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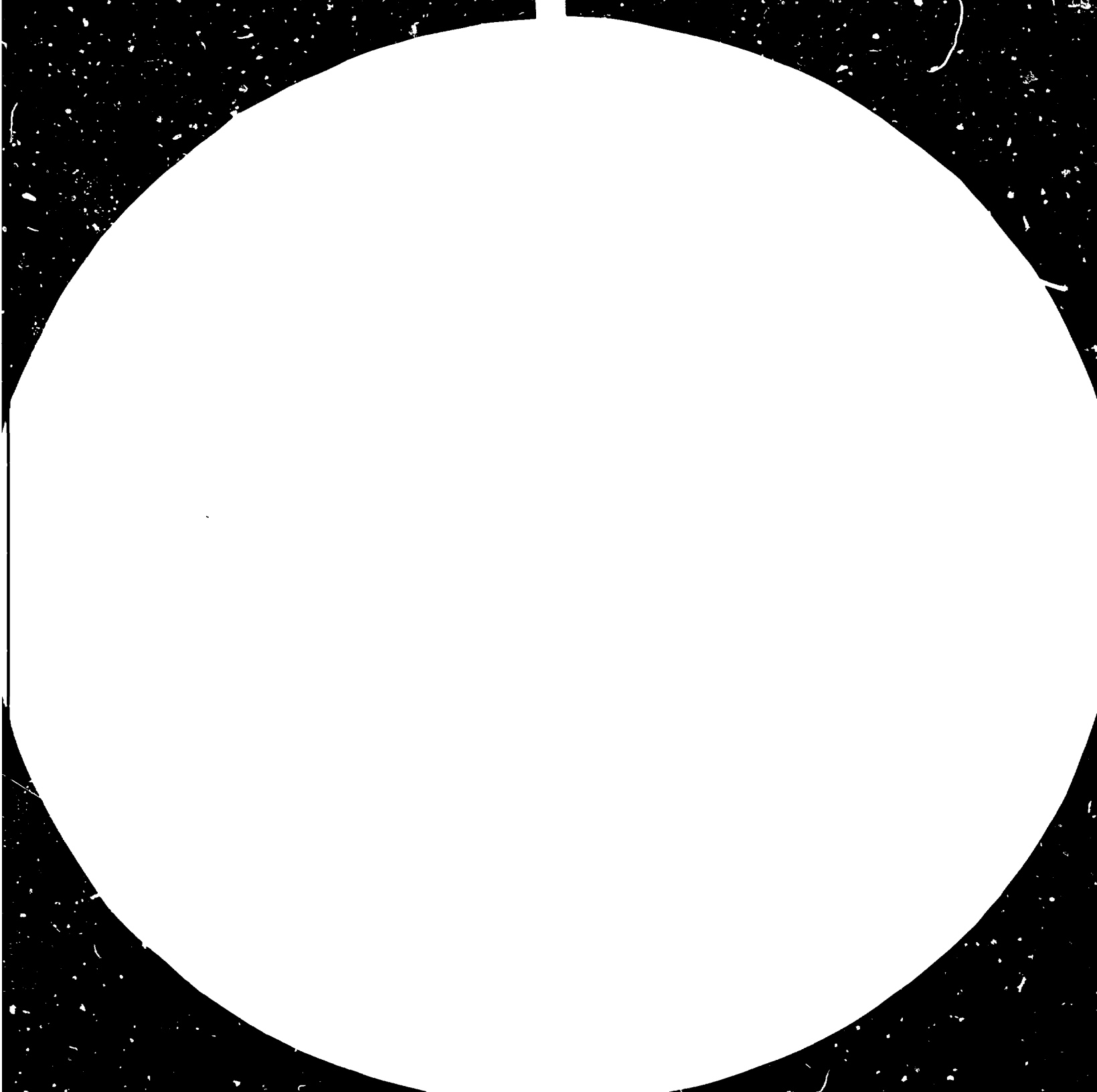

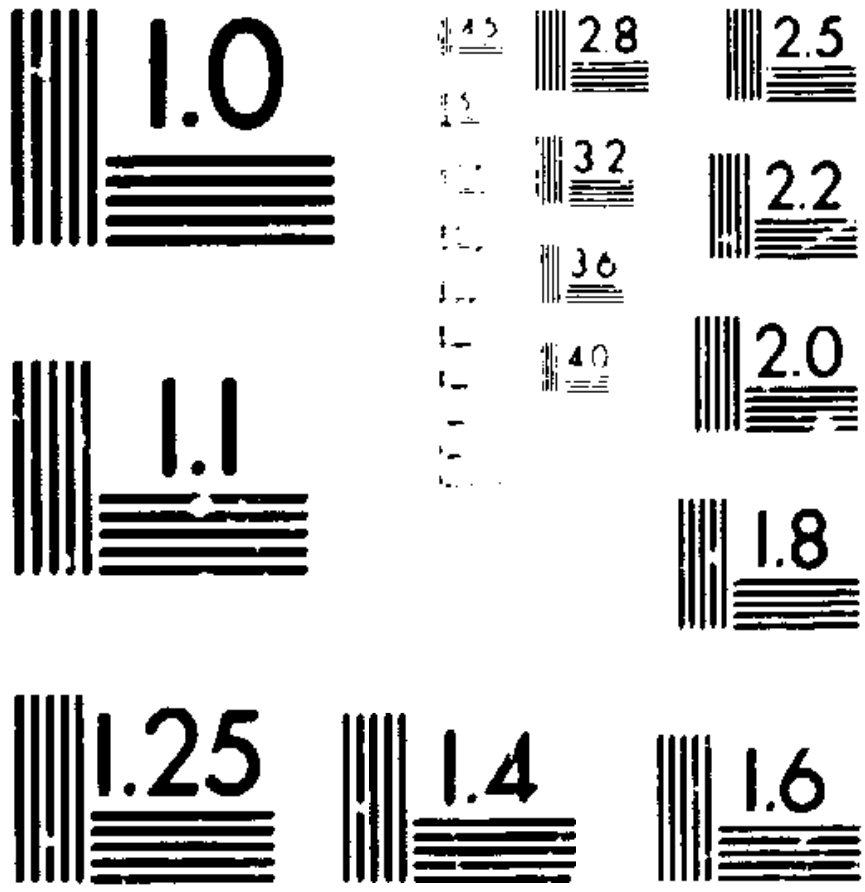

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INDUSTRY AND DEVELOPMENT

No. 11

Addendum

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Préface

Les participants à ce numéro de la revue Industrie et Développement étudient les incidences pour les pays en développement des rapides progrès intervenus récemment dans certains domaines de la technologie de pointe, et plus particulièrement des semi-conducteurs et de la conception assistée par ordinateurs, et analysent en outre les relations commerciales et industrielles Est-Sud. Le premier sujet retient plus particulièrement l'attention actuellement, et celle-ci évolue essentiellement autour de la question de savoir si les pays en développement, notamment les pays nouvellement industrialisés, peuvent tirer parti des percées technologiques récentes et prochaines ou si celles-ci entraîneront une perte dans les avantages comparés et les réalisations en matière d'exportations des pays en développement pour les activités industrielles où l'automatisation, remplaçant la main-d'oeuvre, permet de réduire les coûts dans les pays développés ?

M. Dieter Ernst étudie ce point et les questions connexes dans son étude des semi-conducteurs centrée sur la miniaturisation. L'industrie s'est déjà modifiée considérablement au cours des dernières années, avec le développement de l'automatisation, l'intégration verticale, la prédominance des sociétés transnationales japonaises et américaines en nombre toujours plus réduit, un ralentissement de la tendance des dernières années 1960 et des premières années 1970 qui allait vers une réimplantation des installations de production et de montage dans les pays en développement. Bien que Ernst ne compte pas sur un retour immédiat de la production des semi-conducteurs dans les régions du Nord, les années de forte croissance prévisible de cette production dans le Sud semblent terminées et les avantages en matière de création d'emplois, d'associations interindustrielles, de formation technique et de gains technologiques seront inférieurs à ce qu'ils étaient. Les investissements dans la production des semi-conducteurs des pays développés seront intensifiés en raison de la proximité de vastes marchés, de la nécessité d'installations étroitement intégrées pour maintenir le niveau concurrentiel et la réduction de l'importance de la main-d'oeuvre non qualifiée et bon marché par rapport aux autres coûts. Bien que l'avenir de la production des semi-conducteurs dans le Sud semble donc assez sombre, des mesures plus importantes prises par des gouvernements de pays en développement pour accentuer leur intervention dans les prises de décisions de cette industrie pourraient contribuer à prévenir le retour généralisé de cette industrie à des emplacements dans les pays du Nord. Il conviendrait de souligner les avantages que présente le Sud, notamment la disponibilité d'une main-d'oeuvre bon marché mais qualifiée, y compris des ingénieurs, la facilité de procéder à des opérations de travail continu, le manque de syndicats puissants qui pourraient s'opposer aux modifications de l'organisation des processus de production, et les possibilités de disposer d'une infrastructure d'un coût peu élevé et de réglementations minimales concernant l'environnement et le travail.

M. Raphael Kaplinsky évalue de façon analogue la situation pour la technologie de la conception assistée par ordinateurs (CAO). La croissance rapide de l'utilisation de la CAO dans les pays développés au cours des dernières années réduit les coûts et accroît les qualités concurrentielles. La CAO peut donc atténuer les avantages comparés du Sud dans certains secteurs importants de fabrication. Cette technologie est à peine disponible dans le Sud et n'est peut-être même pas souhaitable car elle réduit les besoins en main-d'oeuvre et exige des mises de fonds élevées. Toutefois, les pays en développement devront envisager l'utilisation de la CAO pour maintenir leurs

positions concurrentielles. Un certain nombre de gouvernements des pays développés soutiennent la CAO et les pays en développement devront peut-être envisager de faire de même. M. Kaplinsky pense que l'intervention gouvernementale devrait s'efforcer essentiellement de faire mieux comprendre que son aide peut être accordée de façon directe et dans le domaine de la formation aux promoteurs et utilisateurs et à la création de centres de services et de recherches.

