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ABSTRACT

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ABSTRACT

Technology transfer and arms production in developing countries

Saadet Deger and Somnath Sen

There has been a growing discussion in recent years about the increasing volume of arms trade and concomitant transfer of military-industrial technology from advanced industrial countries to developing countries. This paper appraises these issues in a relatively formal framework and tries to analyse the impact of defence expenditure in the context of arms imports, domestic production of strategic equipment, choice of appropriate techniques and technology transfers. The authors show that, in spite of a few advantages, the overall costs of defence-related technology transfers may be very high and sometimes possibly prohibitive for developing countries. The authors try to quantify some of the magnitudes involved.

Overall concentration, regional concentration and the growth of the parastatal sector in Tanzanian manufacturing industry

M. S. Silver

Regional and overall concentration indexes are specified for Tanzanian manufacturing industry during 1967-1974, a period of political change from reliance on the private sector to more emphasis on the public sector. The implications of the parastatal sector for industrial concentration are assessed. Initially, concentration by size increased, but, as large nationalized companies (largely in the region of the capital) grew less rapidly than small private companies, overall and regional concentration fell.

Why is countertrade thriving?

Lynn Eisenbrand

Barter - the only trading arrangement available before the invention of money - has recently, as a result of the foreign exchange difficulties of a growing number of countries, become revitalized in the form of countertrade, which includes near-money arrangements such as counter-purchase and compensation. These arrangements are discussed and their use and advantages assessed. It is argued that general trading companies are particularly well suited to take advantage of countertrade possibilities, and various experiences based on such institutions, including joint ventures, are discussed. It is concluded that countertrade plays an increasingly important role as a complement to standard financing of international trade.

Industrialization and employment generation in the service sector of developing countries: an appraisal

Secretariat of UNIDO

The paper examines the role of industry and particularly that of the manufacturing sector in generating urban employment. More specifically, it reviews the recent performance of manufacturing industry in generating employment in both developing and developed countries, describes the nature and extent of linkages between manufacturing industry and the service sector, and assesses various industrial policies designed to accelerate urban employment generation. A major conclusion of the study is that the crucial contribution of industry to urban employment generation stems not only from its direct employment impact, but more importantly from its indirect and income-induced efforts combined, through its extensive linkages with various sectors of the urban economy, particularly the service sector, and through increasing demand for urban services as per capita incomes rise.

A statistical review of the world industrial situation 1984

Secretariat of UNIDO

This annual review summarizes in 14 tables and two figures the latest available statistics on industrial development in various groupings of developing and developed countries. Data are given, in some cases for selected years and in others for all years from 1963 to 1984, on group shares in manufacturing value added (MVA), growth rates, structure of manufacturing and trade in manufactures. The review shows, for example, that the share of developing countries, excluding China, in world MVA continued to increase slightly in 1984 to an estimated 11.6 per cent, with, as in 1983, an increase in the share of Asia more than offsetting a decline in that of Latin America; that growth of MVA per capita increased in 1984 in developing countries of Africa, Asia and Latin America and in the developed market economies; and that growth of MVA in the least developed countries has, since the 1960s, failed to keep up with population growth.

SOMMAIRE

Transfert de technologies et production d'armes dans les pays en développement

Saadet Deger et Somnath Sen

On parle de plus en plus depuis quelques années du volume croissant du commerce d'armes et du transfert concomitant de technologie militaro-industrielle des pays industriels avancés vers les pays en développement. Cet article contient une évaluation relativement officielle de ces questions et un essai d'analyse des incidences des dépenses consacrées à la défense nationale dans le contexte des importations d'armes, de la production intérieure de matériel d'équipement stratégique, du choix de techniques appropriées et des transferts de technologie. Les auteurs montrent qu'en dépit de quelques avantages, les transferts de technologie liée à la défense nationale peuvent être d'un coût global très élevé, voire dans certains cas prohibitif pour les pays en développement. Ils s'efforcent de quantifier certaines des grandeurs en jeu.

Concentration globale, concentration régionale et croissance du secteur para-étatique dans les industries manufacturières tanzaniennes

M. S. Silver

L'auteur présente les indices de la concentration régionale et globale dans les industries manufacturières tanzaniennes pour les années 1967 à 1974, période de réorientation politique où la dépendance à l'égard du secteur privé a cédé le pas à l'octroi d'un plus grand rôle au secteur public. L'article contient également une évaluation de l'influence exercée par le secteur para-étatique sur la concentration industrielle. La concentration des entreprises par taille a commencé par augmenter mais, du fait que les grandes entreprises nationalisées (surtout situées dans la zone de la capitale) ont connu une croissance moins rapide que les petites entreprises privées, la concentration globale et régionale a régressé.

Pourquoi les échanges compensés sont-ils prospères ?

Lynn Eisenbrand

Les problèmes de devises que connaissent un nombre croissant de pays ont récemment revivifié le troc - seule forme de commerce utilisable avant l'invention de la monnaie - sous la forme des échanges compensés, c'est-à-dire des arrangements d'ordre quasi-monétaire, comme les contre-achats et les opérations de compensation. L'article présente un examen de ces arrangements et une évaluation de leur utilisation et de leurs avantages. On y

défend la thèse que les sociétés de commerce général sont particulièrement bien placées pour tirer parti des possibilités d'échanges compensés et l'on examine diverses expériences fondées sur l'intervention de ces institutions - des coentreprises notamment. La conclusion est que les échanges compensés jouent un rôle de plus en plus important en tant que complément des moyens de financement usuels du commerce international.

Industrialisation et création d'emplois dans le secteur des services des pays en développement : évaluation

Secrétariat de l'ONUDI

Dans cet article, on examine le rôle de l'industrie et en particulier du secteur manufacturier dans la création d'emplois urbains. L'article passe plus spécifiquement en revue les effets récents des industries manufacturières sur la création d'emplois, dans les pays en développement comme dans les pays développés; il décrit la nature et l'importance de relations entre les industries manufacturières et le secteur des services et évalue diverses politiques industrielles visant à accélérer la création d'emplois urbains. L'une des principales conclusions de l'étude est que la contribution capitale de l'industrie à la création d'emplois urbains tient non seulement à ses incidences directes sur l'emploi, mais aussi et surtout aux effets combinés - indirects, et induits par le biais des revenus - qu'elle exerce grâce à ses liens considérables avec différents secteurs de l'économie urbaine, le secteur des services notamment, et à l'accroissement de la demande de services urbains entraîné par l'augmentation des revenus par habitant.

Etude statistique de la situation industrielle mondiale en 1984

Secrétariat de l'ONUDI

Cette étude annuelle résume en 14 tableaux et deux figures les dernières statistiques disponibles sur le développement industriel dans divers groupes de pays en développement et développés. Elle fournit des données - dans certains cas pour quelques années sélectionnées et dans d'autres pour chaque année de 1963 à 1984 - concernant les parts de ces groupes dans la valeur ajoutée manufacturière (VAM), les taux de croissance, la structure des industries manufacturières et les échanges d'articles manufacturés. Elle montre par exemple que la part des pays en développement moins la Chine dans la VAM mondiale a continué d'augmenter légèrement en 1984 pour atteindre le chiffre estimé de 11,6 %, l'augmentation de la part de l'Asie ayant, comme en 1983, plus que compensé la diminution de celle de l'Amérique latine; que la croissance de la VAM par habitant s'est accélérée en 1984 dans les pays en développement d'Afrique, d'Asie et d'Amérique latine et dans les pays développés à économie de marché; et que depuis les années 60 la progression de la VAM ne suit pas l'accroissement démographique dans les pays les moins avancés.

EXTRACTO

Transferencia de tecnología y producción de armamentos en los países en desarrollo

Saadet Deger y Somnath Sen

En los últimos años se ha venido intensificando el debate sobre el creciente volumen del comercio de armamentos y sobre la transferencia conexa de tecnología industrial militar de los países industrializados adelantados hacia los países en desarrollo. En la monografía se evalúan estas cuestiones en un marco relativamente estructurado y se procura analizar la repercusión de los gastos de defensa en el contexto de las importaciones de armamentos, la producción nacional de equipo estratégico, la elección de técnicas adecuadas y las transferencias de tecnología. Los autores muestran que, pese a unas cuantas ventajas, los costos globales de las transferencias de tecnología relacionada con la defensa pueden ser muy altos y, a veces, incluso prohibitivos para los países en desarrollo. Los autores tratan de cuantificar algunas de las dimensiones del problema.

Concentración global y regional y crecimiento del sector paraestatal en la industria manufacturera de Tanzanía

M. S. Silver

En esta monografía se especifican los índices de concentración regional y global de la industria manufacturera de Tanzanía durante 1967-1974, período de cambio de política caracterizado por el paso de la dependencia del sector privado a un mayor énfasis en el sector público. Se evalúan las repercusiones del sector paraestatal en la concentración industrial. Aunque inicialmente aumentó la concentración por tamaño, a medida que en las grandes empresas nacionalizadas (principalmente en la región de la capital) se registró un crecimiento menos rápido que en las pequeñas empresas privadas, disminuyó la concentración global y regional.

¿Porqué está prosperando el comercio de compensación?

Lynn Eisenbrand

El trueque -única modalidad de intercambio existente antes de que se inventara el dinero- se ha revitalizado últimamente, como resultado de las dificultades en materia de divisas a que se enfrenta un número creciente de países, y ha adoptado la forma de comercio de compensación, que incluye arreglos de cuasidinero como la retrocompra y la compensación. En la monografía se examinan estos arreglos y se evalúan su utilización y sus ventajas. Se afirma que las empresas comerciales generales se encuentran en condiciones especialmente favorables para beneficiarse de las posibilidades del comercio de compensación, y se analizan diversas experiencias de ese tipo de instituciones, incluidas las empresas conjuntas. Se llega a la conclusión de que el comercio de compensación desempeña un papel cada vez más importante como complemento de la financiación típica del comercio internacional.

La industrialización y la generación de empleos en el sector de los servicios de los países en desarrollo: evaluación

Secretaría de la ONUDI

En la monografía se examina el papel de la industria y, en particular, el del sector manufacturero en la generación de empleo urbano. En concreto, se analiza el desempeño reciente de la industria manufacturera en la generación de empleo tanto en los países en desarrollo como en los países desarrollados, se describe la naturaleza y el alcance de los vínculos entre la industria manufacturera y el sector de los servicios, y se evalúan diversas políticas industriales destinadas a acelerar la generación de empleo urbano. Una de las conclusiones principales del estudio es que la contribución básica de la industria a la generación de empleo urbano se debe no sólo a su repercusión directa sobre el empleo, sino, aspecto que es más importante aún, a la combinación de sus actividades indirectas e inducidas por los ingresos, mediante sus amplios vínculos con diversos sectores de la economía urbana, especialmente con el sector de los servicios, y mediante la creciente demanda de servicios urbanos a medida que aumentan el ingreso por habitante.

Reseña estadística de la situación industrial mundial, 1984

Secretaría de la ONUDI

En esta reseña anual se resumen en 14 cuadros y dos figuras las estadísticas más recientes de que se dispone sobre el desarrollo industrial en diversas agrupaciones de países en desarrollo y países desarrollados. En algunos casos se proporcionan datos para años seleccionados y, en otros, para todos los años comprendidos entre 1963 y 1984 sobre la participación por grupos en el valor agregado industrial (VAI), las tasas de crecimiento, la estructura del sector manufacturero y el comercio de manufacturas. De la reseña se desprende, por ejemplo, que la participación de los países en desarrollo, excluida China, en el VAI mundial continuó aumentando ligeramente en 1984 hasta alcanzar el 11,6%, habiéndose registrado, al igual que en 1983, un aumento de la participación de Asia que compensó con creces la baja registrada en la participación de América Latina; que el crecimiento del VAI por habitante aumentó en 1984 en países en desarrollo de Africa, Asia y América Latina y en las economías de mercado desarrolladas; y que, desde el decenio de 1960, el crecimiento del VAI en los países menos adelantados no ha estado a la par con el crecimiento demográfico.

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AIMS AND SCOPE OF *INDUSTRY AND DEVELOPMENT*

Industry and Development attempts to provide a link between practitioners and theorists working on economic and related aspects of industrialization. The focus of the journal is on applied economics, particularly in areas emphasized in the Lima Declaration and Plan of Action on Industrial Development and Co-operation.

The journal is published an average of four times a year as an integral part of the work programme of the Division for Industrial Studies of the United Nations Industrial Development Organization. It is prepared under the general guidance of a Supervisory Panel, composed of staff members from the Division, with the Head of the Global and Conceptual Studies Branch as its chairman. The Panel member responsible for the detailed supervision of this issue was J. Cody.

The Supervisory Panel of *Industry and Development* welcomes readers' opinions and comments, and will be glad to consider for possible publication articles relevant to the aims and scope of the journal (see "Information for contributors", back cover).

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ISIC refers to the International Standard Industrial Classification.

References to dollars ($) are to United States dollars, unless otherwise stated.

Totals may not add precisely because of rounding.

The following symbols have been used in tables:

Two dots (..) indicate that data are not available or are not separately reported.

A dash (--) indicates that the amount is nil or negligible.

TECHNOLOGY TRANSFER AND ARMS PRODUCTION IN DEVELOPING COUNTRIES

Saadet Deger* and Somnath Sen**

Introduction

There has been growing concern in recent years among disarmament analysts regarding the icreasing volume of arms trade and the related transfer of military technology from advanced industrial countries to developing countries. The mechanics of the international trade in arms is well documented [1]. Recent studies have generally emphasized the political and security aspects of the matter [2, 3]. On the other hand, Sen and Smith [4] have shown how important economic issues relating to arms sales can be modelled within a formal framework. The emphasis in much of the work mentioned above is on the supplier countries and the analysis focuses mainly on the sellers of armaments. In this paper we concentrate on the recipient developing countries and analyse the impact of defence expenditure in the context of arms imports, domestic production of strategic equipment and technology transfers.

Developing economies absorb the major share of international arms imports, accounting for 69 per cent of the total during the period 1977-1980 according to estimates of the Stockholm International Peace Research Institute. Moreover, the current trend is for developing countries to buy new and relatively modern weapons, as noted by the Institute: "The current arms trade registers - covering major weapons on order or being delivered in 1981 - identify approximately 1,100 separate arms transfer agreements. Ninety-four per cent of these contracts are for new weapons systems, 2 per cent are for second-hand weapons, and 4 per cent are for refurbished weapons" ([1], pp. 176-177). Further, the 1970s have seen a relative decline of military aid as a conduit of arms transfers. Armaments now tend to be bought by developing countries rather than given free or on concessionary terms. Coupled with a large rise in the volume of trade, as well as the escalating cost of equipment, the concomitant foreign exchange and other opportunity costs for developing countries are considerable.

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Hand in hand with final products, there is a growing demand for military-oriented technology. This is a relatively new aspect of the problem and needs further investigation. When it becomes politically difficult to supply actual weapons, recipient States might be content to receive technological aid whose implications are different from those of a straightforward arms sale but can still be quite important. For example, the United States of America has found it difficult to give armaments to China but has maintained a steady flow of dual-purpose technology and defence-related materials. Licensed production has become more important in recent years as third world countries have gone in progressively for import-substituting industrialization. A case in point is a contract concluded by Turkey with the United States, under which a new plant to build military helicopters would start licensed production within one year of conclusion of the contract, have 30 per cent indigenous components in another year and increase to 80 per cent indigenization in five years time. The Indian State corporation Hindustan Aeronautics Ltd. has built over 200 helicopters (originally French) since 1965 and is constructing a local version of earlier fighter aircraft built under license from the United Kingdom of Great Britain and Northern Ireland and assembling fighter aircraft from kits licensed by the Union of Soviet Socialist Republics. Nigeria has recently ordered a complete factory from Austria to produce tanks and tank destroyers. These examples help to show that a large number of countries at various stages of domestic industrial and technological development are trying in various ways to produce their own weapon systems based on international technolog, Clearly the process of technology transfer needs to be analysed carefully.

Though accounting for only a small share by world standards, developing countries have themselves entered the export market for arms. Brazil is the classic example of a country which vigorously promotes arms exports and has a thriving indigenous military industry based partly on expanding exports. Other countries are following the trend and there is little doubt that developing countries will increasingly compete in world markets to sell their armaments. An interesting new feature is the entry of transnational corporations in this field. The recent decisions by firms in Italy and Brazil to pool resources to produce strike fighters [1] may simply be an early signal for many more such developments.

International transfer of military technology takes many forms. The most important is of course the world trade in weapons - the final product. But domestic production in developing countries has also grown in importance, particularly in recent years. Their activities range from multinational subcontracting for components to production in the form of assembly or manufacture of arms under licence. Foreign direct investment is exceptional for obvious reasons. Arms production has also been incorporated into domestic industrialization strategies. Thus India, in pursuit of import-substituting industrialization, has attempted to be relatively self-sufficient in arms, while Brazil, by fostering export promotion, has been as successful in selling arms to devel-

oping countries as in other commercial activities. The interrelationship between technology transfer, manufacture and imports is therefore quite complex.

Three issues have attracted maximum attention. The first concerns the social welfare gains (and losses) arising from armaments requirements, including imports, domestic production and measures taken in response to possible embargoes in a security crisis. The second deals with appropriate choices of techniques that arms industries face in developing countries and the impact of technology transfer on them. The third relates to the need to analyse the import costs and growth effects of technology and arms purchases. The first issue is predominantly political and strategic, based on the concepts of security and threat. The second and third issues are, respectively, technological and economic. In view of the scope and complexity of the issues, only the last two can be covered within the confines of this paper. Sections A and B analyse the topics in a relatively formal fashion. The final section concludes with a heuristic description of the impact of military technology in general. An annex related to section A presents a mathematical model of technology transfer in the military sector.

A. Military production and choice of techniques

Military production in developing countries, its effect on other industries and the related concept of choice of appropriate techniques will be dealt with in this section. There are two major methods by which developing countries may become arms producers - either through subcontracting under licence from industries in developed countries or through achieving greater self-sufficiency. The latter method will be only partially successful, however, and a substantial proportion of both final products and intermediate goods will still have to be imported. Both methods thus involve foreign exchange costs which will be analysed more fully later.

Even if the technology is fully imported and the home country has no direct control over it, any form of domestic production of arms should have some beneficial spin-off effects. The dissemination of information and the fruits of technological progress, though restricted to defence-related activities at the beginning, should ultimately trickle down to civilian industrial sectors. The underlying reasons for the installation of arms-manufacturing units under licence are similar to those which give rise to civilian products. The attraction of low unit labour costs, the incentive to sell the finished product to the developing country involved or to re-export it to other developing countries, import restrictions on finished products, tax holidays and other related advantages have all combined to give a strong impetus to developed countries to set up military production units in many third world economies. Under these circumstances, there could be a reasonable spread of technical know-how, training of local skilled personnel, understanding of industrial processes which can be used in civilian sectors and a growth in dual-purpose technology.

However, the benefits have mostly been nullified since ultimate control lies with the manufacturer in the developed country. Given the vast cost of research and development and the highly secret nature of military technology, the spin-off from these sectors has not been as great as would be expected from civilian products. As Lock and Wulf point out, "The control of the technologies involved remains to a considerable degree outside the country and only a very limited research and development capacity is created locally" ([5], p. 50). The lack of any viable control has been the main reason why technology has not been adopted to suit local conditions and its spread has been restricted to enclaves of technical progress without interconnections with the rest of the industrial structure.

Another group of countries (Argentina, Brazil, India, Israel and others) have tried to pursue a more independent policy in arms production and technology use, which in turn is related to their overall planning strategy. Most of these countries are relatively large and have an industrial base on which defence production can be built. They are not heavily dependent on a few cash crops or exportables and have access to reasonable amounts of foreign exchange. The constraints on skilled personnel are less rigid compared to most developing countries, and the infrastructure (mainly in industrial zones) is sufficient.

Domestic arms manufacture has been motivated by the desire for substantial foreign exchange savings, reductions in unit costs, military research and development with civilian spin-off, creation of aggregate demand for the rest of the economy and inter-industry demand creation through backward and forwards linkages. Many of these countries have co-ordinated their defence production policy with import-substituting industrialization and thus tried to gain some measure of internal consistency. The initial technology is often imported but the final goal is complete self-sufficiency.

There can be no doubt that within the narrow confines of military production, these countries have done rather well. In spite of criticism of their performance from some analysts [5], most indicators demonstrate the initial success of the strategy. Clearly a lot remains to be done before complete self-sufficiency is achieved, but the initial teething troubles seem to be over. Stockholm International Peace Research Institute data [1] demonstrate unequivocally that some developing countries not only are producing their own basic weapons, but also have started to export them. A pertinent example may be noted here: "In 1981, Brazil started deliveries of the Zingu trainer/light transport jet to the French air force" ([1], p. 188). We think that this is indicative of the strength of third world arms production <u>per se</u>.

However, the optimistic expectation that the spin-off from arms industries will permeate the rest of the economy remains unfulfilled. There is little evidence to support the much-vaunted effective demand arguments. Kennedy [6] and Whynes [7] set out a large number of reasons why military production will create high

interindustrial spin-off, but there seems to be little impetus in this direction. Instead of general comments, a brief case-study of India will clarify the problems involved.

Economic spin-off from the domestic production of arms in developing countries takes essentially two forms - creation of effective demand for underemployed industrial capital (or unutilized capacity) and technical progress through a shift in the production function. The Indian case may exemplify whether such a spin-off exists or not. The choice of India is not fortuitous. It is because in India, economic spin-off from the military is intuitively expected to have a positive effect. Since the early 1950s, India has consistently followed a policy of self-sufficient industrialization, import controls and the expansion of manufacturing activity. Simultaneously, in spite of accepting military aid, it has made determined efforts to produce armaments within the country and to achieve near self-sufficiency in all but the most sophisticated military hardware. Given this parallel growth in civilian and military industrialization, it is natural to expect that if spin-off does have a positive effect, it will be clearly reflected in the Indian case. In other words, if empirical analysis shows the existence of beneficial spin-off effects, we should not be surprised. On the other hand, if we do not find such evidence for India, then we have a counter-intuitive result and will have to accept that the beneficial consequences of spin-off have been vastly overestimated.

Previous studies [8, 9] seem to indicate that Indian industrialization has benefited from military production and transfer of technology. The general consensus is that in spite of teething problems, the Indian economy and industry is in a unique position to gain substantially from economic spin-off from the military. It is plausible that the doctrine of self-sufficiency in both domestic industrialization and military production would have helped and reinforced both sectors.

However, we have recently conducted an econometric investigation [10] which shows that both defence spin-off for major Indian industries and the evidence for its existence are very weak. We selected the industries most likely to benefit from military industrialization, namely iron and steel, non-ferrous metals, metal products, electrical and other machinery and transport equipment. An empirical test was then conducted to see whether aggregate defence spending gave a positive stimulus to the output (value added) of these industries or not. Given that Indian industry has often suffered from excess capacity, military spin-off and multiplier effects from demand creation should have demonstrated a strong positive effect. Nevertheless, we found scant evidence that such interindustrial stimulus exists. Thus the emphasis on spin-off in the military literature seems to be misplaced.

We now turn to the related question of choice of appropriate techniques in the military-industrial complex and the special problems of developing countries. The major difficulty faced by the producers here is the rapid rate of technical progress and the high

degree of obsolescence that are characteristic of defence-oriented technology. Further, the degree of substitutability between fixed factors and output may be limited both before and after investment embodying technological change. In the academic literature this is called the clay-clay model [11]. The detailed technical issues are relatively complex and are best understood in the context of a formal model which captures the elements of such a technology. This is discussed in the annex to this paper.

The salient features and a few conclusions of the mathematical model may be briefly noted at this stage. The main focus is on technical change. This is assumed to be exogenous, as in the case of a developing country importing arms or technology from abroad with little control over its design. Technical progress increases the quality of the machine or capital stock which is used in conjunction with labour to produce the requisite output. Various interpretations of machine (capital stock) and output are possible. We discuss two of these later. Further, technological progress is labour-augmenting, thus its incorporation makes labour more efficient. The date of construction of the machine embodies its technology, thus the later the date and more recent the vintage, the better the quality. A crucial distinction is made between the physical and economic lifetime of machines. Even if the machine is capable of producing output, it may not be profitable to do so after a certain time period, termed the economic life of the capital good. It determines the rate of economic obsolescence and the point at which the machine, even though physically productive, is discarded. Both of these are major decisions in industrial management.

The mechanics of the model are quite general, but it can be readily translated to the case of the use and production of armaments in two major ways. The first interpretation is straightforward and relevant to any production process at the macro-economics level. We can conceive of the aggregate output of arms being produced by the total capital stock and labour, with technology being imported from abroad. This is a reasonable assumption for quite a few developing countries. All the results that follow in the annex can then be interpreted in a standard fashion.

A second way of looking at the model is more interesting and takes a micro-economics perspective. Consider the output of the defence technology as an index of the effectiveness of a weapons system, for example, the number of bombs that an aeroplane can carry. The bomber is the capital stock used to generate the above-mentioned output. Labour is measured in man-hours and technological progress implies fewer man-hours required to carry the same destructive cargo. Later vintages are more efficient than older ones in the sense that fewer man-hours of flying time is required to have the same effectiveness as before. Technological obsolescence implies that aeroplanes currently being used have vintages which do not exceed the economic lifetime. Thus if the economic lifetime is 20 years, then in 1984, bombers built from 1964 to 1984 are being used, earlier ones having been discarded. The rate of technical progress is given by the state of the art in

military technology, which may be transferred to developing countries. Thus we have a case of technology transfers from developed to developing countries in the form of arms imports.

Note that our model does not conflict with the widely held view that developing countries transfer second-hand technology in armaments. The concepts of embodiment and vintage still remain, the only difference being that an earlier span of technology is being used rather than the most recent one. When current technology is imported the implications follow the same pattern. The most important point is that the technical progress parameter is given from outside the system. This is certainly true for many developing countries which have to import machinery or final products in the armaments sector and have no direct control over research and development.

What sort of conclusions can be drawn from the model? The annex provides two, but others are also possible. Let us concentrate on the economic lifetime of the machine. It can be demonstrated that the higher the rate of technical progress, the greater the economic lifetime of machines chosen by the optimizing agent. Thus better-quality machines have lower rates of economic obsolescence.

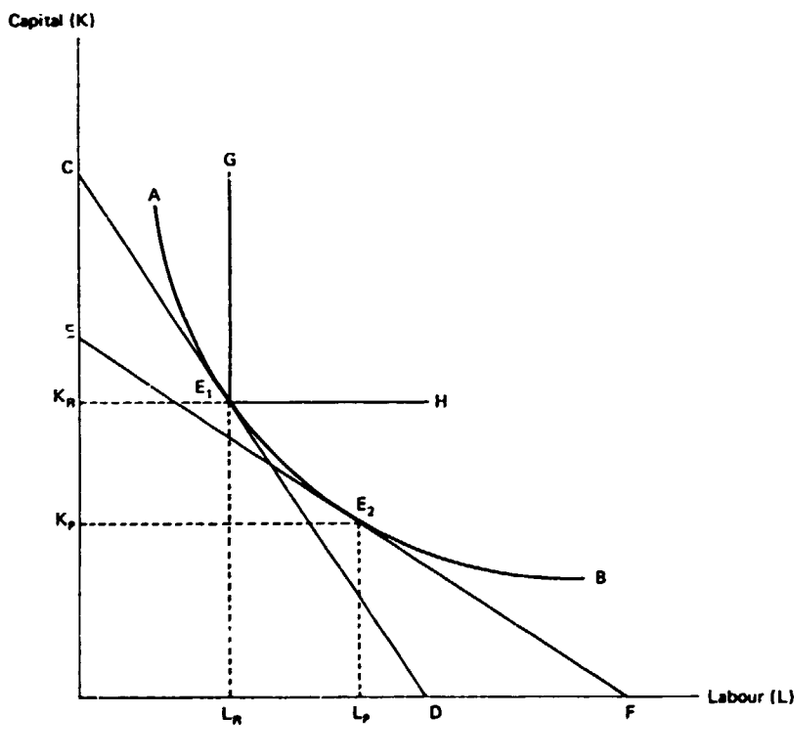
This has implications for developing countries wishing to buy armaments and transfer technology from possible alternative sources. It pays to buy better technology with higher rates of technical progress, since longer-lasting machines, and hence less obsolescence, are economically beneficial. Obviously other constraints such as total costs and foreign exchange will also have to be taken into account. But if one is interested in the pure cost-benefit analysis of arms and machinery purchase, then it is preferable to buy the best technology. Thus the Saudi Arabian decision to import advanced air command systems from the United States of America is an example of rational choice, provided the socio-political or absorptive capacity constraints are ignored.

A second result (given by equation (30) in the annex) is also interesting. The higher the proportion of total strategic expenditure on capital stock, the lower will be the economic lifetime and the faster the rate of obsolescence. This is because a higher capital expenditure increases the quality of machines by the addition of newer vintages. This in turn leads to older machines' becoming quickly obsolete. The former Shah of Iran found to his cost that the more he spent on machinery and equipment the shorter was the span of economic return from armaments and the quicker their obsolescence. Thus substantial resource costs would be attached to quick transfers of technology, and developing countries must be careful to avoid overkill (both military and economic) in their arms programmes.

The foregoing discussion has concentrated on micro-economic aspects of choice of techniques within the narrow confines of defence production and arms purchases per se. One must also consider the implications of defence-oriented technical progress in

the context of the whole economy, particularly in terms of the available supply of factors of production. It is well known that most technological progress limits the degree of substitution between inputs. We have already discussed an abstract example, the clay-clay model. Now consider another case where there is perfect substitution before technical progress but none after. By analogy with the previous terminology, this is called the putty-clay model. Consider a military technology where output (D) is produced by two factors, capital (K) and labour (L). Suppose that prior to technical change, there is a higher possibility of substitution between K and L, so that D can be produced by a widely differing range of the capital-labour ratios. The isoquant (AB) in figure I represents current technology.

Figure I. Technical change and the capital-labour ratio



A rich country with higher capital and labour endowments will choose to produce output at E_1, with slope CD giving the wage-rental ratio. The factors in use will be K_R and L_R. A poor country with a lower wage-rental ratio will produce at E_2, using more labour L_p and less capital K_p.

Now consider a type of technical progress which shrinks substitution possibilities to a bare minimum -- in our example let the production function become L-shaped (no substitution). Since the rich developed country is generally assumed to be the source of technological innovation in military equipment, the new isoquants

will be like GE,H. As is clear from the figure, this technology is extremely inappropriate for the importing developing country, since it involves using more capital per unit of labour. Thus to preserve employment at level L_p, the capital stock must be increased substantially, otherwise there will be unemployment. Inappropriate technology is obviously the bane of developing countries, and this is particularly crucial in military-oriented fields where technical progress is faster, often has to be imported without control and can involve massive resource costs, particularly of inputs which are in short supply.

The theoretical discussion above pinpoints the salient features of military-oriented technology transfer and choice of feasible techniques by developing countries. From a purely strategic point of view, it may be optimal for developing countries to choose the most efficient technology. However, growing expenditures on new vintages will, by increasing obsolescence, make resource costs prohibitive. The macro-economic costs of inappropriate technology will also have to be considered. Labour-surplus developing countries might be saddled with highly capital-intensive methods of production leading to a choice of techniques incompatible with endowments and factor price ratios. Thus, even though technology transfer might have some general beneficial effects, the costs will be extremely high. The analysis has thus far concentrated on domestic resource utilization and costs. However, implicit in the discussion remains the fact that most defence technology is imported, even by economies which have adopted strategies of import-substituting industrialization. The major expenditures will have to be covered with foreign exchange, and this exteneral constraint may have overriding importance. We turn to this issue in the next section.

B. Import costs of technology and armaments transfer

It was noted in section A that most developing countries import substantial quantities of armaments either as final products or as intermediate goods which are used for licensed production. The few economies which have opted for self-sufficiency are still in an early stage of evolution and will have to import some defence-oriented commodities in the foreseeable future. Clearly the foreign-exchange costs and the external constraints are important considerations in technology transfer.

To understand the implications and growth effect of military-related imports we can construct a simple empirical model. Let total imports (R) be divided into imports of consumption goods (R_C), intermediate goods needed for investment (R_I) and military products (R_M). Thus

$$R = R_C + R_I + R_M \qquad (1)$$

Assuming proportional import functions for each constituent part, we have:

$$R_C = \alpha Y \qquad (2)$$

$$R_I = \beta I \tag{3}$$

$$R_M = \gamma M \tag{4}$$

where Y is gross domestic product, I total investment, M military expenditure and $(\alpha, \beta, \gamma) > 0$. Then (1) becomes:

$$R = \alpha Y + \beta I + \gamma M \tag{5}$$

Alternatively, dividing by Y we have:

$$r = \alpha + \beta i + \gamma m \tag{6}$$

where lower-case letters denote shares in gross domestic product.

Now consider the case where all military imports (R_M) are diverted to the import of commodities needed for investment. If new investment after this diversion takes place is $\hat{I}$, then we have:

$$\beta\hat{I} = R_M + R_I \tag{7}$$

or

$$\hat{I} = (R_M + R_I)/\beta \tag{8}$$

Since the previous investment I was equal to R_I/β from (3), the additional investment that can be generated is:

$$\dot{I} = \hat{I} - I = R_M/\beta \tag{9}$$

Dividing (9) by Y we get:

$$\dot{I}/Y = (R_M/Y)/\beta = (\gamma M/Y)/\beta = \gamma m/\beta \tag{10}$$

The growth effect of this investment is thus:

$$\Delta Y/\Delta K \cdot I/Y = \gamma m/\beta \cdot \Delta Y/\Delta K = \gamma m/\beta v \tag{11}$$

where v is the incremental capital-output rate $\Delta K/\Delta Y$.

Equation (11) gives the effect on growth of the economy ($\Delta Y/Y$) when all military imports are diverted to investment or intermediate goods imports. This is clearly a hypothetical situation unlikely to be realized in practice. However, the analysis will help to identify the sort of magnitudes involved in costing for military spending and technology and arms transfers, and thus serve as an useful indicator.

