It is also important to take note here of the risk factor. If particular host countries are regarded as especially unstable as sources of supplies (for political, social or economic reasons) MNEs would tend to

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1 Ibid., and Lim and Pang, *op.cit.*
subcontract less there than their capabilities would warrant.

The geographical location of the host country is also important: those that are very near to the main markets can undertake international subcontracting not just for high-value, low-weight items but also for bulky and heavy ones. The very high incidence of international subcontracting activity in Mexico, particularly along its border with the US, illustrates the opportunities that are open here.

While large and industrially advanced developing countries can attract a higher level of local linkages by MNEs, the process may not be an automatic one. In most developing countries, many of the activities introduced by MNEs are well beyond the skill and technical abilities of the host economy, and the setting-up of any linkages (beyond those for the supply of very simple components) will always necessitate some short term costs of 'learning' on the part of suppliers. Left to purely market forces, the development of local suppliers may take a very long time - even if it were to become economical - simply because private firms may not be willing to bear these costs and uncertainties. Once a certain level of supplier capabilities is reached in a sufficiently wide range of activities (and the relevant infrastructure is established), the process of linkage creation may of course become self-sustaining. But we must bear firmly in mind that there is a large difference between host country endowments in the very first stages of industrialisation and those possessed by it after these stages have been passed.

This brings us to the question of policy influences on the creation of linkages. The possible divergence between
social and private perceptions of the costs and benefits of local purchasing in developing countries furnishes a powerful case for host government intervention in private-enterprises' purchasing policies. If there are certain potential suppliers which (over a certain time) can become efficient in international terms, but which need a period of 'learning' and technological assistance, then a policy of protection/subsidisation is warranted on classic 'infant industry' grounds. The experience of a number of manufacturers which have been able to 'grow up' successfully from the infant stage provides strong empirical support for this case. Experience also shows, however, that many host countries have pushed the process of import substitution too fast and too far, and have forced the setting up of some suppliers which can never be internationally competitive.

Be that as it may, it remains a fact that government intervention in the sourcing choice has been the single most powerful determinant of the creation of local linkages by MNEs. In particular, the policy of import substitution of components (i.e. of increasing local content) has forced user MNEs to find and develop local suppliers, providing such assistance as may have become necessary and suffering such costs (in terms of quality loss as well as price) as may have been inevitable. Without such intervention it is likely that local linkages in the developing world would have been considerably less than exist today, though certainly some linkages would have been struck up under market pressures alone.

There may be other policies which affect the make/buy decision, after the extent of local content has been determined. These policies can take the form of subsidising small sub-
contractors, or the reservation of certain products for manufacture by them, or the granting of fiscal incentives to firms that buy from them. We have mentioned these above, and noted that in certain circumstances they can play a very important role in stimulating linkages. Once these policies set the stage for linkage creation, the determination of the strength and extent of linkages can be left to the enterprises concerned. Perhaps the only policy intervention that may be required may be to ensure that small suppliers are not unduly exploited by large buyers, though there is little evidence from the Indian linkages study that such exploitation exists.

To conclude this section, we may reiterate that this micro-level analysis of linkage creation leads to useful theoretical insights and to concrete policy proposals on the creation of indirect employment. It does not, however, yield any firm estimates of how much indirect employment is created by MNEs: even with a small sample studied in depth, as in the India linkages study, there was no way of arriving at such a numerical estimate. Some of the small suppliers undoubtedly owed their existence to the subcontracting arrangement they had with their principal, others did not. The large suppliers, selling to the whole automotive industry (and several with foreign equity and/or technical collaboration), did not 'owe' their existence to any particular purchaser, but clearly a part of their capacity was set up to take the needs of each into account. The MNE may have been replaced in this particular activity by its larger local counterpart, but it may have contributed to employment by the other types of effects.
(income and horizontal) mentioned above. For the purpose of policy, therefore, it seems sensible to eschew quantitative approaches and to concentrate on more mundane, microeconomic analysis.

6. **Conclusions**

There is no doubt that the indirect employment effects of MNEs are of great significance to developing countries, and that even after allowing for the 'alternative situation' hypothesis such effects are probably positive and important. In the very nature of the phenomenon, however, it is practically impossible to estimate how important they are exactly in quantitative terms.

This does not mean that policies cannot be formulated to stimulate and maximise indirect employment effects. On the contrary, the above discussion suggests strongly the need for appropriate policy measures on all the three sets of indirect effects:

- As far as total income effects are concerned, it is necessary to ensure that foreign investments are socially efficient i.e. not highly protected over long periods against international competition, and that they are guided into sectors where their relative advantage over local enterprises are the greatest.

- As far as 'horizontal' effects are concerned, it is necessary to promote efficient industrial structures which do not suppress indigenous enterprise, which permit adaptations of technology to local needs, which encourage local innovation,
and balance the need for competition with the need to achieve efficient scales of production.

- As far as vertical linkages are concerned, the most important policy consideration is to promote the local purchase of supplies without setting up internationally uncompetitive production structures, taking full account of the dynamic benefits of 'learning' and the various externalities associated with the building up of a diversified industrial structure.

There are also other policies needed to ensure that domestic laying-out is encouraged relative to in-house production, and that beneficial technical and other linkages are established between MNEs and their suppliers.