La coopération de l'industrie entre les pays membres du Conseil d'assistance économique mutuelle (CAEM) et les pays en développement fait l'objet d'une étude de M. Ushakova. L'importance d'une telle coopération est examinée et se révèle considérable, bien qu'inégalement répartie entre les pays en développement et fait en outre ressortir les investissements dans les projets de construction des principaux secteurs publics et dans les industries stratégiques comme celle du fer et de l'acier, de l'extraction et du raffinage du pétrole, des travaux métallurgiques, des engrais et des machines agricoles. L'aide du CAEM est fonction d'une forte croissance économique et d'une réforme sociale. La stratégie du CAEM fait l'objet d'un examen détaillé.

Le document du secrétariat de l'ONUDI analyse les perspectives d'un développement commercial entre les pays développés membres de la CAEM (c'est-à-dire de l'Europe de l'Est) et les pays en développement. Les structures de ces échanges et les objectifs qui justifient ces structures font l'objet d'une étude et plusieurs scénarios pour l'année 1980 sont analysés. Ce document arrive à la conclusion que les perspectives d'un élargissement des échanges commerciaux entre l'Est et le Sud sont assez limitées. Les raisons de cette tendance sont notamment la nature résiduelle des échanges commerciaux entre l'Est et le Sud dans le cadre de la planification économique du CAEM et la plus faible complémentarité des exportations des deux blocs, étant donné que le Sud cherche de plus en plus à exporter des produits manufacturés de préférence à des matières premières. Un élargissement substantiel des échanges commerciaux entre l'Est et le Sud exige une révision de la structure industrielle du CAEM pour mieux tenir compte des avantages comparés internationaux, de sorte que le Sud puisse accroître ses exportations de produits non primaires. Les petits pays du CAEM pourraient exporter des produits industriels standardisés, le Sud pourrait accroître les exportations de biens de consommation durables non essentiels et il serait possible également d'accroître les échanges commerciaux interbranches.

Prefacio

Los colaboradores de este número de Industria y Desarrollo examinan las consecuencias que tienen, para los países en desarrollo, los recientes adelantos rápidos en determinadas esferas de la alta tecnología, concretamente en la de los semiconductores y en la del diseño con ayuda de computadora, estudiando el comercio Este-Sur y las relaciones industriales. En la actualidad existe gran interés por el primer tema, que gira en torno a la cuestión fundamental de si los países en desarrollo, en concreto los países en reciente proceso de industrialización, pueden aprovechar los adelantos tecnológicos recientes y futuros, o si éstos significarán una pérdida de las ventajas comparativas y los resultados de exportación de los países en desarrollo en aquellas actividades industriales en que la automatización, al sustituir a la mano de obra, puede reducir los costos en los países desarrollados.

Dieter Ernst se refiere a esta cuestión y a otras afines en su estudio de la industria de los semiconductores, centrado en la microplaqueta ("microchip"). Esta industria ha cambiado mucho en los últimos años con mayor automatización, integración vertical, predominio de un número cada vez menor de empresas transnacionales estadounidenses y japonesas y una disminución de la tendencia de fines del decenio de 1960 y principios del de 1970 hacia la ubicación de las instalaciones de producción y montaje en los países en desarrollo. Aunque Ernst no prevé un regreso inmediato de la producción de semiconductores al Norte, parecen haber pasado ya los años de un previsible crecimiento elevado de esa producción en el Sur, y las ventajas serán menores en lo que se refiere a generación de empleo, vinculaciones entre las industrias, formación de especializaciones y ganancias tecnológicas. Se intensificarán las inversiones en la producción de semiconductores en los países desarrollados, debido a la cercanía de grandes mercados, la necesidad de instalaciones muy integradas para mantener la competitividad y la disminución de la importancia de la mano de obra barata y no especializada en relación con otros costos. Aunque el porvenir de la producción de semiconductores en el Sur parece, por lo tanto, bastante poco prometedora, una mayor acción por parte de los gobiernos de los países en desarrollo, encaminada a aumentar su participación en la adopción de decisiones en esa industria podría ayudar a impedir el regreso general de la industria a lugares situados en el Norte. Sería necesario resaltar las ventajas del Sur, en particular la disponibilidad de mano de obra barata pero especializada, incluidos ingenieros, la facilidad de trabajar las 24 horas del día, la falta de sindicatos poderosos, que pudieran oponerse a cambios en la organización de los procesos de producción, y la existencia de una infraestructura barata de unas reglamentaciones ambientales y laborales mínimas.

Rafael Kaplinsky examina una situación similar en lo que se refiere a la tecnología para el diseño con ayuda de computadora (CAD). El rápido crecimiento de la utilización del CAD en los países desarrollados en los últimos años reduce costos y aumenta la competitividad. Por tanto, el CAD puede reducir la ventaja comparativa del Sur en algunos sectores importantes de las

manufacturas. En el Sur apenas se dispone de esa tecnología, y quizá ni siquiera sea conveniente porque reduce la demanda de mano de obra y requiere grandes desembolsos de capital. Sin embargo, los países en desarrollo tendrán que estudiar la utilización del CAD para mantener su capacidad competitiva. Cierto número de gobiernos de países desarrollados apoyan el desarrollo del CAD, y los países en desarrollo quizá tengan que hacer lo mismo. Kaplinsky sugiere que la intervención gubernamental debería centrarse en el aumento de la conciencia de su potencial, la capacitación, la ayuda directa a los encargados de cuestiones de desarrollo y los usuarios, y el establecimiento de centros de servicios y de investigación.

Ushakova examina la cooperación en la esfera industrial entre los países miembros del Consejo de Asistencia Económica Mutua (CAEM) y los países en desarrollo. Se analizan las dimensiones de esa cooperación y se ve que son considerables aunque está desigualmente distribuida entre los países en desarrollo, y se hace hincapié en las inversiones en proyectos importantes de construcción del sector público y en industrias estratégicas como la siderúrgica y las de extracción y refinado del petróleo, transformación de metales, fertilizantes y maquinaria agrícola. La ayuda del CAEM se basa en el logro de un alto crecimiento económico y de la reforma social. Se examinan detalles de la estrategia del CAEM.

El documento de la secretaría de la ONUDI estudia las perspectivas de un aumento del comercio entre los países desarrollados miembros del CAEM (es decir, los de Europa oriental) y los países en desarrollo. Se analizan las modalidades del comercio y los objetivos en que se basan esas modalidades, y se examinan varios escenarios para el decenio de 1980. Se llega a la conclusión de que las perspectivas de un aumento en el comercio Este-Sur son bastante limitadas. Entre las razones de ello se encuentra la índole residual del comercio Este-Sur en el marco de la planificación económica del CAEM y la reducción en la complementariedad de las exportaciones de los dos bloques, a medida que el Sur trata cada vez más de exportar manufacturas en vez de materias primas. Para lograr una expansión sustancia del comercio Este-Sur sería necesaria una revisión de la estructura industrial del CAEM, a fin de que reflejara más exactamente una ventaja comparativa internacional, de forma que el Sur pudiera aumentar sus exportaciones de productos no primarios. Los países más pequeños del CAEM exportarían productos industriales normalizados, el Sur aumentaría las exportaciones de bienes de consumo duraderos no esenciales y se incrementaría el comercio entre los distintos ramos.

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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. Responsibility for the detailed supervision of a specific issue is rotated among the members of the Panel. The responsible member for this issue was J. Cody.

The Supervisory Panel of *Industry and Development* welcomes readers' opinions and comments.

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NOTE TO READERS

Industry and Development appears first in English, followed as soon as practicable by the French and Spanish versions. However, a leaflet bearing French and Spanish translations of the preface (which summarizes each article) is inserted in the English version. Beginning with No. 12, the leaflet will take the form of an independent trilingual abstract and will be inserted in all versions.

Preface

Contributors to this issue of Industry and Development examine implications for developing countries of recent rapid advances in certain areas of high technology, specifically semiconductors and computer-aided-design, and consider East-South trade and industrial relations. Interest in the first topic is particularly great at present, revolving around the fundamental question of whether developing countries, specifically the newly industrializing countries, can take advantage of recent and forthcoming technological breakthroughs, or whether these will mean a loss in comparative advantage and export performance of developing countries in industrial activities in which automation, replacing labour, may reduce costs in developed countries?

Dieter Ernst considers this and related questions in his study of the semiconductor industry focused on the microchip. The industry has altered greatly in recent years, with increasing automation, vertical integration, dominance by ever fewer United States and Japanese transnational corporations and a slow-down in the trend of the late 1960s and early 1970s towards relocating production and assembly facilities in developing countries. Although the author does not foresee an immediate return of semi- conductor production to the North, the years of predictable high growth of such production in the South seem over, and the benefits in terms of employment generation, interindustry linkages, skill formation and techno- logical gains will be less. Investments in semiconductor production in developed countries will intensify due to proximity to large markets, the need for closely integrated facilities to maintain competitiveness and the decreased importance of cheap unskilled labour compared to other costs. Although the future of semiconductor production in the South therefore appears somewhat bleak, greater action by Governments of developing countries to increase their say in decision-making in the industry could help forestall the widespread return of the industry to locations in the North. The advantages of the South would need to be emphasized, particu- larly the availability of cheap but skilled labour, including engineers, ease of running around-the-clock operations, lack of strong labour unions, which might be opposed to changes in the organization of production pro- cesses, and the availability of low-priced infrastructure and minimal environmental and labour regulations.

A similar situation is assessed by Raphael Kaplinsky for computer-aided-design (CAD) technology. The rapid growth of the use of CAD in developed countries in recent years reduces costs and increases competitiveness. CAD may therefore erode the comparative advantage of the South in some important sectors of manufacturing. This technology is hardly available in the South, and may not even be desirable because it reduces labour requirements and requires high capital outlay. Nevertheless, developing countries will need to consider use of CAD to maintain competitiveness. A number of Governments of developed countries are supporting CAD development, and developing countries may need to consider the same. Kaplinsky suggests that government intervention should focus on increasing awareness of its potential, training, direct aid to developers and users and establishment of service and research centres.