It may be pointed out that the model implicitly assumes that the diversion away from military imports will only benefit the investment sector, while the import of consumption goods remains the same. This assumption may not in fact hold true. The model also assumes that import diversion will not affect the overall military burden (m = M/Y), which remains at the same level. This is unrealistic, and it may be expected that the hypothesis of a cur-

tailment of imports will mean the release of some complementary resources on the domestic front for civilian use. The latter will increase growth rates. As a first approximation we assume that the two effects will cancel themselves out. Thus the final growth effect will be given by (11) only, provided all military imports can be eliminated.

Using time series averages for a large cross-section of 50 developing countries*, the import equation (6) was estimated in its most basic form, without any additional exogenous variable. The estimates are as follows:

$$r = \underset{(0.55)}{0.34} + \underset{(2.84)}{0.88}i + \underset{(1.54)}{0.46}m \qquad (12)$$

$R^2 = 0.1811 \quad$ s.e. = 9.29

(where s.e. is the standard error and time values are in parentheses)

The low R^2 value of the empirical import equation (12) is not surprising. This being the basic form, any relevant additional exogenous variables, such as terms of trade and policy dummies, would improve the fit. However, our primary interst is not the goodness of fit but the coefficients relating in particular to military transfers. With regard to the coefficients of relevance, both β and γ are positive and significant.

The growth effect of defence-oriented import diversion is:

$$\tilde{g} = (\gamma m/\beta v) \qquad (13)$$

The average value of m is 4.5 per cent in our sample set, similarly v is 3.08. From (12), $\beta = 0.88$ and $\gamma = 0.46$. Thus at mean mil-

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*The data set covered a cross-section of 50 countries, each data point being an average for the period 1965-1973. The countries were: Algeria, Argentina, Brazil, Burma, Chad, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Gabon, Ghana, Greece, Guatemala, Guinea, Honduras, India, Indonesia, Iran†, Iraq, Israel, Jordan, Kenya, Libyan Arab Republic††, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Peru, Philippines, Republic of Korea, Republic of Viet-Nam†††, Saudi Arabia, Singapore, Somalia, South Africa, Spain, Sri Lanka, Sudan, Syrian Arab Republic, Thailand, Tunisia, Turkey, Uganda, United Republic of Tanzania and Venezuela. For data on the military burden, see [1], various issues; for all other data see [12].

†Former name of the Islamic Republic of Iran.
††Former name of the Libyan Arab Jamahiriya
†††Former name of the southern part of Viet Nam before its reunification.

itary burden, the growth effect is:

$$\tilde{g} = 0.76$$

It is clear that the estimated value of $\tilde{g} = 0.76$ is substantial, given the average growth rate of 6 per cent in the 50 countries sampled. In other words, $\tilde{g} = 0.76$ is the amount by which growth is being depressed by the presence of military imports in the cross-section of developing countires. If all military imports were stopped, then growth would rise by $\tilde{g} = 0.76$. This is extremely high by any standard and constitutes a severe development burden to the economy.

Previous literature in the field has given heuristic accounts of military import costs by suggesting that defence expenditure reduces imports of essential commodities for development as well as stimulating demand for intermediate goods. The foregoing model is an attempt to formalize the discussion and show rather precisely how much growth is affected by military arms and technology transfers.

C. Conclusions

Arms imports, local production of defence-related equipment under licensed contract and domestic manufacture of complete weapons systems all contribute to the transfer of technology from developed to developing countries. The technological linkages with other sectors of the economy, the spin-off effects of defence production, familiarization with new techniques, adaptation to local conditions and the spread of skills are possible benefits that such a technology transfer might produce in the third world. Since military technologies are products of a high level of sophistication and are often at the frontiers of research and development, the possible spin-offs are immense. In particular, dual-purpose technology, in which basic research conducted for military purposes has a substantial impact on civilian productivity, can be at the vanguard of technological progress in developing countries. For example, it is thought that in India the foundations for advanced research in the areas of nuclear energy, space and satellite programmes and the electronics industries were laid during the 1960s principally as a response to strategic developments [9]. The recent progress made by Indian scientists in these fields have had sizeable civilian benefits and positive growth effects, which would not have been possible without the stimulus from defence. Kuznets rightly points out "The effective search for new knowledge and for its exploitation in the production of goods for peace-type uses, served in good part also war purposes - because of the technological affinity between the two. Reciprocally, some of the search for new knowledge and for its exploitation specifically for war purposes was of use for peace-type production" ([13], p. 424).

However, as we have previously noted, the idealized perception of technology transfer and spread over the economy has rarely materialized as expected, for a number of reasons. First, the technology adopted by the defence sectors may be far too advanced

for the rest of the economy, which would therefore not be enthusiastic about applying the new methods. Secondly, the imported or even partially adopted technology may not be suitable for the factor endowments of the economy and thus would not be appropriate from the point of view of comparative advantage. Thirdly, strategic technology would be kept secret and not be allowed to spread to civilian production. Fourthly, military projects are sometimes necessary for security reasons only and thus may not be able to generate high profits in commercial production. They may therefore be insufficiently cost-effective in a competitive market environment and relatively useless for private enterprise.

For the least developed countries without an industrial base, defence production, for obvious reasons, is not relevant. It has been argued that exposure to arms and its concomitant technology will change their perception of technology. Attitudes are important in a developing society and clearly any exposure to machines and mechanized equipment brings some benefits. However, it is difficult to believe that this will be of immense help, and from a purely cost-benefit point of view a tractor may be far superior to a tank as a source of learning by doing.

Finally, the largest single obstacle to technology transfer through military channels remains. Given that many developing countries are currently suffering from balance-of-payments deficits and international indebtedness is rising fast, the foreign exchange costs of imported military goods and technology seem to be of crucial importance. As our calculations in section B show, the growth cost of military imports through foreign exchange constraints are high. Even if domestic resources are available, foreign exchange constraints are potentially more restrictive and difficult to cope with. Under these circumstances, military technology and arms may be far too expensive for the developing economy.

To sum up, the analysis presented in this paper shows that there may be some advantage in defence-related technology transfers, particularly when military commitments are binding for exogenous reasons. However, from the point of view of potential interindustrial spin-off, the choice of appropriate techniques given aggregative factor endowments and comparative advantage, the proportion of output invested in equipment, technological obsolescence and the economic lifetime of machines, as well as foreign exchange requirements, the cost may be very high and even prohibitive.

Annex

A MATHEMATICAL MODEL OF TECHNICAL PROGRESS IN THE MILITARY-INDUSTRIAL SECTOR

In this annex we first analyse a theoretical model of technical progress and then show how it can be adapted to military technology. Technical change is assumed to be exogenous; it is embodied in the most recent machine; we thus have a vintage capital model [14].

Consider an aggregative model of defence output (D) which is produced by capital (machines) and labour (L), where capital is measured in the same unit as D. Technological progress is labour-saving, comes from outside the model (through imports, for example), and is embodied in the machine of the latest vintage. Absence of substitutability implies that the capital-output ratio (v) is a constant. The date of construction of the machine embodies the technology of θ, and the later the date the more efficient the machine. The economic lifetime of the machine is T, which is endogenous, and the current time period is t. The model is analysed in continuous time and only steady states are considered, since a proper study of transition paths is beyond the scope of this paper.

If the rate of embodied technical progress is μ and its function is to decrease the amount of labour per machine, thus making it more efficient, then a machine built at date θ is currently using $\ell e^{-\mu\theta}$ units of labour, where ℓ is an arbitrary constant used to determine units. Suppose that at steady state the total labour force employed is growing at rate n, thus

$$L(t) = L_0 e^{nt} \tag{14}$$

where L_0 is known

It is clear [15] that long-term equilibrium will be characterized by output of the defence sector growing steadily at $(n + \mu)$ (labour growth plus technical progress) and the wage rate at μ.

Thus output at date t will be

$$D(t) = D_0 e^{(n+\mu)t} \tag{15}$$

and the wage rate is

$$w(t) = w_0 e^{\mu t} \tag{16}$$

(where a "$_0$" subscript means the initial period value). Note that D_0 and w_0 are unknown and must be solved by the system. Assuming

$d_0 = D_0/L_0$ in per worker terms we can write (14) as

$$D(t) = d_0 L_0 e^{(n+\mu)t} \tag{17}$$

Let us assume that a fixed proportion (k) of output D at any period t is being used to install (or buy) new machines. Thus the capital stock K(t) is given by

$$K(t) = kD(t) \tag{18}$$

For the date θ we have

$$K(\theta = kD(\theta) \tag{19}$$

where (from equations (14) and (16))

$$D(\theta) = D_o e^{(n+\mu)\theta} = d_o L_o e^{(n+\mu)\theta} \tag{20}$$

Therefore the number of machines of date is given by

$$K(\theta) = kd_o L_o e^{(n+\mu)\theta} \tag{21}$$

Consider then the current period t where machines built at dates θ (where $t - T < \theta < t$) are being used. Each machine produces $\frac{1}{v}$ units of output. Thus total output from the machines of vintage vintage θ is $\frac{1}{v} K(\theta)$. Summing over all vintages, the current output is

$$D(t) = \int_{t-T}^{t} \frac{1}{v} K(\theta)d\theta = \int_{t-T}^{t} \frac{1}{v} kd_o L_o e^{(n+\mu)\theta} d\theta \tag{22}$$

Further, each machine of date (vintage) θ uses $\ell e^{-\mu\theta}$ units of labour, as analysed earlier. Given the number of θ machines from (20), labour employed in vintage machines is $\ell e^{-\mu\theta} K(\theta)$. Summing over all θ, the employment in period t is given by

$$L(t) = \int_{t-T}^{t} \ell e^{-\mu\theta} K(\theta)d\theta$$

$$= \int_{t-T}^{t} \ell e^{-\mu\theta} kd_o L_o e^{(n+\mu)\theta} d\theta \tag{23}$$

Equilibrium implies the basic consistency condition D(t) from (17) and (22) must be equal, and similarly for L(t) from (14) and (23). Thus

$$d_o L_o e^{(n+\mu)t} = \int_{t-T}^{t} \frac{1}{v} kd_o L_o e^{(n+\mu)\theta} d\theta \tag{24}$$

and $$L_o e^{nt} = \int_{t-T}^{t} \ell e^{-\mu\theta} kd_o L_o e^{(n+\mu)\theta} d\theta \tag{25}$$

Simplifying (24) and (25)

$$\frac{v}{k} = \int_0^T e^{-(n+\mu)\tau}\, d\tau \tag{26}$$

and

$$\ell = k d_0 \int_0^T e^{-n\tau}\, d\tau \tag{27}$$

We thus have two equations, (26 and (27), but three unknowns, T, d_0 and w_0. The model must provide solutions for the economic lifetime of the machines T, the level of output per unit of labour employed d_0 and the wage rate w_0. We need therefore another equation.

Since old vintages are more labour-intensive, the cut-off point at which a vintage will be discarded is where the wage cost just equals output of that particular vintage and the surplus is zero. Any older vintage will of course have negative rentals. This is the crucial concept of economic lifetime or obsolescence, whereby even though the machine is physically productive (has a positive marginal product), it will be discarded since it is too expensive to run. When $\theta = t-T$ this will be so. We already know that any θ machine uses $\ell e^{-n\theta}$ units of labour. Given w(t) from (16), the wage bill for the machine is $w(t)\ell e^{n(t-\theta)} = w_0 \ell e^{n(t-\theta)}$. For $\theta = t-T$, this is simply $w_0 \ell e^{nT}$. Since output per machine is fixed at $\frac{1}{v}$, we have

$$w_0 \ell e^{nT} = \frac{1}{v} \tag{28}$$

Equations (26), (27) and (28) complete the model.

As discussed in the main text, the abstract mathematical model can be adapted to the problems of military technology, arms imports and weapons production in developing countries. At the macro-economics level D can be interpreted as aggregate output of armaments for an arms-producing country. Similarily we have total capital stock as K. The technology is imported. At the micro-economics level, the weapon in use can be identified with K and its destructive potential as D. Again technical change originates abroad, so that new vintage arms are imported. Interpretations of the results are then easy. In particular, the nature of technical progress, research and development, exogenously determined technology transfer (given by μ in the model), obsolescence of machines and the economic lifetime of capital stock are all readily explained.

A large number of comparative dynamics results can be generated from our model, but we shall focus on two issues, both related to obsolescence and the economic lifetime of machines and receiving considerable attention in the literature. Specificially we ask, what are the effects of raising μ (exogenously specified rate of technical progress) and k (proportion of output used to buy capital stock) on the economic lifetime T. We need to find the signs of $\partial T/\partial \mu$ and $\partial T/\partial k$.

From (26) it is clear that an increase in μ will reduce the value of $e^{-(n+\mu)T}$ and thus the area of the integral in (26) for a given T. To preserve the equality, T must rise, thus

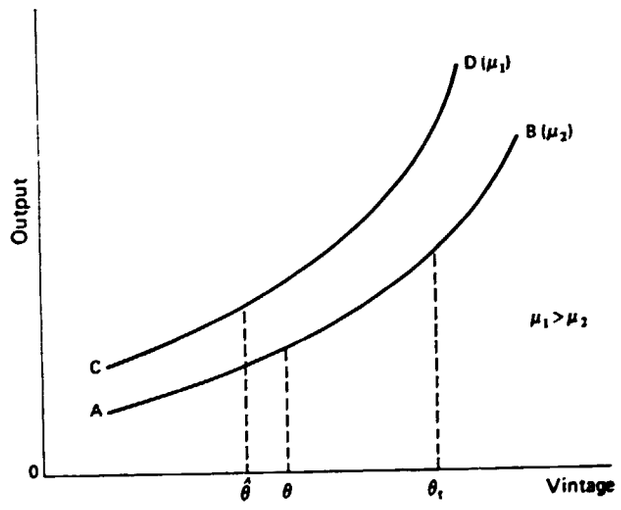
$$\partial T/\partial \mu > 0 \qquad (29)$$

By a similar analysis, an increase in k reduces v/k, and thus to preserve equality in (26), T must be reduced. Therefore

$$\partial T/\partial k < 0 \qquad (30)$$

Equation (29) shows that a rise in the rate of technical progress will actually increase the economic lifetime of machines and thus allow older machines (armaments) to be used. This is an unexpected result. The literature abounds with critical references to rapid changes in sophisticated technology and the procurement and production of armaments which encourage obsolescence and thus increase resource costs. However, a closer examination shows clearly why $\partial T/\partial \mu$ should be positive. An increase in μ means that older vintages of the new technology (high μ) will be more efficient than recent vintages of the old technology (low μ). Thus it is profitable with better technology to keep machines in use longer than before. Figure II shows this explicitly.

Figure II. Technical progress and economic lifetime of machines



Suppose that at the initial rate of technical progress μ_2, vintages θ to θ_t are being used. The path of output is given by AB. A higher μ raises the whole path of output to CD. It then becomes profitable, given variable factor costs, to install vintages like $\hat{\theta}$, and thus use older machines of the superior technology.

On the other hand, the proportion of output going to capital stock has the opposite effect on T. From equation (30), if k rises T falls. Again, as the main text shows, a close examination explains why this is a plausible outcome.

References

1. Stockholm International Peace Research Institute (SIPRI), Yearbook of World Armaments and Disarmament, 1982 (London, Taylor and Francis, 1983).

2. A. Pierre, The Global Politics of Arms Sales (New Jersey, Princeton University Press, 1982).

3. Cardesman, "US and Soviet competition in arms exports and military assistance", Arms Force Journal International, August 1981.

4. Somnath Sen and Ron Smith, The Economics of International Arms Transfers, Birkbeck College discussion paper (London University, 1982).

5. P. Lock and H. Wulf, "The economic consequences of the transfer of military oriented technology", The World Military Order, M. Kaldor and A. Eide, eds. (London, Macmillan, 1979).

6. G. Kennedy, The Military in the Third World (London, Duckworth, 1974).

7. D. K. Whynes, The Economics of Third World Military Expenditure (London, Macmillan, 1979).

8. E. Benoit, Defence and Economic Growth in Developing Countries (Boston, Lexington Books, 1973).

9. P. Terhal, "Guns or grains", Economic and Political Weekly, 1981.

10. Saadet Deger and Somnath Sen, "Military expenditure: spin-off and economic growth", Journal of Development Economics, 1983.

11. F. Hahn and R. C. O. Matthews, "The theory of economic growth: a survey", Surveys of Economic Theory, vol. II (London, Macmillan, 1969).

12. World Bank, World Tables (Washington, D.C., 1976).

13. S. Kuznets, "Driving forces of economic growth: what can we learn from history", Weltwirtschaftliches Archiv, vol. 116, No. 2 (1980).

14. A. Dixit, The Theory of Equilibrium Growth (London, Oxford University Press, 1976).

15. R. M. Solow and others, "Neoclassical growth with fixed factor proportions", Review of Economic Studies, 1967.

UNITED REPUBLIC OF TANZANIA: OVERALL CONCENTRATION, REGIONAL CONCENTRATION, AND THE GROWTH OF THE PARASTATAL SECTOR IN THE MANUFACTURING INDUSTRY

M. S. Silver*

Introduction

This paper is concerned with changes in the overall concentration and regional concentration of manufacturing industry in the mainland of the United Republic of Tanzania over the period from 1967 to 1974. Changes in overall concentration show changes in the extent to which all economic activity in a country is dominated by a few large firms. Concentration measures may be defined to encompass not only all economic activity, but any subset of such activity. Thus, concentration measures may relate to the extent to which, for example, a given region - or, alternatively, a given industry - within a country is dominated by a few large firms.

One characteristic feature of the development of the economy of the United Republic of Tanzania during the period from 1967 to 1974 was the rapid increase in the number of "large" establishments. This was by no means a feature of the growth of "small" establishments. Such changes may be identified against the 1967 nationalization measures, the subsequent introduction of new -- and the expansion of existing - relatively large parastatal organizations and the adverse implications of the new socialist policies for manufacturing investment in the non-parastatal sector, a sector characterized by relatively small establishments. Changes in overall manufacturing concentration are evaluated in view of these. With decentralization forming part of government industrial strategy, changes in concentration are also determined at the regional level. Increases in employment for a particular region may, for example, arise from an evenly distributed expansion in employment for firms in a region or the contraction of existing small establishments and the setting up of a single very large establishment. Measures of concentration go some way in examining the nature of changes in the "make-up" of a region's industry. Changes in overall concentration are also considered. Finally, the impact of the growth of the parastatal sector on overall concentration is analysed. For this purpose, recourse is made to a recently developed framework which is adapted for this new context.

The State's rapid growth and eventual control of the "heights" of industry was accomplished by nationalization and increased investment in existing and new parastatals. Increased investment

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provided a major stimulus for manufacturing production to grow rapidly. However, the picture was not one of self-generating growth but a series of exogenous injections. Silver [1] has examined the efficiency of the parastatal sector, finding the growth in production and employment impressive, but indicators of commercial and technical efficiency disappointing.

Nationalization and the development of the parastatal sector

In February 1967, the Government of the United Republic of Tanzania embarked upon a new economic development policy, the basis of which was socialism and self-reliance as outlined in the Arusha Declaration. The nationalization measures which immediately followed the Arusha Declaration included the "acquiring" of a shareholding of between 57 and 60 per cent in six relatively large manufacturing establishments and a 49 per cent shareholding in a seventh. The basis for the choice of firms appears to have related to size and foreign ownership as noted by Roe:

> "The nationalisation measures, like the Declaration itself, are instruments of symbolism and there is no evidence that the politicians listened to any practical economic or financial arguments about the advantages of nationalisation before they went ahead and nationalised." ([2])

The nationalized firms included two breweries, a tobacco company, a shoe manufacturer, a metal box manufacturer and a cement company. The State's shareholdings in industrial establishments were placed under the control of the National Development Corporation - though this was later reorganized and lost some of its autonomy. The National Development Corporation was directed to ensure that in all new joint State and private projects in the manufacturing sector it would attempt to possess a majority shareholding [2, 3, 4, 5]. In 1967 there were 26 parastatal manufacturing establishments with 5,302 persons "engaged". By 1974 this had increased to 47 parastatal manufacturing establishments engaging 34,778 persons - an increase in the number of persons engaged of 30.8 per cent per annum, compared with an increase of 2.8 per cent per annum for non-parastatal manufacturing.* These

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*Data for the parastatal sector is from the United Republic of Tanzania, Analysis of Accounts of Parastatals, 1966-1975 (Dar es Salaam, Ministry of Finance and Planning, January 1977) and for the manufacturing sector (from which figures for the non-parastatal sector were deduced), the United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Production 1967 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, December 1970) and Survey of Industrial Production 1974 (Dar es Salaam, Ministry of Finance and Planning, February 1977). The data excludes establishments employing less than 10 persons for consistency with later results. However, were such establishment to be included, data for the parastatal sector would remain unchanged and employment for the non-parastatal sector would fall by 0.007 per cent per annum (Survey of Employment and Earnings 1967 and 1973-1974).

figures further demonstrate the much larger average size of establishments (in terms of employment) in the parastatal sector as compared with other sectors. The average number of persons engaged per establishment was 204 and 740 in parastatal manufacturing establishments in 1967 and 1974 respectively, compared with 72 and 79 in non-parastatal manufacturing establishments in those same years.

Changes in the regional distribution of manufacturing industry

The second five-year plan, which embodied the principles of the Arusha Declaration, recognized the need for a "strategy of systematic regional development" devoting a separate volume to "Regional Perspectives" [6]. The second five-year plan noted the dangers of development being exclusively centred around one or two major areas, in particular, Dar es Salaam. ([7], pp. 176-186. The tendency, since independence in 1962, for most major industrial projects to have been established in Dar es Salaam is illustrated in table III, p. 183.) Aside from a general emphasis on rural programmes to alleviate this imbalance [8], the plan incorporated an urban development programme consistent with decentralizing objectives.

> "A clear policy in regional location of new industrial projects is to be implemented to the effect that all new industries that do not necessarily have to be in Dar es Salaam for special reasons should be located in other towns. Since most new industries are to be started with government participation such a policy can be effectively implemented through existing policy machinery." ([7], p. 178, para. 16.)

Such a policy of locating establishments away from areas where urbanization and localization economies exist would not be costless [9]. An alternative policy would be to accept the regional imbalance from locating industry at optimum profit locations with some expectation that the increased surplus resulting therefrom would "trickle down" to other regions [10].

Table 1 shows that a substantial proportion of manufacturing employees in 1967 were engaged in establishments operating in the Dar es Salaam and Coast Region.* The five regions - Dar es Salaam (and Coast), Morogoro, Tanga, Arusha and Kilimanjaro - accounted for 71.6 per cent of all persons in the country engaged in manufacturing in 1967 - in a geographical area comprising 25.9 per cent of the mainland of the United Republic of Tanzania and including 29.3 per cent of all its inhabitants. The predominance of the Dar es Salaam and Coast region (in terms of persons engaged) can be seen from table 1 to have increased between 1967 and 1974. The overall

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*As noted above, the Survey of Industrial Production covers only establishments employing 10 or more persons. Establishments employing less than 10 persons may well be distributed quite differently over regions than the larger establishments covered by the Survey.

Table 1. Regional distribution of manufacturing employment and output in the United Republic of Tanzania

Region	Persons engaged a/				Value added				Geographical area (percentage)	Number of inhabitants, 1967 (percentage)
	Number		Percentage		Thousands of shillings		Percentage			
	1967	1974	1967	1974	1968	1974	1968	1974		
Dar es Salaam and Coast	13 732	34 480	39.8	49.0	217 874	657 798	57.6	56.9	3.8	6.6
Morogoro	1 717	4 392	5.0	6.2	35 630	49 969	9.4	4.3	8.3	5.8
Tanga	3 757	7 791	10.9	11.1	34 422	122 434	9.1	10.6	3.3	6.5
Arusha and Kilimanjaro	5 494	9 030	15.9	12.8	52 140	156 863	13.8	13.6	10.5	10.4
Iringa and Mbeya	1 843	2 112	5.3	3.0	7 183	34 377	1.9	3.0	15.9	13.8
Mwanza, Mara, Shinyanga and West Lake	5 969	9 687	17.3	13.8	29 117	107 096	7.7	9.3	13.7	26.5
Other regions b/	1 990	2 823	5.8	4.0	1 958	37 437	0.5	3.2	44.5	30.4
United Republic of Tanzania: mainland	34 502	70 315	100.0	100.0	378 324	1 156 652 c/	100.0	100.8 c/	100.0	100.0

Sources: United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Production 1967 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, 1970), table 4; United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Production 1968 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, July 1971), table A5; United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Production 1974 (Dar es Salaam, Ministry of Finance and Planning, February 1977), table A5; S. B. Jenson and J. Mkama, District Data 1967 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, November 1968).

a/ Paid employees, working proprietors and unpaid family workers as at 31 December 1967 and 1974.

b/ Including Dodoma, Kigoma, Mtwara (and Lindi), Ruvuma, Singida and Tabora.

c/ These columns do not add to the totals because of a discrepancy of +0.8 per cent before rounding, or 9,322 thousand shillings.

regional imbalance in the distribution of manufacturing employment remained, in 1974, most marked. An alternative indicator of the regional distribution of manufacturing industry is the flow of value added generated by establishments in each region. Since 1968 such data has been available on a continual basis in the annual Survey of Industrial Production. Manufacturing production or value added can be identified as remaining firmly centred around the Dar es Salaam and Coast region for such establishments in 1968 and 1974. The percentage contribution of the Dar es Salaam and Coast region to manufacturing value added is higher than for the number of persons engaged, reflecting the higher capital intensity of establishments in this region.* The five regions - Dar es Salaam and Coast, Morogoro, Tanga, Arusha and Kilimanjaro - were responsible for the generation of 89.9 and 85.4 per cent of value added in 1968 and 1974 respectively for manufacturing establishments employing 10 or more persons (further details on the regional imbalance are given in Silver [11]).

Table 2 allows our concern over differential growth rates for "small" and large establishments to be examined. Since such data is only available for manufacturing industry in the Survey of Industrial Production, the analysis is limited to establishments employing 10 or more persons. Four regions or groups of regions (Dar es Salaam and Coast; Tanga; Arusha and Kilimanjaro; Mwanza, Mara, Shinyanga and West Lake) showed a decrease in (or at most fluctuating around a stable level) the number of manufacturing establishments employing 10-49 persons (hereafter referred to as small establishments). However, these regions exhibited an increase in the number of establishments employing 100 or more persons (hereafter referred to as large establishments). The increase in the number of large establishments in the above regions, and generally for all regions, partly stems from the relatively large expansion of the manufacturing parastatal sector following the Arusha Declaration [12]. However, the decline in the number of small manufacturing establishments in the above-mentioned regions and on aggregate for all regions merits concern. It should be noted that in the less industrialized "other regions" (constituting over 44 per cent of the geographical area of the mainland of the United Republic of Tanzania) there has been some increase in the number of small establishments, possibly prompted to serve local needs. However, small establishments have a role to play in the relatively industrialized areas, being the "seed" for larger establishments and serving specialized needs [13, 14].

Table 2 provides an analytical problem in that it is impossible to determine whether, for example, the decline in small manufacturing establishment stems from existing small establishments

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*The share of the Dar es Salaam and Coast region increased between 1967 and 1974 for the number of persons engaged but fell for value added between 1968 and 1974. The corresponding figure for "persons engaged" for 1968 is 45.1 per cent, rendering the disparities between the two indicators less marked, though still substantial [5].

Table 2. Changes in number of manufacturing establishments by region and size

Region and size of establishments a/	Number of establishments b/							
	1967	1968	1969	1970	1971	1972	1973	1974
Dar es Salaam and Coast								
Number of persons engaged								
10-49	97	118	95	91	97	92	92	80
50-99	35	39	33	34	37	37	37	47
100 or more	28	33	37	43	47	53	57	57
Total	160	190	165	168	181	182	186	184
Morogoro								
Number of persons engaged								
10-49	18	27	21	24	24	30	26	24
50-99	2	6	6	5	3	6	6	8
100 or more	3	4	4	4	3	3	3	3
Total	23	37	31	33	30	39	35	35
Tanga								
Number of persons engaged								
10-49	47	49	41	43	47	48	44	39
50-99	13	12	7	6	11	7	11	10
100 or more	9	9	13	13	13	18	17	19
Total	69	70	61	62	71	73	72	68
Arusha and Kilimanjaro								
Number of persons engaged								
10-49	45	56	39	47	41	45	43	40
50-99	13	10	11	14	12	16	16	13
100 or more	14	11	13	13	17	18	23	26
Total	72	77	63	74	70	79	82	79
Iringa and Mbeya								
Number of persons engaged								
10-49	4	9	5	15	11	5	8	9
50-99	5	4	2	2	5	5	3	3
100 or more	7	8	7	8	5	7	8	8
Total	16	21	14	25	21	17	19	20

Mwanza, Mara, Shinyanga and West Lake								
Number of persons engaged								
10-49	36	43	36	30	27	37	37	30
50-99	18	15	12	11	13	12	13	18
100 or more	18	20	26	29	31	29	27	31
Total	72	78	74	70	71	78	77	79
Other regions c/								
Number of persons engaged								
10-49	13	16	17	15	17	21	24	26
50-99	5	4	3	3	3	5	2	3
100 or more	1	1	2	2	4	3	6	5
Total	19	21	22	20	24	29	32	34
All regions								
Number of persons engaged								
10-49	260	318	254	265	264	278	274	248
50-99	91	90	74	75	84	88	88	102
100 or more	80	86	102	112	120	131	141	149
Total	431	494	430	452	468	497	503	499

Sources: United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Production 1967 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, December 1970), table 1; United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Production 1968 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, July 1971), table 1; United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Planning 1969 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, May 1972), table 1; United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Planning 1970 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, February 1973), table 1; United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Planning 1971 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, March 1974), table 1; United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Planning 1972 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, December 1975), table 1; United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Planning 1973 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, October 1976), table 1; United Republic of Tanzania, Bureau of Statistics, Survey of Industrial Planning 1974 (Dar es Salaam, Ministry of Economic Affairs and Development Planning, February 1977), table 1.

a/ Size groups refer to the number of persons engaged on one specific date (usually 31 December) for 1967 and 1968 and average number of persons engaged for subsequent years. "Persons engaged" includes employees, working proprietors and unpaid family workers. The average number of persons engaged was calculated by adding for each category the number of persons present during each shift for all working days and dividing the result by the total number of working days.

b/ Excluding establishments employing less than 10 persons.

c/ Including Dodoma, Kigoma, Lindi, Mtwara, Rukwa (though no establishments were reported operating in this area), Ruvuma, Singida and Tabora.

expanding into the larger size groups and/or declining into employing less than 10 persons, closing or becoming own-account establishments. In addition, existing medium or large-sized establishments may be declining into this group or new establishments may be joining this group, with the above-mentioned effects obscuring this tendency. Similarly, the expansion in the number of large manufacturing establishments may stem from new establishments being set up in this size group or from small or medium-sized establishments expanding into this group, with these influences being mitigated by existing establishments leaving this group to enter a smaller group or closing. Owing to the limited data base, attempts to estimate such transitional propensities ran into degree-of-freedom problems. However, as will be demonstrated later, the role of the State in expanding and setting up large establishments goes some way to help explain such patterns.

Concentration indices

The expansion of the parastatal sector may have led to increased concentration not only because of the amalgamation of previously separately owned establishments under a single ownership (or at least control) but also because of the concern of the State with controlling and establishing "large" establishments per se, as part of a more general aim to own and control the "heights of industry". The Arusha Declaration did little to help the confidence of private investors, so small firms may not have expanded at a similarly fast rate; table 2 suggests some contraction. Our first concern is with the trend in overall concentration following the Arusha Declaration. We note that since data on "size" is only available for establishments and not enterprises, our concept of concentration relates to establishment size and not control of a number of establishments by separate single owners (enterprises). We relax this more limited conceptualization of concentration later. The indicator of size used throughout is the number of persons engaged. The index of concentration adopted is the Hirfindahl index given by:

$$H = \frac{\Sigma S_i^2}{(\Sigma S_i)^2} \qquad (1)$$

where S_i is the size of establishment i.

Since data related to size bands and not individual establishments, we assume that all firms in a particular size band are the same size. This leads to a downward bias in the indices, though such errors are likely to be small or self-cancelling as long as the size classes are constant over time, as in this study [15]. The size bands used were 10-19, 20-49, 50-99, 100-499, and 500 or more persons and were thus more extensive than those employed for summary purposes in table 2.