The detailed implications of all such policies have been discussed at length elsewhere, and in this general review we need not go any further.
Appendix 1: Cross-Country Comparisons of Backward and Forward Linkages

<table>
<thead>
<tr>
<th>Country</th>
<th>Standard sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
</tr>
<tr>
<td>Latin America</td>
<td></td>
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<tr>
<td>Argentina</td>
<td>1970</td>
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<tr>
<td>Chile</td>
<td>1953</td>
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<tr>
<td>Colombia</td>
<td>1968</td>
</tr>
<tr>
<td>Mexico</td>
<td>1970</td>
</tr>
<tr>
<td>Peru</td>
<td>1980</td>
</tr>
<tr>
<td>Average</td>
<td>1928 66 52 87 51 28 40 44 46 51 32 42 28 38 25 49 12 33 11</td>
</tr>
<tr>
<td>Africa</td>
<td></td>
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<tr>
<td>Kenya</td>
<td>1957</td>
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<tr>
<td>Madagascar</td>
<td>1965</td>
</tr>
<tr>
<td>Tanzania</td>
<td>1969</td>
</tr>
<tr>
<td>Zambia</td>
<td>1969</td>
</tr>
<tr>
<td>Average</td>
<td>12 23 55 37 52 35 31 35 17 49 29 32 23 29 22 38 26 29 24</td>
</tr>
<tr>
<td>Asia</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>1964/65</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1960</td>
</tr>
<tr>
<td>Iran</td>
<td>1963</td>
</tr>
<tr>
<td>Korea, Rep. of</td>
<td>1970</td>
</tr>
<tr>
<td>Malaysia (W)</td>
<td>1965</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1965/66</td>
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<tr>
<td>Philippines</td>
<td>1985</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>1970</td>
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<tr>
<td>Singapore</td>
<td>1997</td>
</tr>
<tr>
<td>Average</td>
<td>19 21 62 39 59 44 50 38 29 44 22 36 27 34 24 28 48 14 23 10</td>
</tr>
<tr>
<td>Average, total</td>
<td>17 23 30 41 52 42 41 37 32 46 40 20 34 31 33 26 45 18 27 18</td>
</tr>
<tr>
<td>Latin America</td>
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<td>Colombia</td>
<td>1966</td>
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<tr>
<td>Mexico</td>
<td>1966</td>
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<tr>
<td>Peru</td>
<td>1980</td>
</tr>
<tr>
<td>Average</td>
<td>31 57 17 28 55 63 49 81 84 46 43 37 39 18 57 4 23 29 21</td>
</tr>
<tr>
<td>Africa</td>
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<tr>
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<td>1969</td>
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<td>Zambia</td>
<td>1969</td>
</tr>
<tr>
<td>Average</td>
<td>23 7 11 15 6 52 37 20 28 77 61 70 52 77 42 66 20 45 49 25</td>
</tr>
<tr>
<td>Asia</td>
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</tr>
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<td>India</td>
<td>1964/65</td>
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<td>Korea, Rep. of</td>
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<td>Sri Lanka</td>
<td>1970</td>
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<td>Singapore</td>
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<tr>
<td>Average</td>
<td>45 57 16 25 35 63 54 48 71 91 55 39 43 30 19 51 5 43 39 16</td>
</tr>
<tr>
<td>Average, total</td>
<td>33 39 14 22 30 59 55 42 68 67 59 47 42 41 26 58 10 36 43 20</td>
</tr>
</tbody>
</table>

Source: IVY computations on the basis of input-output tables from developing countries, Schultz and Schumacher, op.cit.

Note: The regional and total averages are based on the results for those tables in which exports were presented as a row and transactions valued at producers' prices. — X denotes two cases in which — due to particular accounting methods — W exceeds 100%.

These linkages refer to output and not to employment, for an explanation of the 'standard sectors' see next page.
Appendix 1: (continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>Sector</th>
<th>ISIC&lt;sup&gt;a&lt;/sup&gt;</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1938&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>1</td>
<td>Agric., forestry and fishing</td>
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</tr>
<tr>
<td>2</td>
<td>Mining and quarrying</td>
<td>11 - 14, 19</td>
</tr>
<tr>
<td>3</td>
<td>Processed foods</td>
<td>20 - 22</td>
</tr>
<tr>
<td>4</td>
<td>Apparel, incl. textiles and footwear</td>
<td>23, 24</td>
</tr>
<tr>
<td>5</td>
<td>Leather and -products</td>
<td>29</td>
</tr>
<tr>
<td>6</td>
<td>Wood and paper prod., printing</td>
<td>25 - 28</td>
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<tr>
<td>7</td>
<td>Rubber products</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>Chemicals</td>
<td>31</td>
</tr>
<tr>
<td>9</td>
<td>Petroleum products</td>
<td>32</td>
</tr>
<tr>
<td>10</td>
<td>Non-metallic mineral products</td>
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</tr>
<tr>
<td>11</td>
<td>Basic metals, metal products</td>
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<tr>
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<td>Non-electrical machinery</td>
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<tr>
<td>13</td>
<td>Electrical machinery</td>
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<tr>
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<td>Transport equipment</td>
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<td>Industry n. e. c.</td>
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<td>16</td>
<td>Electricity, gas, water</td>
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<tr>
<td>17</td>
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<tr>
<td>18</td>
<td>Trade</td>
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<tr>
<td>19</td>
<td>Transp., storage and commun.</td>
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<tr>
<td>20</td>
<td>Services</td>
<td>82 - 81, 81 - 83</td>
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</tbody>
</table>

<sup>a</sup> International Standard Industrial Classification of All Economic Activities.
<sup>b</sup> UN, Statistical Papers, Series M, No. 4, Rev. 1.
<sup>c</sup> UN, Statistical Papers, Series M, No. 4, Rev. 2, Add. 1.
<sup>d</sup> The equivalent to subsector 951 in the preceding version of ISIC is distributed among various sectors thus comprising production as well as repair of goods.