Co-operation in industry between member countries of the Council for Mutual Economic Assistance (CMEA) and developing countries is reviewed by Ushakova. The dimensions of such co-operation are discussed and shown to be considerable, although spread unevenly among developing countries and

emphasizing investments in major public sector construction projects and strategic industries such as iron and steel, petroleum extraction and refining, metalworking, fertilizers and agricultural machinery. CMEA aid is based on achievement of high economic growth and social reform. Details of the CMEA strategy are discussed.

The paper by the UNIDO secretariat examines prospects for increased trade between developed country members of CMEA (that is, Eastern Europe) and developing countries. Trade patterns and the objectives underlying these patterns are analysed, and several scenarios for the 1980s are discussed. It is concluded that prospects for expanded East-South trade are rather limited. Reasons for this include the residual nature of East-South trade within the framework of CMEA economic planning and the reduction in complementarity of exports of the two blocs as the South increasingly attempts to export manufactures rather than raw materials. Substantial expansion of East-South trade would require a revision of the CMEA industrial structure to reflect more closely international comparative advantage, so that the South could increase its non-primary exports. The smaller CMEA countries might export standardized industrial products, the South might increase exports of non-essential consumer durables and intra-branch trade might be increased.

Explanatory notes

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

The following abbreviations are used in this publication:

CAD	computer-aided design
CMEA	Council for Mutual Economic Assistance
NIC	newly industrializing country
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of Petroleum Exporting Countries
RAM	random access memories

RECENT DEVELOPMENTS IN THE SEMICONDUCTOR INDUSTRY: IMPLICATIONS FOR INTERNATIONAL RESTRUCTURING AND GLOBAL PATTERNS OF TECHNOLOGICAL DOMINANCE AND DEPENDENCE

Dieter Ernst*

Crisis, innovation and international restructuring of industry

This study presents a detailed analysis of recent changes in international location patterns of industry and shows that innovation has been an important, but not the sole, factor. In order to determine the specific impact of micro-electronic devices on industrial products and processes, the analysis will focus on three basic questions.

The first question deals with the interaction between innovation, comparative advantage and changes in international location patterns. Will the spread of micro-electronics lead to an erosion of existing patterns of comparative advantage in developing countries, particularly in newly industrializing countries and areas (NICs), and to a consequent relocation of industrial activities back to the classical growth areas of the Organization for Economic Co-operation and Development (OECD)? In other words, will the application of micro-electronic devices to industrial products and processes act as an important structural constraint to a world market-oriented industrialization of developing countries, thus increasing further the already considerable obstacles to such an industrialization scenario, including the strongly neo-protectionist policies applied in practically all major OECD countries? In trying to answer this question, attention will be focused on a specific sector, namely semiconductor manufacturing and particularly chip assembly. This choice has been deliberate, in view of the prominent role assigned to chip assembly since the mid-1960s in implementing the doctrine of export-oriented industrialization.

The second question relates to the role technology is to play in the process of restructuring semiconductor manufacturing on a global scale. In particular, consideration will be given to the factors preventing semiconductor firms from implementing radical strategies based on extensive automation and designed to bring about the repatriation of virtually all stages of production and their organization under a system of highly centralized control. An attempt will also be made to determine the degree to which prevailing theories of international restucturing of industry are capable of answering this question and thus serving as guidelines for policy.

Finally, this second question is meant to underline the need for a fresh theoretical approach which could help to shed more light on the complex and dynamic interplay of factors conditioning decisions on the international location of industry.

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*Institute for Social Sciences, The Hague, Netherlands. Based on a chapter of a larger study, "Restructuring world industry in a period of crisis - the role of innovation: an analysis of recent developments in the semiconductor industry" (UNIDO/IS.285, 17 December 1981), prepared by the author as a UNIDO consultant.

The third question then concerns the options available to developing countries to proceed from world market-oriented chip assembly to integrated semiconductor design and manufacturing. There are two main concerns. First, is it realistic to expect that production activities of an increasingly complex technological nature will be transferred to industrial sites in the third world, particularly to industrial growth poles in NICs and some members of the Organization of Petroleum Exporting Countries (OPEC). Secondly, assuming that at least for some countries this would be a realistic prospect, what then would be the impact on the interindustrial integration, innovative capacities and international competitiveness of those countries?

All three basic questions are linked together by one common denominator. The overriding concern of this study is how innovation in a period of crisis affects global patterns of control over international trade and over strategic assets needed for developing and producing industrial products and services, particularly technology and capital? What is the likely impact on the capacity of major actors in the international restructuring of this industry to push through their strategies? And, finally, what are the implications for developing countries trying to implement strategies of transition to more self-reliant patterns of industrialization?

The available evidence points to a further hierarchization of North-South and South-South relations, with the result that industrial production activities based on high technology and catering for dynamic world markets will be increasingly concentrated in a few industrial growth poles located primarily in countries of the Organisation for Economic Co-operation and Development (OECD), to a lesser degree in those of the Council for Mutual Economic Assistance (CMEA), and in a few OPEC countries and NICs.

This study basically attempts to show that the use of new technologies and the distribution of control over the relevant innovative capacities conditions, but does not by itself determine, the restructuring of world industry.

In the final analysis, industrial restructuring is determined by the economic, social and political power structures within which the social actors engaged in industrial production, trade and the exchange of production factors have to operate.

Relocation back to the North: a review of recent studies

The application of microelectronic circuits to industrial products and processes is about to change considerably the established modes of designing, producing and consuming industrial products and services.[1/] It will also play an important role in corporate decisions on how to proceed with the process of continuously readapting international location patterns in a period of crisis. But what exactly will its impact be and how is it going to influence the comparative advantages to be reaped from locating industrial producton in some growth poles of the third world? Will there be a relocation back to the North of industrial production activities which, because of their relatively high labour intensity, during the 1960s and 1970s had abandoned traditional production sites in the OECD region for new growth poles, particularly in South East Asia and Latin America?

An outspoken proponent of the hypothesis of relocation back to the North has been Juan Rada. In a study carried out for the International Labour Organization (ILO), he starts from the following diagnosis: "The increase in automation lessens the importance of direct labour costs in total production costs, thus making the manufacture of formerly labour-intensive goods economically feasible in developed countries" ([2], p. 106). This is certainly a correct statement, to the extent that it pinpoints the huge potential for radical changes in the economics of all stages of industrial production.

However, the conclusions which Rada draws from this diagnosis seem highly debatable, especially the following: "This effect is already apparent with regard to goods such as textiles, garments and electronic products, which the developing countries used to export in large quantities to the economically more developed part of the world. In these cases, the competitive advantage of less developed countries is being eroded through automation, and some key industries are returning to the developed countries" ([2], p. 106).[2/]

Our critique centres around the following two points. First of all, Rada's statement implies that, in the textiles, garments and electronics sectors, industries are already returning on a significant scale to developed countries, which is not borne out by empirical evidence. Thus it would seem to be a serious misreading of reality if policy prescriptions on innovation and international restructuring in industry were based on the assumption that relocation back to the North is the most immediate concern for developing countries.

Current industrialization strategies in the third world are beset with a wide range of obstacles and dangers, some of which are indeed conditioned or further intensified by the development and application of micro-electronic devices. But to attribute them to relocation back to the North would reflect a serious misunderstanding of the real dimensions of the interaction between innovation and international restructuring in industry.

Secondly, the comparative advantage of manufacturing activities located in third-world countries could indeed wither away rapidly. This comparative advantage is based on the following two factors: low overall labour costs; and greater machine utilization made possible by the longer annual working hours characteristic of countries with high degrees of internal repression and severely restricted trade union movements. At present, capacity utilization no longer requires workers toiling 60 hours or more per week, but can rely on robotized systems tending to work around the clock with just a few periodic interruptions for preventive maintenance. Further, labour cost differentials no longer play the decisive role in total product cost, and this erosion of labour cost advantages will tend to accelerate with the progressive introduction of micro-electronics-related innovations. How fast this will be translated into a massive retransfer of industries to the North is still an open question.

In the long run, it would be plausible to expect large producers to bring back a large share of offshore production, assuming that none of the actors engaged in the international restructuring of industries succeeded, separately or in coalition with others, to implement effective countervailing policies. However, this will not automatically happen, since it involves human beings and social classes who have already shown their capacity to fight for their interests. History in fact teaches that, when introducing new technologies, the original expectations of management with

regard to how the technologies will work, how the work relations will have to be reorganized and what this would mean for international investment decisions hardly ever materialize without substantial changes.[3]

Prospects of relocation in the television manufacturing industry

Let us take the case of consumer electronics, and more particularly the manufacture of television sets, to develop some of the arguments presented above. A recent OECD study [4] shows that relocation back to the North has not been an issue for the industry, at least if relocation is defined as the closing-down of labour-intensive production lines in third world locations and their return to the classial industrial sites of the OECD region. However, the availability of automatic insertion techniques and the reduced number of components* has considerably changed the economics of television manufacturing and is thus bound to be reflected in corporate decisions on industrial restructuring and international location. The OECD study in fact shows that the already very heavy trend in the industry towards increasingly centralized vertical integration within the firm has been further strengthened as a result of the introduction of the new technologies, and that the trend is increasingly apparent on a world-wide scale.