Table 1 shows that manufacturing employment nearly doubled between 1967 and 1974, and table 2 shows that the increase arose mainly from small or medium-sized firms increasing in size, new large establishments being set up, and/or large establishments increasing in size. The average number of employees in "large" establishments increased from 1,163 to 13,228 between 1967 and 1974. There was no expansion in the "small" firm sector due to, say, new establishments being set up. As such, we would expect concentration to increase. However, an increase in the number of "large" firms need not automatically lead to an increase in concentration, since the very addition of more large firms may counteract the increase in concentration. For example, if the sector is composed of two firms engaging five employees, the establishment of new firms will lead to a fall in concentration. The new firm will have to engage 20 persons to be large enough to counteract the fall in concentration to yield a Hirfindahl index equal to the level of concentration before the new firm joined the sector. The Hirfindahl index can be broken down into the contribution of the number of firms and variance (inequality) in firm sizes for each period:

$$H = n\sigma^2 + 1/n$$

$$\text{where } \sigma^2 = \frac{1}{n}\Sigma\left[\frac{1}{n} - \frac{S_i}{\Sigma_i S_i}\right]^2 \qquad (2)$$

Table 3 allows changes in concentration for total manufacturing to be discerned. Removing the contribution of changes in the number of firms from the Hirfindahl index for total manufacturing gives a similar trend to that derived in table 3:

1967	1968	1969	1970	1971	1972	1973	1974
0.55	0.77	0.82	0.96	0.91	0.94	0.74	0.74

Table 3 shows an initial substantial increase in overall establishment concentration since the Arusha Declaration, which fell off somewhat in the early 1970s and particularly sharply between 1972 and 1973. This latter fall has been identified as not stemming from an increase in the number of establishments per se. The manufacturing sector is too large for the addition of 68 new establishments between 1967 and 1974 to have had a substantial effect. It is, however, the change in the size distribution of establishments that is having a marked effect. The variation in the size of firms increased in the late 1960s as a few large firms increased dispersion at the top end of the size range (which is given more weight in the index). As the number of large establishments increased in size, the concentration fell accordingly. Had the Government pursued a continuous expansion policy centred around a small, constant number of establishments, concentration would have accordingly continued to increase in the 1970s. However, market limitations and/or scarce resources, coupled with an aim to have an interest in, and promote, a range of industries, led to ceilings on growth paths. As relatively large parastatal establishments were allowed to settle around these relatively high

Table 3. Concentration indices a/ for establishments in Tanzanian manufacturing by region
(x 10^{-2})

Region	1967	1968	1969	1970	1971	1972	1973	1974
Dar es Salaam	2.41	2.62	3.18	3.14	2.88	3.09 (3.04) b/	2.54	2.73
Coast						32.36	63.35	27.72
Morogoro	17.75	30.15	21.76	27.14	30.93	28.15	27.34	26.09
Tanga	3.30	3.31	3.18	8.07	2.87	2.89	3.77	4.91
Arusha	3.62	4.26	8.87 (4.57) b/	8.35	4.87	7.89	6.32	6.81
Kilimanjaro			10.19	10.21	11.02	6.[illegible]	8.22	7.97
Iringa	8.92	13.52	16.07 (10.18) b/	11.38	14.04	17.73	11.74	11.05
Mbeya			27.17	20.90	35.68	25 94	29.28	30.92
Mwanza	2.64	2.47	7.13	11.30	12.40	12.11	15.27	16.78
Mara			21.92 (3.66) b/	21.41	21.41	17.37	21.81	17.06
Shinyanga			14.01	13.99	10.94	15.31	14.99	10.45
West Lake			21.10	38.76	16.82	38.90	20.02	16.17
Mtwara	66.98	36.21	49.75	41.29	87.74	92.26	91.82	79.58
Ruvuma						77.87	79.77	94.93
Dodoma	50.00	56.30	62.22	62.44	30.67	59.53	56.17	56.17
Lindi						21.98 (20.39)	17.80	15.31
Rukwa						- c/	- c/	- c/
Singida						100.00	- c/	50.00
Kigoma	15.92	14.55				100.00	58.68	100.00
Tabora			14.12	16.15	16.59	15.53	12.45	13.71
All regions	0.78	0.97	1.05	1.18	1.12	1.14	0.94	0.94

Source: United Republic of Tanzania, Survey of Industrial Production, various issues.

a/ Hirfindahl concentration indices calculated for each region and for the mainland of the United Republic of Tanzania from data on the size (persons engaged) distribution of establishments in intervals: 10-19; 20-49; 50-99; 100-499; 500 or more persons.

b/ Figures in brackets give the index based on the level of aggregation applicable to the previous period, though this is not always discernible.

c/ "-" denotes no manufacturing establishments engaging more than 10 persons operating in the region.

ceilings and new (relatively large) parastatal establishments were promoted, concentration fell.

Table 3 shows some variability in regional concentration trends, with Dar es Salaam experiencing a rise in concentration in the late 1960s, thereafter fluctuating at a level above that existing in 1967. In many regions, a fall in concentration after the generally quite large increases in concentration in the 1960s can be identified, though regions experiencing increases in the 1970s included Mbeya, Mwanza and Mtwara. Table 3 allows one to isolate trends in concentration for particular regions. However, overall concentration is a weighted average of regional indices, the weights for each region j being given by:

$$w_j = \Sigma S_j^2 / (\Sigma S_j)^2 \qquad (3)$$

and overall concentration by:

$$H = \Sigma w_j H_j \qquad (4)$$

where $H_j = \Sigma S_i^2 / (\Sigma S_i)^2$ for the i establishments in each region.

Note that squaring in the numerator of the weights gives much more importance to larger regions than to smaller regions in deriving trends in overall establishment concentration. Table 4 compares the contribution of different regions with overall concentration for 1967 and 1974. Note how the (relative) change in concentration in the Dar es Salaam and Coast region is much less than the (relative) contribution of this area to overall concentration. This has arisen because of the much faster increase in employment in this region, as reflected in table 1. The Dar es Salaam and Coast region experienced a substantial increase in employment between 1967 and 1974 (table 1). This is mainly attributable to the preponderance of large establishments of similar size (table 2), which has not led to commensurate increases in the variance of firm sizes (note the squaring of firm sizes gives more weight to large firms) as reflected in the concentration indices (table 3) but has led this region to become an almost determining factor in overall concentration trends (table 4). The increase in the size of firms in the United Republic of Tanzania and to a large extent in the Dar es Salaam and Coast region led to an increase in concentration in the early 1960s. However, by the early 1970s, the number of similarly large establishments contributed to a fall in concentration. Even when the "pure" effect of the number of firms was deducted, the fall still remained.

The parastatal sector and manufacturing concentration

The role of the State in the expansion of the parastatal sector requires consideration with respect to its effects on concentration. Data in the Survey of Industrial Production are unfortunately only given for establishments and not enterprises. As noted before, our concern has been with the concentration of establishments and cannot, therefore, take into account the ownership of a

Table 4. Regional contribution to overall establishment concentration, 1967 and 1974
($\times 10^{-2}$)

	Contribution to overall establishment concentration		Concentration indexes	
	1967	1974	1967	1974
Dar es Salaam and Coast	0.382	0.642	2.41	2.67
Morogoro	0.044	0.102	17.75	26.09
Tanga	0.039	0.061	3.30	4.94
Arusha and Kilimanjaro	0.092	0.060	3.62	3.68
Iringa and Mbeya	0.025	0.007	8.92	8.23
Mwanza, Mara, Shinyanga, West Lake	0.079	0.140	2.64	7.35
Mtwara and Ruvuma	0.150	0.018	66.98	44.34
Dodoma, Kindi, Rukwa, Singida	-- a/	-- a/	50.00	8.98
Kigoma and Tabora	0.001	0.003	15.92	12.98
All regions b/	0.779	0.941	0.779	0.941

Source: See table 3.

a/ "--" denotes a figure of less than 0.000005 (note that all figures should be multiplied by 10^2).

b/ The columns do not necessarily add to the totals because of rounding.

number of establishments in, say, different industries by a single individual, group of individuals or institution. However, we can relax this assumption with respect to State ownership of industry. Employment data were used from the individual returns of the Survey of Industrial Production. These data related to manufacturing establishments with a 50 per cent or more interest held by one of the development corporations of the State (usually the National Development Corporation). There were a few exclusions due to non-response, but the number was marginal. Concentration ratios were calculated with the employment figures for each of these establishments (21 in 1967 and 38 in 1972) removed from the size distribution data and included as one large establishment (enterprise). The results are presented in table 5. The analysis was confined to the period from 1967 to 1972, and new concentration indices are given under the row heading "establishments and parastatal enterprises" (H_A). The row headed "parastatal sector" is derived by dividing the original "establishments" index (H_E) into the newly compiled "establishments and parastatal enterprise" indices (H_A). The resulting figures provide a numbers equivalent form of Berry's index of diversification n* - or, in this context, State control. Details of the mathematical derivation of this analytical framework are given in the appendix, the essential relationship being $H_A = (1 - D)^{-1}H_E$.

D provides an index of the spread of diversification of State ownership and control based on principles akin to Berry's diversification index [16]. If the State does not "diversify" its ownership and control to more than one establishment, $D_i = D = 0$. If the State takes full control of equally sized establishments, then $D = (n - 1)/n$ where n is the number of establishments. The measure takes into account the size of the establishments which the State may diversify into (either through take-over, setting up a new establishment or expanding the size of existing ones). Furthermore, the measure is expressed relative to the overall or combined size of the manufacturing private establishments and the parastatal enterprise as given in equations (11) and (12) of the appendix. Note that the squaring process gives especially large weight to the very large parastatal establishments.

The index of diversification, D, may be expressed in "numbers equivalent" form via $n^* = 1/(1 - D)$; results are presented in table 5, being directly derived from the framework in equation (12) of the appendix. It should be noted that variations in n* do not arise from the deviations in the size distribution of parastatal establishments relative to all establishments. This is incorporated in H_E. The concern of n* is with the spread or diversification of the State's interests over an increasing number of, and greater proportion of persons engaged in, manufacturing establishments and the effect of this on aggregate concentration.

Table 5 shows for the mainland of the United Republic of Tanzania the increase in the scale of the concentration indices once the parastatal sector is considered as a single entity. This effect was not a single shift in the ratios due to nationalization but a continual and substantial process of expansion. The 132.1 per cent increase in aggregate concentration given by H for

Table 5. Contribution of parastatal sector to manufacturing concentration in and outside of Dar es Salaam ($\times 10^{-2}$)

	1967	1968	1969	1970	1971	1972	Percentage increase, 1967-1972
Dar es Salaam and Coast							
Establishments, a/ H_E	2.41	2.62	3.18	3.14	2.88	3.04	26.1
Establishments and parastatal enterprises, b/ H_A	5.66	5.84	8.56	8.30	9.68	8.91	57.4
Parastatal sector, c/ n*	2.35	2.23	2.69	2.64	3.36	2.93	24.7
Outside Dar es Salaam and Coast							
Establishments, a/ H_E	1.41	1.46	1.28	1.80	1.64	1.52	7.8
Establishments and parastatal enterprises, b/ H_A	1.74	1.94	2.16	3.11	2.46	4.26	144.8
Parastatal sector, c/ n*	1.23	1.33	1.69	1.73	1.50	2.80	127.6
United Republic of Tanzania: mainland							
Establishments, a/ H_E	0.78	0.97	1.05	1.18	1.12	1.14	46.2
Establishments and parastatal enterprises, b/ H_A	1.56	1.86	2.73	2.81	5.85	3.62	132.1
Parastatal sector, c/ n*	2.00	1.92	2.60	2.38	5.22	3.18	59.0

a/ Including manufacturing establishments, private and parastatal, each of the latter being classified as individual establishments.

b/ Including manufacturing establishments, private and parastatal, the latter being classified as one enterprise.

c/ Including manufacturing establishments in the parastatal sector.

the mainland of the United Republic of Tanzania was made up of a 46.2 per cent increase in establishment concentration and an overriding 59.0 per cent increase due to the diversification of the parastatal sector. Outside Dar es Salaam, aggregate concentration increased by 144.8 per cent, though only a relatively very small proportion of this was attributable to changes in establishment concentration. The substantial increase in the diversification or spread of the parastatal sector can be identified to be primarily responsible for increases in aggregate concentration. Government decentralization policy, whilst not succeeding in absolute terms (table 1), has given rise to a substantial increase in the concentration of industry outside Dar es Salaam.

Manufacturing industry within the Dar es Salaam and Coast region can be identified as experiencing an increase in aggregate concentration - though not to the extent apparent outside of these geographical boundaries. Approximately half of this increase arose from increased State diversification and half from establishment concentration.

Conclusions

This paper has examined the effects on concentration of this interesting case of a country rapidly expanding the State-owned and controlled sector of manufacturing industry whilst attempting to bias this expansion away from established areas of industry in general and Dar es Salaam in particular. Given the decrease in the number of (generally smaller) establishments in the private sector, the effect on establishment concentration has, not surprisingly, been a rapid increase. However, this increase (for the mainland of the United Republic of Tanzania in aggregate and many regions) was only temporary, being curtailed by a ceiling on the growth of establishments combined with an increasing number of such (large) establishments. Establishment concentration actually fell in the early 1970s.

Aggregate concentration increased in scale and rate when the parastatal sector was redefined as a single enterprise by recourse to unpublished data. The diversification of the State was considered by adapting a framework by Clarke and Davies [17] to this new context. State diversification outside of the Dar es Salaam and Coast region was almost exclusively responsible for the rapid increase in aggregate concentration and played an equal role (along with establishment concentration, H_E) in the growth of aggregate concentration within the Dar es Salaam and Coast region. Unfortunately, as demonstrated by Silver [1], the increase in investment and growth in production stemming from the government expansion of the parastatal sector has been accompanied by quite poor results in the areas of technological and commercial efficiency. Furthermore, there was little evidence that such efficiency was sacrificed on the altar of "the wider social-economic needs of the country as a whole" - though this is all part of another study.

Appendix

The following framework is derived from recent work by Clarke and Davis [17] but applied in this new context by the author. For a geographical area, the Hirfindahl index of aggregate concentration, inclusive of State control, is given by:

$$H_A = \frac{\sum_{i=i}^{\ell} S_i^2 + \left[\sum_{i=m}^{n} S_i\right]^2}{\left[\sum_{i=i}^{n} S_i\right]^2} \tag{5}$$

for i=1 ... private and m, ... n parastatal establishments. The Hirfindahl index of aggregate concentration exclusive of State control (treating parastatal establishments as separate entities and not as a single enterprise) is given by:

$$H_E = \sum_{i=1}^{n} S_i^2 \Big/ \left[\sum_{i=1} S_i\right]^2 \tag{6}$$

$$\text{Define } D_i = \begin{cases} D_{i,s} = 1 - \sum_{i=m}^{n} S_i^2 \Big/ \left[\sum_{i=m}^{n} S_i\right]^2 & \text{for i=m, ... n equivalent to one parastatal enterprise.} \\ D_{i,p} = 1 - S_i^2 / (S_i)^2 = 0 & \text{for i=1, ... } \ell \text{ private establishments.} \end{cases} \tag{7}$$

$$\text{Multiply } D_{i,p} \text{ by } S_i^2 \text{ and } D_{i,s} \text{ by } \left[\sum_{i=m}^{n} S_i\right]^2$$

$$= \begin{cases} D_{i,s}\left[\sum_{i=m}^{n} S_i\right]^2 = \left[\sum_{i=m}^{n} S_i\right]^2 - \sum_{i=m}^{n} S_i^2 & \text{for i=m, ...n.} \\ \text{and zero} & \text{for i=1, ... } \ell. \end{cases} \tag{8}$$

Substitute (8) into (5)

$$H_A = \frac{\sum_{i=1}^{\ell} S_i^2 + D_{i,s}\left[\sum_{i=m}^{n} S_i\right]^2 + \sum_{i=m}^{n} S_i^2}{\left[\sum_{i=1}^{n} S_i\right]^2} \tag{9}$$

$$H_A = \frac{\sum_{i=1}^{n} S_i^2}{\left[\sum_{i=1}^{n} S_i\right]^2} + \frac{D_{i,s}\left[\sum_{i=m}^{n} S_i\right]^2}{\left[\sum_{i=1}^{n} S_i\right]^2} = H_E + \frac{-D_{i,s}\left[\sum_{i=m}^{n} S_i\right]^2}{\left[\sum_{i=1}^{n} S_i\right]^2} \tag{10}$$

From (5) and (10)

$$H_A \left[1 - \frac{-D_{i,s} \left[\sum_{i=m}^{n} S_i \right]^2}{\sum_{i=1}^{\ell} S_i^2 + \left[\sum_{i=m}^{n} S_i \right]^2} \right] = H_E \qquad (11)$$

$$H_A = (1 - D)^{-1} H_E \qquad (12)$$

$$\text{where } D = \frac{D_{i,s} \left[\sum_{i=m}^{n} S_i \right]^2}{\sum_{i=1}^{\ell} S_i^2 + \left[\sum_{i=m}^{n} S_i \right]^2} \qquad (13)$$

References

1. M. S. Silver, The Growth of Manufacturing Industry in Tanzania: An Economic History (Colorado, Westview Press, 1984).

2. A. Roe, "The role of the company in Tanzanian development: a post-Arusha Declaration appraisal", P. A. Thomas, Private Enterprise and the East African Company (Dar es Salaam, United Republic of Tanzania, Tanzanian Publishing House, 1969).

3. P. Neers, "Tanzania's policy on private foreign investment", Multi-National Firms in Africa, C. G. Widstrand, ed. (African Institute for Economic Development and Planning and the Scandinavian Institute of African Studies, 1975).

4. C. Pratt, The Critical Phase in Tanzania 1945-1968, Nyerere and the Emergence of a Socialist Strategy (Cambridge, Cambridge University Press, 1976).

5. J. R. Rweyemamu, Underdevelopment and Industrialisation in Tanzania: A Study of Perverse Capitalist Industrial Development (Nairobi, Oxford University Press, 1973).

6. Tanzania Second Five-Year Plan for Economic and Social Development: 1st July 1969 - 30th June 1976, volume III: Regional Perspectives (Dar es Salaam, United Republic of Tanzania, Government Printer, 1970).

7. Tanzania Second Five-Year Plan for Economic and Social Development: 1st July 1969 - 30th June 1974, volume I: General Analysis (Dar es Salaam, United Republic of Tanzania, Government Printer, 1969).

8. D. G. R. Belshaw, "Decentralised planning and poverty-focused rural development: intra-regional planning in Tanzania", Papers on the Political Economy of Tanzania, Studies in the Economics of Africa, K. S. Kim, R. B. Mabele and M. J. Schultheis, eds. (London, Heinemann Educational, 1979).

9. R. C. Estall and R. O. Buchanan, Industrial Activity and Economic Geography (London, Hutchinson and Company, 1970).

10. A. O. Hirschman, The Strategy of Economic Development (Connecticut, New Haven, 1958).

11. M. S. Silver, "A regional analysis of industrial production and labour productivity trends in Tanzania, 1965 to 1972", Canadian Journal of African Studies, vol. 13, No. 3 (1980).

12. M. S. Silver, "Ownership indices of industrial production for Tanzania, 1965-1972", Studies in Comparative International Development, vol. XV, 1980.

13. D. Phillips, "Industrialisation in Tanzania - the case of small scale production", Papers on the Political Economy of Tanzania, Studies in the Economics of Africa, K. S. Kim, R. B. Mabele and M. J. Schultheis, eds. (London, Heinemann Educational, 1979).

14. K. Schadler, "Crafts and small-scale industries in Tanzania", Studies in Production and Trade in East Africa, Afrika-Studien Serie 51, P. Zajadacz, ed. (Munich, Weltforum-Verlag, 1970).

15. P. E. Hart, "Entropy, moments and aggregate business concentration in the UK", Oxford Bulletin of Economics and Statistics, vol. 44, 1982.

16. C. H. Berry, Corporate Growth and Diversification (Princeton University Press, 1975).

17. R. Clarke and S. W. Davies, "Aggregate concentration, market concentration, and diversification", Economic Journal, vol. 1.93, No. 369 (1983).

WHY IS COUNTER-TRADE THRIVING?

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Introduction

Although it has been generally acknowledged that in an ideal economic world, counter-trade is not the most efficient means of trade, in the fluctuating conditions of today's capital market it offers a viable alternative to traditional hard currency commercial exchanges. It is interesting to note that during the early 1980s, otherwise a period of slow growth, the incidence of counter-trade transactions increased significantly: by 50 per cent in 1981, 64 per cent in 1982 and 117 per cent in 1983. ([1], p. 403) It appears that during this period rampant inflation, persistent recession and high interest rates in the world economy led to increased reliance upon non-traditional trading practices - barter and counter-trade - which minimize the amount of hard currency a country needs in order to trade its goods internationally. This study will examine how and by whom counter-trade in manufactures and other products is being employed in today's market. It will then consider the implications of counter-trade for the economies of both the developed and developing world.

Measures and definition

Aggregate measures of counter-trade

Although serious questions have been raised in many circles as to the ultimate desirability of counter-trade as a means of exchanging goods and services, the significance of counter-trade in today's global market is undeniable - and therefore cannot be ignored. Estimates as to the share of world trade accounted for by counter-trade vary considerably - from 5 per cent to 40 per cent, depending on the degree of strictness applied to the term. Business International contends that if counter-trade is to include barter, counter-purchase, compensation deals and buy-back arrangements, it would comprise 15 per cent of today's total global trade. ([1], p. 403) The United States Department of Commerce has estimated that one fourth of all world trade involves some form of barter. ([2], p. 76) A study by Purchasing World concurs, claiming that of the 300 purchasing managers interviewed for its survey, close to one half acknowledged that they were actively bartering while another 10 per cent predicted that they would soon begin to

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do so. ([3], p. 72) Argentina, Australia, Colombia, Malaysia and Zambia are among the 30 countries that have officially recognized counter-trade as an accepted trade practice, considering it "an important - if not critical consideration in their international purchases". ([4], pp. 8-16)

Definition of counter-trade

Although there exists a wide spectrum of possible counter-trade transactions, this study will examine only the more common methods of counter-trade - namely, barter, counter-purchase and compensation. Among these, barter is perhaps the best known and is the only form of counter-trade which does not involve any cash flow between the transaction parties. Barter is, in other words, the bilateral exchange of goods and services of equivalent monetary value.

In a counter-purchase arrangement, on the other hand, the supplier of a product agrees in return, as a condition of the original sale, to market the buyer's product. The buyer's product may be of lesser value than the product originally purchased - necessitating that the supplier be at least partially reimbursed in cash. Typically, the supplier has between one and five years to market the buyer's products. This arrangement can be contracted as a part of the original sale or in a parallel contract. ([5], pp. 67-76) Counter-purchase, therefore, represents two separate but linked transactions.

Compensation involves the sale of production parts, equipment or technology in exchange for a percentage of the output from the plant resulting from the initial sale. An official of the United States Department of Commerce defines compensation counter-trade in an even broader fashion:

> "Compensatory trade ... is any deal involving asset transfer as a condition of purchase, including local content requirements, licensing and other performance requirements - as well as the traditional forms of countertrade." ([5], p. 67)

Compensation is considered by many countries to be the most desirable form of counter-trade, since it is easy to negotiate, execute and determine earnings accrued. Its most distinguishable features are as follows:

(a) It is usually long term (from 10 to 20 years, since there exists a greater time needed between reciprocal deliveries);

(b) It can involve partial payment in cash and partial payment in the resultant product;

(c) The value of the original supplier's purchases over the life of the compensation contract is always equal to or greater than the value of the standard export contract. ([5], p. 70)

Advantages of counter-trade

General

As was demonstrated by the countries of the Council for Mutual Economic Assistance during the post-war era, counter-trade can play an important role as a vehicle of trade and growth for countries suffering acute shortages of foreign exchange or having inadequate access to trade financing. The particular conditions that led many countries of the Council for Mutual Economic Assistance to enter into counter-trade arrangements with the West are recurrent in many areas and countries of the world today. Those developing countries with serious debt obligations, industrializing countries lacking the foreign reserves to import critical technological or other capital-intensive goods, or developed countries that seek expanded sales through penetration of new markets have enlisted counter-trade as a means of expanding trade opportunities. As summarized by an official of the National Council for United States-China Trade, counter-trade offers:

> "... a mode of international commerce which enables a nation to cope with persistent shortages of hard currency. By linking imports of foreign plants, equipment and technology to exports of resultant products of native commodities - a nation can limit its foreign markets, support domestic capital projects and technical transfers." ([5], p. 69)

Furthermore, during the slow growth of the late 1970s and early 1980s, industrializing countries used their purchasing power as a lever to overcome protectionist barriers, forcing many industrialized countries to open their markets to counter-traded goods. Fierce competition among Western exporters of manufactured goods and capital equipment increases the leverage that large potential buyers have in removing trade barriers. On the other hand, counter-trade conveniently provides developing countries with buyers of their raw materials and low-technology manufactured goods - goods which would otherwise face weak demand in the world market.

Advantages to private industry

A study conducted by the Harvard Business Review outlines six major advantages of counter-trading for private companies. These advantages include the following [3]:

(a) A restraint of vendor price increases, which ensures, in turn, greater security of supply of raw materials vital to plant operation;

(b) The unloading of excess inventory - inventory which reduces a company's potential profits (if the company were obliged to resort to the regular channels such as stock liquidators, the resulting profits would be greatly diminished);

(c) Increasing production capacity (with counter-trade, the idle portion of underutilized capacity can be merchandized);

(d) Decreased costs through the trading of old or obsolete goods for advertisement rights: by decreasing the cost of removing obsolete equipment and machinery, counter-trade accelerates the product cycle whereby new, more advanced technology can be incorporated into a company's production process;

(e) Helping to introduce new products (especially in seasonal industries such as clothing): by contracting with a barter trade company to absorb all inventory by reimbursement in services rather than cash, a manufacturer has an escape valve that permits additional production risks. Through barter or counter-trade, he now has the possibility to sell his merchandise at a greater profit;

(f) Cash conservation: counter-trade reduces the costs of the goods purchased since the goods are exchanged at their full retail value at only wholesale costs to the supplier.

Long-term advantages of counter-trade to private industry

Multinational corporations can also potentially benefit from the clients and markets established through successful counter-trade transactions. The increase in counter-trade stipulations in many government-supported projects have inadvertently laid the corner-stone for the creation of powerful allies between private companies that counter-trade and the Government concerned. For example, as a part of a contract to buy 200 military vehicles, the Government of the Netherlands insisted that 10 per cent of the value of the contracted purchases be counter-traded by the company concerned. The suppliers in the Netherlands turned out to be that company's lowest cost supplier of the goods counter-traded - goods which they continued to purchase long after the initial contract had expired. In addition, the companies in the Netherlands whose goods had been counter-traded saw to it that the company was awarded subsequent contracts. A similar situation arose in Switzerland, where repeat contracts were awarded by the Swiss Government after the company in question had successfully marketed $136 million worth of Swiss goods in five years (as opposed to the allotted eight years), earning friends among the 220 Swiss companies whose goods found international markets. In both cases, the firms influenced the Government to place subsequent orders with them. Thus, counter-trade, by promoting strong allies among both the private and public sector of the purchasing country, led to long-term mutually profitable relations among the transacting parties.

Many United States companies, particularly in the aerospace and electronics industries, benefit from counter-trade transactions of one kind or another. Between 1975 and 1981, the largest United States companies had sales of $15.2 billion in counter-trade deals. It has been estimated that three fourths of these deals would have been lost if some sort of counter-trade concessions had not been extended, e.g. buy-back arrangements or marketing assistance to the buying party [4]. Over 30 large United States corporations have established in-house trading organizaions to promote market and distribution channels for goods in the United States.

Barter arrangements rose from $98 million in 1974 to $294 million in 1980 (some inaccuracy in these figures is expected since many goods are shipped directly to third country markets and, for this reason, are not included in the United States statistics). ([6], p. 12) Clearly, counter-trade has become an integral and accepted trading option by the larger United States companies capable of distributing goods on a large-scale basis.

Counter-trade: a growing imperative

Apart from the profits accrued to private corporations as a result of counter-trade, recently a new and perhaps more compelling reason to counter-trade has arisen - namely, necessity. In today's highly competitive capital and manufactured goods markets, those companies unwilling to play the counter-trade game often stand to lose business to those who are. A producer that sells in a buyer's market (e.g. when the product, technology and quality are comparable) might offer counter-trade as a special service to differentiate its product from that of its competitor's. One United States company won a bidding war for a $150 million electric generator project against competitors in Japan and the Federal Republic of Germany - not because of major technological or cost advantages but because it agreed to market some $150 million worth of the company's products. Another United States company was able to sign a truck sale with Jamaica by arranging for intermediaries to export Jamaican alumina. ([4], p. 8) Although many of the large name brands have been reluctant to counter-trade, arguing that their goods are marketable in their own right without the need to make additional concessions or offer additional services, not all companies enjoy this competitive edge. It is among those companies that are not the undisputed leaders in a particular market that counter-trade may make the difference in a close bid for a sale or project.

Counter-trade by government prescription

The growing pressure for international companies to counter-trade has become even more apparent as an increasing number of Governments have made the extension of trade concessions to a particular country conditional upon that country's willingness to counter-trade its goods. In one case, the Government of Austria reduced the tariff duty on Japanese car imports in direct proportion to a Japanese car manufacturer's commitment to procure Austrian steel and engineering goods. As one Austrian banker conceded, this transaction was clearly "a case of imposing counter-trade in a civilized manner". ([1], p. 401) Likewise, the Government of the People's Republic of China also provides duty rebates for imported capital goods - but only to those imports to be used in updating its 100,000 obsolete plants. Likewise, many industrializing and newly industrialized countries have made counter-trade a required element of any foreign trade transactions with heavy penalties for non-compliance. This phenomenon is particularly marked among those countries burdened with large foreign debt obligations, and who lack the foreign currency reserves necessary in order to both continue their traditional levels of

imports and service their debt payments. The International Monetary Fund austerity measure that requires a 20 per cent reduction in a country's imports before it will re-finance its loans has forced indebted countries to further reduce their foreign currency expenditure. ([7], p. 132) Counter-trade, however, permits a country to work within its import restrictions while satisfying the export requirements needed to meet its debt payments.

Mexico and Brazil have passed specific laws granting import licences for certain products only against an export sales contract of equal or greater value. Under Mexico's March 1982 currency exchange law, counter-trade was the only means available to industrialists to import the inputs that were vital for maintaining current levels of production. ([1], p. 401) Brazil's Comissario para Concessão do Beneficos Fiscaisa Programas Especiaes do Exportacão requires its participating companies to export $3 worth of manufactured products for every $1 they import. Convertible currency has become so scarce in Brazil that even large exporters have difficulties in obtaining permission to import [7]. According to the United States International Trade Commission, Romania will require 50 per cent of all exports to be covered by counter-trade agreements. ([6], p. 13) The Indonesian Government has required as of 1982 that all government purchases larger than $775,000 be coupled with 100 per cent counter-trade agreements and has mandated a 50 per cent penalty for non-compliance. ([4], p. 10) If foreign traders wish to sell to these indebted countries, counter-trade - or the willingness to market their goods in return for any sale - has become a necessity.

Counter-trade as a means to repatriate funds

Additionally, for those companies having subsidiaries or capital investment in countries that have blocked the repatriation of foreign funds, counter-trade offers a means to receive some return on their foreign investment. For example, after a considerable delay in a dividends payment to an international corporation by its subsidiary in Zaire, the corporation requested that the payments be made in copper. Similarily, during the Mexican "summer of 1982", the Government permitted only those companies that expanded their exports to repay their foreign debts in cash - and then only if they used no more than 20 per cent of their export proceeds [4]. As a result of the debt crisis and its implications in terms of international liquidity, many international lenders and investors have begun to counter-trade rather than extend their financial exposure. As viewed rather pessimistically by one observer of such circumstances in today's world market, bartering is not always profitable, but it is better than not getting paid [4].

China: a case-study

China offers an interesting example of a country that - although possessing no explicit counter-trade requirements - simply refuses to talk trade unless some form of counter-trade is offered by the prospective supplier. It is generally accepted that if a

person is to do business with China, he is first expected to buy Chinese goods. When one corporation approached the Government of China with an offer to sell it commercial aeroplanes, the Chinese Government would only consider the offer if the corporation would first sell a variety of Chinese goods. Accordingly, between 1978 and 1982, the corporation arranged for the sale of Chinese merchandise to be accounted against any future counter-trade commitments it might make. In 1983 (five years after its initial approach), the corporation was awarded its first contract for two DC-9 aeroplanes worth $50 million [4]. Clearly, its willingness to take a risk on Chinese goods - even at an initial loss - enabled it to eventually penetrate the Chinese market, which would have otherwise remained inaccessible.

Advantages of counter-trade to industrializing countries

Industrializing countries have much to gain from introducing counter-trade into their international commercial transactions. Not only does counter-trade provide a country with the means to reduce its external debt, but it also can provide it with the technological or capital-intensive imports necessary for its development plans. Many industrializing countries have already made at least a partial commitment in the direction of counter-trade. As the head of the State Planning Commission of China noted:

> "As for business sectors where we are in need of technology and equipment, we [will] adopt the method of counter trade, introducing the needed technology and equipment and paying for it with the products obtained." ([5], p. 69)

China and Japan have already concluded long-term trade agreements whereby China imports plants and equipment from Japan on the understanding that it will pay with the resultant products. One company is at present negotiating with Beijing for a compensatory arrangement whereby oil exploration, services and equipment will be exchanged for future delivery of crude oil and other products. Other oil-exporting countries have also counter-traded with different industrialized countries in order to obtain the processing machinery and high-tech products critical to their development efforts. Mexico and Canada have recently concluded an economic co-operation agreement according to which the Canadian Government will provide technology for the processing of petroleum, various wood products, foods, coal mining and oil-field development assistance in exchange for Mexican oil. Mexico had already made similar arrangements with Spain and Japan. By trading oil (or other strong market commodities), industrializing countries can overcome their foreign currency shortages, thereby obtaining the capital goods necessary for future development of their resources and industrial capability.

Trade patterns: oil exporters and newly industrialized countries

The advent of a new group of relatively advanced industrialized countries has provided oil exporters with alternative counter-trade partners or sources of capital-intensive equipment or

machinery. Recently, Nigeria has concluded a contract with Brazil, exporting its oil and natural rubber for Brazilian manufactured goods. Malaysia plans to buy a $M 50 million ($US 21.4 million) naval patrol boat from the Republic of Korea in exchange for crude oil. A second boat is to be bought subsequently with any number of Malaysia's export commodities (palm oil, rubber, timber or electrical products). As evidenced by these transactions, there exists a complementarity between oil-importing newly industrialized countries and those oil-exporting countries seeking to develop their technological or industrial capabilities.

The import needs of the oil exporters, however, are not restricted to high-technology equipment or capital-intensive goods. Many oil exporters have exchanged oil or energy-related products for the raw materials of newly industrialized countries and industrializing countries. The Islamic Republic of Iran has been swapping oil for the spare parts its army needs. In 1981, almost all of the Islamic Republic of Iran's $1.5 billion of trade with the Union of Soviet Socialist Republics was conducted by barter. In 1982, the Islamic Republic of Iran traded petroleum for $50 million worth of Uruguayan meat, rice and wheat. Likewise, Qatar has exchanged crude oil for $2.5 billion worth of Brazilian cement, textiles and food [7].

Oil: an example of counter-trade as a discounting mechanism

As the market for oil has softened in the early 1980s, oil-importing countries have been able to extract counter-trade concessions from their traditional oil suppliers. France has agreed to triple imports of Algerian gas (to 9.1 billion cubic metres a year) at a price above market rates; and Algeria promised in return to place extra import orders worth $2 billion with French firms. As a result, the French Government was able to mitigate domestic pressure for new and expanded export markets [8]. This practice of "compensating" high oil prices by agreeing to purchase the buyer's goods or by offering special services has become commonplace among many members of the Organization of Petroleum Exporting Countries. By offering to purchase the buyer's goods as a part of an oil sale, oil exporters effectively reduce the cost to the buyer of their oil. In this way, members of the Organization of Petroleum Exporting Countries can ostensibly maintain their prices above the set minimum price without risking profit losses by those buyers who refuse to pay the perhaps short-term high oil price.