The main findings of the OECD study on this question may be summarized as follows:

(a) "Firms which had adopted advanced manufacturing processes did not transfer the most advanced processes abroad. The policy of all the firms is that automated techniques of production, testing, handling and packaging is concentrated in the parent company" ([4], p. 48);

(b) "Some Japanese subsidiaries in the United States of America and in less developed countries still operate manual insertion processes. For developing countries' subsidiaries this is partly due to the firms' international organization of production. In some East Asia subsidiaries, labour costs are so low that production concentrates on labour-intensive sub-assembly functions and automatic insertion is not required. But Japanese firms have transferred automatic insertion machines to both developed and developing countries. Component insertion is done automatically in some East Asia subsidiaries and (these commponents are) then transferred for final assembly to the United States and Japan" ([4], p. 49). Further, "Japanese firms gain competitive advantage from insertion and subassembly in the offshore areas and transfer of these to the United States for final assembly. Japanese firms therefore could obtain better cost advantages from large production bases in East Asia and serve not only the United States but also other world markets" ([4], p. 51). Where transfer of automatic insertion machines has taken place, "the machinery is not as advanced as that adopted in the Japanese factories. The level of automation including testing, handling and packaging is not as extensive as in Japan. Firms' policy is to 'prove' technology in Japan before transfer but preference is basically to keep advantages and problems of advanced automation in Japan" ([4], p. 49). "This transfer process remains strictly under the control of the central manufacturing engineering management in Japan" ([4], p. 51);

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*Over the past decade, the number of components in a television set has fallen from 1,400 to 400 (OECD [4], pp. 29-52).

(c) "United States firms located in East Asia and in Mexico to exploit low labour cost, sometimes in the face of failed attempts towards automation. Automated techniques that are used are located in the United States. Subassemblies are transferred to these offshore areas for manual insertion and assembly and brought back to the United States for final assembly. There are no plans to return such operations to the United States and no plans to introduce automation offshore. Low labour costs are considered to make such transfer inappropriate" ([4], p. 49).

Rather than a relocation back to the North, world-market oriented production lines like television assembly would seem to face the following two major constraints: rising neo-protectionism in major OECD markets [5]; and increasing technological protectionism applied by the dominant firms originating in the OECD region and the consequent further hierarchization of control over technological building blocks and systems knowledge [6].

The above-mentioned OECD study shows that it was the "imposition of import restrictions on offshore regions such as the Republic of Korea and Taiwan Province of China which finally compelled the Japanese to consider assembly in the United States" ([4], p. 51). It further includes the imposition of orderly marketing agreements and television licence constraints among the factors which "made the transfer of products through exports increasingly uncompetitive and precarious in the long term". Thus, according to the study, it was the result primarily of these neo-protectionist devices that "Japanese firms were compelled to consider transfer of production to secure United States and European markets" ([4], p. 51).

The truly important structural constraint would be the second one, that is, the increasing hierarchization of global patterns of technological dominance and dependence. If this constraint materialized, it would have far-reaching implications. Unfortunately, no systematic study has as yet been carried out on this topic for the television industry or for the consumer electronics sector at large. However, a recent study by the Overseas Development Institute [7], which discusses some aspects of this problem from the point of view of the British electronics industry, indicates a further hierarchization of access to key technologies in this sector. The report describes Western European countries as early technological followers, with the main innovations being made in the United States and Japan. It warns that the shortening gap between innovation and the wide dispersal of technology raises questions about the viability as well as the stability of this type of specialization. The result, according to the report of the Overseas Development Institute, might well be that Western European countries, and particularly the United Kingdom, might find themselves increasingly squeezed, on the one hand, by Japan and the United States, which lead in electronics technology, and, on the other, by the low labour costs of electronics assembly work in East Asia.

Some newly industrializing countries and areas, such as the Republic of Korea, Singapore and Taiwan Province of China, have recently drawn up ambitious programmes to upgrade their production activities from labour-intensive, low-value-added assembly to more integrated and higher-value-added production lines. On this issue, the report of the Overseas Development Institute points out that, in the context of the present international market structure and the unequal division of control over technology, such programmes may be misguided activities which distract the energies of the countries concerned from socially much more useful approaches to the development of an electronics industry.

The application of micro-electronic industrial automation systems to the garment industry

According to Rada [2], a second target for relocation back to the North would be the textiles and, in particular, the garment industry.[4] The latter is an industry which has so far proved to be remarkably resistant to the introduction of automation, at least so long as relatively rigid and centralized modes of automation prevailed.[5] But would not the emergence of new flexible industrial automation systems based on micro-electronic devices considerably change this picture?

According to a recent study prepared for ILO, "the introduction of micro-electronics in the late 1970s raised the expectations of some observers, both inside and outside of the industry, that the formidable technical obstacles to automation would be removed. It was felt that the microprocessor, with its vast information processing capacity and inherent flexibility had the capacity to facilitate radical technical change at the subprocess and systems level" ([10], p. 5). For instance, production steps which used to be labour-intensive, such as monitoring the quality of fabrics, design, producing patterns and cutting, could be increasingly penetrated by new modes of highly automated production. Examples would include the use of self-programming robotics and laser-beam cutters, and the application of computer aid systems for design, patterning and quality control. Further, a new generation of automation systems could be introduced for production steps which already had some tradition of mechanization and automation. Cases in point would be the massive integration of microprocessors into control systems for sewing patterns, fast stitching, knitting heads and ink injectors that can be rapidly adjusted to produce different designs and colours.

The accelerating automation of separate production steps would be only part of the story. The real issue would be that clothing manufacture could become more and more conditioned by the application of integrated automation systems. This trend has been strongest in continuous-flow basic industries,[6] but has also recently gathered momentum in a typical batch production industry such as machine tools.[7] For the clothing industry, this basically could mean two things.

First, various production steps which have recently been automated could now be linked together into one continuous automation system. The novelty would be that this could also be done for small- and medium-batch production and auxiliary operations. In analogy to recent develcpments in the machine tools industry, clothing manufacture could then be integrated into flexible manufacturing systems with automatic feeding and transport of the fabric from point to point, with self-programming of sequences of operations, with selection of the stations, tools and optimum speeds for cutting, sewing etc., and with in-process dimensional control.

Secondly, through the application of computer-aided manufacturing systems, it would be possible to apply computer control not only to the process of production itself, but to all the functions needed for clothing manufacture, such as design, patterning, inventory, tooling, production planning, scheduling, machine control, inspection, quality control, storage and marketing. In other words, the transition towards completely automated clothing factories, manned by just a handful of highly skilled trouble-shooting personnel, would become feasible.

Even if it were assumed that the final stage will never be reached,[8] the fact remains that the availability of such automated factory systems would rapidly change the economics of clothing and textile production. This would apply for example to savings in labour, skills, materials and capital. Such savings could be considerable, even if microprocessor-based automation devices were introduced only into separate stages of production. Yet, with the introduction of flexible manufacturing systems and computer-aided manufacture, such savings would increase considerably.

These are some of the expectations concerning the scope for applying microelectronic devices to the garment industry, and thus retransferring a broadening range of production stages back to industrial sites in the OECD region.

However, reality has turned out to be much more complex. In fact, relocation back to the North has not yet taken place on a significant scale and the introduction of flexible and integrated automation systems is not yet a reality for this industry. The above-mentioned ILO study for instance found that "trends in technical change are directed at increasingly comprehensive and integrated systems of garment production. The time period, however, during which radical technologies will be incorporated into the industry is bound to be longer than previously anticipated, due to a number of factors including a low level of research and development, the lack of the necessary maintenance skills, undercapitalization and technical difficulties associated with limp fabric" ([10], p. 1).

Innovation, comparative advantage and changes in international location patterns in the semiconductor industry

It has been noted that the basic trend of industrial restructuring in semiconductor manufacturing by and large points to an increasing vertical integration and concentration.

This applies even more so to the global electronics sector centring around the design, production and application of new information technologies based on micro-electronics. Only a limited number of actors will remain active in information technology once the present crisis is over. In the long run, concentration and internationalization trends will gather momentum, and small and medium-sized laboratory firms (the real innovators), and some of the big firms as well will be liquidated.

Such is the context in which one must analyse the interaction between innovation, comparative advantage and changes of international location patterns in the semiconductor industry. The main message of this study is that the issue of immediate concern is not so much the possibility of outright relocation of industrial activities from the South, particularly some South-East Asian export platform countries, back to the OECD region. The manufacture of semiconductors in the third world will continue to expand, at least for certain product families, for those specific stages of production which are not essential for exercising systems control [6], and which are restricted to a fairly small number of exclusive production sites. But changes of considerable scope are taking place, relating to product and process technology, to management techniques and particularly to the ways of organizing shop-floor production and industrial relations. Industry experts stress that managing offshore semiconductor production activities today is completely different from what it was just five to eight years ago. In fact, transition to automatic assembly requires a considerably modified management approach simply because this mode of

assembly is based on a different economic logic than manual assembly. The strategic concern with automatic assembly is how to run extremely expensive equipment with a minimum of interruption, if possible around the clock, and in such a way that final yields can be significantly improved over standards achievable with manual assembly. In addition, the structure of the labour force, and particularly of operators, is changing very much. While it normally took about three months for a worker to become competent at manual bonding, today, with automatic bonding, it takes only two weeks to train a machine operator. Future analysis should be mainly concerned with such changes and their impact on industrialization scenarios in the third world.

In the final analysis, it is the overall trend towards increased concentration of control over strategic assets and the concomitant emergence of new patterns of global and regional oligopolistic competition which should be in the centre of future discussions. Intra-OECD rivalry, particularly among United States firms, and between them and Japanese firms, is the main driving force which fuels the global technological race.

The following four points are especially worth emphasizing:

(a) The new economics of semiconductor manufacturing is already having a considerable impact on international location patterns. However, the understanding of what is really happening is handicapped by a serious lack of empirical evidence which would make it possible to analyse changes in international location patterns according to the products and stages of production involved;

(b) There is a complex interaction of factors conditioning the new strategies of international location in semiconductor manufacturing which do not fit into the monocausalistic approaches of prevailing theories of international restructuring of industry;

(c) Offshore chip assembly is already undergoing major structural changes, which, from the point of view of developing countries, may produce fewer benefits in the form of employment generation, forward and backward interindustrial integration, skill formation and technological spin-offs.

Lack of empirical evidence

The lack of data required for an analysis of changes in international location patterns will not be easy to overcome, because most firms hardly ever release quantitative information on key variables underlying their foreign investment decision-making process ([16], p. 27). Such variables include employment figures abroad, local wage rates and other elements of labour costs, especially in low wage countries, and also the methodology used to establish the overall costs, benefits and risks of a specific investment project. When the considerable flaws of technology forecasting are taken into account, it becomes clear that most of the available projections of possible future trends of international restructuring in the semiconductor industry should be viewed with caution, because they have been deduced from incomplete knowledge of the present situation.

The foregoing comments would apply to international allocation trends for chip assembly lines. The available evidence shows that new companies, particular United States firms, are no longer rushing to offshore locations in East Asia, as was the case during the late 1960s and early 1970s. But this is only a very partial picture of what has happened.

What was it that caused United States firms to rethink the rationale for offshore investment? In order to arrive at a conclusive answer to this question, there is a need for further information which would make it possible to identify more clearly the driving forces and main constraints of the new strategies of international location in the semiconductor industry. This should in fact be a priority area for future research [17].

Recent changes in the international location of semiconductor manufacturing

The new economics of semiconductor manufacturing are already having a considerable impact on international location patterns in this industry. New actors and production sites have emerged. The rules of conduct in the industry are therefore very different from what they were just ten years ago. Yet most of the changes have passed by largely unnoticed, at least outside the inner circles of headquarters management of major firms, and attempts to analyse the international restructuring process for the industry are still to a large extent based on theories derived from the experience of the 1960s and the early 1970s [18, 19, 20].

Changes in geographic location patterns are occurring at four levels:

(a) Locational shifts among major OECD countries, that is, mainly between the United States, Japan and a few production centres in Western Europe;

(b) Locational shifts from the centre to the periphery of the OECD region, particularly to Ireland, Scotland and Wales;

(c) Transition to new patterns of investment in traditional export platform countries such as Singapore, Malaysia and the Republic of Korea;

(d) Relocation from traditional export platform countries to new offshore locations such as Bangladesh, China, the Philippines, Sri Lanka and some new locations in the Caribbean basin.

It is probably too early to provide a full explanation of the many, often contradictory, activities taking place on these four levels and the interests of the actors involved. However, an inventory of the more important decisions and a study of their underlying causes would make it possible at least to draw up some tentative working hypotheses to serve as a basis for more systematic research.

This study will present some evidence for the three probably most important structural changes which will condition international location patterns during the 1980s: the growing importance of the economics of demand; the increasing emphasis on systems productivity in the economics of production; and the increasing pressure on both semiconductor and systems firms to increase their vertical integration throughout the global electronics industry. It will focus on recent locational shifts within the OECD region, in particular to the European periphery and to Japan.

It should be noted at the outset that the last two modes of international restructuring in the semiconductor industry, namely relocation to and within the South, are bound to become of increasing importance. In fact, radical cases of relocation within the South and of a consequent industrial restructuring of offshore production facilities can already be discerned. However, this particular field of research on international restructuring in industry is hampered by a serious shortage of empirical

data, which should be remedied as a matter of priority in future research. In particular, the following developments would seem to deserve in-depth empirical research:

(a) The rapidly expanding interests of United States semiconductor firms in the Philippines and the new patterns of specialization between United States and Philippine firms, particularly in assembly subcontracting, which reached its peak during the 1979-1980 chip shortage;

(b) The establishment of Philippine firms in marketing and silicon foundry services in California;

(c) Recent attempts to proceed to more integrated forms of semiconductor manufacturing in Singapore and the Republic of Korea (high technology area in Samsung);

(d) Recent developments in Brazil and Mexico.

Locational shifts within the OECD region

Since 1975, the bulk of international investment of semiconductor manufacturers has gone into locations within the OECD region. Until the 1970s, inter-OECD international investment flows consisted mainly of investment by United States firms in Western Europe. Those investments mainly involved the computer industry and government procurement markets, particularly the military and the telecommunications sectors. Since 1975, however, this pattern has rapidly changed, and three location trends have increasingly dominated international investment in the semiconductor industry (OECD [16], pp. 26-35): a move of Western European and Japanese firms into United States locations; increasing Japanese investment in Western Europe; and the growing importance of the European periphery, particularly Ireland, for United States and Japanese investment geared to the Western European market.

The changes occurring in international location patterns in the semiconductor industry and their focus on the OECD region may be explained by three main factors.

First of all, there is the growing importance of access to huge, sophisticated and dynamic markets. This market orientation seems to be the single most decisive determinant of international location patterns in the semiconductor and electronics industry:* If this diagnosis is correct, it implies that all stages of production, from design to assembly, should be located as close as possible to areas of market growth.

Within the OECD region, the United States market will remain by far the most attractive. However, in terms of market growth, other areas are bound to gain in importance. A recent OECD study of the electronics industry arrived at the following conclusion: "The last decade has seen the growing importance of the Japanese market for electronic capital goods following the liberalization of Japanese trade and foreign investment

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*"It is abundantly clear that the availability of large and innovative markets is an important factor influencing success in the electronics business. Similarly the size and growth potential of markets is the largest single factor influencing the geographical pattern of the activities of firms in the electronics sector" (OECD [16], p. 38).

policy in this area which has occurred gradually since 1974. Over this period the growth of demand for advanced electronic products (particularly the most advanced integrated circuits) in Western Europe has tended to lag behind that of the United States and Japanese markets. Forward-looking market surveys expect this trend to be reversed over the next 10 years with growth rates of demand in Europe substantially higher than in the United States with Japan lying somewhere in between. It is thus likely that the geographical focus of the industry will shift accordingly" ([16], p. 38).

According to a recent study of the European electronics industry [21], Western Europe will be the most important future growth market for integrated circuits. The study predicts a fivefold growth in real terms from around $2.2 billion (in 1980 dollars) in 1981 to about $11 billion in 1991. It concludes that "a market of $11 billion (in 1980 dollars) in 1991 clearly represents a very substantial and exciting opportunity for the world's integrated circuits producers", and that "this $11 billion market is likely to be contested vigorously" and, "given their natural advantages, if the Europeans and Americans allow the Japanese to capture a major part of it, they will really have only themselves to blame".

Future growth markets are already emerging outside the OECD region in Brazil, Mexico, the Persian Gulf area and the region of the Association of South-East Asian Nations. Tables 1 and 2 show the considerable growth potential for computer imports in these areas of the third world.

The degree of homogenization of demand is already such that it is possible to speak of an emerging world market for electronic products. In other words, NICs and countries belonging to CMEA and OPEC tend to demand the same kind of highly complex devices and electronic capital goods.

Secondly, the economics of semiconductor manufacturing are undergoing substantial changes. In that connection, the following two implications for the choice of international location patterns are noteworthy:

(a) The need to integrate all stages of production as far as possible in order to be able to reap technical and industrial synergetic effects;

(b) The easing of pressure to go ahead with worldwide sourcing for cheap, unskilled labour, due to important changes in the cost structure, such as the increasing weight of the very high cost of equipment and research and development, of developing and maintaining software, and of highly trained professionals.

Thirdly, in order to survive in an increasingly concentrated and global industry, semiconductor manufacturers have no choice but to increase their vertical integration with the electronics sector as a whole. One important implication for international location decisions is that semiconductor firms would increasingly have to subordinate their product and marketing strategies to application needs, which would further strengthen the market orientation of their international investment decisions.

In short, the point that should be underlined at the current stage is that during the 1970s the impact of innovation on international restructuring in the semiconductor industry has been formidable, and that changes in international location patterns are already taking shape which discussions on international restructuring have not yet been taken sufficiently into account.

Table 1. Regional trends in computer imports, 1975-1978

Region or country	Total imports (millions of dollars)				Percentage change	
	1975	1976	1977	1978	1975-1976	1977-1978
Western Europe	5 231.8	5 989.2	7 019.5	8 856.6	14.48	26.2
North America	1 441.7	1 790.4	2 041.2	2 751.8	24.19	34.8
Asia	703.6	768.7	882.0	1 106.7	9.25	25.4
Latin America	601.7	520.8	556.9	731.3	-13.45	28.9
CMEA countries[a/]	826.8	775.7	389.5	482.3	-6.18	23.8
Oceania	276.8	279.2	330.8	407.6	0.87	23.2
Africa	236.0	235.0	263.6	333.7	-0.42	26.6
Middle East	...	...	189.9	317.7	...	67.3
Arab countries only[b/]	108.1	134.5	169.4	277.8	24.42	63.9
China	...	...	7.9	20.9	...	164.5
World total	9 482.5	10 520.8	11 683.9	14 983.2	10.95	28.2

Source: United Nations international trade statistics for Standard International Trade Classification (SITC) category 714, which includes computers and office machinery but does not include software or other computer services.

a/ Including Cuba, Mongolia and Viet Nam.

b/ This group includes 20 Arab countries located in the Middle East and Africa. The totals for Africa and the Middle East also include their constituent Arab countries in these statistics. The figures are developed by region for comparative purposes. They do not add up to the world total, since some duplication and overlapping will occur.

Table 2. Fastest-growing computer import markets

Rank according to growth rate	Rank among top 50 import markets	Country or area	Growth, 1977-1978 (percentage)	Market size (millions of dollars)
1	36	Iraq	219.7	47.0
2	49	China	164.5	20.9
3	29	Saudi Arabia	105.3	80.1
4	17	Hong Kong	61.9	180.4
5	48	Thailand	59.1	21.0
6	20	Mexico	50.6	160.8
7	45	Romania	49.7	24.7
8	28	Republic of Korea	48.9	96.2
9	19	South Africa	48.1	167.4
10	16	Brazil	43.3	193.7
11	1	United States	43.2	1 961.5

Source: B.O. Szuprowicz, "The world's top 50 computer import markets", Datamation, January 1981.

Shifting high-technology investment to Japan - the trend of the future?

It has been noted that possible future location shifts in semiconductor manufacturing will probably focus on the United States and Western Europe, and particularly on the European periphery. Non-OECD locations might become of increasing importance during the 1980s. However, some of the key factors involved are changing extremely fast, and any statement about the future would be based on very unsafe grounds. Recent shifts of high-technology investment to Japan are a case in point. Will such shifts again change the structure of the industry?