Another manner in which counter-trade can act as a hidden discount on the price of oil exports is by allowing a country to charge the list price for its exports while paying above the market prices for counter-traded imports. The Libyan Arab Jamahiriya, for example, wanted to sell oil at prices below those of the Organization of Petroleum Exporting Countries without openly violating its regulations. By arranging a deal whereby the exchanged goods - in this instance, a ship - was bought at an inflated price, the price of the oil was effectively deflated. ([4], p. 9)

According to one observer, the Indonesian State oil corporation (Pertamina) also used counter-trade as a means to discount the price of its oil exports:

> "Pertamina would sell the crudes ostensibly at the official price to traders who could on-sell them at a discount, thereby taking a loss. But Pertamina would also buy the products at the agreed posted price from the same traders, who had purchased the products at a much lower price on the spot market. Thus the margin between spot and posted prices of relevant oil products determines the degree to which traders would cut the price of Indonesia crudes." ([9], p. 146)

Another method to discount the price of oil exports is to sell crudes as part of a "package deal" with the crudes sold at the list price but the crude products, e.g. naptha and heavier fuel oils, sold at below market prices. Indonesia has concluded package deals with a number of corporations besides those with which it had entered into joint venture agreements. The Islamic Republic of Iran has resorted to the same method, discounting its oil exports to Japan in exchange for Japanese capital equipment and other manufactured goods [1].

Counter-trade opportunities: exporters of strategic minerals

It is not only the oil exporters that have begun swapping their products for much needed raw materials and equipment, but also the exporters of strategic raw materials. Those countries with indigenous supplies of bauxite and other strategic minerals are in a particularly good position to counter-trade with the United States Administration after its public commitment to build up its strategic stockpile [6]. The Reagan Administration is considering swapping food for strategic minerals in Bolivia, Chile, Peru and Zaire [8]. It has already traded surplus dairy products for $13 million worth of Jamaican bauxite in 1982 [7] and plans to trade grain for oil from Mexico [6]. In this way, the United States can find markets for surplus goods (that would otherwise be sold at deflated domestic prices) and, at the same time, obtain scarce strategic minerals.

Barter and other swapping arrangements: the developing countries

Intraregional bartering of food products and raw materials has increased greatly in recent years, largely as a result of fluctuating commodity prices, the paucity of hard currency, and rising inflation rates. Under a co-operative economic agreement, countries with foreign currency shortages can exchange goods with a minimum flow of cash. Mexico and Brazil have used this method to exchange minerals (excluding oil) and technology. In 1983, Brazil exchanged 50,000 tonnes of soybeans for 50,000 tonnes of Mexican black beans. These two countries have also created a bilateral clearing account arrangement with most other Latin American countries whereby the two Governments concerned agree to exchange goods or services. The goods traded are priced in artificial accounting units, and at the end of the agreed period (usually one year) any imbalances are settled in cash [7].

Other developing countries are also investigating a wide variety of swapping arrangements. Romania has agreed to export ammonia in return for $90 million worth of South African maize. By mid-1982, Indonesia had already obtained $127 million worth of fertilizer from different sources in exchange for cement, rubber, coffee and cocoa. Bangladesh has made official its desire to swap jute and other indigenous materials and has enlisted a Swedish trading company for this purpose. ([8], p. 72) Uruguay traded meat for $20 million worth of telecommunications equipment from Italy. Colombia is currently negotiating coffee in return for bids to construct a naval base. Brazil has challenged its competitors (France, Sweden and the United Kingdom of Great Britain and Northern Ireland) by offering to import Colombian coal as a part of the deal. In the past, Colombia has traded coffee for trolley buses from the Union of Soviet Socialist Republics and Romania [7]. In the above instances, developing and middle income countries have succeeded in exchanging their indigenous agricultural products for capital-intensive goods and machinery.

Problems in carrying out counter-trade transactions

Despite the obvious gains attainable through counter-trade, however, there exist many obstacles to the efficient handling of this complex means of trade. Those countries that would theoretically be most interested in counter-trade are also those with the least experience with it and thus the least likely to successfully conduct counter-trade transactions. (They lack the mechanisms and institutions necessary to facilitate counter-trade transactions.) The following list summarizes the problems facing countries wishing to initiate a programme of counter-trade.

Technical problems

(a) Lags in delivery times are an integral part of a counter-trade agreement (e.g. in a compensatory counter-trade arrangement, an inevitable lag exists between the original investment and the eventual delivery of the resultant product);

(b) Difficulties in meeting delivery schedules (time lags due to production problems and the associated costs) [4];

(c) The general complexity of counter-trade deals requires a certain level of experience in international counter-trading (for example, experience in assigning a value to the goods traded and in recognizing appropriate or marketable items to take in exchange for one's own goods, the need to have marketing channels and a large client base). In addition, as the export procedure becomes more complicated, trade becomes more risky and thus more costly. ([10], p. 15)

Legal problems

(a) No standardization of counter-trade rules or regulations govern the committed parties: ([11], p. 136) there currently exists no multilateral or negotiable instruments of counter-trade surveillance to enforce counter-trade agreements, which increases

the risk involved in the transaction. Without standardized rules governing counter-trade, the goods bartered can find no secondary market, creating illiquidity in the counter-trade market;

(b) Only limited mechanisms to ensure counter-trade agreements exist, e.g. the risk involved in counter-trade often makes access to counter-trade credit problematic. As it stands, dealers in barter try to cover themselves through rules governing documentary credits and letters of guarantee. Yet, in many cases, various aspects of the agreement are left to private negotiation.

Implications for world trade

Many observers believe that counter-trade has a disruptive effect on existing trade markets. The world has only a limited capacity to absorb counter-traded goods, so that too aggressive a counter-trade policy by a country such as the People's Republic of China (which can offer large quantities of goods at low prices) could threaten Western markets. Thus, it has been argued that the inflow of counter-traded goods could trigger a series of protectionist actions in the form of trade barriers and tariffs from the countries of the Organisation for Economic Co-operation and Development. ([5], p. 72)

Difficulties facing developing countries

Counter-trade is primarily dominated by large firms (from North America, Europe and Japan) that carry the most weight in negotiations because of their extensive marketing networks and established client bases, creating inherent inequalities in the counter-trade agreement. Committing a party to counter-trade is sometimes viewed as a means of unloading uncompetitive or low-quality goods that are otherwise unmarketable. By relying upon counter-trade for this purpose, countries procrastinate in correcting the basic causes of mediocre export performance, delaying critical economic reform. Third party marketing of a country's goods obviates that it develop its own marketing or exporting capability. The long-term development of markets, then, is hindered by relying upon counter-traders whose interest focuses mainly on short-term profits. Often a counter-trader has distribution channels parallel to those of his clients - so that the goods counter-traded compete in essence with other exports [10]. Unlike the countries of the Council for Mutual Economic Assistance, most developing countries have no institutionalized systems of counter-trade and therefore rely primarily upon makeshift guidelines. Many of the products that developing regions such as Latin America can export (agricultural commodities, e.g. coffee and sugar) face quotas imposed by the importing country. ([7], p. 134)

General trading companies: a vehicle of counter-trade

Although there exists considerable empirical evidence as to the rapid increase in counter-trade transactions, such agreements are necessarily limited by the lack of marketing experience, trade financing and international contacts available to any given country

or company. In the short run, international trading companies may provide the necessary link between small companies hoping to export to overseas markets. Exporters that may enjoy considerable domestic markets yet are unknown internationally can profit from dealing with those trading companies that have a large marketing capacity and a solid reputation in the international marketplace. Employment of a trading company's services reduces the unit cost for producers by providing economies of scale in both the marketing, distributing and financing of different trade projects. In addition, by enlisting the assistance of a global trading house, developing countries can counter the growing tide of protectionism, penetrating those Western markets that have otherwise become inaccessible to cheap foreign exports. ([5], p. 67)

General trading companies and financing

One of the most vital services offered by general trading companies is that of financing counter-trade. The different types of financing available include guaranteeing payments independently from the customers. The Japanese trading houses, as they are usually linked in some way to financial institutions, have been heavily involved in financing counter-trade transactions with prominent Japanese banks. ([12], p. 12) According to the Japanese financial tradition, banks lend directly to the sogo shosha (or Japanese trading house), which in turn extends trade credits to its individual clients. By so doing, the banks leave the evaluation of an individual trader's credit risk to the sogo shosha, which has more direct experience and knowledge with the clients and is therefore better equipped to evaluate their financial soundness.

Project loans are extended by a general trading company in exchange for a percentage of the project's annual output in much the same way as compensation counter-trade is transacted. Japanese trading houses have traditionally been very active in this type of financing. For example, one Japanese company extended to a Peruvian mining company a $35 million loan towards the construction of a new mine in exchange for 70 per cent of its annual output. Similarly, the Japanese Overseas Economic Development Fund offered a subsidized loan to Brazil to build a bauxite-aluminium complex with the understanding that Japan would take a percentage of the plant's output. The Overseas Economic Development Fund also extended a $71 million loan to Thailand to build a new port at Laem Chabang - in exchange for Japanese procurement rights. ([13], p. 10) The only limits made by the Japanese Government on the trading houses' loans are that they should not exceed 20 per cent of their total capacity. ([14], p. 61)

General trading companies and joint ventures

Many sogo shosha have also embarked on joint ventures with developing countries, especially those in the Asian region. In 1979, Mitsubishi and the Shell Oil Company formed a joint venture with the Malaysian national oil company to build and operate a gas liquification plant. ([13], p. 13) In addition, the two Mitsubishi companies, Mitsubishi Motor Corporation and Mitsubishi Corporation, each took 15 per cent equity in a Malaysian project to build a

M$ 150 million venture to be called the Perusanan Otomobil Nasional Sdn Bhd (proton). Sixty per cent of the parts in the planned automotive industry will be imported from Mitsubishi, with the Malaysian value added equalling 36 per cent. An estimated 80,000 cars per year are to be manufactured by 1985 and another 120,000 cars per year by 1988. ([13], p. 12) Indicative of the sogo shosha's role in foreign investment is the fact that one of Japan's largest trading houses is also Japan's largest foreign investor [12].

These trading houses, however, could provide the needed stimulus (in the form of trained traders, market knowledge and client base) to those developing countries producing less specialized or sophisticated goods. The homogeneous bulk products often produced in industrializing countries are most suited to the sales and contact network of the sogo shosha. In view of recent market changes, it would appear profitable to both the established Japanese trading houses and the lesser developed Asian countries to co-operate in new trading involving some type of counter-trade.

General trading companies in the United States

The United States has also witnessed a rise in counter-trade conducted by general trading companies.

Although all of them have special counter-trading departments staffed by experienced traders with a knowledge of both the international market and commodities, they differ in terms of their geographical orientation. Sears World Trade, the wholly owned Oubsidiary of Sears and Roebuck, Incorporated, has a predominantly Asian outlook, concentrating primarily on markets in East Asia and the Pacific basin in an attempt to construct a "bridge-head into Asia for a wide range of finance-related businesses". ([15], p. 74). To this end, it has already opened branches in Tokyo, Seoul, Hong Kong, Singapore and Canberra. In order to expand its finance capabilities, it has acquired the fifth largest United States securities firm, the largest industrial commercial and residential property broker in the United States and a major insurance company. ([16], p. 9) It has also created a co-operative arrangement with one of the leading United States banks, whereby the bank will offer it trade leads in return for the company's trade financing projects. ([17], p. 152) However, despite such seemingly targeted efforts at penetrating the Asian market, Sears World Trade, having suffered losses of $21 million on revenue of $79.1 million, has not yet quite found its niche in the Asian market. ([15], p. 72)

The Export Trading Company Act of 1982: its effects on United States counter-trade financing

A new era in United States counter-trade financing was heralded with the Export Trading Company Act, which was passed in 1982. The Act authorized the Export-Import Bank to guarantee loans extended to export trading companies by financial institutions or other public/private creditors. (In this way, the Export-Import Bank can ensure that its credit benefits flow to smaller than

medium-sized domestic producers.) In addition, banks were permitted for the first time to invest up to 5 per cent of their consolidated capital in export trading companies, to own export trading companies in whole or in part, and to have ownership in more than one export trading company. The Federal Reserve Board restrains banking holding companies from lending more than 10 per cent of their consolidated capital and surplus to affiliated export trading companies, and they must not lend on terms that are more favourable than those extended to similar unaffiliated borrowers. ([8], p. 123) As a result of this legislation, commercial banks in the United States can now for the first time take title to goods and engage in non-banking transactions through their export trading companies such as the purchase and placement of commodities and products offered in barter and counter-trade arrangements.

Bank export trading companies: summary of advantages

(a) Informational: uniting disparate companies and products for their mutual benefit (with the advent of the Export Trading Company Act, banks have more access to international information, improving their ability to establish channels of information to track the flow of products) [17];

(b) Counter-trade advisory services: many of the newly created export trading companies associated with United States banks have opened special unit branches whose function it is to facilitate counter-trade transactions. For example, Citicorp hired a counter-trade expert to develop its new export trading company; it has also hired experienced counter-traders out of large commodity houses and placed them in charge of its overseas offices; ([18], p. 130)

(i) Citicorp was the first bank to open a counter-trade department; ([17], p. 150)

(ii) The European American Bank hired the former president of Merban International because of his counter-trade expertise;

(iii) Sears World Trade is working on deals worth nearly $1 billion, of which 20 to 30 per cent involves counter-trade;

(c) Regional development: certain United States regional banks are developing regional trade ties through the creation of their own export trading companies. One has directed its initial operations towards developing trade between south-western United States and Mexico, supplying raw materials and replacement parts required by Mexico's economic recovery programme. Another is focusing specifically on increased trade with China. It has recently opened an office at Shanghai to facilitate United States exports of industrial metal items (e.g. die castings) [18]. In addition, First Interstate will concentrate the initial year of its counter-trade activity on servicing manufacturers in the western United States who are setting up a sales network in the Asian market;

(d) New market outlets: through the bank's extensive client base, it can facilitate the placement of goods with end-users and initiate trade through unrelated parties;

(e) The creation of new financial instruments to expedite counter-trade, including "new documents" (hybrids of letters of credit), the creation of special accounts;

(f) New trading mechanisms introduced: [19], p. 70) for example, banks can now create "framework agreements" according to a clearing house system that would dispense with the need to match each and every two-way transaction in size or timing, thereby removing the strict bilateralism of counter-trade;

(g) Assisting middle-market companies under "umbrella" counter-trade agreements that incorporate a smaller company into a larger contract agreement: for example, small companies can now take advantage of barter deals by enlisting the help of independent traders.

How developing countries can employ general trading companies

Members of the Association of South-East Asian Nations: a case-study

Clearly, developing countries can profit by enlisting the services of general trading companies - particularly those established in countries where there exists some degree of complementarity of market structure and natural resource endowment or where geographical proximity facilitates counter-trade. Japan, a country scarce in energy products and other critical raw materials yet rich in technology and human capital, forms a natural trading partner with those members of the Association of South-East Asian Nations poor in human know-how or capital yet rich in raw materials and oil. The Japanese sogo shosha, being among the oldest of the world's trading houses, are in an ideal position to conduct intra-regional trade in Asia, either between the members of the Association of South-East Asian Nations and Japan or among the various members of the Association of South-East Asian Nations. By employing the sogo shosha, members of the Association of South-East Asian Nations have immediate access not only to a well- established international marketing network, but to a wealth of counter-trade experience and know-how.

The evolution of Japan's domestic economy in recent years has made irrefutable the logic of employing Japanese trading houses in intraregional counter-trade deals with the Association of South-East Asian Nations. Traditionally, the sogo shosha has handled large-scale commodity sales and other bulk products. However, as the Japanese economy has started to concentrate on more sophisticated, capital-intensive products in high-tech fields such as electronics and computer software, the services offered by the sogo shosha face diminishing demands in the Japanese domestic market. ([20], p. 89) Manufacturers in profitable domestic sectors now opt to export directly rather than through a sogo shosha (e.g. Toyota, which was once a part of Mitsui, has since drifted away to

establish its own car sales and subsidiary, as have electronic firms and machine tool makers such as Sony and Matsushita). ([12], p. 83) As a result, the sogo shosha has been excluded from its own domestic market - particularly in the larger trading houses that are not sufficiently specialized to handle more sophisticated goods.

Many members of the Association of South-East Asian Nations (and other industrializing countries) are, in fact, looking for appropriate trading companies to handle their export goods. The chief executive of one Malaysian company has stated that it "would like to find a company with significant technology and leadership in its field that has a worldwide sales network ..." ([21], p. 36) Indonesia has increased its use of trading companies, as witnessed by its employment of Marubeni to establish foreign markets for its domestic plywood industry, but some countries have gone even further with attempts to promote the development of their own trading companies. The Thai Government has recently (1983) afforded 19 companies the status of general trading company - a status which confers on them certain privileges such as exemption from import duties on goods intended ultimately for export. ([11], p. 136) Several Latin American countries have considered establishing small trading companies to handle the counter-trade operations of the smaller Latin American companies. Although these efforts have met with varying degrees of success, the costs and difficulties of counter-trading will naturally diminish as the trading companies acquire more experience in global counter-trade operations.

The feasibility of intraregional counter-trade arrangements in Asia is enhanced by the relatively mature financial network existing among Asian countries. The ASEAN Finance Corporation has been established expressly to help close the gap in Asia between multinational enterprises and the relatively modest domestic business infrastructure and to nurture indigenous entrepreneurs. The services it offers (ranging from providing equity capital and guaranteeing outside loans, to underwriting debt and equity issues and providing financial technological and management advice) will greatly promote trade in Asia and offer security in counter-trade operations. Likewise, the Asian Development Bank provides loans towards development projects of many members of the Association of South-East Asian Nations. The creation of regional financial institutions will help serve as a conduit for channelling goods and investment towards it even as it promotes intraregional trade.

Conclusion

Although ideally developing countries will be able to develop their own international marketing network in the long run, in the short run such an objective is hindered by domestic constraints - inexperience in international marketing, a dearth of skilled counter-traders, and the inaccessibility of finance. Naturally, as countries gain more experience in counter-trading and as their products earn international acceptance and recognition, it will become increasingly easy for them to find markets for their goods without the assistance of outside traders. In the case of the People's Republic of China, counter-trade will eventually "enable Chinese

commodities to gain world acceptance and become earners of hard currency in their own right ..." ([5], p. 69) In the mean time, however, countries can influence the course of counter-trade negotiations, determining the type and quantity of product to be imported according to its particular development objectives or strategies. In this way, counter-trade can be employed to further the growth and trade goals of a country while keeping intact the concept of national economic sovereignty, whereby a country determines for itself the course of its own economic evolution.

References

1. "Countertrade phenomenon is spreading globally in scope and intensity", Business International, 23 December 1983, pp. 401-403.

2 "Barter trade - Quid pro quo", Economist, 20 February 1982, pp. 75-77.

3. Jack O. Kaikati, "Marketing without exchange of money", Harvard Business Review, November/December 1982, pp. 72-74.

4. David B. Yoffie, "Profiting from countertrade", Harvard Business Review, May-June 1984, pp. 8-16.

5. Robert B. Dennis, "The countertrade factor in China's modernization plan", Columbia Journal of World Business, vol. XVII, No. 1 (Spring 1982), pp. 67-76.

6. "US trade: back to barter", Banker, January 1982, pp. 12-13.

7. Leo Welt, "Why Latin America is wary of barter", Euromoney, January 1984, pp. 132-134.

8. "A new weapon in the battle for trade", Euromoney, February 1984, pp. 123-129.

9. Susamu Awawohara, "Wheeling the oils", Far Eastern Economic Review, 26 April 1984, pp. 128-130.

10. Jacques de Miramon, "Countertrade: a modernized barter system", OECD Observer, No. 114, January 1982, pp. 12-15.

11. Assaad Samaan Assaad, "It's time to make barter legitimate", Euromoney, January 1984, p. 136.

12. "Japan's traders seek house repairs", Economist, 3 December 1983, pp. 82-83.

13. Economist Intelligence Unit, Quarterly No. 1, 1984.

14. "New look, old dominance", Far Eastern Economic Review, 9 May 1981, pp. 94-97.

15. Hikaru Kerns, "A start from the top", Far Eastern Economic Review, 19 April 1984, pp. 72-77.

16. "Sears Roebuck moving away from pots and pans", Banker, October 1981, pp. 8-10.

17. Stephan H. Collins, "Green light for US banks to barter?", Euromoney, November 1981, pp. 150-152.

18. Dick Barovick, "US banks plunge into export trading", Euromoney, January 1984, pp. 128-130.

19. Ron N. Brackner, "If countertrade is inevitable make the best of it", Banker, May 1984, pp. 69-71.

20. Hikaru Kerns, "Faltering giants", Far Eastern Economic Review, 29 March 1984, p. 89.

21. Hugh Peyman, "Plantation giants eye new conquests", Far Eastern Economic Review, 26 December 1980, pp. 36-37.

Bibliography

Awanohara, Susamu. Finance for Asean - at last. Far Eastern economic review (Hong Kong) 46, 30 January 1981.

Breaking down barriers. Banker (London) 132:676:16, June 1982.

Caplin, Basil. Japan: a question of economic capability. Banker (London) 132:675:39, May 1982.

Emerging Bank ETC's will have profound effect on future trading prospects. Business international (New York) 185-191, 17 June 1983.

Eximbank: war and peace. Banker (London) 132:682:51-52, December 1982.

General Electric/Eximbank team beats the Japanese in cash-poor Mexico. Business international money report (New York) 99-100, 1 April 1983.

Getting it together - privately. Far Eastern economic review (Hong Kong) 42-43, 9 January 1981.

Lewis, John and David Bonavia. The honeymoon is over. Far Eastern economic review (Hong Kong) 46-47, 20 February 1981.

McClenahen, John S. A world of trade problems persists. Industry week (Cleveland, Ohio) 19-22, 18 May 1981.

Rowley, Anthony. The unspecific Pacific. Far Eastern economic review (Hong Kong) 51-53, 5 June 1981.

Tourret, Richard. Sime Darby follows a new path. Euromoney (London) 129-131, July 1984.

INDUSTRIALIZATION AND EMPLOYMENT GENERATION IN THE SERVICE SECTOR OF DEVELOPING COUNTRIES: AN APPRAISAL

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Introduction

In recent years, the eradication of abject poverty in developing countries has become a prime focus of the concerted development efforts at both the national and the international level. The intensification of anti-poverty programmes reflects, to a large extent, a growing disenchantment with the traditional development strategies of a majority of developing countries influenced by the "trickle-down" theory, according to which the benefits of economic growth would trickle down to the poor segment of the society. As a result, an increasing number of development thinkers and policy-makers have been attracted to a variety of action-oriented anti-poverty programmes, including the strategy designed to meet the basic needs of the poorest people, such as food, shelter and clothing, and the interventionist approach to the poverty problem in the form of public provision of urban social infrastructure, such as water, electricity, sewerage and sanitation.

It would seem evident, however, that the fundamental solution to urban poverty is through the creation of productive employment. For a number of reasons, employment generation, where feasible, would appear to be the more desirable means of alleviating poverty and achieving increased equity than income redistribution. The formulation and implementation of a comprehensive employment policy would engender less resistance from the existing political power structure and the vested-interest groups of the economy than drastic redistributional policy measures. It would entail less administratively cumbersome steps. Above all, the issue of employment goes directly to the core of the question of preserving human dignity and hence is worthy of special attention (Morawetz [1]).

In an ideal neoclassical world characterized by perfect information and foresight, correct factor prices, rational behaviour of both producers and consumers, and equitable income distribution, each economic agent would maximize his utility and each one is rewarded according to his own marginal productivity. This would lead to a full-employment economy. In such a utopian economy, there is a convergence of private and societal interests. The basic needs of people are met through the market and the activities of the public sector are confined only to the provision of those collective consumption goods that the market system fails to provide, for example, national defence, judicial services and public health.

Obviously, there is an urgent need for some form of public intervention to ensure the satisfaction of the minimum needs of the poorest segment of society, because the realities with which we live today are far removed from the idealized neoclassical world.

All sorts of market distortions exist to subject the urban poor to intolerable conditions of human misery and material deprivation. On the other hand, it would not be far-fetched to argue that even where factor market distortions, irrational behaviour of economic agents and imperfect information prevail, the need for the public provision of services to the urban poor would be significantly mitigated by the generation of productive employment targeted at this group and real income derived therefrom. It seems essential, therefore, that not only should the basic needs of the urban poor be adequately provided for and their accessibility to social services ensured, but also policy measures to remove the fundamental cause of urban poverty through job creation should be vigorously pursued.

It is in this context of the poverty-alleviating significance of employment that we examine the role of industry, particularly that of the manufacturing sector in generating urban employment, since poverty is closely related to the local productive structure. For instance, an integrated and mature urban economy with large industrial establishments and a relatively small self-employed informal sector tends to contain less poverty. But modern industrial sectors are also known to be relatively low labour-absorbers. However, the crucial contribution of industry to urban employment generation stems not only from its direct employment effect but more importantly from its combined indirect and income-induced effects, through its extensive linkages with various sectors of the urban economy and particularly the service sector, and through increasing demand for urban services as per capita incomes rise. This is the major theme that this paper attempts to articulate.

The sequence of the analysis is as follows. The recent performance of manufacturing industry in generating employment in both developing and developed countries is reviewed in section A. The nature and extent of linkages between the marufacturing sector and the service industry are dealt with in section B, using an international input-output table linking the Pacific basin countries through trade. Various industrial policies to accelerate urban employment generation are assessed in section C. Some major inferences and their policy implications are given at the end.

A. Recent employment absorption performance of the manufacturing sector

Under the International Standard Industrial Classification of all Economic Activities (ISIC), the growth trends of value added and employment in three-digit industrial branches for five upper-middle- and four middle-income developing countries over the period 1970-1980 are given in annex table 7 in terms of absolute values and average annual growth rates. Though the experience of the nine countries has been far from uniform - some countries managed to increase their production with a proportionately much smaller contribution from increased manpower, while others required a proportionately greater contribution - table 7 suggests that in some newly industrializing countries, such as Argentina, Brazil, the Republic of Korea and Singapore, each percentage addition of

the growth of output required less than 1 per cent increase in employment in many industrial branches, with the exception of a very few heavy industrial branches and a few light industries. On the other hand, in Turkey and Yugoslavia, three heavy industries and five light industries seem to have required a proportionately higher rate of increase in labour input for a given rate of increase in the volume of output. In comparatively less industrialized countries, such as Tunisia and Zimbabwe, the employment growth rate surpassed the growth rate of value added in nine out of 28 manufacturing subsectors. In general, employment lags behind output according to patterns which seem evident across manufacturing subsectors in most countries.

It has been contended that not only employment growth has been lagging behind output expansion in the industrial sector, but also the rate of labour absorption in the industrial sector fell behind the growth rate of the urban population and even behind the general population growth rate. Thus, the industrial sector failed to provide productive job opportunities for the surplus labour in the agricultural sector. As a result, agriculture and services have borne the brunt of surplus labour absorption. It has been further argued that industrial output expansion and employment creation have not been commensurate with the preponderance of resources allocated to industry, and that industry has tended to impede the development of other sectors of the economy and hence their capacity to generate employment by pre-empting scarce foreign exchange.

Against this background there has been not only mounting criticism of the central importance attached to industrialization in formulating a development strategy, but also persistent demand for a reordering of development priorities in favour of agriculture, employment creation, provision of basic needs and growth with equity and social justice.

Table 1 permits an international comparison of the growth rate of manufacturing value added with that of manufacturing employment and other relevant variables, such as service employment, urban population, total employment and general population in the more recent period of 1975-1980. An examination of aggregate and individual growth rates for both developing and developed countries reveals a number of interesting patterns. First, both manufacturing employment and manufacturing value added for developing market economies as a whole increased at a remarkable rate during the post-oil-embargo period, although the former (3.9 per cent) lagged considerably behind the latter (6.3 per cent). But the employment growth rate in the manufacturing sector was not too far behind the growth rate of urban population (4.3 per cent) and that of service employment (4.1 per cent), and actually exceeded that of population growth and total employment. By contrast, in developed market economies as a whole, employment gains in the manufacturing sector registered a meagre growth rate of 0.2 per cent per annum while manufacturing value added grew at a rate of 3.4 per cent per annum. The growth rate of manufacturing employment trailed substantially behind that of service employment and urban population. However, the observed differences in the growth rates of manu-

Table 1. Selected development statistics, 1975-1980

A. Population and production

Country or grouping a/	Population (thousands) 1975	Population (thousands) 1980	Urban population (as percentage of total population) 1975	Urban population (as percentage of total population) 1980	Gross domestic product (millions of 1975 dollars) 1975	Gross domestic product (millions of 1975 dollars) 1980	Manufacturing value added (millions of 1975 dollars) 1975	Manufacturing value added (millions of 1975 dollars) 1980
Developing market economies	1 021 753	1 143 549	36 c/	39 c/	245 709	307 063	43 701	59 175
Bangladesh	76 581	88 163	9	11	8 790	10 990	669	849
Bolivia	4 894	5 570	30	33	2 473	2 927	330	402
Chile	10 196	11 104	79	80	8 571	11 522	1 759	2 447
Colombia	23 177	25 794	66	70	13 367	17 429	2 855	3 704
Egypt	36 916	41 963	44	45	13 408	20 311	2 351	3 486
Ghana	9 989	11 679	32	36	4 594	4 187	652	590
India	618 830	684 460	21	22	79 598	94 448	12 433	16 071
Jamaica	2 043	2 188	46	41	2 876	2 500	484	342
Jordan	2 702	3 244	53	56	978	1 450	113	204
Kenya	13 514	16 466	12	14	2 887	3 567	340	474
Pakistan	75 491	86 898	26	28	12 265	16 033	2 026	2 825
Peru	15 397	17 625	63	67	15 453	16 760	3 855	3 968
Republic of Korea	35 280	38 455	49	55	20 560	29 630	5 451	10 027
Singapore	2 249	2 390	100	100	5 650	9 022	1 386	2 504
Sri Lanka	13 603	14 814	24	27	3 559	4 656	715	858
Thailand	41 869	47 062	14	14	14 509	21 804	2 651	4 535
Tunisia	5 608	6 354	48	52	3 808	5 043	385	666
United Republic of Tanzania	15 393	17 934	9	12	2 300	2 760	240	218
Venezuela	13 109	15 620	80	83	27 603	29 645	4 597	4 593
Zambia	4 912	5 766	34	43	2 460	2 379	409	412

continued

Table 1 (continued)

Country or grouping a/	Population (thousands)		Urban population (as percentage of total population)		Gross domestic product (millions of 1975 dollars)		Manufacturing value added (millions of 1975 dollars)	
	1975	1980	1975	1980	1975	1980	1975	1980
Developed market economies	631 794	652 367	72 c/	75 c/	3 698 210	4 358 111	1 017 261	1 202 276
Australia	13 627	14 488	87	89	94 983	108 937	22 979	24 352
Austria	7 519	7 481	53	89	37 740	44 764	10 777	13 548
Belgium	9 796	9 833	71	72	61 934	70 906	17 968	20 625
Canada	22 727	24 484	78	80	146 671	172 783	31 419	36 333
Denmark	5 060	5 122	82	84	32 897	36 578	6 886	7 826
France	52 707	53 508	75	78	339 290	398 780	102 051	114 733
Germany, Federal Republic of	61 832	60 931	83	85	418 206	497 170	158 655	187 568
Israel	3 455	3 937	87	89	12 179	13 064	2 380	2 559
Japan	111 524	116 551	75	78	498 719	636 983	150 316	215 061
Netherlands	13 664	14 079	76	76	87 144	98 961	25 538	28 297
New Zealand	3 087	3 268	83	85	13 948	13 753	3 170	3 208
Norway	4 007	4 078	47	53	28 528	36 022	6 589	6 462
Portugal	9 425	9 836	28	31	13 419	17 224	4 503	6 081
Spain	35 596	37 378	71	74	98 884	110 206	26 434	28 524
Sweden	8 193	8 274	85	87	64 566	70 129	18 269	18 133
United Kingdom	56 035	55 886	90	91	210 404	217 255	60 271	46 275
United States	213 540	223 233	70	77	1 538 698	1 814 596	369 056	442 691

continued

Table 1 (continued)

B. Employment

Country or grouping a/	Total employment (thousands) 1975	Total employment (thousands) 1980	Service employment (thousands) b/ 1975	Service employment (thousands) b/ 1980	Manufacturing employment f/ (thousands) 1975	Manufacturing employment f/ (thousands) 1980
Developing market economies	100 496	117 244	35 994	44 053	16 488	19 956
Bangladesh	886	1 297	407	649	299	441
Bolivia	1 402	1 566 d/	469	544 d/	127	147 d/
Chile	2 716	3 256	1 428	1 948	457	524
Colombia	2 147	3 202	1 430	2 069	514	821
Egypt	9 031	9 565	2 902	3 344	1 296	1 532
Ghana	446	482	234	260	77	80
India	19 691 d/	22 305 d/	10 962 d/	12 402 d/	5 [illegible] d/	5 862 d/
Jamaica	685	737	327	348	74	80
Jordan	87	117	67	92	3	6
Kenya	819	1 006	372	557	101	141
Pakistan	20 424	23 274	5 393	6 146	2 783	3 172
Peru	4 582	5 211	1 628	2 068	728	813
Republic of Korea	11 830	13 706	3 594	5 068	2 205	2 972
Singapore	834	1 072	544	671	218	314
Sri Lanka	999	1 079	195	253	189	180
Thailand	18 182	22 523	3 280	4 259	1 356	1 789
Tunisia	1 367	1 609	394	468	235	340
United Republic of Tanzania	471	608	274	292	121	135
Venezuela	3 504	4 245	1 923	2 432	538	675
Zambia	393	384	171	183	36	40

continued

Table 1 (continued)

Country or grouping a/	Total employment (thousands) 1975	Total employment (thousands) 1980	Service employment (thousands) b/ 1975	Service employment (thousands) b/ 1980	Manufacturing employment f/ (thousands) 1975	Manufacturing employment f/ (thousands) 1980
Developed market economies	241 820	259 234	132 331	149 262	63 769	64 371
Australia	5 841	6 247	3 485	3 910	1 263	1 234
Austria	2 686	2 841	1 397	1 552	911	921
Belgium	3 744	3 746	2 114	2 330	1 128	953
Canada	9 284	10 655	6 000	7 033	1 871	2 105
Denmark	2 332	2 501 e/	1 358	1 512 e/	529	534
France	20 714	21 127	10 585	11 688	5 780	5 445
Germany, Federal Republic of	24 798	25 302	7 974	8 793	8 890	8 958
Israel	1 113	1 255	660	782	275	294
Japan	32 700	33 940	15 990	17 450	8 710	8 400
Netherlands	4 640	4 973	2 758	3 165	1 160	1 067
New Zealand	1 223	1 270	661	703	297	314
Norway	1	1 913	960	1 182	411	388
Portugal	3 [illegible]	3 926	1 195	1 430	939	1 029
Spain	12 692	11 138	5 036	4 977	3 394	2 880
Sweden	4 062	4 232	2 330	2 632	1 125	1 025
United Kingdom	24 704	24 865	14 004	14 892	7 629	6 982
United States	85 846	99 303	55 824	65 231	19 457	21 942

continued

Table 1 (continued)

C. Average annual growth rates, 1975-1980

(Percentage)

Country or grouping a/	Population	Urban Population g/	Gross domestic product	Manufacturing value added	Total employment	Service employment	Manufacturing employment
Developing market economies	2.3	4.3 c/	4.6	6.3	3.1	4.1	3.9
Bangladesh	2.9	6.5	4.6	4.9	7.9	9.8	8.1
Bolivia	2.6	4.1	3.4	4.0	2.2	3.0	2.9
Chile	1.7	2.3	6.1	6.8	3.7	6.4	2.8
Colombia	2.2	3.9	5.5	5.3	8.3	7.7	9.8
Egypt	2.6	2.8	8.7	8.2	1.2	2.9	3.4
Ghana	3.8	5.1	-1.8	-1.9	1.6	2.1	0.8
India	2.0	3.3	3.5	5.3	2.3	2.5	2.7
Jamaica	1.4	2.5	-2.8	-6.7	1.2	1.3	1.6
Jordan	3.7	4.7	8.2	12.5	6.1	6.5	14.9
Kenya	4.0	6.8	4.3	6.9	4.2	8.4	6.9
Pakistan	2.9	4.3	5.5	6.9	2.6	2.6	2.7
Peru	2.7	4.2	1.6	0.6	2.6	4.9	2.2
Republic of Korea	1.7	4.7	7.6	12.9	3.0	7.1	6.2
Singapore	1.2	1.5	9.8	12.5	5.1	4.3	7.6
Sri Lanka	1.7	3.6	5.5	3.7	1.6	5.3	-2.1
Thailand	2.4	3.4	8.5	11.3	4.4	5.4	5.7
Tunisia	2.5	3.9	5.8	11.6	3.3	3.5	7.7
United Republic of Tanzania	3.1	4.3	5.5	-1.9	5.2	1.3	2.2
Venezuela	3.6	4.7	1.4	-0.0	3.9	4.8	4.6
Zambia	3.3	6.7	-0.7	0.1	-0.4	1.4	2.1

continued

Table 1 (continued)

Country or grouping a/	Population	Urban Population g/	Gross domestic product	Manufacturing value added	Total employment	Service employment	Manufacturing employment
Developed market economies	0.6	1.9 c/	3.3	3.4	1.4	2.4	0.2
Australia	1.2	1.9	2.8	1.2	1.4	2.4	-0.5
Austria	-0.1	0.5	3.5	4.7	1.1	2.1	0.2
Belgium	0.1	0.4	2.7	2.8	0.01	2.0	-3.3
Canada	1.5	1.7	3.3	2.9	2.8	3.2	2.4
Denmark	0.2	0.9	2.1	2.6	1.4	2.2	0.2
France	0.3	1.4	3.3	2.4	0.4	2.0	-1.2
Germany, Federal Republic of	-0.3	0.4	3.5	3.4	0.4	2.0	-0.1
Israel	2.6	3.2	1.4	1.5	2.4	3.5	1.3
Japan	0.9	2.1	5.1	7.4	0.7	1.8	-0.7
Netherlands	0.6	0.6	2.6	2.1	1.4	2.8	-1.7
New Zealand	1.1	1.9	-0.3	0.2	0.8	1.2	1.1
Norway	0.4	2.8	4.8	-0.4	2.3	4.2	-1.1
Portugal	0.9	2.9	5.1	6.2	1.0	3.7	1.8
Spain	1.0	2.2	2.2	1.5	-2.6	-0.2	-3.2
Sweden	0.2	1.0	1.7	-0.1	0.8	2.5	-1.8
United Kingdom	-0.1	0.3	0.6	-5.1	0.1	1.2	-1.8
United States	0.9	1.5	3.4	3.7	3.0	3.2	2.4

Sources: UN, Handbook of Development Statistics, New York, 1983; ILO, Yearbook of Labour Statistics, Geneva, 1983. World Bank, World Development Report, various issues (Washington, D.C.).

a/ The selection of countries under each grouping is based on availability of data on the structure of employment in major divisions of economic activity during the period 1975-1980.

b/ Service employment covers trade, restaurants, hotels, transport, storage, communications, financing, insurance, real estate and business, community, social and personal services.

c/ Group average.

d/ Public sector and establishments of non-agricultural private sector with ten or more persons employed.

e/ Figures for 1979, not for 1980.

f/ Manufacturing excludes public utilities and construction.

g/ Growth rates for 1970-1980, not for 1975-1980.

facturing employment and manufacturing value added between developing and developed market economies are consistent with a historically observed secular trend for the share of service employment in the labour force to expand with economic development, while the share of manufacturing employment declines (Kuznets [2], pp. 150-152). Moreover, the average growth rate for developing countries conceals a wide range of intercountry differences ranging from a negative growth rate of 2.1 per cent for Sri Lanka to 15 per cent for Jordan, which is mainly influenced by a very small base figure. By contrast, in most countries of the Organization for Economic Co-operation and Development, manufacturing employment actually decreased with the major exceptions of the United States of America and Canada during the period considered.

Contrary to the gloomy picture presented by many investigators in the past, employment generation in the manufacturing sector of developing countries on the whole seems very remarkable, although it may not be sufficient to absorb a swelling urban labour force fed by rapid rural-urban migration. In fact, there are some studies supporting the unorthodox view that the growth rates of industrial productivity and employment in developing countries today are better than those achieved by already developed countries at comparable stages of growth in the past (Squire [3], p. 24). In this context, it is interesting to note the paradoxical situation that the rapid growth of manufacturing employment may also increase the urban unemployment resulting from the accelerated rural-urban migration in response to urban-rural wage differentials or urban wage subsidies.

As extensively discussed in the literature, there are many factors causing low employment creation in the manufacturing sector in developing countries,* including the following:

(a) Widespread factor price distortions are observed in many developing countries. Wage rates in modern manufacturing industries tend to be higher than the marginal social cost of labour, while capital is undervalued by credit subsidies (low interest rates) coupled with overvalued exchange rates and favourable tariff treatment of imports of capital goods. All these distorted factor prices, which deviate substantially from their opportunity costs or scarcity values, undoubtedly contributed to the adoption of more capital-intensive techniques of production in the manufacturing sector;

(b) Manufacturing industry is the most dynamic sector of the economy, with potential for scale economies and considerable scope for factor substitution and productivity gains. A substantial increase in labour efficiency and productivity would lead to lower labour-input requirements;

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*For a comprehensive survey of the issues related to the employment-generating capacity of the manufacturing sector in developing countries, see Morawetz [1] and Baer and Samuelson [4].

(c) On the other hand, most service activities are constrained by rigid factor proportions of labour-intensive type and rather inefficient production processes. For instance, Berry [5] stressed the paucity of technological change, lagging productivity and a rather narrow range of factor substitution possibilities as a major cause of the expansion of service sector employment.

More importantly, the employment-creating capacity of the modern industrial sector has been too narrowly interpreted in the past. Recent empirical studies of regional income and employment multiplier analysis based on input-output techniques in industrialized countries provide conclusive evidence that the direct employment effect of industrial investment is small compared with the indirect effects arising from inter-industry purchases of inputs and income-induced effects of private consumption. These secondary employment effects were not usually considered when industry was faulted for its inability to generate sufficient employment. Undoubtedly, at the initial stages of industrialization, when inter-industry linkages are still weak and per capita incomes low, the secondary effects may not be significant, but as the industrial base broadens and becomes more integrated, both horizontally and vertically, the employment impact of industrial activities should also increase substantially. In a slightly different context, Stewart and Streeten [6] expressed a similar view that while capital-intensive industries may initially achieve only modest job gains, they may also sow seeds for more impressive future employment gains than less-capital-intensive ventures. Moreover, given the importance of the indirect and income-induced employment effects of manufacturing activities, Galenson [7] tested the hypothesis that the expansion of tertiary employment is related to increases in manufacturing activities through the impact of high incomes on demand for services and the increased demand for service inputs into manufacturing. The major finding of the study, although tentative, was that an efficient manufacturing activity is an extremely important source of generating new employment in the service sector of developing economies. For instance, a percentage increase in manufacturing employment was found to be associated with an increase of 0.6 per cent of employment in tertiary activities, with the resultant multiplier of 1.6. A similar conclusion was derived by Meller and Marfán [8] in their empirical analysis of the multiplier effects of the manufacturing industries in Chile, using the 1962 Chilean (74 x 74) input-output table.

The fundamental issue emerging from the foregoing analysis is not whether the manufacturing sector itself is incapable of absorbing the surplus urban labour and the bulk of the new employment is likely to be located in the service sector, but whether for every worker employed in the manufacturing sector there may well be a multiple expansion of employment in commerce, construction, transportation, and services through a network of forward and backward linkages between manufacturing and services. A simple calculation shows that the manufacturing sector alone cannot be expected to bear the major share of employment absorption. Take a hypothetical case of a manufacturing sector employing 20 per cent of the labour force and a total labour force growing at an annual rate of 3 per cent. Then the growth rate of manufacturing employment required to

absorb all new entrants in the job market would be 15 per cent per annum, and the required growth rate of manufacturing output may as well be a multiple of the employment growth rate. Certainly, they seem to be outside the plausible range. It seems clear, therefore, that the manufacturing sector could be regarded as the engine of growth stimulating employment creation in other sectors of the economy, particularly in the service sector through the inter-industry and income-induced demand for services. The critical intersectoral relationship between manufacturing and services is dealt with in the next section.

B. Linkages between the manufacturing sector and the service sector

The economy can be seen as a network of interrelated sectors including agriculture, industry, service and trade, with the degree of complexity of linkages between sectors depending on the industrial maturity of the economy. Here we shall focus exclusively on the service-industry linkage. The purpose of this section is to provide empirical evidence in support of the thesis that the growth of industry and particularly of the manufacturing sector is essential to the growth of employment creation in the service sector of the economy. The analysis is partly based on the international input-output table for countries of the Association of South-East Asian Nations constructed by the Institute of Developing Economies in Tokyo.* The international table covers six developing countries (Indonesia, Malaysia, Philippines, Republic of Korea, Singapore and Thailand) and two developed economies (Japan and United States) in the Pacific basin region, and the table of each country is linked to those of all other countries through trade. Admittedly, the structure of the economies and the nature and extent of economic interdependence, as revealed by the 1975 table of the Institute of Developing Economies, between developing and developed countries in the region may not be typical of the structure of production and trade and of North-South economic relations in other parts of the world. Nevertheless, given the different stages of industrialization of the countries dealt with, the table permits a cross-section analysis of the structural characteristics of their economies and particularly the linkage and integration patterns within industry and between industry and other sectors of the economy at different stages of development. Furthermore, the analysis may shed light on

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*Using the uniform sector classification at the disaggregation levels of 7, 24 and 54 sectors, the international input-output table of the Institute of Developing Economies links the input-output tables of the Pacific basin countries (Indonesia, Japan, Malaysia, Philippines, Republic of Korea, Singapore, Thailand and United States of America) through their respective trade matrices for 1975. The import matrix of each country was decomposed into import submatrices from its partner countries and the rest of the world at 1975 producer prices. An inverse matrix was available only for the 24-sector table. For further details, see the Institute of Developing Economies [10].

the likely course of future industrialization in other less-industrialized developing countries.

At the risk of over-simplification, it may be stated that there have been two opposing schools of thought regarding the nature of labour absorption in the service sector of developing countries. For analytical convenience, let us designate them as the schools of "supply-determined employment" and of "demand-induced employment". The proponents of supply determinism, such as Friedmann and Sullivan [9], argue that given the continuing and even accelerating rural-urban migration in developing countries, urban growth rates are typically twice the rate of population growth, while employment growth in the manufacturing sector is far less than the corresponding growth rate of the urban work-force. As a result of the inability of the manufacturing sector to absorb a substantial portion of the rapidly growing urban work-force, the bulk of the urban labour force has been absorbed into small-scale enterprises, personal services and many other activities in the informal sector, in addition to open unemployment. Thus, the service sector has acted as a residual employer of the ever-increasing urban labour force fed by the accelerating movement of people to cities.

On the other hand, many investigators, such as Berry [5] and Udall [11], attach less importance to the role of the service sector as a residual employer disguising the underemployment of those not absorbed by the industrial sector and more to the expansion in the demand for services as a major factor in the growth of service sector employment. In a similar vein, Sabolo [12] distinguishes between intermediate service demand and income-induced demand for services, and further shows that the share of employment in intermediate services is positively related to the growth of non-tertiary production, particularly industry, where intermediate services refer to service inputs for production such as transport and communications, commerce excluding petty trade, banking and finance, professional services and government services.

It is obvious that the proportion of service employment generated in response to the increased demand for services through inter-industry transactions and income expansion will increase with economic development and that of supply-determined traditional service employment which is usually found in the informal sector will decline in the process of development. We shall discuss below the first type of service activities, which is legitimately demanded by productive activities of other sectors of the economy.

Inter-industry transactions between manufacturing and services

Table 2 provides an international comparison of intersectoral dependence between manufacturing and tertiary activities (trade and transport and services) as measured by the degree of importance of an input to the total inputs for an output, which is expressed in percentages. A close examination reveals significant general patterns of intersectoral relations in these countries.

Table 2. Dependency ratios a/ between manufacturing and services in selected Pacific basin countries, 1975

Branch	Dependency ratios by branch: Manufacturing (03)	Trade and Transport (06)	Services (07)
		Indonesia	
03	29.6	44.4	42.9
06	11.1	19.3	12.2
07	2.2	31.8	18.0
		Malaysia	
03	36.1	44.4	41.2
06	9.7	13.0	10.2
07	2.5	41.3	30.9
		Philippines	
03	34.0	38.5	31.2
06	18.2	18.2	16.5
07	3.1	33.4	45.9
		Republic of Korea	
03	49.7	44.4	39.4
06	11.5	25.4	14.8
07	3.9	28.0	33.5
		Singapore	
03	48.1	46.0	50.2
06	14.4	9.5	10.2
07	2.6	38.7	29.7
		Thailand	
03	37.0	50.6	47.2
06	11.9	15.6	19.5
07	2.9	30.4	17.2
		Japan	
03	58.6	36.8	29.7
06	9.1	24.9	15.8
07	12.8	35.4	42.3
		United States	
03	60.6	23.0	26.1
06	10.3	20.1	7.7
07	9.7	48.1	49.9

Notes: Figures drawn from more complete sectoral breakdown in annex table 8.
Countries listed alphabetically by economic grouping.

a/ Branch purchases of inputs as percentage of its total intermediate input purchases.

First, despite considerable variations across sectors and countries, the dependence of the tertiary sector on manufacturing in the developing country group, as measured by purchases of manufactured inputs of the sector as a percentage of its total input purchases, was markedly and consistently high. This general dependence on manufacturing was notable in all developing countries in the Pacific basin region, but considerably weaker in the developed country group comprising Japan and the United States. As reflected in the more complete annex table 8, of equal significance is the dependence of electricity, gas and water on manufacturing in all the Pacific basin developing countries, ranging from 60 per cent in Indonesia to 76.5 per cent in Malaysia, which contrasts sharply with the relatively low dependence of the sector on manufactured inputs in Japan (38.7 per cent) and the United States (14.2 per cent). This critical dependence of the utilities industry on manufacturing in developing countries has important implications for the provision and accessibility of social infrastructure to the urban poor.

Second, numerical data on intrasectoral dependence within the manufacturing sector cast new light on the degree of industrialization achieved by various countries, which in turn has important implications both for generating legitimate demand for services, and hence employment creation in the service sector, and for the labour-absorptive capacity of the manufacturing sector. The manufacturing sector depends on its own output for its growth, and these inter-industry transactions in manufacturing were relatively significant in all the Pacific basin economies: Indonesia, 30 per cent; the Philippines, 34 per cent; Malaysia, 36 per cent; Thailand, 37 per cent; Singapore, 48 per cent; Korea, 50 per cent; Japan, 59 per cent; and the United States, 61 per cent. More importantly, the statistics bear out the fact that inter-industry transactions within the manufacturing sector increased in step with the degree of industrialization achieved by a given country. Thus inter-industry dependency ratios for manufacturing varied systematically from about 30 per cent in Indonesia to 61 per cent in the United States according to the extent of industrial maturity attained. Similar empirical relationships between the magnitude of inter-industry transactions and the stages of growth were not, however, observed for any other sectors classified in the study.

Third, given the dominant share of the manufacturing sector in the total purchases of intermediate inputs of the economy as a whole in both developing and developed countries, the manufacturing sector generally needs to obtain a relatively small percentage of its total inputs from each individual sector of the economy, but this small share may prove to be a large fraction of total intermediate inputs sales of the selling sector, and hence critically important for sustaining output of the individual tertiary sector in question. For instance, the manufacturing sector in Malaysia needed to obtain a meagre 1.4 per cent of its total input requirements from the public utilities industry (water, gas and electricity) in 1975, but this small percentage represented almost 60 per cent of total sales of intermediate inputs by that industry. In the Republic of Korea, only 4 per cent of total input requirements in manufacturing was supplied from services, but it constituted

about 30 per cent of total inputs sales of the service sector. Similarly, in Japan, the manufacturing sector bought about 9 per cent of its total input needs from the trade and transport sector, but these sales to the manufacturing sector amounted to nearly 40 per cent of total input sales by the trade and transport sector.

Fourth, manufacturing sector demand for trade and transport in developing countries tends to be substantially greater than that sector's demand for services, often by a multiple of 4 to 5. For instance, in the Philippines, purchases by the manufacturing sector of inputs from the trade and transport sector accounted for about 18 per cent of its total intermediate input purchases, while the corresponding share of services was only 3 per cent. In this regard, it is worth noting that demand by the manufacturing sector for services increases substantially as a country develops. For instance, the share of services in the total intermediate input purchases of the manufacturing sector in developing countries ranged from 2.2 per cent in Indonesia to 3.9 per cent in the Republic of Korea, but the same percentage share jumped to 9.7 per cent in the United States and 12.8 per cent in Japan.

Fifth, in both developing and developed countries, inter-industry transactions between services and trade and transport are quite significant. Particularly, the trade and transport sector was shown to depend heavily on services, ranging from a dependency ratio of 28 per cent in the Republic of Korea to 48 per cent in the United States, and, to a lesser extent, the dependence of the service sector on trade and transport in terms of its input requirements ranged from about 8 per cent in the United States to 20 per cent in Thailand. Equally important are the inter-industry transactions in both sectors, particularly in the service sector, with dependency ratios of 42 per cent for Japan, 46 per cent for the Philippines, 34 per cent for the Republic of Korea and 50 per cent for the United States. The growth of the service sector feeds upon itself. Lastly, but not least important, unlike the inter-industry relationships between the manufacturing and the non-manufacturing sectors, the patterns of inter-industry relations in the non-manufacturing sectors do not systematically correspond to the stages of economic development.

Sixth, the nature and scope of sectoral dependence could be more sharply delineated by aggregating the supplying sectors into the three traditional broad categories of activities: primary (agriculture and mining), industry (manufacturing, public utilities and construction) and tertiary (trade and transport and services). This has been done in table 3. Among other things, table 3 highlights the following:

(a) There seems to be an inverse correlation between the importance of primary inputs to manufacturing and the stages of industrialization. In all less industrialized countries of the region, namely Indonesia, Malaysia, the Philippines and Thailand, the manufacturing sector purchased its inputs more from the primary sector than from industry, but the opposite was true in the Republic of Korea and Singapore, which are relatively more industrialized developing countries. Moreover, manufacturing dependence

Table 3. Branch dependence on primary, industrial and tertiary sectors (Percentage)

Country and sector	Agriculture	Mining	Manufacturing	Electricy, water and gas
Indonesia				
Primary	23.7	5.1	55.3	0.9
Industry	44.7	62.7	31.5	77.7
Tertiary	31.5	32.7	13.3	21.4
Malaysia				
Primary	7.1	0.9	49.9	0.4
Industry	74.0	57.9	38.0	85.7
Tertiary	18.9	41.3	12.2	13.8
Philippines				
Primary	22.7	1.4	44.1	0.1
Industry	49.1	66.6	34.6	73.8
Tertiary	28.3	32.0	21.3	26.1
Republic of Korea				
Primary	28.6	14.4	32.8	2.7
Industry	51.7	53.0	51.9	72.6
Tertiary	19.7	32.5	15.4	24.8
Singapore				
Primary	5.1	0.0	34.7	0.0
Industry	71.3	77.6	48.3	77.3
Tertiary	23.6	22.4	17.0	22.7
Thailand				
Primary	23.7	2.3	45.5	0.6
Industry	47.1	60.3	39.8	79.1
Tertiary	29.2	31.3	14.8	20.3
Japan				
Primary	27.2	1.2	17.0	24.1
Industry	46.7	22.8	6.1	47.0
Tertiary	26.2	76.2	21.9	28.8
United States				
Primary	35.0	16.9	16.7	25.9
Industry	36.5	42.2	63.3	58.1
Tertiary	28.5	40.8	20.0	16.0

continued

Table 3 (continued)

Country and type of activity	Construction	Trade and transport	Services
Indonesia			
Primary	11.1	0.8	14.8
Industry	53.2	48.2	55.0
Tertiary	35.6	51.1	30.2
Malaysia			
Primary	3.0	0.1	8.0
Industry	76.4	45.7	51.1
Tertiary	20.7	54.3	41.1
Philippines			
Primary	7.7	5.0	0.4
Industry	67.0	43.5	37.3
Tertiary	25.3	51.6	62.4
Republic of Korea			
Primary	3.9	0.2	2.2
Industry	69.6	46.5	49.1
Tertiary	26.5	53.4	48.3
Singapore			
Primary	0.0	5.4	1.7
Industry	77.0	46.5	58.5
Tertiary	23.0	48.2	39.9
Thailand			
Primary	8.7	0.1	7.4
Industry	63.4	53.8	55.9
Tertiary	28.1	46.0	36.7
Japan			
Primary	3.5	0.0	1.3
Industry	62.3	39.1	41.2
Tertiary	34.2	60.3	57.6
United States			
Primary	2.7	0.6	1.3
Industry	68.1	31.2	41.2
Tertiary	29.2	68.2	57.6

Note: Figures calculated from more detailed table 8 in annex.

on primary inputs was only 17 per cent in both Japan and the United States. Thus, the process of industrialization tends to diminish the importance of the primary sector, including agriculture, and increase the dependence of manufacturing on its own output;

(b) Public utilities purchased from industry nearly three quarters or more of its total input requirements in the developing country group of the region. These dependency ratios were considerably lower in the developed countries, with figures of 47 per cent in Japan and 58 per cent in the United States, but public utilities still claimed by far the largest share of the three sectors;

(c) Given the nature of construction work, namely assembling and installing manufactured parts and construction materials, it is not surprising to find high construction-industry dependency ratios in developing and developed countries alike. It is also noteworthy that the tertiary sector proved to be of considerable importance for sustaining output in the construction sector;

(d) In the trade and transport sector in the developing country group, the share of both industry and tertiary inputs appear to be roughly comparable, each ranging between 45 per cent and 55 per cent. But the tertiary shares became much larger than the industry shares in the developed country group, 60 per cent in Japan and 68 per cent in the United States. This may suggest that as the trade and transport sector becomes more developed and sophisticated, its dependence on inputs from tertiary activities, and particularly highly specialized skill-intensive services, may also markedly increase;

(e) The share of industry in the total input purchases of the service sector in the developing country group clearly dominated that of the tertiary in most cases except for the Republic of Korea, where the two shares were evenly matched, and the Philippines, where the tertiary share exceeded that of industry by a great margin. In the developed market economies of Japan and the United States, the relative importance of industry and tertiary inputs to the service sector tipped clearly in favour of the latter, perhaps reflecting the growing importance of inter-industry transactions within the service sector as the economy depends increasingly on highly sophisticated service inputs in its technologically advanced and skill-intensive stages of post-industrial service-oriented production.

Finally, it should be noted that international trade can play an important role in mitigating some of the national constraints to development posed by the lack of domestic inter-industry linkages as well as poor natural resource endowments. At the risk of oversimplification, there may be two different routes to industrialization of developing countries. One option is to specialize in the production and export of a relatively narrow range of products in which a country is seen to have comparative advantage and to import all necessary intermediate and capital goods as well as consumer goods with their export earnings. Another alternative is to launch a strategy of industrial development which would concentrate on

building an extensive network of domestic linkages and broadening the industrial base of the developing country. Admittedly, the question of which option to choose may depend on the characteristics of the country, such as its size and natural resource endowments. For instance, large countries are generally in a more advantageous position to develop extensive domestic linkages than small countries because of the potential for exploiting scale economies and industrial technology unconstrained by the domestic market size. On the other hand, small countries constrained by the limited size of their domestic markets may have no alternative to the export-oriented growth strategy. In reality, the option open to a country may not be a matter of choosing one alternative or another. Instead, there may be some scope for a trade-off between domestic linkages and trade possibilities. In this regard, it is also worth noting that although foreign trade may provide an opportunity for escaping an initial resource constraint in supply in a small open economy, there are still many essential non-tradables, like power, which are required to give industry a start and which cannot be imported.

Income-induced demand for services

As urbanization and industrialization accelerate, the service sector tends to grow faster than industry because of two major factors. The first factor, as discussed earlier, is the increased inter-industry transactions between industry and services, since industry needs more specialized commercial activities, trade, communications, finance and government services. The second source of growth of the service sector is related to rising incomes creating a demand for the whole range of consumer services, such as recreation, health care, improving the quality of the environment and other professional and personal services.

In this context, Sabolo [12] has distinguished between the two types of services -- new and old. New services are generally associated with the positive income elasticity of demand, which usually characterizes high-income consumption items, such as education, health, tourism, entertainment and leisure-time activities, while old services are normally found in traditional activities such as petty trading and domestic services with negative income elasticity. In fact, many investigators (for example, Kuznets [13], Galenson [7] and Baer and Samuelson [4], Berry [5] and Udall [11]) have attached great importance to the role of services in final demand, considering most of the services as superior goods with an income elasticity higher than one. The income elasticity of demand for services obviously has an important implication for the employment-creation strategy. If income elasticities for most services are sufficiently high, the development strategy could concentrate on first maximizing the economic growth rate. Then, rising per capita incomes should produce substantially increased demand for highly remunerated services in the growing urban industrial sector, thus leading to the rapid expansion of urban service employment.

Table 4 summarizes sectoral contributions to private consumption in the Pacific basin countries in 1975. Empirical results tend to confirm a number of theoretical postulates regarding the relationships between private consumption and income which have been extensively treated in economic theory. The share of manufactured consumer goods in total private consumption is by far the largest in all the Pacific basin developing countries, ranging from 40 per cent in Thailand to 57 per cent in Singapore. This contrasts sharply with a relatively small share of agricultural products in private consumption in those countries, varying within the range of about 5 per cent in Singapore to 16 per cent in Indonesia. When the sample was extended to include Japan and the United States, the agricultural share was further reduced to 4 per cent in Japan and 1 per cent in the United States. These cross-section data are consistent with the theoretical postulates of Engel's laws, Colin Clark, Kuznets, and many others, according to which the share of agriculture and other primary products in gross domestic production declines and those of industry and services increase as per capita incomes rise. If the country sample studied had included those at much lower income levels, the results might have shown the full range of consumption-income relationships in which a relatively large initial share of foods and other agricultural products at the lower per capita income levels steadily decreases as per capita incomes rise, while the relative share of manufactured goods in total private consumption gains in step with increasing per capita income until it reaches a threshold level associated with the high-income groups of developed countries. Beyond that level, the relative share of services overtakes that of manufactured goods as the greater proportion of income is allocated to highly specialized service activities at high-income levels. Table 4 lends empirical support to the theoretical validity of such a consumption-income relationship. In the developed economies of both Japan and the United States, the share of private consumption of manufactured goods was around 30 per cent as compared with the service share of 40 to 45 per cent.

Industry multiplier effects

It was emphasized at the outset that the total direct and indirect effects on output, income and employment of any sectoral activity must be considered to assess the impact of that activity on the economy at large and on the service sector in particular. This is because the production of each good requires direct inputs of various goods and services (backward linkages). Moreover, each of these inputs has its own set of inputs and this process continues in ever-decreasing magnitudes in successive stages. Therefore, the multiplier effect of any sectoral activity should include not only the direct backward linkage but also the sum of the effects of these linkages in successive stages. This takes on added significance for manufacturing activities because the direct employment effects of manufacturing industry is generally known to be relatively small, but its indirect and income-induced linkages provide a strong stimulus for output and employment expansion in other sectors including services. Table 5 provides such direct and

Table 4. Contributions to gross domestic consumption in selected Pacific basin countries (Thousands of dollars)

Branch	Indonesia	Malaysia	Philippines	Republic of Korea
Agriculture	3 175 829	545 787	1 523 725	1 544 492
	(15.56)	(10.60)	(14.06)	(10.85)
Mining	19 949	243	3 476	16 246
	(0.10)	--	(0.03)	(0.11)
Manufacturing	9 772 884	2 187 966	4 928 699	7 438 151
	(47.94)	(42.51)	(45.48)	(52.25)
Electricity, gas and water	103 740	48 051	94 369	158 630
	(0.51)	(0.93)	(0.87)	(1.11)
Construction	--	17 653	1 626	--
	(--)	(0.34)	(0.02)	(--)
Trade and Transport	3 720 204	953 423	2 708 186	2 668 666
	(18.25)	(18.52)	(24.99)	(18.75)
Services	3 592 959	1 394 185	1 578 103	2 408 860
	(17.63)	(27.09)	(14.56)	(16.92)
Total consumption	20 385 565	5 147 308	10 838 188	14 235 045

continued

Table 4 (continued)

Branch	Singapore	Thailand	Japan	United States
Agriculture	160 963	1 796 408	11 645 710	9 304 925
	(4.8)	(14.35)	(4.6)	(0.95)
Mining	--	7 723	10 197	530 468
	(--)	(0.06)	(--)	(0 05)
Manufacturing	1 919 601	5 006 122	85 239 676	280 469 036
	(57.21)	(40.)	(29.68)	(28.68)
Electricity, gas and water	153 477	104 928	5 408 058	28 523 788
	(4.57)	(0.84)	(1.88)	(2.92)
Construction	11 532	68 840	--	--
	(0.34)	(0.55)	(--)	(--)
Trade and Transport	544 440	2 648 077	67 743 841	212 902 107
	(16.23)	(21.16)	(23.59)	(21.77)
Services	565 100	2 882 993	117 118 871	446 168 996
	(16.84)	(23.04)	(40.78)	(45.63)
Total consumption	3 355 113	12 515 091	287 166 353	977 899 338

Source: Institute of Developing Economies, International Input-Output Table for ASEAN countries, 1975 (Tokyo, 1982).

Notes: Figures within parentheses indicate percentage shares of total consumption.
Countries listed alphabetically by economic grouping.

Table 5. Direct and indirect input-output coefficients for a dollar change in final demand for a given product or activity

	Product or activity	Indonesia	Malaysia	Philippines	Republic of Korea
01	Paddy	1.087794	1.309168	1.199653	1.126126
02	Other agriculture	1.103520	1.158030	1.202982	1.337524
03	Livestock	1.117321	1.706095	1.550824	2.105431
04	Forestry	1.166855	1.116734	1.202132	1.284816
05	Fishery	1.172136	1.150069	1.182184	1.523280
06	Crude petroleum and natural gas	1.039808	1.000000	1.318593	1.000000
07	Other mining	1.221997	1.135083	1.342015	1.437299
08	Food, beverages and tobacco	1.832049	1.845532	1.961652	1.960318
09	Textiles, leather and their products	1.775956	1.627511	1.788538	2.208751
10	Lumber and wood products	1.749884	1.579001	1.937089	1.540936
11	Pulp, paper and printing	1.349878	1.438737	1.537934	1.815186
12	Chemical products	1.515820	1.775806	1.635755	1.837265
13	Petroleum and its products	1.826167	1.060208	1.174483	1.230548
14	Rubber products	1.923322	1.755556	1.739979	1.917035
15	Non-metallic mineral products	1.498843	1.492355	1.849275	1.885732
16	Metal products	1.469318	1.711507	1.642846	2.091232
17	Machinery	1.223302	1.518427	1.905922	1.770863
18	Transport equipment	1.311398	1.637478	1.708311	1.801056
19	Other manufacturing products	1.369040	1.303988	1.755509	1.918830
20	Electricity, gas and water supply	1.369040	1.457121	1.866463	1.821214
21	Construction	1.609875	1.835766	2.024515	2.008047
22	Trade and transport	1.269565	1.364536	1.455585	1.393311
23	Services	1.457337	1.255802	1.396020	1.604569

continued

Table 5 (continued)

	Product or activity	Singapore	Thailand	Japan	United States of America
01	Paddy	1.000000	1.165301	1.416542	1.852280
02	Other agriculture	1.471452	1.239345	1.629803	2.137505
03	Livestock	1.612232	1.904025	2.412580	2.163242
04	Forestry	1.643816	1.146195	1.895387	2.239078
05	Fishery	1.956342	1.370906	1.775640	1.523818
06	Crude petroleum and natural gas	1.000000	1.000000	1.681361	1.704225
07	Other mining	1.535601	1.213689	1.881004	1.855121
08	Food, beverages and tobacco	1.786354	1.921742	2.242838	2.947923
09	Textiles, leather and their products	1.623529	1.927026	2.415563	2.074217
10	Lumber and wood products	1.802124	1.783074	2.122613	1.886910
11	Pulp, paper and printing	1.432048	1.631388	2.379996	1.886069
12	Chemical products	1.645038	1.628808	2.404253	1.970774
13	Petroleum and its products	1.043274	1.143188	1.293915	2.476322
14	Rubber products	1.527388	1.764400	2.229309	1.974503
15	Non-metallic mineral products	1.678540	1.772083	2.123930	1.868223
16	Metal products	1.384266	1.737091	2.560812	2.098535
17	Machinery	1.536504	1.591340	2.408248	1.871221
18	Transport equipment	1.334046	1.643218	2.546529	2.148847
19	Other manufacturing products	1.600388	1.460752	2.340738	1.825267
20	Electricity, gas and water supply	1.432486	1.705314	1.618926	1.995866
21	Construction	1.690794	1.844172	2.229170	2.016458
22	Trade and transport	1.513442	1.346269	1.752015	1.582921
23	Services	1.447763	1.493877	1.800171	1.743203

Source: Institute of Developing Economies, International Input-Output Table for ASEAN Countries, 1975 (Tokyo, 1982).