For very large-scale integrated circuits (VLSIC) manufacturing, and particularly 64 K random access memories (RAM), present trends suggest that United States firms will be increasingly tempted to relocate to Japan. One major United States electronics firm has already done so with highly successful results. There are convincing reasons for such a move to Japan. In order to regain their share of the crucial market for random access memories, in which Japanese firms have made impressive gains, United States firms would themselves exploit the cost and quality advantages of more favourable interest rates, the industrial structure and work organization patterns of Japan. If more United States firms started to manufacture VLSIC in Japan, the consequences for United States makers of VLSIC manufacturing equipment could be serious. However, it is probably still too early to judge whether the ambitious plans of some United States firms will be fulfilled. In fact, the introduction of VLSIC seems to require much more time than originally thought. This would seem to apply particularly to 64 K RAM.

Restructuring of offshore chip assembly

Offshore chip assembly has been undergoing major structural changes which have passed by largely unnoticed outside the inner circles of corporate management, professional industry analysts and consulting firms. Owing to the changing economics of semiconductor manufacturing, offshore chip assembly today hardly corresponds to what it was just a few years ago.

The introduction of new technologies to automate chip assembly played an important role, but somewhat different from what was expected a few years earlier by informed industry observers. At that time, relocation back to the North seemed to be the most likely development.

In 1977, the most comprehensive description of chip-making had this to say: "The traditional cost-saving technique has been to employ less expensive overseas labour for the labour-intensive packaging operation. As the cost of overseas labour rises and improved packaging technology becomes available, overseas hand labour is gradually being supplanted by highly automated domestic assembly" [22]. By domestic the author means United States assembly. Juan Rada took this position to its logical extreme, stating that "the competitive advantage of less developed countries is being eroded through automation, and some key industries are returning to the developed countries" (Rada [3], p. 106). Textiles, garments and electronic products are key industries mentioned by Rada. We have already discussed some of the major shortcomings of this position. We shall now consider in greater detail recent structural changes in offshore chip assembly which, according to Rada, should have been a priority candidate for relocation back to the North.

Defined as a closing-down of labour-itensive production lines in third world locations and their return to traditional industrial sites in the OECD region, relocation back to the North has not been an important issue for the semiconductor industry. The availability of new techniques, such as new equipment generations for automatic bonding and testing, has considerably changed the economics of semiconductor manufacturing. Thus, the increasing automation of chip assembly is bound to be reflected in corporate decisions on international location. However, since relocation back to the North has not occurred on the scale previously envisaged in the industry, an attempt should be made to find out what factors conditioned the international restructuring decisions of semiconductor firms.

Before attempting to do so, an empirical assessment of some recent major structural changes in offshore chip assembly will be made. In particular, the following developments will be considered:

(a) There has been a slow-down of investment in offshore assembly lines since the mid-1970s;

(b) Employment figures in practically all offshore locations have been stagnating, if not declining;

(c) Output and export figures continue to rise for all major offshore locations;

(d) Value-added in offshore manufacturing, which steadily increased until 1973, has since then been dramatically declining.

Slow-down of investment

Some overall allocation trends for offshore chip assembly by United States firms, as reported in various studies on the subject, are presented below. The shaky empirical basis both of the inventory until 1979 and of projections from then on has been stressed. The important point is that the rush for new offshore production sites, characteristic of the late 1960s and early 1970s, was not sustained after 1974-1975.

Allocation trends for chip assembly lines of United States firms

1961	A United States firm establishes the first offshore semiconductor assembly plant in Hong Kong.
1964	The same firm opens a plant in the Republic of Korea.
1968-1973	Peak of offshore movement. Since then several factors have caused United States firms to rethink the rationale for offshore investment.[a/]
1974-1975	First chip crisis. Little new or expanded offshore investment by mature United States firms. While some newer United States firms continue to establish offshore operations in East Asia to gain the cost advantages that still

exist, the run into new offshore production sites, characteristic of the late 1960s and early 1970s, is clearly over.

1979 — Approximately 29 per cent of chip assembly by United-States-based firms is conducted within the United States.[b/]

1981 — 1980-1981 chip crisis accelerates the process of phasing-out offshore assembly facilities, particularly those using older technologies and less capital equipment.

1989 — Nearly 40 per cent of chip assembly by United-States-based firms will be done in the United States.[b/]

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a/ J.L. Truel, "L'industrie mondiale des semi-conducteurs" (Paris, 1980); L. Siegel, Delicate Bonds: The Global Semiconductor Industry (Mountain View, California, January 1981).

b/ Estimate for 1979 and projection to 1989 are from Frost and Sullivan, Inc. New York, quoted from Northern California Electronics News, January 7, 1980.

In fact, there has been an overall slow-down of investment in offshore assembly since 1975.

The following figure shows that the number of East Asian assembly lines, which until 1974 was growing at practically the same speed as world-wide integrated circuit sales, has significantly lagged behind since then.

However, such data is incomplete. It would be necessary to know whether the slow-down in the expansion of offshore assembly lines has been just a short-term result of the 1974-1975 semiconductor crisis, or whether it continued when demand recovered and global semiconductor production capacities began to expand very rapidly again. Of even greater importance would be an analysis of the concrete moves behind the aggregate figure.

Table 3 gives a more differentiated picture of what happened to important offshore locations in the third world. It is based on a sample of 27 leading Japanese, United States and Western European firms which in 1979 were responsible for more than 90 per cent of world semiconductor production.

Whatever its shortcomings,* table 3 amply reflects four developments:

(a) In the traditional offshore locations in South-East Asia, including Hong Kong, Malaysia (starting in the early 1970s), the Republic of Korea, Singapore and Taiwan Province of China, the arrival of new entrants has clearly levelled off since around 1974;

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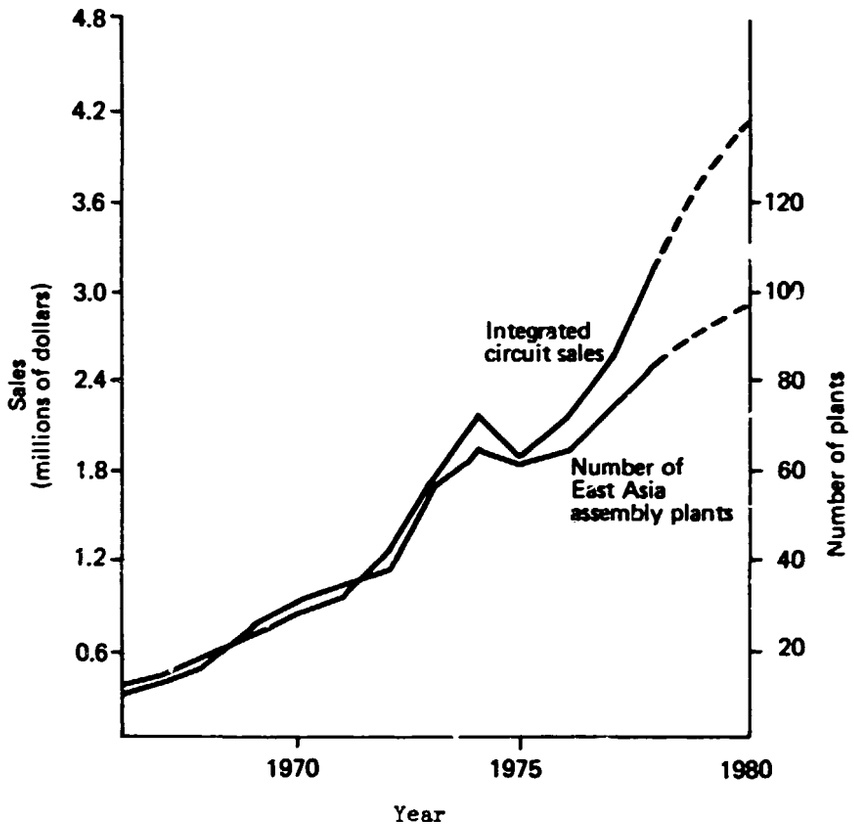
*The most important one being that no differentiation is possible between the various plants according to size of investment, sales volume and turnover, product groups, stages of production and technological complexity.

Growth trends in world-wide sales of integrated circuits and assembly plants in East Asia



Source: Rosen Associates (New York, November 1980).

(b) After 1974 only one South-East Asian country, namely the Philippines, was able to attract a substantial amount of new investment. Indonesia and Thailand on the other hand had very poor results. It should be noted that since 1979 three additional candidates for offshore location became available in the region, namely China, particularly its coastal special economic zones [23], India and Sri Lanka;

(c) The traditional locations in Latin America that is, the Caribbean basin and the border industries belt of Mexico, also show a relative stagnation, whereas Brazil shows an overall dynamic trend. In fact, for Brazil, access to the potentially huge Latin American market has been the guiding principle, and costs, particularly labour costs, have been of only secondary importance;

(d) In the Mediterranean basin only very recently have some offshore locations been developed, but still on a fairly limited scale.

Table 3. Development of offshore investment in various third world locations by major Japanese, United States and Western European semiconductor firms[a/], 1971-1979

Country or area	Number of firms[b/]			
	1971	1974	1976	1979
South East Asia				
Area of Hong Kong	1	6	6	7
Indonesia	0	3	3	3
Malaysia	0-2	11-13	13-14	14
Philippines	0	0	1	6 + 1 planned
Republic of Korea	6	8	8	8
Singapore	9	10	12	13
Taiwan Province of China	3	3	6	8
Thailand			1	1
Latin America and the Caribbean				
Barbados	0	0	0	1
Brazil	0-2	2	5	5 + 3 planned
El Salvador		1	1	2
Mexico			12	13
Puerto Rico			2	3
Mediterranean basin				
Malta			1	1
Morocco			1	1
Portugal			2-3	3

Source: J.L. Truel, "L'industrie mondiale des semi-conducteurs" (Paris, 1980), p. 12.

a/ The sample includes 24 United States, 6 European and 7 Japanese firms.

b/ Each firm is counted only once in each country or area, even if it owns more than one plant.

Stagnating employment

Table 4 shows that the employment for United States affiliates abroad increased only slightly between 1974 and 1978. Taking into account the increase in United States activities in Western Europe, this would mean that employment in third-world locations has at least stagnated, if not declined.