Notes: Figures represent direct and indirect domestic output effects in dollars.

Countries listed alphabetically by economic grouping.

indirect output multipliers for the 23 sectors of the Pacific basin economies.*

One of the most notable general patterns of the sectoral multipliers given in table 5 is that manufacturing subsectors (08-19) tend to produce a greater output, and perhaps employment, impact on the economy per dollar delivery of final demand than any other subsectors outside manufacturing. These relatively large multiplier effects of various manufacturing activities, which were observed in both the developing and developed countries of the region, are mainly attributable to the comparatively high density of inter-industry transactions of both forward and backward linkage types within and around the manufacturing sector. However, the multiplier effect varied considerably from one industry to another within the manufacturing sector. Light manufacturing (food, beverages and tobacco, textiles and leather products) seems to create generally large output multiplier effects regardless of the stages of development of the country in question, and also presumably large employment effects, given the relatively high labour-intensity in these industries. The multiplier effects of the resource-based industries show somewhat mixed results. The multiplier effect was shown to be fairly high in lumber and wooden products and rubber products throughout the region, but relatively low in pulp, paper and printing, except in Japan, the Republic of Korea and the United States, and also low in petroleum and its products, with the exception of the oil-producing countries of the region, namely Indonesia and the United States, which had remarkably large multipliers. The multiplier effects in the remaining resource-based industries, in chemical, non-metallic mineral and metal products, were generally strong in most countries and exceptionally so in Japan. The multiplier effect of capital goods industries, mainly machinery and transport equipment, is likely to be influenced by the domestic capability of producing capital goods, and hence tends to be small in countries at an early stage of industrialization, such as Indonesia, Malaysia and Thailand, with the notable exception of the Philippines, and has become very

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*These output multipliers are the column sums of the Leontief inverse matrix $(I-A)^{-1}$. They do not, however, include the income-induced effects per dollar delivery of final goods. For instance, the personal consumption of the car industry employees who received their wages for the production of a car creates the demand for various goods and services, and subsequent spending of workers who are involved in the production of goods, and this income propagation process goes on indefinitely. To capture the direct and indirect output requirements by each sector per dollar delivery of final demand, and also the income-induced effect resulting from increased consumer spending, the household sector is normally removed from final demand and included in the processing sector, and then the new augmented Leontief matrix is inverted to derive total sectoral multipliers which include the income-induced effect.

significant in the fully industrialized countries such as Japan and the United States.

By contrast, the multiplier effects originating from agriculture and other primary sectors (01-06), with the major exception of livestock industry, proved to be generally low in the Pacific basin developing countries. However, these same primary sector multipliers were markedly higher in both Japan and the United States, perhaps due to the presence of well-developed agro-based industries which support agriculture and other primary production.

It is also particularly noteworthy that construction generates one of the highest multiplier effects through its extensive backward and forward linkages with other sectors of the economy in nearly all Pacific basin economies. In addition, the multiplier effects of tertiary activities, mainly trade and transport and services, tend to be slightly higher than those of agriculture and other primary industries, but considerably lower than those of the manufacturing sector, with some minor exceptions.

Finally, it is important to note that empirical results obtained here are generally consistent with theoretical expectations that the more integrated and diversified the structure of production of the economy, the higher the sectoral multiplier effect. This fact is clearly borne out by the remarkable disparity between developing and developed countries in the multiplier values of all industries presented in table 5. There seem to be strong correlations between the degree of industrialization and the overall sectoral multiplier effects. This implies that the growth of industrial output does not have a significant impact on employment in the service sector until fairly late in the development process when a network of inter-industry linkages is relatively well developed.

In a slightly different way, table 6 enables us to identify some of the high-linkage industries which may lead to higher overall rates of growth and hence produce a strong demand for services and consequent employment gains in the service sector. Despite considerable intercountry differences, industries with high backward linkages include the following: food, beverages and tobacco; textiles, leather and its products; lumber and wood products; and construction. Industries with high forward linkages include paddy cultivation, livestock, mining and nonmetallic mineral products. Among industries with high total linkages are three light manufacturing industries classified as high-backward-linkage industries, in addition to construction, rubber products and livestock for some countries.*

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*Using an input-output notation, forward linkage of industry "i" is $\sum_i a_{ij}$, where an a_{ij} is an input coefficient, namely, the ratio of purchased input from sector "i" by sector "j" to the total value of production in sector "j". Similarly, backward linkage is $\sum_j a_{ij}$ and total linkage is $\sum_i a^*_{ij}$, where a^*_{ij} is an element of the Leontief inverse matrix.

Table 6. Comparison of sectoral linkage rankings

	Product or activity	Total linkage							
		Indonesia	Malaysia	Philippines	Republic of Korea	Singapore	Thailand	Japan	United States
01	Paddy	22	15	21	22	22	20	22	18
02	Other agriculture	21	18	19	21	15	18	20	6
03	Livestock	20	6	13	2	9	3	4	2
04	Forestry	19	21	20	19	7	21	14	4
05	Fishery	18	19	22	16	1	16	17	23
06	Crude petroleum and natural gas	23	23	18	23	23	23	19	21
07	Other mining	17	20	17	17	12	19	15	17
08	Food, beverages and tobacco	2	1	2	5	3	2	7	1
09	Textiles, leather and their products	4	8	7	1	8	1	3	7
10	Lumber and wood products	5	9	3	15	2	5	13	16
11	Pulp, paper and printing	13	13	14	9	18	11	9	13
12	Chemical products	7	3	12	10	6	12	6	12
13	Petroleum and its products	3	22	23	20	21	22	23	3
14	Rubber products	1	4	9	7	13	7	10	11
15	Non-metallic mineral products	8	11	6	8	5	6	12	15
16	Metal products	9	5	11	3	19	8	1	7
17	Machinery	16	10	4	13	11	13	5	14
18	Transport equipment	14	7	10	12	20	10	2	5
19	Other manufacturing products	11	16	8	6	10	15	8	19
20	Electricity, gas and water supply	12	12	5	11	17	9	21	10
21	Construction	6	2	1	4	4	4	11	9
22	Trade and transport	15	14	15	18	14	17	18	22
23	Services	10	17	16	14	16	14	16	20
	Average linkage index a/	1.46	1.49	1.63	1.72	1.55	1.58	2.12	2.06

continued

Table 6 (continued)

Product or activity	Backward linkage							
	Indonesia	Malaysia	Philippines	Republic of Korea	Singapore	Thailand	Japan	United States
01 Paddy	22	16	21	22	22	20	22	18
02 Other agriculture	21	20	20	17	16	18	21	5
03 Livestock	20	7	14	2	11	8	2	3
04 Forestry	19	21	19	20	6	21	15	4
05 Fishery	18	18	22	16	1	16	16	23
06 Crude petroleum and natural gas	23	23	17	23	23	23	20	21
07 Other mining	17	19	18	18	9	19	14	17
08 Food, beverages and tobacco	2	2	2	1	3	1	5	1
09 Textiles, leather and their products	5	8	7	3	8	7	6	8
10 Lumber and wood products	4	6	1	15	2	2	13	15
11 Pulp, paper and printing	12	13	13	10	18	11	7	13
12 Chemical products	9	5	12	9	7	10	3	12
13 Petroleum and its products	1	22	23	21	21	22	23	2
14 Rubber products	3	1	9	11	14	3	12	11
15 Non-metallic mineral products	7	11	5	5	5	5	10	14
16 Metal products	8	4	11	7	19	9	1	7
17 Machinery	16	12	6	13	12	13	8	16
18 Transport equipment	14	9	10	12	20	12	4	6
19 Other manufacturing products	13	15	8	8	10	15	9	19
20 Electricity, gas and water supply	10	10	3	6	15	6	19	10
21 Construction	6	3	4	4	4	4	11	9
22 Trade and transport	15	14	15	19	13	17	17	22
23 Services	11	17	16	14	17	14	18	20
Average linkage index a/	0.30	0.31	0.48	0.48	0.33	0.36	0.51	0.52

continued

Table 6 (continued)

	Product or activity	Forward linkage							
		Indonesia	Malaysia	Philippines	Republic of Korea	Singapore	Thailand	Japan	United States
01	Paddy	1	1	1	1	22	1	6	7
02	Other agriculture	6	5	11	13	13	15	20	11
03	Livestock	5	6	5	2	6	8	9	6
04	Forestry	14	4	14	12	5	11	3	9
05	Fishery	15	17	22	21	4	18	14	5
06	Crude petroleum and natural gas	22	23	6	23	23	23	2	1
07	Other mining	6	2	18	6	2	3	1	3
08	Food, beverages and tobacco	21	19	21	20	14	21	21	18
09	Textiles, leather and their products	12	13	19	14	18	13	17	20
10	Lumber and wood products	3	12	3	9	8	10	8	15
11	Pulp, paper and printing	9	9	10	7	12	7	7	10
12	Chemical products	8	10	7	8	10	12	11	12
13	Petroleum and its products	11	8	8	4	21	2	4	8
14	Rubber products	19	22	12	15	3	14	12	14
15	Non-metallic mineral products	2	3	4	3	1	4	5	2
16	Metal products	7	16	2	5	7	5	10	4
17	Machinery	13	20	20	17	15	9	19	17
18	Transport equipment	18	14	17	18	17	17	18	23
19	Other manufacturing products	10	15	16	19	16	20	3	16
20	Electricity, gas and water supply	4	7	9	10	19	6	23	13
21	Construction	23	21	23	22	20	22	22	22
22	Trade and transport	17	11	5	11	9	16	16	21
23	Services	20	18	13	16	11	19	15	19
	Average linkage index a/	0.46	0.46	0.39	0.41	0.34	0.48	0.65	0.65

Source: Institute of Developing Economies, International Input-Output Table for ASEAN Countries, 1975 (Tokyo, 1982).

Notes: The 23 categories are ranked from the most (1) to the least (23) significant.
Countries listed alphabetically by economic grouping.

a/ Calculated from the total input-output coefficients given on table 5.

It is particularly interesting to note that both service industries - trade and transport and services - are placed at the end of the rankings in all three types of linkage measurement, implying that the employment generation in the service sector is of a passive nature and responds only to stimulus provided by other sectors of the economy, particularly the manufacturing industries.

Backward linkage is important in identifying key industries with high output and employment potential, because it induces attempts to supply its inputs through additional domestic production, and derived demand may be considered to stimulate decisions and employment to a greater degree than induced supply by forward linkage. The positive role of the textile industry in recent economic development in Hong Kong, the Republic of Korea and Taiwan Province of China, and of the construction industry in the development of Greece, Lebanon and Singapore, should be noted. It must be cautioned, however, that expansion in an industry which has a maximum of inter-industry linkages may fail to galvanize an economy if, as a result of supply bottlenecks, the latter is incapable of responding to the stimulus.

C. Employment generation strategies*

Although the employment absorptive capacity of the manufacturing sector is relatively limited and its real contribution to urban employment gains lies in the stimulus generated through its inter-industry and income-induced demand for services, leading to the multiple expansion of employment in the service sector, it does not follow that there is little scope for increasing employment within the manufacturing sector. On the contrary, a mix of appropriate industrial policies may not only enlarge the absorptive capacity of employment in the manufacturing sector, but also help expand productive employment in the service sector. We shall discuss in the following some of the policy options for improving employment creation in the urban economy.

Before considering certain issues related to employment generation in the urban economy, it must be recognized that the formulation of an industrial strategy may entail a conflict of objectives, particularly a conflict between increasing output and increasing employment. For instance, given capital as the scarce factor of production and unskilled labour as an abundant factor, there may be a dilemma in choosing between employment gains and accelerated output growth, since the most labour-intensive techniques of production expressed as the maximum labour-capital ratio is not necessarily consistent with maximizing output per unit of capital expressed as the maximum output-capital ratio. It seems likely that, at least at higher wage-income levels, labour-intensive techniques of production using an abundant supply of unskilled labour may be generally less efficient than capital-intensive techniques. The problem may be further complicated by the fact that the labour-intensive technology may generate more

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*This section draws partly on Morawetz [1].

jobs only in terms of the direct employment effect of the manufacturing activities, but it remains uncertain whether more capital-intensive techniques might call forth a greater amount of service employment, whereas labour-intensive techniques might have a much weaker service employment impact. There has been conflicting empirical evidence on this question. As mentioned earlier, Stewart and Streeten [6] have shown that a modest initial employment gain associated with the capital-intensive techniques of production may be ensured by substantially larger employment gains later. On the other hand, our cross-section sectoral multiplier analysis in section B suggests that the light manufacturing industries, such as textiles, leather, wood products, food and beverages and construction, tend to have a larger total multiplier effect than most basic industries. However, since these multipliers were measured in terms of output and not of employment, and the capital intensity of each industry was not known, the evidence presented might be inconclusive or at least should be interpreted with great caution. The question of the relative impact of capital-intensive as compared with labour-intensive technology on service sector employment would therefore warrant further in-depth investigation.

The issue of a conflict between increasing output and expanding employment leads to another type of conflict, namely the intergenerational conflict. Morawetz [1] and Stewart and Streeten [6] have noted that capital-intensive techniques of production may yield more output and less employment today, but generate more employment than labour-intensive techniques later. This may be true if capital-intensive techniques are more conducive to higher aggregate savings and investment or rapid technological change than labour-intensive types. Hence there would arise an intergenerational conflict or equity issue of whether more employment should be generated now at the expense of future gains or vice versa.

The whole controversy surrounding capital-intensive as opposed to labour-intensive technology might be somewhat misplaced. Capital is not the only scarce factor of production. Some resource-rich developing countries, particularly surplus oil-exporting countries, have no such capital constraint to development. In many cases, management talents and skilled manpower may prove to be a far more critically binding constraint than capital. Hirschman [14] argued that skilled labour and managerial personnel are the most scarce factors of production to economize, but he further stressed that given a shortage of such resources, a capital-intensive technology would enable industry to economize these scarce factors. The productivity question should therefore be extended beyond simple output-capital ratios and examined within the context of total scarcity factors, as pointed out by Morawetz [1].

We shall examine below some of the potentially effective ways to facilitate the creation of productive urban employment, including the role of the service sector.

Correct factor pricing

As discussed earlier and extensively treated in the literature, factor price distortions would undoubtedly contribute to the adoption of capital-intensive techniques of production and low absorption of labour in the manufacturing sector, resulting in severe strains being placed on the service sector to absorb those who could not find productive employment in industry, often in the form of disguised unemployment. Such factor price distortions include artificially high industrial wage rates set above their scarcity values and propped up by social legislation and fringe benefits, various forms of subsidy to capital formation, overvalued exchange rates and differential favoured treatment of imports of capital goods and intermediate goods. However, the available range of techniques in the manufacturing sector is often not wide enough to increase labour use significantly by substituting labour for capital. Policy measures to reduce the extent of factor market distortions would undoubtedly improve the employment absorptive capacity of the manufacturing sector. In this context, Witte [15] has provided empirical evidence to show that in Mexico and Peru during the period 1945-1965 distorted factor prices which made it profitable for firms to adopt capital-intensive techniques of production largely explain the failure of manufacturing industry to generate substantial job opportunities, despite the rapid growth of manufacturing output.

Appropriate technologies and appropriate product mixes

Industrial policies designed to encourage the adoption of appropriate production technology and processes, and output mixes which intensively use relatively abundant factors, particularly unskilled labour, would have significant macro-economic employment implications, apart from the complex issues related to technology transfer and the development of indigenous capacity to generate appropriate technology. However, the extent to which such employment gains would materialize is limited by the elasticity of factor substitution and the range of factor substitutability, both of which tend to be fairly narrowly circumscribed in developing countries. Even if it is possible to produce goods using the most abundant factor of production, the question still remains whether the goods produced in the appropriate factor proportions are also in line with consumer preferences.

Redistribution of income

Since the composition of output at the macro-economic level is, to a large extent, determined by the structure of final demand, redistribution of income in favour of the poor may have employment implications resulting from a change in the product mix induced by such a redistributive measure. The consumption pattern of the rich is likely to be considerably different from that of the poor, and hence the redistribution of income may result in a new product mix using more labour-intensive techniques of production and generating more employment for a given stock of scarce factors of production. The real issue is not the existence of potential employment gains

resulting from income redistribution, but their quantitative significance. In this regard, Morawetz ([1], p. 506) cited the almost unanimous conclusion of a number of empirical investigations on this question, to the effect that "even quite significant redistributions of income seem likely to have only marginal effects on growth and employment, usually increasing the latter by less than 5 per cent". Moreover, such a redistribution scheme may increase the demand for food and other agricultural products in the light of the well-known income-consumption relationships established by Engel. A decrease in the demand for services may therefore follow, with negative effects on employment generation in the service sector. Further empirical investigation of this matter is necessary.

Small-scale versus large-scale production

Little is known about the relative importance of small-scale as opposed to large-scale firms in developing countries in terms of their size and share in total output and income and above all their employment growth implications. A majority of small firms are usually found in the informal sector, for which statistics are notoriously scarce and incomplete.* But fragmentary evidence seems to suggest that small firms tend to be very important in employment generation. For instance, table 9 in the annex shows that the informal sector constituted 20 per cent of the total urban labour force employing 34,400 persons in the city of Colombo, Sri Lanka in 1976-1977. Furthermore, table 10 in the annex shows the concentration of informal sector employment in the trade and commerce sector with over 56.6 per cent of total enterprises, followed by services with 21.68 per cent and the manufacturing and processing sector with 12.35 per cent of aggregated enterprises. A sectoral distribution of the labour force in the informal sector correspondingly reflects a higher labour-absorption capacity for the trade and commerce sectors. Likewise, table 11 in the annex shows a sectoral division between the formal and informal sector in Pakistan, 1972-1973, with the informal sector accounting for the overwhelming proportion of total sectoral employment in agriculture (100 per cent), commerce and trade (99 per cent), construction (80 per cent), transport (62 per cent) and finance and insurance (68 per cent). In contast, informal sector employment accounted for only 35 per cent of total manufacturing employment, with the remainder in the formal sector. However, in Ghana in 1970, as shown in annex table 12, the informal sector accounted for 86 per cent of total manufacturing employment, while 66 per cent of total employment in construction was found in the formal sector, and 92 per cent of total employment in commerce was in the informal sector. The above selected examples show that no systematic or predictable patterns of sectoral distribution of informal sector employment can be observed, although their quantitative importance in the aggregate

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*See UNIDO [16] for a systematic compilation of empirical estimates of industrial and manufacturing activities in the informal sector in developing countries.

is quite significant. Admittedly, some of this irregularity is due to ambiguity in the definition of the informal sector and the different classification systems adopted.

Apart from the order of magnitudes concerning employment in small-scale industry, an important question remains to be answered with regard to the differential employment impact of small-scale and large-scale industry. Empirical evidence on this point is rather scanty. Meller and Marfán [8] analysed the employment impact of small and large firms, using the 1962 Chilean input-output table (74 x 74, with 20 manufacturing industries). One of their major findings confirms our earlier conclusion that there is little correlation between direct and total employment effects. In particular, industry rankings by relative labour-intensity change when total employment effects rather than direct employment effects alone are considered. Moreover, large industry tends to generate greater employment multiplier effects than small industry, the average employment multiplier for large industry being 1.9, and for small industry, 1.3. However, small industry always has greater labour requirements than large industry.

If small firms tend to use more labour-intensive techniques of production than large firms, then another important policy question could be raised. Should small firms be encouraged at the expense of large enterprises to generate more employment? Obviously, when total rather direct employment impact is considered, the answer is in the negative. Further, Morawetz [1] has raised another interesting point that small firms tend to produce low-quality products mainly catering to the poor. It may therefore be necessary to carry out radical redistributions of income to generate and sustain demand. On the whole, the comparative assessment of the benefits of promoting small-scale or large-scale industry for employment generation in the urban economy must await more solid empirical evidence, the evidence accumulated thus far appearing insufficient and inconclusive.

Finally, it should be noted that there are many other issues which may have important employment implications. Such issues include capacity utilization, technology transfer and industrial development strategies (for example, import substitution as opposed to export-led industrialization). These issues are obviously beyond the scope of this paper.

D. Concluding remarks

The employment absorptive capacity of the urban industrial sector in developing countries has been thus far seriously underestimated by most investigators, since only the direct employment effects of urban industrial activities have been taken into account in assessing the absorptive capacity. There is undoubtedly considerable scope for improving the employment-generating capacity of the manufacturing sector by formulating and implementing more rational industrial policies, such as removing some of the factor price distortions and adopting techniques of production which would entail the maximum use of an abundant supply of unskilled labour. But what is equally, if not more, important for urban employment

creation is the catalytic role that industry could play in expanding legitimate employment opportunities in the service sector through inter-industry demand for service inputs and income-induced demand for various types of services. It is on this indirect rather than direct employment impact of the urban industrial sector that a strategy of urban employment growth must be focused.

Furthermore, it is equally important to recognize that the sustained growth of the service sector in terms of both output and employment would not be possible without the concomitant development of industry, since the service sector of the economy critically depends on manufactured inputs for a significant portion of its total input requirements, exceeding 40 per cent in most cases. By contrast, the manufacturing sector generally needs to obtain a relatively small percentage of its total inputs from trade and transport and services, but this small share may represent a significant fraction of total intermediate input sales of the selling sector and hence be critically important for sustaining output and employment of the individual service subsector in question. Empirical evidence to support the asymmetrical dependence relationship between the manufacturing sector and the service sector of the economy has been amply cited in this article. In essence, industrialization is vital to the growth of an urban economy, since manufacturing constitutes the core of the supply-creating networks of interrelated sectors in such an economy. Manufacturing industries not only supply a wide range of final goods to the user sectors, but more importantly produce a whole host of intermediate and capital goods essential to the growth of output and employment of the linked sectors, including services.

In short, rapid industrialization which makes possible speedy increases in per capita incomes may be consistent with the objective of maximizing employment creation in the long term, even if this implies the adoption of capital-intensive factor proportions. The resulting higher per capita incomes are likely to generate substantially increased demand for highly specialized services along with the growing demand for complementary services required by the rapidly expanding industrial sector. Thus, a high growth strategy through rapid industrialization might lead to high rates of economic growth, while surplus labour might be effectively absorbed by rapidly increasing employment opportunities in both the service sector as well as industry.

However, the gravity of urban employment problems exacerbated by the accelerating rural-urban migration cannot be ignored in the short term, since a growing reserve army of the unemployed and the consequent spread of poverty would pose serious threats to the stability of the political, social and economic systems of developing countries. A two-pronged assault on the urban employment problem may therefore be called for. On one front, rational urban policies should be designed and implemented to meet the basic needs of the poor, to ensure the adequate provision of urban services and to allocate sufficient resources to revitalize and rationalize the informal sector of the urban economy absorbing those who could not find productive employment in the industrial sector. On the other front, it is essential to launch simultaneously a long-term

strategy of industrial development which would ultimately increase the proportion of legitimately demanded and highly remunerative service employment and reduce the extent of disguised unemployment and most unproductive employment in the informal sector of the urban economy.

Finally, unlike other intersectoral studies, such as that dealing with the agriculture-industry linkage, relatively little is known about the industry-service interdependence. It is therefore essential to undertake more in-depth research, both theoretical and empirical, on the nature and extent of mutually supportive relationships between industry and services, using an empirically sound analytical framework with strong theoretical foundations, and developing the detailed and disaggregated data base necessary to support such an undertaking.

Notes

1/ D. Morawetz, "Employment implications of industrialization in developing countries: a survey", Economic Journal, vol. 84, September 1974, p. 491.

2/ S. Kuznets, Modern Economic Growth: Rate, Structure, and Spread (New Haven, Yale University Press, 1966).

3/ L. Squire, Employment Policy in Developing Countries (London, Oxford University Press, 1981).

4/ W. Baer and L. Samuelson, "Toward a service-oriented growth strategy", World Development, vol. 19, 1981, p. 499.

5/ A. Berry, "A positive interpretation of the expansion of urban services in Latin America, with some Colombian evidence", Journal of Development Studies, vol. 14, 1978, p. 210.

6/ F. Stewart and P. Streeten, "Conflicts between output and employment objectives in developing countries", Oxford Economic Papers, vol. 23, 1971, p. 145.

7/ W. Galenson, "Economic development and sectoral expansion of employment", International Labour Review, June 1963, p. 362.

8/ M. Marfán and P. Meller, "Small and large industry: employment generation, linkages, and key sectors", Economic Development and Cultural Change, vol. 29, 1980, p. 263.

9/ J. Friedmann and F. Sullivan, "The absorption of labour in the urban economy: the case of developing countries", Economic Development and Cultural Change, vol. 22, April 1974, p. 385.

10/ The Institute of Developing Economies, International Input-Output Table for ASEAN Countries, 1975 (Tokyo, 1982).

11/ A. T. Udall, "The effects of rapid increases in labour supply on service employment in developing countries", Economic Development and Cultural Change, vol. 24, July 1976, p. 765.

12/ Y. Sabolo, The Service Industries (Geneva, International Labour Office, 1975).

13/ S. Kuznets, Modern Economic Growth of Nations (Cambridge, Harvard University Press, 1971).

14/ A. O. Hirschman, The Strategy of Economic Development (New Haven, Yale University Press, 1958).

15/ A. D. Witte, "Employment in the manufacturing sector of developing economies: a study of Mexico and Peru", Journal of Development Studies, vol. 10, October 1973, p. 33.

16/ "A survey of empirical studies in industrial and manufacturing activities in the informal sector in the developing countries" (UNIDO/IS.470, 1984).

Annex

STATISTICAL DATA

Table 7. Growth of value added and employment in manufacturing industries, 1970-1980 a/

ISIC code	Manufacturing industries	Argentina			
		Value added (thousands of 1975 dollars)		Employment (thousands of persons)	
		1970	1980	1970	1980
311	Food products	1 680 579	1 873 749 (1.1)	243 174	241 795 (-0.1)
313	Beverages	174 632	241 960 (3.3)	49 988	58 436 (1.6)
314	Tobacco	44 198	56 252 (2.4)	9 453	8 583 (-1.0)
321	Textiles	1 699 896	1 603 311 (0.6)	147 788	89 192 (-4.9)
322	Wearing apparel	397 840	353 083 (-1.2)	61 228	39 805 (-4.2)
323	Leather and leather products	128 544	120 510 (-0.6)	15 839	18 719 (1.7)
324	Footwear	205 020	97 920 (-7.1)	34 629	18 600 (-6.0)
331	Wood products	180 944	168 320 (-0.7)	56 046	52 154 (-0.7)
332	Furniture and fixtures	137 917	162 019 (1.6)	39 887	25 520 (-4.4)
341	Paper and paper products	412 759	427 678 (0.4)	26 982	27 201 (0.1)
342	Printing and publishing	399 330	390 150 (-0.2)	45 635	34 216 (-2.8)
351	Industry chemicals	692 153	907 889 (2.8)	25 484	24 451 (-0.4)
352	Other chemical products	1 032 840	1 305 395 (2.4)	68 071	60 275 (-1.2)
353	Petroleum refinery	522 165	626 598 (1.8)	9 322	10 134 (0.8)
354	Petroleum, coal and products	252 516	227 647 (-1.0)	4 205	3 410 (-2.1)
355	Rubber products	335 070	500 310 (4.1)	19 206	24 037 (2.3)
356	Plastic products	193 908	266 002 (3.2)	14 436	21 558 (4.1)
361	Pottery, china etc.	69 615	65 790 (-0.6)	8 080	7 717 (-0.5)
362	Glass and glass products	144 564	153 169 (0.6)	16 309	14 540 (-1.1)
369	Non-metal products	555 456	656 448 (1.7)	81 890	70 112 (-1.5)
371	Iron and steel	1 085 578	1 956 565 (6.1)	55 056	62 005 (1.2)
372	Non-ferrous metals	273 168	380 484 (3.4)	10 618	13 390 (2.3)
381	Metal products	1 223 868	1 502 724 (2.1)	115 703	105 908 (-0.9)
382	Machinery not elsewhere classified	977 760	1 371 580 (3.4)	82 015	58 633 (-3.3)
383	Electrical machinery	774 603	736 351 (-0.5)	65 175	46 715 (-3.3)
384	Transport equipment	2 419 023	3 459 463 (3.6)	140 359	142 828 (0.2)
385	Professional goods	73 440	123 930 (5.4)	8 040	7 711 (-0.4)
390	Other industries	81 260	94 644 (1.5)	20 417	18 000 (-1.3)

continued

Table 7 (continued)

ISIC code	Manufacturing industries	Brazil			
		Value added (thousands of 1975 dollars)		Employment (thousands of persons)	
		1970	1980	1970	1980
311	Food products	2 923 200	5 440 400 (6.4)	372 000	521 000 (3.4)
313	Beverages	183 446	359 455 (7.0)	59 000	57 000 (-0.3)
314	Tobacco	126 480	234 360 (6.4)	15 000	28 000 (6.4)
321	Textiles	1 837 212	2 967 804 (4.9)	343 000	361 000 (0.5)
322	Wearing apparel	386 802	619 875 (4.8)	111 000	262 000 (9.0)
323	Leather and leather products	120 900	193 750 (4.8)	26 000	38 000 (3.9)
324	Footwear	241 722	387 375 (4.8)	54 000	126 000 (8.8)
331	Wood products	507 654	1 007 250 (7.1)	136 000	184 000 (3.1)
332	Furniture and fixtures	490 896	..	105 000	128 000 (2.0)
341	Paper and paper products	496 531	942 851 (6.6)	67 000	108 000 (4.9)
342	Printing and publishing	838 032	709 104 (-1.7)	97 000	135 000 (3.4)
351	Industry chemicals	325 416	1 495 364 (16.5)	62 000	94 128 (4.3)
352	Other chemical products	1 002 295	4 397 825 (15.9)	50 000	74 000 (4.0)
353	Petroleum refinery	653 619	1 376 040 (7.7)	28 000	49 608 (5.9)
354	Petroleum, coal and products	99 200	234 360 (9.0)	14 000	15 264 (0.9)
355	Rubber products	353 280	800 768 (8.5)	33 000	56 000 (5.4)
356	Plastic products	334 740	758 744 (8.5)	43 000	112 000 (10.0)
361	Polltery, china etc.	269 642	669 456 (9.5)	14 694	19 034 (2.6)
362	Glass and glass products	216 930	604 305 (10.8)	34 839	45 129 (2.6)
369	Non-metal products	664 785	1 909 746 (11.1)	187 467	242 837 (2.6)
371	Iron and steel	1 097 105	3 198 340 (11.3)	35 244	68 112 (6.8)
372	Non-ferrous metals	190 916	646 511 (13.0)	13 617	26 316 (6.8)
381	Metal products	781 011	2 082 696 (10.3)	218 139	421 572 (6.8)
382	Machinery not elsewhere classified	893 816	4 564 846 (17.7)	180 000	529 000 (11.4)
383	Electrical machinery	1 432 795	3 207 750 (8.4)	115 000	259 000 (8.5)
384	Transport equipment	1 545 893	4 601 728 (11.5)	158 000	281 000 (5.9)
385	Professional goods	74 400	..	16 000	46 833 (11.3)
390	Other industries	238 032	..	47 000	186 167 (14.8)

continued

Table 7 (continued)

ISIC code	Manufacturing industries	Kenya			
		Value added (thousands of 1975 dollars)		Employment (thousands of persons)	
		1970	1980	1970	1980
311	Food products	62 480	125 840 (7.3)	11 945	32 105 (10.4)
313	Beverages	18 179	51 450 (10.9)	2 465	4 066 (5.1)
314	Tobacco	3 220	5 934 (6.3)	871	875 (0.04)
321	Textiles	10 557	32 085 (11.8)	7 688	17 395 (8.5)
322	Wearing apparel	11 495	25 745 (8.4)	2 184	3 453 (4.7)
323	Leather and leather products	1 296	4 455 (13.1)	485	1 450 (11.6)
324	Footwear	2 133	4 455 (7.6)	851	2 085 (9.4)
331	Wood products	5 796	10 752 (6.4)	5 019	8 178 (5.0)
332	Furniture and fixtures	3 780	3 339 (-1.2)	876	1 827 (7.6)
341	Paper and paper products	12 852	48 195 (14.1)	1 031	2 958 (11.1)
342	Printing and publishing	3 448	30 208 (13.6)	2 471	2 797 (1.2)
351	Industry chemicals	11 926	21 976 (6.3)	1 193	2 491 (7.6)
352	Other chemical products	19 669	25 194 (2.5)	1 621	4 513 (10.8)
353	Petroleum refinery	11 781	24 327 (7.5)	257	340 (2.8)
354	Petroleum, coal and products	..	..	..	..
355	Rubber products	3 990	16 815 (15.5)	505	1 646 (12.5)
356	Plastic products	1 715	11 564 (21.0)	634	1 711 (10.4)
361	Polltery, china etc.	225	699 (12.0)	95	143 (4.2)
362	Glass and glass products	1 650	5 126 (12.0)	480	924 (6.8)
369	Non-metal products	20 696	23 084 (1.1)	1 822	4 773 (10.1)
371	Iron and steel	1 330	..	..	1 719
372	Non-ferrous metals	..	..	..	..
381	Metal products	17 010	44 955 (10.2)	4 087	9 215 (8.5)
382	Machinery not elsewhere classified	5 250	3 150 (-4.9)	565	845 (4.1)
383	Electrical machinery	9 452	25 020 (10.2)	3 645	5 563 (4.3)
384	Transport equipment	26 036	199 515 (22.6)	14 051	17 537 (2.2)
385	Professional goods	..	..	..	318
390	Other industries	3 536	8 736 (9.5)	556	344 (-4.7)

continued

Table 7 (continued)