Table 4. World employment for United States semiconductor firms, 1966-1978

Year	Work-force (thousands of employees)		
	United States	Offshore estimate[a/]	Total
1966	82	4	86
1967	85	10	95
1968	87	20	107
1969	99	40	139
1970	88	45	133
1971	75	50	125
1972	98	60	158
1973	120	80	200
1974	133	85	218
1978	...	89	...

Source: For 1966-1974, United States Department of Commerce, A Report on the United States Semiconductor Industry (Washington, D.C., Government Printing Office 1979). For 1978, United States International Trade Commission, adapted from J.L. Truel, "L'industrie mondiale des semi-conducteurs" (Paris, 1980) p. 6.

a/ Until 1974, the great majority of foreign employees were in third-world locations. In 1974 for instance, of a total of 85,000 only 5,000 were employed in factories located in Japan and Western Europe.

In addition, table 5, presenting figures for a leading United States semiconductor firm, shows a declining share of foreign employees as a percentage of total employees. This is at least the interpretation given to the figures by a senior executive of the firm in a statement before the United States Congress in January 1980: "As progressively higher thresholds are reached by the United States semiconductor industry in product and process technology, the tendency appears to be a decrease of foreign employees. This trend is enhanced by the increased use of automatic bonding equipment in the offshore assembly plants". His firm, "for instance, more than tripled total corporate employment from 1975 to 1979, but the proportion of foreign employees dropped from a peak of 41 per cent in 1976 to 30 per cent in 1979 even though a higher percentage of sales were abroad and a higher percentage of ... total employees were foreign sales and marketing personnel" [24].

Table 5. Global employment trends of a major United States semiconductor firm

Year	Employment increase (percentage)	Offshore employment (percentage)
1975	-	36
1976	58	41
1977	11	39
1978	34	33
1979	31	30

Source: Global Electronics Information Newsletter (Mountain View, California), No. 1, June 1980, p. 5.

However, the above-mentioned firm, which currently employs about 14,000 workers world-wide, may not be entirely representative of the industry, since it concentrates on microprocessor production, one of the most sophisticated branches of the semiconductor industry. Other semiconductor operations (when separated from non-semiconductor activities of the same companies) tend to employ larger percentages of employees abroad. Additional information would therefore be necessary in order to determine to what degree the case of the firm in question reflects a general trend.

Continuing rise in output and export figures for all major offshore locations

Output and exports of assembled semiconductors have continued to increase for practically all major offshore locations, as shown by data on semiconductor imports to the United States under tariff code items 806.30 and 807.00, recently made available by the United States Department of Commerce ([25], [26]). The data give a fairly good picture of recent trends in output and exports of major offshore semiconductor assembly locations for the following two reasons: most of the semiconductors assembled in offshore locations are re-exported to the United States, where they are tested and marketed or in some cases marketed directly following testing in Asia; and most of the re-exports qualify for special treatment under tariff code items 806.30 and 807.00, which, in essence, exclude from duty the United-States-produced content of the assembled goods.

Table 6 shows that, except in the case of Taiwan Province of China, import figures covering Tariff Schedule of the United States Annotated (TSUSA) items 806.30 and 807.00 substantially reflect the overall semiconductor exports of the countries concerned to the United States.

Table 7 shows recent trends in United States semiconductor imports from offshore locations in the third world.

Four basic conclusions may be drawn from table 7:

(a) Imports from offshore locations rapidly increased during the 1970s;

Table 6. Exports of semiconductors by selected developing countries or areas, 1976
(Millions of dollars)

Exporting country or area	Total exports	Importing country			
		Japan	United States	Other countries	806.30 and 807.00 portion
Area of Hong Kong	126.2	5.2	90.6	30.4	71.2
Malaysia[a/]	na	16.5	206.0	-	192.2
Mexico	102.5	-	100.7	1.8	83.4
Republic of Korea	298.6	47.9	164.8	85.9	148.3
Singapore	339.5	4.3	237.0	98.2	197.1
Taiwan Province of China	197.7	17.5	68.6	111.6	36.9

Source: Department of Commerce, A report on the United States Semiconductor Industry (Washington, D.C., Government Printing Office, 1979).

a/ Complete data for Malaysia not available.

Table 7. Contribution of offshore locations[a] to United States semiconductor imports and supplies, 1970-1978
(Millions of dollars)

Year	(a) Semiconductor supplies of United-States-based semiconductor firms[b]	(b) Total semiconductor imports	(c) Total 806.30 and 807.00 imports	(d) c/a (percentage)	(e) c/b (percentage)	(f) United States content of semiconductor imports	(g) f/c (percentage)	(h) Dutiable value	(i) h/c (percentage)
1970	1 720	157.464	139.071	8.1	88	78.409	56	60.662	44
1971	1 502	179.092	152.204	10.1	85	81.255	53	70.949	47
1972	1 848	330.277	249.717	13.5	76	127.346	51	122.371	49
1973	3 124	618.613	410.207	13.1	66	185.637	45	224.570	55
1974	3 646	961.338	681.844	18.7	71	310.359	46	371.485	54
1975	3 002	802.687	617.276	20.5	77	291.718	47	325.558	53
1976	4 312	1 107.399	877.648	20.4	80	400.908	46	476.740	54
1977	4 841	1 352.317	1 120.121	23.1	83	616.860	55	503.261	45
1978	...	1 800.000	1 478.535	-	82	886 705	60	591.830	40

Sources: Bureau of the Census, Foreign trade data print-outs, TSUSA 806/807, quoted in United States Department of Commerce, A Report on the United States semiconductor industry (Washington, D.C., Government Printing Office, 1979); and "Import trends in TSUSA items 806.30 and 807.00", United States International Trade Commission Publication 1029 (Washington, D.C., Government Printing Office, 1980).

a/ Semiconductor imports from offshore locations are measured by imports under TSUSA items 806.30 and 807.00.

b/ Excluding shipments from affiliates located outside the United States.

(b) Semiconductor imports from offshore locations during the 1970s increased their share in the shipments of United States semiconductor firms to the United States market;

(c) The share of semiconductor imports from offshore locations in overall United States semiconductor imports, which fell from 1970 to 1973, subsequently recovered to the levels of the late 1960s;

(d) The foreign content of semiconductor imports from offshore locations, that is, the value added in these production lines, has changed considerably.

The last conclusion is probably the most important characteristic of the newly emerging modes of industrial restructuring in offshore chip assembly. It will be discussed in detail below. With regard to conclusion (b), table 7 shows that in 1977 imports from non-offshore locations, that is, from Japan and Western Europe, were only $232 million as compared with the $1,120 million from offshore locations. In terms of shipments of United-States-based firms, they therefore amounted to less than 5 per cent.

Conclusion (c) suggests that the great majority of semiconductor imports to the United States is still produced in third world locations, particularly in South East Asia and in Mexico. But reality is more complex. It has already been shown that this statement needs to be modified in connection with specific product groups, particularly standardized memories such as 16 K RAMs, in which Japanese firms have made significant gains. In addition, the figures end at 1978, indicating for that year already a significant increase, compared with 1977, of 38 per cent in imports from non-third-world locations. However, it has already been noted that the run into new OECD locations started only in response to the chip shortage of 1978-1979 and the consequent Japanese penetration of important segments of the United States market. In other words, the picture drawn by the figures up to 1978 might no longer apply today. In the meantime, imports from Japan and even more so from the European periphery, particularly Ireland, have increasingly gained in importance.

Rise and fall of value added in offshore chip assembly

The changes in the foreign content of semiconducto. imports from offshore locations are probably of greatest importance (see columns (h) and (i) of table 7). Whether or not the value added in offshore locations will cover a growing part of the value of semiconductor exports is in fact crucial for both employment and for strategies to increase the integration of these activities with overall industrial production.

Two distinct phases may be discerned. First, there was a rise of foreign content from 1970 to 1973, followed by a period of consolidation until about 1976 (see column (i) of table 7). According to the Department of Commerce study, the following three factors played an important role: rising wage levels in the traditional offshore locations; the availability of locally produced parts in some places, particularly Malaysia, the Republic of Korea, Singapore and Taiwan Province of China; and the availability of parts from third countries, especially Japan. Secondly, a decline in foreign content which began in 1977, if not reversed, may lead to a levelling-off, or even drop, in Asian semiconductor employment.

The decline reflects recent changes in the economics of semiconductor manufacturing. As the complexity of circuitry increases, more value is produced in the early wafer-fabrication stage in Japan, the United States or some locations in Western Europe. In addition, the more advanced circuits require complex, computerized final testing, which again is usually done in OECD locations, particularly in Japan and the United States.

Table 8 shows that, except for Hong Kong, which had a much higher level of foreign content, the average foreign content share of most other major offshore locations was either close to or significantly below 45 per cent, the lowest being 32 per cent. Thus it would seem safe to conclude that the decline of foreign content is a well-established trend for all major offshore semiconductor production sites.

To conclude, the recent decline of foreign content in semiconductor imports from offshore locations, at a time when such imports continue to increase in absolute terms, confirms our main point: relocation of chip assembly back to the North is not a significant issue, despite the gradual automation of that process. Rather, future in-depth empirical research should be directed to the considerable structural changes of semiconductor manufacturing taking place in offshore locations with regard to product and process technology, and to its implications for a restructuring of conventional offshore activities. World-market-oriented semiconductor manufacturing might in fact continue to expand in some third world locations, but the new type of offshore semiconductor manufacturing might produce fewer and less viable positive effects on employment generation, forward and backward interindustrial integration and technological spin-offs.

Future projects

What are the most likely future scenarios for the international restructuring of the semiconductor industry and what role will production sites in the third world play?

Complex interplay of factors conditioning international location patterns

Although there are no conclusive answers to the above questions, it is possible to identify some of the options facing the major actors in the international restructuring of the semiconductor industry, particularly private firms based in the OECD region, and to confront them with the available evidence, which is mostly conflicting. Four points would seem to be worth stressing.