ISIC code	Manufacturing industries	Republic of Korea: Value added (thousands of 1975 dollars) 1970	Value added (thousands of 1975 dollars) 1980	Employment (thousands of persons) 1970	Employment (thousands of persons) 1980
311	Food products	190 355	827 179 (15.8)	71 500	103 500 (3.8)
313	Beverages	89 600	337 600 (14.2)	28 300	16 200 (-5.4)
314	Tobacco	145 800	376 650 (9.9)	11 000	11 500 (0.4)
321	Textiles	289 370	1 523 000 (18.1)	203 900	343 200 (5.3)
322	Wearing apparel	30 900	397 580 (29.0)	48 700	166 100 (13.1)
323	Leather and leather products	1 404	115 830 (55.5)	3 300	16 800 (17.7)
324	Footwear	3 887	31 603 (23.3)	4 100	19 200 (16.7)
331	Wood products	73 836	132 436 (6.0)	34 900	36 700 (0.5)
332	Furniture and fixtures	11 036	29 884 (10.5)	8 000	16 000 (7.2)
341	Paper and paper products	38 048	202 304 (18.2)	18 400	37 700 (7.4)
342	Printing and publishing	72 306	177 057 (9.4)	28 900	28 100 (-0.3)
351	Industry chemicals	135 813	551 241 (15.0)	23 200	30 000 (2.6)
352	Other chemical products	104 208	523 211 (17.5)	25 800	33 800 (2.7)
353	Petroleum refinery	104 346	241 893 (8.8)	3 200	3 000 (-0.6)
354	Petroleum, coal and products	25 164	106 248 (15.5)	11 800	7 400 (-4.6)
355	Rubber products	48 384	314 496 (20.6)	27 100	95 700 (13.4)
356	Plastic products	23 912	98 210 (15.2)	8 800	37 600 (15.6)
361	Polltery, china etc.	10 108	27 816 (10.7)	6 500	14 700 (8.5)
362	Glass and glass products	29 640	83 904 (10.9)	8 700	15 400 (5.9)
369	Non-metal products	117 920	383 776 (12.5)	32 500	45 900 (3.5)
371	Iron and steel	44 400	575 350 (29.2)	26 400	56 000 (7.8)
372	Non-ferrous metals	14 508	132 060 (24.7)	4 800	16 200 (12.9)
381	Metal products	26 592	304 700 (27.6)	33 700	70 900 (7.7)
382	Machinery not elsewhere classified	35 190	197 685 (18.8)	25 400	62 400 (9.4)
383	Electrical machinery	46 564	1 021 082 (36.2)	38 900	174 400 (16.2)
384	Transport equipment	33 570	374 865 (27.3)	36 200	87 000 (9.2)
385	Professional goods	9 477	104 949 (27.2)	5 500	65 500 (28.1)
390	Other industries	48 048	119 196 (9.5)	47 600	60 600 (2.4)

continued

Table 7 (continued)

ISIC code	Manufacturing industries	Singapore			
		Value added (thousands of 1975 dollars)		Employment (thousands of persons)	
		1970	1980	1970	1980
311	Food products	64 092	87 612 (3.2)	8 690	9 720 (1.1)
313	Beverages	15 566	27 874 (5.9)	2 330	2 650 (1.3)
314	Tobacco	9 632	10 752 (1.1)	1 040	1 270 (2.0)
321	Textiles	18 000	36 300 (7.3)	7 030	9 670 (3.2)
322	Wearing apparel	15 824	43 000 (10.5)	9 710	26 850 (10.7)
323	Leather and leather products	1 905	1 365 (-3.3)	670	1 200 (6.0)
324	Footwear	4 920	2 501 (-6.5)	1 950	1 460 (-2.9)
331	Wood products	23 587	19 007 (-2.1)	8 970	10 260 (1.4)
332	Furniture and fixtures	7 110	18 644 (10.1)	1 740	6 050 (13.3)
341	Paper and paper products	5 328	19 092 (13.6)	2 470	4 250 (5.6)
342	Printing and publishing	44 528	90 068 (7.3)	6 780	11 860 (5.8)
351	Industry chemicals	7 852	25 066 (12.3)	810	2 140 (10.2)
352	Other chemical products	15 878	80 791 (17.7)	3 020	4 270 (3.5)
353	Petroleum refinery	231 441	325 815 (3.5)	2 200	3 340 (4.3)
354	Petroleum, coal and products	..	..	..	..
355	Rubber products	22 288	25 074 (1.2)	6 450	4 050 (-4.5)
356	Plastic products	4 428	18 204 (15.2)	2 130	9 150 (15.7)
361	Polltery, china etc.	850	755 (-1.2)	920	160 (-16.0)
362	Glass and glass products	5 950	5 285 (-1.2)	860	790 (-0.8)
369	Non-metal products	27 268	49 323 (6.1)	3 020	3 680 (1.9)
371	Iron and steel	13 923	33 592 (9.2)	1 060	1 860 (5.8)
372	Non-ferrous metals	6 510	7 308 (1.2)	410	460 (1.2)
381	Metal products	59 490	85 930 (3.7)	8 550	17 470 (7.4)
382	Machinery not elsewhere classified	29 727	201 483 (21.0)	3 700	20 100 (18.4)
383	Electrical machinery	57 784	652 400 (27.4)	13 560	87 620 (20.5)
384	Transport equipment	100 980	374 085 (13.9)	16 120	27 280 (5.4)
385	Professional goods	18 872	44 147 (8.9)	880	10 450 (28.1)
390	Other industries	9 240	21 615 (8.9)	7 940	7 040 (-1.2)

continued

Table 7 (continued)

ISIC code	Manufacturing industries	Tunisia			
		Value added (thousands of 1975 dollars)		Employment (thousands of persons)	
		1970	1980	1970	1980
311	Food products	43 680	76 752 (5.8)	9 822	14 434 (3.9)
313	Beverages	14 690	27 798 (6.6)	1 831	3 300 (6.1)
314	Tobacco	9 144	16 383 (6.0)	945	2 749 (11.3)
321	Textiles	29 666	39 120 (2.8)	7 049	10 377 (3.9)
322	Wearing apparel	12 744	72 452 (18.9)	6 082	23 940 (14.7)
323	Leather and leather products	4 836	4 732 (-0.2)	632	1 287 (7.4)
324	Footwear	9 312	8 245 (-1.2)	1 771	3 909 (8.2)
331	Wood products	9 840	8 880 (-1.0)	1 993	2 950 (3.9)
332	Furniture and fixtures	3 780	8 370 (8.3)	1 053	2 646 (9.6)
341	Paper and paper products	11 466	18 081 (4.7)	1 574	2 395 (4.3)
342	Printing and publishing	9 776	..	1 994	2 775 (3.4)
351	Industry chemicals	20 650	43 750 (7.8)	4 840	9 399 (6.9)
352	Other chemical products	27 670	57 794 (7.6)	..	..
353	Petroleum refinery	7 780	12 054 (4.6)	360	389 (0.8)
354	Petroleum, coal and products	..	..	..	..
355	Rubber products	3 375	6 885 (7.4)	166	579 (13.3)
356	Plastic products	2 340	.	216	2 104 (25.6)
361	Polltery, china etc.	3 234	6 300 (6.9)	513	1 398 (10.5)
362	Glass and glass products	1 480	4 100 (10.7)	242	1 009 (15.3)
369	Non-metal products	30 213	79 076 (10.1)	6 172	16 022 (10.0)
371	Iron and steel	14 904	24 656 (5.2)	1 702	3 592 (7.8)
372	Non-ferrous metals	1 680	1 600 (-0.5)	607	870 (3.7)
381	Metal products	5 980	18 330 (11.9)	1 544	8 995 (19.3)
382	Machinery not elsewhere classified	294	784 (10.3)	76	328 (15.7)
383	Electrical machinery	5 040	18 360 (13.8)	1 044	4 079 (14.6)
384	Transport equipment	4 658	31 921 (31.2)	1 324	3 793 (11.1)
385	Professional goods	..	..	..	171
390	Other industries	2 900	5 600 (6.8)	798	1 047 (2.8)

continued

Table 7 (continued)

ISIC code	Manufacturing industries	Turkey			
		Value added (thousands of 1975 dollars)		Employment (thousands of persons)	
		1970	1980	1970	1980
311	Food products	416 000	915 200 (8.2)	76 400	120 400 (4.7)
313	Beverages	120 330	380 090 (12.2)	9 900	11 200 (1.2)
314	Tobacco	342 220	506 100 (3.9)	34 700	52 800 (4.3)
321	Textiles	682 950	659 400 (-0.4)	129 400	165 200 (2.5)
322	Wearing apparel	28 470	..	2 300	11 000 (16.9)
323	Leather and leather products	17 892	..	2 600	4 100 (4.7)
324	Footwear	12 690	17 280 (3.1)	2 900	4 600 (4.7)
331	Wood products	66 030	90 880 (3.2)	8 800	13 200 (4.1)
332	Furniture and fixtures	3 335	..	1 300	4 000 (11.9)
341	Paper and paper products	82 423	128 524 (4.5)	12 100	18 000 (4.1)
342	Printing and publishing	9 972	71 466 (21.8)	9 600	10 600 (0.9)
351	Industry chemicals	116 291	534 310 (16.5)	5 800	22 700 (14.6)
352	Other chemical products	143 724	431 172 (11.6)	24 200	18 900 (-2.4)
353	Petroleum refinery	402 732	988 524 (6.4)	1 300	6 700 (17.8)
354	Petroleum, coal and products	53 083	66 232 (2 2)	900	3 300 (13.9)
355	Rubber products	52 244	58 598 (1.2)	8 600	10 200 (1.7)
356	Plastic products	51 832	..	5 600	11 700 (7.6)
361	Polltery, china etc.	36 549	..	4 300	8 600 (7.2)
362	Glass and glass products	43 736	41 272 (-0.6)	6 400	9 000 (3.5)
369	Non-metal products	88 792	179 602 (7.3)	25 800	42 700 (5.2)
371	Iron and steel	392 480	575 340 (3.9)	22 900	53 700 (8.9)
372	Non-ferrous metals	99 700	138 583 (3.3)	8 000	21 300 (10.3)
381	Metal products	212 302	218 608 (0.3)	34 500	39 300 (1.3)
382	Machinery not elsewhere classified	79 352	419 432 (18.1)	20 400	47 300 (8.8)
383	Electrical machinery	102 450	192 606 (6.5)	9 700	29 400 (11.7)
384	Transport equipment	92 014	194 645 (7.8)	29 700	49 400 (5.2)
385	Professional goods	1 590	..	200	1 300 (20.6)
390	Other industries	11 590	..	2 300	3 900 (5.4)

continued

Table 7 (continued)

ISIC code	Manufacturing industries	Yugoslavia			
		Value added (thousands of 1975 dollars)		Employment (thousands of persons)	
		1970	1980	1970	1980
311	Food products	902 120	1 626 190 (6.1)	78 000	181 000 (8.8)
313	Beverages	199 080	480 320 (9.2)	13 000	36 000 (10.7)
314	Tobacco	266 760	442 260 (5.2)	17 000	18 000 (0.6)
321	Textiles	781 710	1 420 290 (6.2)	182 000	224 000 (2.1)
322	Wearing apparel	312 570	566 250 (6.1)	50 000	134 000 (10.4)
323	Leather and leather products	105 000	182 000 (5.7)	15 000	24 000 (4.8)
324	Footwear	147 840	240 000 (4.9)	29 000	64 000 (8.2)
331	Wood products	280 840	549 290 (6.9)	74 000	100 000 (3.1)
332	Furniture and fixtures	316 660	615 480 (6.9)	57 000	91 000 (4.8)
341	Paper and paper products	224 640	458 640 (7.4)	30 000	42 000 (3.4)
342	Printing and publishing	401 700	674 650 (5.3)	52 000	69 000 (2.9)
351	Industry chemicals	289 440	798 640 (10.7)	35 000	40 000 (2.8)
352	Other chemical products	217 830	653 490 (11.6)	28 000	40 000 (3.6)
353	Petroleum refinery	146 000	432 160 (11.5)	13 000	11 000 (-1.7)
354	Petroleum, coal and products	54 810	119 070 (8.1)	5 000	5 000 (0)
355	Rubber products	96 640	249 150 (9.9)	25 000	30 000 (1.8)
356	Plastic products	58 560	209 840 (13.6)	17 000	33 000 (6.9)
361	Polltery, china etc.	38 430	81 740 (7.8)	9 000	15 000 (5.2)
362	Glass and glass products	79 120	178 480 (8.5)	14 000	18 000 (2.5)
369	Non-metal products	323 190	805 410 (9.6)	50 000	88 000 (5.8)
371	Iron and steel	358 380	711 330 (7.1)	42 000	103 000 (9.4)
372	Non-ferrous metals	211 060	422 120 (7.2)	45 000	30 000 (-3.9)
381	Metal products	775 880	1 585 990 (7.4)	78 000	207 000 (10.3)
382	Machinery not elsewhere classified	429 080	946 500 (8.2)	74 000	178 000 (9.2)
383	Electrical machinery	484 800	1 179 680 (9.3)	112 000	151 000 (3.0)
384	Transport equipment	640 520	1 281 040 (7.2)	132 000	147 000 (1.1)
385	Professional goods	67 900	135 800 (7.2)	10 000	10 000 (0)
390	Other industries	29 610	62 980 (7.8)	6 000	11 000 (6.2)

continued

Table 7 (continued)

ISIC code	Manufacturing industries	Zimbabwe			
		Value added (thousands of 1975 dollars)		Employment (thousands of persons)	
		1970	1980	1970	1980
311	Food products	56 867	98 154 (5.6)	15 070	23 971 (4.8)
313	Beverages	29 559	60 621 (7.4)	4 679	6 287 (2.9)
314	Tobacco	20 898	30 186 (3.7)	3 998	6 117 (4.3)
321	Textiles	52 114	83 676 (4.8)	11 124	17 373 (4.6)
322	Wearing apparel	47 040	48 020 (0.2)	12 115	14 624 (1.9)
323	Leather and leather products	1 152	..	245	620 (9.7)
324	Footwear	11 592	24 840 (7.9)	2 942	4 546 (4.4)
331	Wood products	12 978	17 010 (2.7)	4 697	8 678 (6.3)
332	Furniture and fixtures	10 500	16 500 (4.6)	4 462	5 094 (1.3)
341	Paper and paper products	17 168	24 360 (3.6)	1 995	2 469 (2.2)
342	Printing and publishing	28 303	44 330 (4.6)	3 561	5 143 (3.7)
351	Industry chemicals	29 323	45 017 (4.4)	2 140	2 941 (3.2)
352	Other chemical products	32 021	49 159 (4.4)	3 406	3 976 (1.6)
353	Petroleum refinery	142	218 (4.4)	10	16 (2.1)
354	Petroleum, coal and products	2 496	2 392 (-0.4)	13	182 (30.2)
355	Rubber products	12 388	..	1 311	2 259 (5.6)
356	Plastic products	7 200	..	1 429	2 206 (4.4)
361	Polltery, china etc.	639	738 (1.5)	80	391 (17.2)
362	Glass and glass products	1 846	2 132 (1.5)	399	583 (3.9)
369	Non-metal products	25 276	29 192 (1.5)	5 662	6 136 (0.8)
371	Iron and steel	69 662	115 342 (5.2)	6 473	13 255 (7.4)
372	Non-ferrous metals	7 320	12 120 (5.2)	975	1 705 (5.7)
381	Metal products	46 726	77 366 (5.2)	9 905	15 240 (4.4)
382	Machinery not elsewhere classified	19 642	32 522 (5.2)	2 926	4 786 (5.0)
383	Electrical machinery	15 128	25 048 (5.2)	3 499	5 280 (4.2)
384	Transport equipment	28 137	31 188 (1.0)	3 297	4 295 (2.7)
385	Professional goods	576	..	124	179 (3.7)
390	Other industries	6 630	15 198 (8.6)	1 659	2 395 (3.7)

Source: UNIDO data base; information supplied by the Statistical Office of the United Nations Secretariat.

a/ Figures within parentheses indicate average annual growth rates during 1970-1980.

Table 8. Intersectoral dependency ratios for selected countries, 1975

Branch	Ratio a/ by branch						
	01	02	03	04	05	06	07
Indonesia							
01 Agriculture	23.6	0.2	49.5	0.0	4.4	0.8	14.7
02 Mining	0.1	4.9	5.8	0.9	6.7	0.0	0.1
03 Manufacturing	37.6	43.6	29.6	60.3	52.7	44.4	42.9
04 Electricity, water and gas	0.4	14.9	1.5	7.2	0.1	1.1	2.0
05 Construction	6.7	4.2	0.4	10.2	0.4	2.7	10.1
06 Trade and transport	20.5	9.6	11.1	16.4	30.6	19.3	12.2
07 Services	11.0	22.7	2.2	5.0	5.0	31.8	18.0
Total inputs b/	815	265	10 517	188	2 839	1 755	1 936
Gross production c/	9 357	6 410	15 780	397	4 787	7 813	7 333
Ratio of total inputs to gross production	8.71	4.13	66.65	47.36	59.31	22.46	26.40
Malaysia							
01 Agriculture	7.1	0.9	34.5	0.0	0.6	0.1	6.8
02 Mining	0.0	0.0	15.4	0.4	2.4	0.0	1.2
03 Manufacturing	69.7	54.1	36.1	76.5	76.2	44.4	41.2
04 Electricity, water and gas	0.6	0.8	1.4	8.6	0.2	1.2	4.9
05 Construction	3.7	3.0	0.5	0.6	0.0	0.1	5.0
06 Trade and transport	8.5	17.0	9.7	10.7	15.5	13.0	10.2
07 Services	10.4	24.3	2.5	3.1	5.2	41.3	30.9
Total inputs b/	374	47	4 290	74	475	556	555
Gross production c/	1 983	339	6 657	146	661	1 649	3 221
Ratio of total inputs to gross production	18.86	13.86	64.44	50.68	71.86	33.72	17.23

continued

Table 8 (continued)

Branch	Ratio a/ by branch						
	01	02	03	04	05	06	07
Philippines							
01 Agriculture	22.6	1.2	32.9	0.1	1.6	5.0	0.2
02 Mining	0.1	0.2	11.2	0.0	6.1	0.0	0.2
03 Manufacturing	47.7	60.7	34.0	67.6	66.0	38.5	31.2
04 Electricity, water and gas	0.2	5.8	0.5	6.1	0.4	3.9	3.5
05 Construction	1.2	0.1	0.1	0.1	0.6	1.1	2.6
06 Trade and transport	17.3	18.9	18.2	21.8	20.9	18.2	16.5
07 Services	11.0	13.1	3.1	4.3	4.4	33.4	45.9
Total inputs b/	977	145	7 752	201	1 205	1 900	915
Gross production c/	5 252	562	11 290	292	1 813	6 128	4 138
Ratio of total inputs to gross production	18.60	25.80	68.66	68.84	66.46	31.01	22.11
Republic of Korea							
01 Agriculture	28.1	13.4	23.6	0.1	1.1	0.1	1.9
02 Mining	0.5	1.0	9.2	2.6	2.8	0.1	0.3
03 Manufacturing	51.2	38.9	49.7	69.6	69.4	44.4	39.4
04 Electricity, water and gas	0.1	13.3	2.1	2.7	0.2	1.6	3.2
05 Construction	0.4	0.6	0.1	0.3	0.0	0.5	7.1
06 Trade and transport	9.4	16.1	11.5	20.4	19.9	25.4	14.8
07 Services	10.3	16.4	3.9	4.4	6.6	28.0	33.5
Total inputs b/	1 388	134	17 789	659	1 671	1 825	2 141
Gross production c/	5 900	442	23 446	996	2 659	6 235	6 451
Ratio of total inputs to gross production	23.53	30.32	75.87	66.16	62.84	29.27	33.19

continued

Table 8 (continued)

Branch	Ratio a/ by branch						
	01	02	03	04	05	06	07
Singapore							
01 Agriculture	5.1	0.0	4.1	0.0	0.0	5.4	1.7
02 Mining	0.0	0.0	30.6	0.0	0.0	0.0	0.0
03 Manufacturing	71.1	76.3	48.1	71.4	77.0	46.0	50.2
04 Electricity, water and gas	0.1	1.3	0.1	2.4	0.0	0.2	0.5
05 Construction	0.1	0.1	0.1	3.5	0.0	0.3	7.8
06 Trade and transport	17.3	7.2	14.4	10.9	22.6	9.5	10.2
07 Services	6.3	15.2	2.6	11.8	0.4	38.7	29.7
Total inputs b/	236	6	5 583	110	560	1 115	854
Gross production c/	367	13	7 552	182	848	2 300	2 452
Ratio of total inputs to gross production	64.31	46.15	73.92	60.44	66.04	48.48	34.83
Thailand							
01 Agriculture	23.7	2.3	36.2	0.0	1.1	0.1	7.3
02 Mining	0.0	0.0	9.3	0.6	7.6	0.0	0.1
03 Manufacturing	45.8	54.6	37.0	69.0	62.6	50.6	47.2
04 Electricity, water and gas	0.3	0.6	2.0	9.3	0.7	1.5	3.3
05 Construction	1.0	5.1	0.8	0.8	0.1	1.7	5.4
06 Trade and transport	15.1	18.4	11.9	15.5	24.[illegible]	15.6	19.5
07 Services	14.1	18.9	2.9	5.0	4.1	30.4	17.2
Total inputs b/	1 230	52	7 566	211	1 299	1 351	1 489
Gross production c/	5 386	309	11 581	374	2 053	5 367	5 483
Ratio of total inputs to gross production	22.84	16.83	65.33	56.42	63.27	25.17	27.16

continued

Table 8 (continued)

Branch	Ratio a/ by branch						
	01	02	03	04	05	06	07
			Japan				
01 Agriculture	27.2	0.6	9.1	0.0	0.2	0.0	2.9
02 Mining	0.0	0.6	7.9	24.1	3.3	0.0	0.5
03 Manufacturing	45.7	17.5	58.6	38.7	61.2	36.8	29.7
04 Electricity, water and gas	0.6	4.9	2.3	3.6	1.1	2.4	3.2
05 Construction	0.4	0.4	0.1	4.7	0.0	0.5	5.6
06 Trade and transport	12.0	52.2	9.1	8.3	17.9	24.9	15.8
07 Services	14.2	24.0	12.8	20.5	16.3	35.4	42.3
Total inputs b/	18 190	2 507	342 928	11 040	67 898	73 349	124 598
Gross production c/	44 586	5 094	483 513	21 901	14 843	167 282	305 124
Ratio of total inputs to gross production	40.80	49.21	70.92	50.41	59.12	43.85	40.84
			United States				
01 Agriculture	34.2	0.4	9.3	0.0	0.3	0.1	1.1
02 Mining	0.8	16.5	7.4	25.9	2.4	0.5	0.2
03 Manufacturing	34.2	30.5	60.6	14.2	67.9	23.0	26.1
04 Electricity, water and gas	1.3	5.5	2.1	38.7	0.2	4.9	4.2
05 Construction	1.0	6.2	0.6	5.2	0.0	3.3	10.9
06 Trade and transport	9.6	5.5	10.9	3.3	18.0	20.1	7.7
07 Services	18.9	35.3	9.7	12.7	11.2	48.1	49.9
Total inputs b/	79 832	25 310	643 024	47 182	127 954	133 394	339 855
Gross production c/	114 167	58 275	1 018 909	87 781	221 039	393 263	1 020 596
Ratio of total inputs to gross production	69.83	43.43	63.11	53.75	57.89	33.92	33.30

Note: Countries listed alphabetically by economic grouping.

a/ Intermediate input purchases of a given branch as a percentage of its total intermediate input purchases.

b/ Total intermediate input purchases in millions of dollars, excluding freight and insurance, and import duties and taxes.

c/ In millions of dollars.

Table 9. Estimated population and labour statistics for Colombo, Sri Lanka, 1976-1977

Total population	Total number employed	Employment by sector				Number of informal sector units
		Formal	Informal			
			Total	City residents	Commuters to city	
562 426	178 594	144 204	34 390	24 490	9 898	30 058

Source: The Marga Institute, The Informal Sector of Colombo City (Sri Lanka) (Geneva, International Labour Office, 1979).

Table 10. Informal sector units of enterprise in Colombo, Sri Lanka, 1976-1977

Major category of activity	Percentage	Estimated number of units
Trade and commerce	53.61	16 115
Manufacturing and processing	12.35	3 712
Services	21.68	6 517
Transport	8.14	2 448
Agriculture and fishing	2.80	843
Construction	1.41	423
Totals	100	30 058

Source: The Marga Institute, The Informal Sector of Colombo City (Sri Lanka) (Geneva, International Labour Office, 1979).

Table 11. Urban employment distribution by formal and informal sectors a/ in Pakistan, 1972-1973
(Thousands of persons)

Branch	Total employed (1)	Sector		Percentage distribution by sector		Employment as percentage of total
		Formal (2)	Informal (3)	Formal (4)	Informal (5)	(6)
Agriculture	376.90	0 b/	376.9	0	100	9.06
Mining	66.57	15.5	50.93	23.28	76.72	1.60
Manufacturing	759.93	497.1	262.83	65.41	34.59	18.21
Construction	287.03	59.30	227.73	20.65	79.34	6.90
Wholesale and retail trade and hostels etc.	946.92	10.80	936.12	1.15	98.85	22.71
Transport	345.59	133.20	212.39	38.54	61.46	8.29
Finance, insurance and real estate	96.36	31.10	65.26	32.28	67.72	2.31
Community and social services c/	1 211.15	540.20	670.95	44.61	55.39	29.05
Not elsewhere classified	78.15	3.0	75.15	3.84	96.16	1.90
Totals	4 168.60	1 290.2	2 878.29	30.95	69.05	100.00

Sources: Guisinger and Irfan, "Pakistan's informal sector", Journal of Development Studies, vol.16, July 1980.

For column (1), Central Statistical Organization, "Housing, economic and demographic survey 1972" (Karachi, unpublished).

For column (2), Statistical Division, Ministry of Finance, Planning and Development, "Establishment enquiry 1972-1973" (Karachi, undated).

Note: Column (3) = Column (1) - Column (2).

a/ The formal sector pertains to establishments with an employment size of 20 or more workers in non-manufacturing activities and 10 or above in manufacturing.

b/ The establishment enquiry reported 57,000 employees in the formal agriculture sector, but on perusal of the list of establishments for 1973-1974, it was found that formal agriculture consists mostly of government agricultural extension services, hence they are included in community and social services. The rest of agricultural employment is treated as informal.

c/ Electricity, gas and water supply is included in community and social services.

Table 12. Employment distribution by formal and informal sectors in Ghana, 1960-1974
(Thousands of persons)

Branch	1960 Both sectors a/		1970 Both sectors a/		1970 Formal b/		1970 Informal b/		1974 Formal sector
Agriculture	1 581	(61.8)	1 787	(57.2)	49	(2.74)	1 737	(97.2)	
Mining	48	(1.9)	31	(1.0)	25	(80.64)	6	(19.35)	89
Manufacturing	224	(9.1)	380	(12.0)	53	(13.94)	327	(86.05)	60
Construction	89	(3.5)	74	(2.3)	49	(66.21)	25	(33.78)	47
Utilities	14	(0.6)	12	(0.4)	2	(16.66)	-	(83.33)	20
Commerce	371	(14.5)	436	(13.9)	36	(8.26)	100	(91.74)	37
Transport	68	(2.6)	84	(2.7)	33	(39.29)	51	(60.71)	35
Other services	154	(6.0)	329	(10.5)	138	(41.95)	191	(58.05)	181
Total	2 249	(100.0)	3 133	(100.0)	395	(12.61)	2 737	(87.36)	469

Sources: The following Ghanaian Government publications: Five-year Development Plan (Accra, 1977), p. 333; 1970 Census; 1970 Labour Statistics; Economic Survey (Accra, 1977). The figures for the informal sector were derived as residuals by the author.

a/ Figures within parentheses represent percentage share of branch in total for both sectors.

b/ Figures within parentheses represent percentage share of sector in each branch.

A STATISTICAL REVIEW OF THE WORLD INDUSTRIAL SITUATION 1984*

Secretariat of UNIDO

Introduction

The purpose of the present article is to provide the latest available data on the world industrial situation in relation to the recommendations of the Lima Declaration and Plan of Action on Industrial Development and Co-operation, the New Delhi Declaration and Plan of Action on Industrialization of Developing Countries and International Co-operation for their Industrial Development and the International Development Strategy for the Third United Nations Development Decade.

The data provide information on the growth and composition of industrial production and trade. The first section refers to each of the major economic groupings and developing regions, while the second section covers the least developed countries. The statistics were derived from the UNIDO data base, which was developed by the Statistics and Survey Unit of the Division for Industrial Studies and is maintained and updated by that Unit. Primary sources of information include the Statistical Office and the Office of Development Research and Policy Analysis of the United Nations Secretariat, the regional commissions, the World Bank, the Inter- national Monetary Fund and the Organisation for Economic Co- operation and Development.

Because the basic data may reflect different statistical and accounting practices in reporting countries, the statistical programme of the Statistics and Survey Unit is focused on making adjustments in the data to ensure a greater degree of international comparability. The Unit prepares estimates for the latest years available. The recency of the statistics varies, however, according to the amount of detail required and the type of data being considered. The reader should note that several producers of the international statistics used here may revise country data for several preceding years when they update their statistical series. Thus, the figures are based on the latest available data for the entire period shown and may differ slightly from the corresponding estimates published in earlier years. Finally, where figures are stated in constant prices, the calculations were carried out from data expressed in United States dollars at 1975 prices. All growth rates are calculated from information for each year throughout the period indicated, using a semi-log regression over time.

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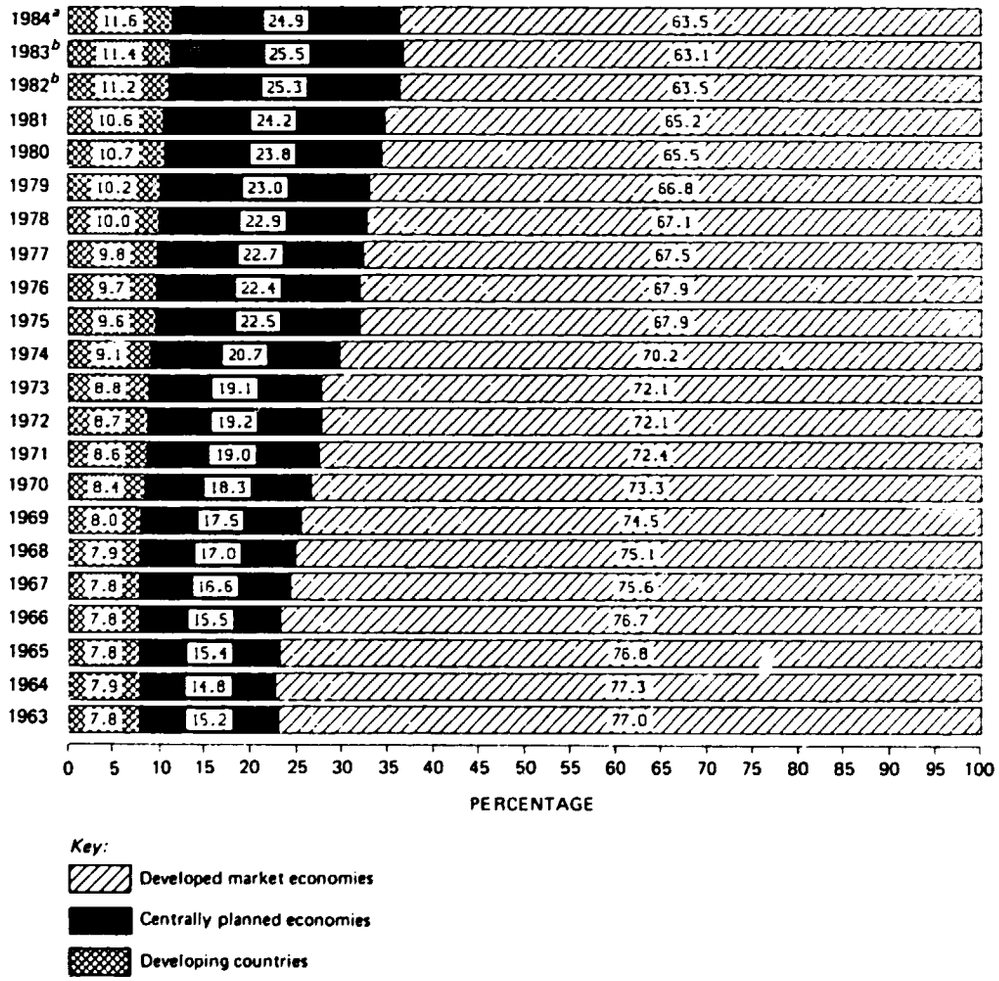
The following classification of economic groupings is used in the text and in most tables, in conformity with the classification adopted by the United Nations Statistical Office: "Developing countries" includes the Caribbean area, Central and South Africa, Africa (other than South Africa), West Asia (other than Israel) and South and East Asia (other than Japan). "Developed market economies" includes North America (Canada and the United States of America), Europe (other than Eastern Europe), Australia, Israel, Japan, New Zealand and South Africa. "Centrally planned economies" includes Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, Romania and the Union of Soviet Socialist Republics. Unless otherwise specified, "world" excludes Albania, China, the Democratic People's Republic of Korea, Mongolia and Viet Nam.

Countries are generally arranged in the order adopted in the Statistical Yearbook. Inclusion of a particular country or area in, or its exclusion from, any economic or geographical grouping has been dictated by considerations of the availability of comparable data in statistics of the United Nations and other international agencies.

STATISTICAL DATA ON GROWTH AND COMPOSITION OF INDUSTRIAL PRODUCTION AND TRADE, BY ECONOMIC GROUPINGS, BY DEVELOPING REGIONS AND BY INCOME GROUPS

Figure I. Share of economic groupings in world manufacturing value added, at constant (1975) prices, 1963-1984



Source: UNIDO data base; information supplied by the Office of Development Research and Policy Analysis and the Statistical Office of the United Nations Secretariat, with estimates by the UNIDO secretariat.

[a]Estimates.

[b]Preliminary figures.

Table 1. Distribution of world manufacturing value added, by economic grouping,[a] at constant (1975) prices, 1979-1982

(Percentage)

Economic grouping	*1979*	*1980*	*1981*	*1982*
Developing countries	9.85	10.27	10.21	10.70
Centrally planned economies	22.15	22.92	23.25	24.26
Developed market economies	64.55	63.08	62.70	60.84
China[b]	3.45	3.73	3.84	4.20
World	100.00	100.00	100.00	100.00

Source: UNIDO data base, information supplied by the Office of Development Research and Policy Analysis and the Statistical Office of the United Nations Secretariat, with estimates by the UNIDO secretariat.

[a]Including China.

[b]Calculations based on the *Statistical Yearbook of China, 1983* and on unpublished information.

Table 2. Share of developing regions[a] in world manufacturing value added, at constant (1975) prices, 1963-1984

(Percentage)[b]

Year	*Africa*	*West Asia*	*South and East Asia*	*Latin America*
1963	0.78	0.47	2.13	4.44
1964	0.79	0.48	2.10	4.55
1965	0.80	0.49	2.08	4.47
1966	0.79	0.51	1.99	4.51
1967	0.76	0.53	2.04	4.50
1968	0.78	0.55	2.05	4.56
1969	0.79	0.56	2.09	4.58
1970	0.84	0.57	2.14	4.81
1971	0.86	0.59	2.19	4.96
1972	0.83	0.59	2.21	5.05
1973	0.83	0.60	2.24	5.08
1974	0.83	0.61	2.34	5.26
1975	0.87	0.67	2.54	5.49
1976	0.86	0.68	2.64	5.49
1977	0.87	0.69	2.75	5.44
1978	0.90	0.72	2.90	5.48
1979	0.93	0.71	2.92	5.64
1980	0.99	0.70	3.05	5.92
1981	1.01	0.70	3.20	5.71
1982[c]	1.04	4.21		5.87
1983[c]	1.02	4.43		5.79
1984[d]	1.01	4.57		5.64

Source: UNIDO data base, information supplied by the Office of Development Research and Policy Analysis and the Statistical Office of the United Nations Secretariat, with estimates by the UNIDO secretariat.

[a]Excluding China.

[b]Regional percentages may not add up to the share of all developing countries in world manufacturing value added shown in figure I, because of gaps in the coverage of developing countries.

[c]Preliminary figures.

[d]Estimates.

Table 3. Growth of manufacturing value added per capita, by economic grouping and by developing region, at constant (1975) prices, 1963-1984

(Percentage)

Year	All developing countries	Least developed countries	Centrally planned economies	Developed market economies	Developing regions			
					Africa	West Asia	South and East Asia	Latin America
				Increase or decrease over previous year				
1964	6.7	4.4	4.3	7.1	6.7	6.6	3.8	7.7
1965	3.7	6.5	10.3	5.3	5.4	7.1	4.1	2.5
1966	3.4	9.6	7.1	5.6	2.6	6.8	0.4	4.7
1967	2.0	4.5	10.4	1.8	1.7	5.9	4.1	1.2
1968	6.6	5.0	9.4	6.1	7.3	9.1	5.6	6.5
1969	6.9	4.6	10.4	6.5	7.6	7.4	8.2	6.0
1970	5.6	-2.9	8.1	1.4	7.9	2.6	3.8	6.3
1971	4.6	-3.9	7.3	2.0	3.4	5.1	4.0	4.8
1972	5.7	-1.7	7.8	6.0	0.6	4.2	6.0	6.5
1973	7.7	15.1	7.7	8.5	6.6	7.6	8.5	7.3
1974	2.8	0.7	9.4	1.6	0.3	0.4	4.1	2.9
1975	1.6	-0.6	5.9	5.8	0.4	4.8	4.3	0.1
1976	6.5	1.5	6.8	7.4	3.0	6.2	10.0	5.4
1977	3.4	2.4	5.8	3.8	3.0	3.8	7.0	1.5
1978	4.1	0.9	4.0	2.6	4.6	5.2	7.3	2.1
1979	3.9	-1.8	3.7	3.1	4.7	0.6	2.9	4.8
1980	2.5	0.4	3.3	-2.4	4.0	3.3	2.6	2.8
1981	-1.9	3.8	1.9	0.1	0.2	2.0	3.6	-5.1
1982[a]	1.2	-2.9	2.0	5.2	1.6		3.9	1.4
1983[a]	3.8	0.6	3.7	2.6	1.0		7.6	0.2
1984[b]	6.9		3.5	7.2	3.0		8.5	1.8
				Average annual growth rate				
1963-1973	5.1	3.3	8.6	4.6	4.5	6.2	4.6	5.1
1973-1984	2.9	0.8[c]	4.2	0.9	2.1	4.9		1.3

Source UNIDO data base information supplied by the Office of Development Research and Policy Analysis, the Statistical Office of the United Nations Secretariat and the Economic Commission for Africa, with estimates by the UNIDO secretariat

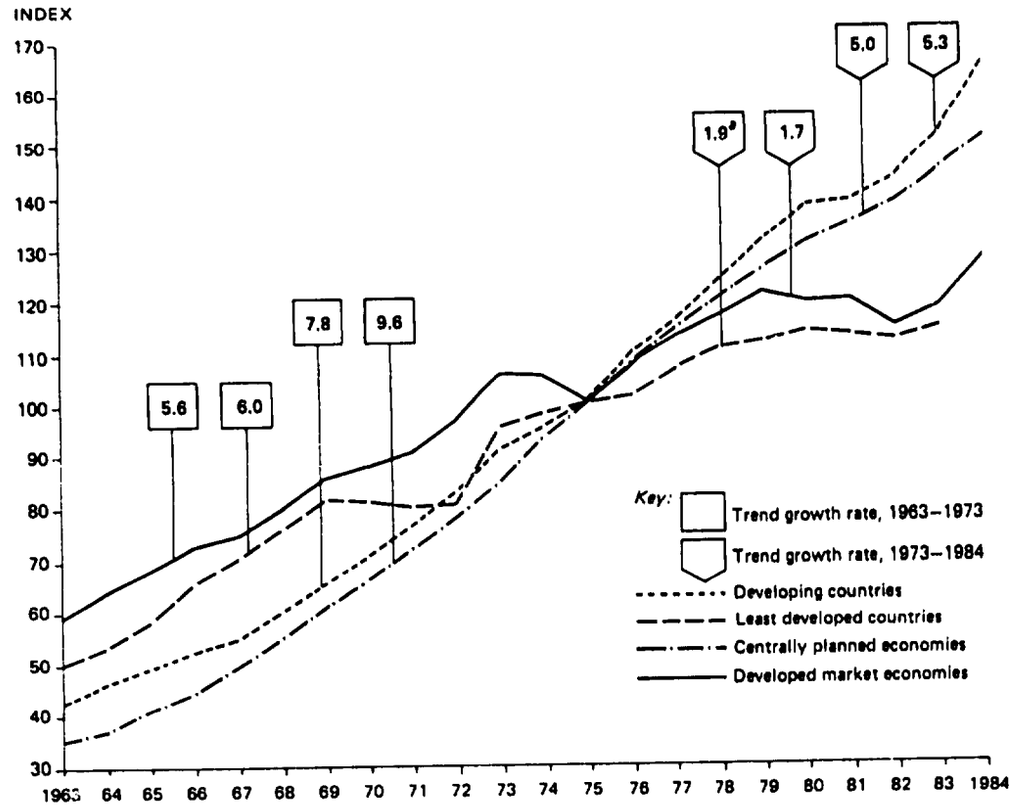
[a]Preliminary figures

[b]Estimates

[c]Figure refers to the period 1973-1983

Figure II. Indices of industrial production in manufacturing, by economic grouping, 1963-1984

(1975 = 100)



Source: UNIDO data base, information supplied by the Office of Development Research and Policy Analysis and the Statistical Office of the United Nations Secretariat, with estimates by the UNIDO secretariat.

[a]Covering the period 1973-1983.

Table 4. Share of economic groupings[a] in world manufacturing value added, at constant (1975) prices, selected industrial branches, 1970, 1975 and 1981

(Percentage)

Branch[b]	ISIC code	Developing countries			Centrally planned economies			Developed market economies		
		1970	1975	1981	1970	1975	1981	1970	1975	1981
Food products	311/2	13.7	13.8	15.7	25.4	27.8	25.9	60.9	58.4	58.4
Beverages	313	12.7	14.5	18.9	21.6	23.7	23.7	65.7	61.8	57.4
Tobacco	314	27.3	29.0	32.8	14.9	16.3	15.6	57.8	54.7	51.6
Textiles	321	17.4	18.8	19.6	26.4	30.7	32.5	56.2	50.5	47.9
Footwear	324	10.0	11.3	12.1	36.5	41.4	45.7	53.5	47.3	42.2
Wood and cork products	331	9.8	11.0	12.9	20.0	23.4	23.5	70.2	65.6	63.6
Paper	341	6.5	7.7	8.4	7.2	9.6	8.8	86.3	82.7	82.8
Printing and publishing	342	6.4	6.9	6.3	5.7	7.3	7.0	87.9	85.8	86.7
Industrial chemicals	351	6.0	7.6	8.1	21.4	28.3	29.2	72.6	64.1	62.7
Other chemicals	352	13.8	17.4	19.2	6.5	8.0	7.4	79.7	74.6	73.4
Petroleum refineries	353	37.4	38.3	42.9	12.1	16.0	15.4	50.5	45.7	41.7
Miscellaneous products of petroleum and coal	354	12.8	11.8	16.1	37.3	41.2	41.9	49.9	47.0	42.0
Rubber products	355	10.9	12.6	13.7	16.5	21.1	22.1	72.6	66.3	64.2
Pottery, china and earthenware	361	12.0	12.9	12.2	27.1	35.4	41.6	60.9	51.7	46.2
Glass	362	8.2	9.8	10.6	19.1	26.1	28.7	72.7	64.1	60.7
Other non-metallic mineral products	369	8.6	10.7	13.6	31.3	36.1	34.6	60.1	53.2	51.8
Iron and steel	371	6.3	8.1	10.6	19.5	23.9	23.8	74.2	68.0	65.6
Metal products, excluding machinery	381[c]	5.9	6.9	6.9	18.7	26.6	31.6	75.4	66.5	61.5
Non-electrical machinery	382[c]	3.0	4.9	4.7	17.6	23.8	26.9	79.4	71.3	68.4
Electrical machinery	383[c]	5.1	6.2	6.2	18.5	25.3	26.6	76.4	68.5	67.2
Transport equipment	384[c]	5.7	7.5	6.9	16.9	23.1	28.1	77.4	69.4	65.0

Source: UNIDO data base; information supplied by the Statistical Office of the United Nations Secretariat, with estimates by the UNIDO secretariat.

[a] Excluding China.

[b] According to the *International Standard Industrial Classification of All Economic Activities*, Statistical Papers, Series M, No. 4, Rev. 2 (United Nations publication, Sales No. E.68.XVII.8).

[c] Shares for branches within ISIC 38 may be somewhat distorted owing to variations in the national reporting practices of several important producers of fabricated metal products, machinery and transport equipment.

Table 5. Share of developing countries[a] and developing regions in world manufacturing value added, at constant (1975) prices, selected industrial branches, 1970 and 1981

(Percentage)

Branch[b]	ISIC code	All developing countries		Developing regions							
				Africa		West Asia		South and East Asia		Latin America	
		1970	1981	1970	1981	1970	1981	1970	1981	1970	1981
Food products	311/2	13.73	15.70	1.88	1.72	0.54	0.79	3.44	4.56	7.87	8.62
Beverages	313	12.71	18.94	1.83	3.10	0.59	1.10	1.86	3.46	8.43	11.28
Tobacco	314	27.25	32.78	2.94	3.49	3.53	4.28	12.12	15.49	8.66	9.52
Textiles	321	17.40	19.58	2.17	c	1.26	1.17	5.89	8.26	8.09	7.88
Footwear	324	10.03	12.05	1.54	1.98	0.45	c	1.79	3.10	6.25	6.29
Wood and cork products	331	9.75	12.90	1.32	1.54	0.42	c	3.58	5.10	4.43	5.79
Paper	341	6.53	8.37	0.67	0.81	0.26	0.37	1.34	2.09	4.27	5.10
Printing and publishing	342	6.39	6.26	0.54	c	(12	0.32	1.34	c	4.39	3.59
Industrial chemicals	351	5.97	8.10	0.34	0.35	0.51	0.85	1.42	2.51	3.70	4.39
Other chemicals	352	13.80	19.22	1.05	1.49	0.43	0.64	3.38	4.32	8.94	12.78
Petroleum refineries	353	37.41	42.90	1.15	2.63	11.84	11.05	11.01	10.97	13.40	18.25
Miscellaneous products of petroleum and coal	354	12.77	16.14	2.27	3.73	0.95	1.09	2.36	c	7.19	8.13
Rubber products	355	10.87	13.74	0.94	c	0.39	c	2.85	4.74	6.68	7.57
Pottery, china and earthenware	361	12.01	12.19	0.55	c	0.79	c	2.53	2.20	8.14	8.87
Glass	362	8.17	10.55	0.52	c	0.54	0.68	1.81	2.98	5.29	6.42
Other non-metallic mineral products	369	8.60	13.63	0.92	1.20	0.49	1.03	2.37	4.50	4.83	6.91
Iron and steel	371	6.29	10.60	0.36	0.48	0.49	0.56	1.29	2.79	4.15	6.77
Metal products, excluding machinery	381[d]	5.94	6.89	0.55	0.66	0.34	c	1.21	1.65	3.83	4.26
Non-electrical machinery	382[d]	2.95	4.65	0.10	c	0.09	0.29	0.71	1.06	2.04	3.16
Electrical machinery	383[d]	5.12	6.24	0.22	0.28	0.13	c	1.20	2.47	3.57	3.29
Transport equipment	384[d]	5.68	6.88	0.26	0.52	0.11	0.17	1.01	1.82	4.30	4.37

Source: UNIDO data base, information supplied by the Statistical Office of the United Nations Secretariat, with estimates by the UNIDO secretariat.

[a] Excluding China.

[b] See table 4, footnote *b*.

[c] Figures not shown separately because the underlying data from which they would have been derived do not meet minimum standards of quality.

[d] Shares for branches within ISIC 38 may be somewhat distorted, owing to variations in the national reporting practices of several important producers of fabricated metal products, machinery and transport equipment.

Table 6. Growth of manufacturing value added, by economic grouping,[a] at constant (1975) prices, selected industrial branches, 1963-1973 and 1973-1981

(Percentage)

Branch[b]	ISIC code	Developing countries		Centrally planned economies		Developed market economies	
		1963-1973	1973-1981	1963-1973	1973-1981	1963-1973	1973-1981
Food products	311/2	5.3	5.0	6.0	2.8	3.5	2.7
Beverages	313	6.0	9.2	5.5	5.1	5.1	2.4
Tobacco	314	4.5	4.7	4.2	3.0	2.4	1.6
Textiles	321	4.1	2.8	6.2	3.7	3.9	-0.1
Wearing apparel	322	3.7	2.9	8.2	5.1	2.8	0.3
Leather and fur products	323	2.2	4.4	4.8	2.9	1.5	0.2
Footwear	324	2.7	1.9	5.6	4.2	0.8	-0.1
Wood and cork products	331	5.7	4.6	5.0	2.3	4.1	-0.2
Furniture and fixtures excluding metal	332	c	c	8.5	6.1	5.8	1.2
Paper	341	7.3	4.9	7.7	3.7	5.5	2.1
Printing and publishing	342	5.6	1.5	8.4	3.7	3.8	2.7
Industrial chemicals	351	12.2	6.9	12.2	6.9	9.0	2.8
Other chemicals	352	9.6	7.9	10.2	5.5	6.8	4.1
Petroleum refineries	353	9.3	4.7	14.6	4.4	6.9	0.5
Miscellaneous products of petroleum and coal	354	8.6	6.5	3.3	3.1	-0.2	-0.1
Rubber products	355	8.1	4.8	8.6	5.0	5.6	1.4
Plastic products	356	c	c	16.9	8.9	15.0	5.3
Pottery, china and earthenware	361	5.5	3.4	8.9	7.1	3.6	0.6
Glass	362	9.8	6.9	9.7	8.1	5.8	3.0
Other non-metallic mineral products	369	8.6	7.5	8.2	3.1	5.2	1.2
Iron and steel	371	7.7	6.9	5.5	2.8	4.7	-0.5
Non-ferrous metals	372	8.1	4.1	9.6	4.9	5.5	1.3
Metal products, excluding machinery	381	7.9	5.5			5.4	1.7
Non-electrical machinery	382	12.1	5.5			5.9	2.8
Electrical machinery	383	11.7	8.2	10.9	8.6	8.3	4.2
Transport equipment	384	9.1	4.0			5.4	1.9
Professional and scientific equipment, photographic and optical goods	385	c	c			6.3	4.6
Other manufactures	390	c	c	11.2	8.6	4.2	1.8

Source: UNIDO data base, information supplied by the Statistical Office of the United Nations Secretariat, with estimates by the UNIDO secretariat.

[a] Excluding China

[b] See table 4, footnote *b*.

[c] Figures not shown separately because the underlying data from which they would have been derived do not meet minimum standards of quality

Table 7. Structure of manufacturing value added, by economic grouping,[a] at constant (1975) prices, 1963, 1973 and 1981

(Percentage)

Branch[b]	ISIC code	Developing countries[c]			Centrally planned economies			Developed market economies		
		1963	1973	1981	1963	1973	1981	1963	1973	1981
Food products	311/2	18.5	14.4	14.1	15.2	11.8	9.2	10.4	8.4	9.0
Beverages	313	3.3	2.8	3.7	2.7	2.0	1.9	2.0	1.9	2.0
Tobacco	314	3.5	2.7	2.8	1.0	0.7	0.5	1.0	0.8	0.8
Textiles	321	13.9	10.5	8.9	6.7	6.9	5.8	5.4	4.5	3.7
Wearing apparel	322	3.7	2.6	2.4	5.4	4.7	4.4	3.5	2.8	2.4
Leather and fur products	323	0.9	0.6	0.6	1.0	0.7	0.6	0.7	0.4	0.4
Footwear	324	1.5	1.0	0.9	2.1	1.5	1.3	1.0	0.6	0.5
Wood and cork products	331	2.6	2.1	2.1	2.7	1.9	1.4	2.4	2.1	1.7
Furniture and fixtures excluding metal	332	1.4	1.1	0.9	1.4	1.4	1.4	2.0	2.1	1.9
Paper	341	2.3	2.5	2.3	1.2	1.1	0.9	3.8	3.8	3.8
Printing and publishing	342	3.0	2.4	1.9	1.0	1.0	0.8	5.1	4.3	4.6
Industrial chemicals	351	2.4	3.7	4.1	3.8	5.4	5.8	3.8	5.3	5.4
Other chemicals	352	4.5	5.8	6.9	0.9	1.1	1.0	3.4	3.8	4.5
Petroleum refineries	353	7.6	9.3	8.7	0.9	1.4	1.2	1.5	1.7	1.5
Miscellaneous products of petroleum and coal	354	0.5	0.7	0.7	1.2	0.8	0.6	0.6	0.3	0.3
Rubber products	355	1.7	1.9	1.8	1.1	1.2	1.1	1.4	1.5	1.4
Plastic products	356	0.9	1.4	1.2	0.3	0.7	0.8	0.9	2.0	2.4
Pottery, china and earthenware	361	0.9	0.7	0.6	0.8	0.8	0.9	0.6	0.5	0.4
Glass	362	0.7	1.0	1.0	0.8	0.9	1.0	0.9	0.9	1.0
Other non-metallic mineral products	369	3.1	3.5	4.2	5.2	5.1	4.1	3.0	3.0	2.7
Iron and steel	371	4.2	4.8	5.4	7.5	5.8	4.5	6.7	6.6	5.4
Non-ferrous metals	372	1.7	1.8	1.7	2.6	2.8	2.6	1.7	1.8	1.6
Metal products, excluding machinery	381	4.0	4.6	4.5				7.2	7.3	6.7
Non-electrical machinery	382	2.7	5.0	5.0				10.4	11.0	12.0
Electrical machinery	383	3.1	4.4	5.5	30.5	37.6	45.1	6.7	8.7	10.1
Transport equipment	384	5.2	6.9	6.4				10.3	10.3	9.8
Professional and scientific equipment, photographic and optical goods	385	0.4	0.4	0.4				1.7	1.9	2.3
Other manufactures	390	1.8	1.4	1.3	2.0	2.7	3.1	1.9	1.7	1.7
Total manufacturing	3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: UNIDO data base; information supplied by the Statistical Office of the United Nations Secretariat, with estimates by the UNIDO secretariat.

[a] Excluding Albania, China, Iceland and Luxembourg.

[b] See table 4, footnote *b*.

[c] The data for 1963 cover 73 countries, which, in 1975, accounted for 97 per cent of the manufacturing value added of all developing countries; the data for 1973 and 1981 cover 64 countries, which, in 1975, accounted for 92 per cent of the manufacturing value added of all developing countries. Therefore, although the structures for all years are probably representative of developing countries as a whole, the variation in country composition should be noted.

Table 8. Share of economic groupings in world manufactured exports,[a] at current prices, 1963-1983

(Percentage)

Year	*Developing countries*	*Centrally planned economies*[b]	*Developed market economies*
1963	4.2	13.3	82.5
1964	4.3	12.8	82.9
1965	4.4	12.3	83.3
1966	4.5	11.6	83.9
1967	4.6	11.7	83.7
1968	4.5	11.0	84.6
1969	4.6	10.4	85.0
1970	5.0	10.0	85.0
1971	5.2	9.6	85.2
1972	5.7	9.9	84.4
1973	6.7	9.4	83.9
1974	6.8	8.5	84.7
1975	6.3	9.3	84.4
1976	7.5	8.9	83.6
1977	7.8	8.9	83.3
1978	8.1	8.7	83.2
1979	8.7	8.4	82.9
1980	9.1	8.1	82.8
1981	10.5	8.0	81.5
1982	10.7	8.7	80.6
1983[c]	10.9	8.8	80.3

Source: United Nations Conference on Trade and Development, *Handbook of International Trade and Development Statistics*, various issues; and *Monthly Bulletin of Statistics*, various issues, with estimates by the UNIDO secretariat.

[a] Codes 5-8 (except 68) of the *Standard International Trade Classification*, Revised (United Nations publication, Sales No. E.68.XVII.6) (SITC, Revised).

[b] Excluding trade among the centrally planned economies of Asia.

[c] Estimates.

Table 9. World trade in manufactures,[a] by origin, destination and economic grouping, at current prices, selected years

Origin of exports	Year	Exports to developing countries		Exports to centrally planned economies[b]		Exports to developed market economies	
		Value (millions of dollars)	Share (percentage)	Value (millions of dollars)	Share (percentage)	Value (millions of dollars)	Share (percentage)
Developing countries	1963	1 404	41.2	102	3.0	1 902	55.8
	1970	3 231	33.7	559	5.8	5 808	60.5
	1975	11 935	37.9	1 172	3.7	18 352	58.3
	1980	37 560	38.1	3 222	3.3	57 764	58.6
	1982	41 520	37.6	3 760	3.4	65 046	59.0
Centrally planned economies[b]	1963	1 635	15.1	8 043	74.3	1 147	10.6
	1970	2 899	15.2	13 381	70.2	2 804	14.7
	1975	6 790	14.6	31 835	68.6	7 756	16.7
	1980	15 784	18.0	54 692	62.3	17 268	19.7
	1982	19 807	21.9	53 651	59.3	17 062	18.8
Developed market economies	1963	16 950	25.7	2 168	3.3	46 470	71.0
	1970	32 462	20.2	6 634	4.1	121 256	75.6
	1975	111 298	26.5	26 518	6.3	282 155	67.2
	1980	233 721	26.0	42 430	4.7	622 646	69.3
	1982	234 088	28.1	36 346	4.4	563 642	67.6

Source: See table 8.

[a] See table 8, footnote a.

[b] Excluding trade among centrally planned economies of Asia.

STATISTICAL DATA ON THE GROWTH AND COMPOSITION OF INDUSTRIAL PRODUCTION AND TRADE OF THE LEAST DEVELOPED COUNTRIES

Table 10. Growth of gross domestic product and manufacturing value added, at constant (1975) prices, least developed countries of Africa, Bangladesh, all least developed countries and other developing countries, 1963-1983

(Percentage)

Year	*Least developed countries of Africa*		*Bangladesh*		*All least developed countries*		*Other developing countries*	
	Gross domestic product	*Manufacturing value added*	*Gross domestic product*	*Manufacturing value added*	*Gross domestic product*	*Manufacturing value added*	*Gross domestic product*	*Manufacturing value added*
	Increase or decrease over previous year							
1964	2.4	9.3	1.8	4.3	2.0	7.0	7.5	9.3
1965	2.0	9.3	2.0	11.2	1.9	9.1	4.8	6.1
1966	3.2	16.4	−2.0	6.8	1.5	12.7	3.7	6.0
1967	2.1	6.5	10.5	14.6	4.2	7.4	4.4	4.6
1968	8.1	10.5	0.8	1.4	5.6	7.8	7.7	9.4
1969	−0.6	8.2	5.2	4.6	1.2	7.3	7.9	9.6
1970	2.5	0.2	−4.9	−14.2	0.4	−0.5	7.0	8.4
1971	5.3	8.7	−14.8	−46.1	−0.7	−1.4	6.6	7.5
1972	0.7	−5.3	2.2	58.4	0.9	0.8	5.9	8.6
1973	0.7	19.5	13.7	19.2	4.4	18.0	7.7	10.2
1974	4.1	−8.5	3.3	62.3	4.2	3.1	5.3	5.4
1975	2.7	−0.6	12.5	7.7	5.0	1.8	3.7	4.1
1976	4.5	−1.0	2.5	4.9	4.2	1.4	7.3	9.4
1977	5.3	3.2	6.4	7.5	5.3	5.2	5.6	6.0
1978	4.0	3.0	4.7	4.5	4.1	3.7	3.9	6.7
1979	0.5	2.3	2.8	−0.8	1.0	0.8	5.3	6.5
1980	2.3	0.7	6.6	8.7	3.2	2.2	3.5	4.9
1981	3.9	−0.8	1.0	−0.2	2.9	−0.9	0.8	0.6
1982[a]	2.9	1.3	0.8	−4.4	1.9	−0.6	−0.2	3.4
1983[a]	2.1	1.8	3.3	4.9	2.2	2.0	0.9	6.0
	Average annual growth rate							
1963-1973	2.9	7.6	0.5	0.2	2.1	6.0	6.3	7.8
1973-1983[a]	3.2	0.7	4.4	5.8	3.4	1.9	3.8	5.4

Source: UNIDO data base, information supplied by the Office of Development Research and Policy Analysis of the United Nations Secretariat, the Economic Commission for Africa and Bangladesh Government sources, with estimates by the UNIDO secretariat.

[a] Preliminary figures.

Table 11. Share of the least developed countries in the manufacturing value added of all developing countries, at constant (1975) prices, selected industrial branches, 1970, 1975 and 1981

(Percentage)

Branch[a]	*ISIC code*	*1970*	*1975*	*1981*
Food products	311/2	5.03	3.32	3.23
Beverages	313	2.93	3.22	1.74
Tobacco	314	4.29	4.17	3.87
Textiles	321	4.71	4.27	3.54
Wood and cork products	331	2.79	2.08	1.35
Paper	341	0.65	0.74	0.72
Industrial chemicals	351	0.66	0.74	0.58
Other chemicals	352	1.36	1.07	1.20
Petroleum refineries	353	0.64	0.38	0.27
Glass	362	1.50	1.12	0.92
Other non-metallic mineral products	369	1.73	1.32	0.98
Iron and steel	371	0.80	0.65	0.48
Non-ferrous metals	372	0.77	0.41	0.30
Non-electrical machinery	382	0.28	0.14	0.26
Electrical machinery	383	0.13	0.16	0.14
Total manufacturing	3	2.24	1.69	1.45

Source: UNIDO data base; information supplied by the Statistical Office of the United Nations Secretariat, with estimates by the UNIDO secretariat.

[a] See table 4, footnote *b*.

Table 12. Distribution of trade by broad economic categories (BEC),[a] selected least developed countries, 1970, 1975 and 1980[b]

(Percentage)

	1970		*1975*		*1980*	
Category	*Exports*	*Imports*	*Exports*	*Imports*	*Exports*	*Imports*
Food and beverages						
Primary	42.1	4.8	45.9	4.4	39.3	3.8
Processed	2.6	8.2	4.7	9.3	3.4	10.4
Industrial supplies						
Primary	46.3	2.8	38.7	3.6	45.2	2.6
Processed	4.5	29.2	4.7	31.0	5.0	24.6
Fuels and lubricants						
Primary	0.0	0.1	0.0	2.1	0.0	2.3
Processed	2.0	5.5	2.8	4.6	2.5	10.8
Capital goods except transport equipment	0.2	15.6	0.5	15.3	0.2	17.8

continued

Table 12 (continued)

Category	1970 Exports	1970 Imports	1975 Exports	1975 Imports	1980 Exports	1980 Imports
Transport equipment	0.1	15.3	0.4	15.0	0.2	13.7
Consumer goods not elsewhere classified	1.0	10.4	1.6	8.5	3.2	7.5
Goods not elsewhere specified	0.7	1.2	0.4	0.7	0.3	0.4
Non-processed goods[c]	88.4	7.7	84.6	10.1	84.5	8.7
Processed goods[d]	11.1	85.4	15.1	84.4	14.8	85.2
Total (less goods not classified under BEC)	99.5	93.1	99.7	94.5	99.3	93.9

Source: UNIDO data base.

[a]Consolidated categories from *Classification by Broad Economic Categories*, Statistical Papers, Series M, No. 53 (United Nations publication, Sales No. E.71.XVII.12).

[b]Trade data were available for the following least developed countries: Burkina Faso, Central African Republic, Ethiopia, Haiti, Malawi, Mali, Niger, Samoa, Somalia, Sudan, United Republic of Tanzania. If data were not available for the years indicated, figures for neighbouring years were substituted.

[c]Primary food and beverages, industrial supplies and fuels and lubricants.

[d]All categories other than those listed in footnote c above.

Table 13. Imports of manufactures[a] by source, selected least developed countries,[b] 1970, 1975 and 1980[c]

Category	SITC code	Year	Category share in total (percentage)	Sources by economic grouping[d] (percentage distribution): Least developed countries	Other developing countries	Centrally planned economies	Developed market economies
Chemicals	5	1970	13.2	0.2	10.6	5.9	83.2
		1975	17.3	0.1	18.5	1.4	79.7
		1980	16.6	0.1	12.7	2.0	85.1
Basic manufactures (excluding non-ferrous metals)	6[e]	1970	35.6	0.3	30.6	7.0	60.7
		1975	33.2	0.4	29.5	5.4	63.0
		1980	26.9	4.0	25.2	3.0	65.9
Machinery and transport equipment	7	1970	42.7	0.1	8.8	3.8	87.2
		1975	43.4	0.1	9.5	2.7	87.3
		1980	49.7	0.0	10.3	3.7	84.5
Miscellaneous manufactures	8	1970	8.5	0.7	31.9	4.3	62.3
		1975	6.1	0.5	26.6	[illegible]	69.3
		1980	6.8	0.2	19.2	2.0	77.0
Total manufactures	5-8[e]	1970	100.0	0.[illegible]	18.8	5.3	75.1
		1975	100.0	0.[illegible]	18.8	3.3	76.8
		1980	100.0	1.1	15.3	3.1	79.1

Source: Based on data supplied by the Statistical Office of the United Nations Secretariat.

[a]See table 8, footnote a.

[b]Burkina Faso, Central African Republic, Ethiopia, Haiti, Malawi, Mali, Niger, Samoa, Somalia, Sudan, United Republic of Tanzania.

[c]If data were not available for the years indicated, figures for neighbouring years were substituted.

[d]Excluding unspecified areas.

[e]Excluding code 68.

Table 14. Exports of manufactures[a] by destination, selected least developed countries,[b] 1970, 1975 and 1980[c]

Category	SITC code	Year	Category share in total (percentage)	Destinations by economic grouping[d] (percentage distribution)			
				Least developed countries	Other developing countries	Centrally planned economies	Developed market economies
Chemicals	5	1970	9.4	11.6	21.7	0.3	66.4
		1975	11.9	14.2	28.7	0.9	55.5
		1980	5.6	11.2	38.4	0.0	49.9
Basic manufactures (excluding non-ferrous metals)	6[e]	1970	76.9	3.5	8.1	0.3	88.0
		1975	59.5	1.9	12.5	0.0	85.2
		1980	50.0	5.9	18.2	0.7	74.5
Machinery and transport equipment	7	1970	4.0	11.5	41.9	0.0	46.6
		1975	10.7	11.2	40.0	1.3	47.5
		1980	8.1	24.8	9.4	0.2	65.4
Miscellaneous manufactures	8	1970	9.7	4.7	27.0	0.0	68.0
		1975	17.9	3.3	18.7	0.0	77.8
		1980	36.3	2.2	32.0	0.0	65.6
Total manufactures	5-8[e]	1970	100.0	4.7	12.6	0.2	82.4
		1975	100.0	4.6	18.5	0.3	76.3
		1980	100.0	5.9	24.1	0.3	69.2

Source: Based on data supplied by the Statistical Office of the United Nations Secretariat.

[a] See table 8, footnote *a*.

[b] Burkina Faso, Central African Republic, Ethiopia, Haiti, Malawi, Mali, Niger, Samoa, Somalia, Sudan, United Republic of Tanzania.

[c] If data were not available for the years indicated, figures for neighbouring years were substituted.

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