First, if only the interests of semiconductor manufacturers were at stake, then relocation back to the North would indeed be the most probable future scenario for a large part of chip assembly lines located today in developing countries. However, if one considers, secondly, the broader integrated electronics sector in an attempt to identify the options open to firms producing highly diversified systems, then it would be found that a much more complex and dynamic interplay of factors will condition international location decisions and that, by and large, the drive for internationalization will continue.

Table 8. United States and foreign content in imports under TSUSA items 806.30 and 807.00, 1977
(Millions of dollars)

Country or area	Total 806.30 and 807.00 imports	Foreign content		United States content	
		Value	Percentage of total	Value	Percentage of total
Area of Hong Kong	63.885	35.896	56	27.989	44
Malaysia	269.936	120.313	45	149.623	55
Mexico	63.286	21.785	38	41.501	62
Philippines	52.182	16.579	32	35.603	68
Republic of Korea	208.971	81.413	39	127.558	61
Singapore	234.616	108.958	46	125.658	54
Taiwan Province of China	72.720	33.286	46	39.434	54
Total	965.596	418.230	43	547.366	57
Other countries	154.525	85.031	55	69.494	45
Grand total	1 120.121	503.261	45	616.860	55

Source: Bureau of the Census, Foreign trade data print-outs, TSUSA 806/807, quoted in United States Department of Commerce, A report on the United States semiconductor industry, (Washington, D.C., Government Printing Office, 1979).

A third point is that as long as developing countries continue to rely predominantly on the willingness and capacity of private firms originating in the OECD region to redeploy production facilities and technology, they could hardly expect to increase the viability of their existing segmented world-market-oriented chip assembly lines. Within such a scenario of passive and unselective world market integration, the vulnerability of production lines to the economic crisis and to the impact of radical technological breakthroughs will remain excessive, and there will be little chance of proceeding to an increasingly integrated electronics industry which could be subordinated to the specific requirements of developing countries. In other words, as long as developing countries do not devise and implement effective countervailing strategies of international restructuring, the most likely outcome will be that a handful of privileged high technology enclaves will emerge close to the future growth markets in the Persian Gulf region, in South East Asia, and probably also in Brazil and Mexico, thus complementing current developments on the European periphery, particularly in Ireland and Scotland.

A fourth and final point would be that any projection on possible future trends in international location patterns of industry could hardly claim to be realistic, if it were not placed in the much broader context of the likely future interplay of innovation, international transfer of technology and international restructuring in a period of crisis.

Rationale for relocation of semiconductor assembly operations

From the point of view of established United States semiconductor firms, relocation back to the United States would seem to be the preferred scenario for most of their offshore chip assembly lines. This view is reflected in Levinthal [27]. Levinthal argues that United States semiconductor firms should not only automate their assembly operations but move them "back onshore". He claims that this would be the only way for them to counter the Japanese challenge. In contrast to major United States semiconductor firms, which since the early 1960s have made extensive use of global sourcing for cheap labour, particularly in South East Asia, Japanese firms have concentrated from the beginning on assembling products at home, using more automation in their operations. Levinthal argues that insistence on offshore operations, very useful in the early stages of the industry, could put United States firms in an increasingly weak position for at least two reasons:

(a) It deprives them of significant systems productivity gains;

(b) It will make them more vulnerable to political turmoil abroad.

With regard to the first point, Levinthal argues that in order to evaluate correctly the complex trade-offs between United States and offshore locations, a "systems concept rather than a fragmented operation-by-operation process mechanization procedure" would be needed. Only then would it be possible to avoid being restricted to mono-causalistic cost-benefit approaches. He quotes as a typical example that "people who make the monetary decisions are always quick to bring up the argument that even if they automated their operations, personnel to operate and maintain are still less expensive offshore than here in the United States". According to Levinthal, this is a valid argument, but it fails to give a complete picture of the factors involved in a choice of technology and location patterns. The argument fails to take into account such factors as the

increasingly high costs of transportation, the benefits forgone with regard to industrial synergism, and the growing vulnerability to external decisions and political unrest.

The last point is particularly underlined by Levinthal: "If political turmoil begins to haunt the world, especially in those areas where United States companies have their assembly operations, it would be a disaster for the United States semiconductor industry. It would be an almost impossible task to immediately begin onshore assembly in the event of serious political unrest." In this respect, Levinthal considers the United States semiconductor industry to be already highly vulnerable in contrast to Japanese firms, which, in his view, have wisely avoided this danger. "With the new, more vigorous United States defense posture", Levinthal adds, "political polarization and turmoil are bound to occur. We can expect that some countries which now openly welcome the semiconductor industry will make greater demands on companies hoping to maintain their facilities or open new ones."

This analysis fairly well reflects some of the major preoccupations of United States semiconductor firms in a period when both international competition and the economic crisis are intensifying. Political destabilization is threatening former centres of United States offshore sourcing investment, and Governments and technocrats in some of the early offshore locations such as Malaysia, the Republic of Korea and Singapore are very active in devising much more aggressive and demanding strategies. Thus, from the point of view of major United States semiconductor manufacturers, Levinthal is probably right when he concludes: "If the United States semiconductor industry is to maintain control over its destiny it must give serious consideration to investing in automation, getting its act 'back together', and moving assembly processes home." However, there is reason to doubt whether United States semiconductor firms could or even would like to proceed very far along these lines of international restructuring. They no longer operate alone in this sector. Of the ten major United States firms, only two can still claim the status of formal independence, whereas all the others are to one degree or another integrated into highly diversified corporate giants. This paper has already provided substantial evidence of the trend towards an increasing vertical integration within huge, highly diversified conglomerates linking together all major sectors of the global electronics industry.

Some of the possible future trends in international location, as perceived by a highly diversified transnational corporation with a focus on information processing, will now be considered.

Renewed drive for internationalization - a case-study

The president of a major transnational corporation of the Federal Republic of Germany has stated that his company is putting greater emphasis on building up its foreign operations, which already employ about one third of its 338,000 workers. This would include overseas manufacturing and certain research and development activities. The activities of the company are already highly international: its foreign sales and exports in 1980 accounted for approximately 54 per cent of its total sales of $13.3 billion.

What is the logic underlying this renewed drive for internationalization? In contrast to the 1960s and 1970s, the search for cheap labour no longer seems to be the dominant motivation. Rather it is the need to

use the new capital-intensive equipment efficiently, to run it, if possible, around the clock, without any need to comply with labour or environmental regulations.

In the not too distant future a second motivation might increasingly gain in importance: it relates to the need for world-wide recruitng of qualified but relatively low-cost engineers. In fact, electronics companies in the Federal Republic of Germany are facing increasing difficulties to find qualified engineers, even at relatively high wage levels.

A case in point would be the plans of the company to shift its RAM wafer fabrication facilities to a location in Austria. The new 3,720 m^2 plant will cost the company $25 million. Electronics News of 1 December 1980 quotes engineers of the company who stated that the move was mainly due to the need to take advantage of good and lower-cost engineers. As some of the major export platform countries and areas, both on the European periphery (Ireland) and in South-East Asia (the Repulic of Korea, Singapore and Taiwan Province of China) are about to expand significantly their training programmes for electronics engineers, computer programmers and systems analysts, sourcing for low-cost electronics engineers will increasingly be geared to these locations.

In the final analysis, this new kind of internationalization drive results from the increasing emphasis which, since the beginning of the 1970s, such companies have been laying on productivity improvement through the introduction of heavily capital-intensive equipment. In other words, international restructuring and innovation have been linked in a very specific manner.

Since 1976, the company has in fact been cutting back sharply its workforce, doing away with about 40,000 jobs. At the same time, annual capital expenditure increased to approximately $900 million in 1980, and the company planned to maintain if not increase this level of capital formation in future.

Such a productivity-oriented strategy has its hidden costs, including the need to recruit larger numbers of highly qualified engineers and the dramatic increase in equipment costs. Management, when it originally conceived this strategy, seems to have underestimated the negative side-effects. In other words, automating industrial production in traditional OECD locations seems to involve considerable constraints, and this seems to apply even to certain areas of high-technology production, including semiconductors and telecommunications (Ernst [1], chap. II).

From world-market-oriented chip assembly to an integrated electronics industry

What prospects exist for developing countries to transform, both individually and collectively, their segmented world-market-oriented chip assembly lines into an increasingly integrated electronics industry which could be subordinated to the specific requirements of those countries? The evidence suggests that this is a very remote possibility, at least if developing countries continue to rely almost exclusively on OECD-based firms to redeploy production facilities and technologies. Within such a strategy of passive and unselective world market integration, only a handful of countries could expect to keep some offshore chip assembly lines within their borders and to upgrade them into more integrated patterns of a national electronics industry.

Only countries which, in addition to their export-oriented chip assembly plants, have already established a more than embryonic network of capital goods industries could qualify as candidates for such a strategy. That would exclude, for instance, a country like the Philippines, which is booming in chip assembly plants, but has practically no serious capital goods base. Overall, probably no more than 15-20 countries would fall into this category.[9/] For these countries, the question of immediate concern would be the conditions under which they could hope to achieve a sufficient transfer of production activities of an increasingly complex technological nature. Three points should be stressed in this connection. First of all, for some major electronic components and systems firms in Japan, the United States and Western Europe, it might indeed be rational to transfer, albeit in a strictly selective manner, relatively advanced micro-electronic technology to a few industrial growth poles in Latin America, South-East Asia, the Middle East and the Mediterranean area. In addition to access to some regional future growth markets, the following four factors seem to be of particular importance:

(a) The availability of cheap and docile, but highly skilled labour and engineers;

(b) The need to run extremely expensive equipment practically around the clock, that is, to maximize its overall annual utilization and to minimize possible downtimes. Pending further major technological breakthroughs in robotics, for instance with regard to sensors, transducers and actuators, it might well be profitable to operate numerical control machine tools worth $75,000 to $100,000 on a multi-shift basis in a free export zone, for example in Malaysia, where labour regulations are extremely soft and there are practically no trade unions.

(c) In some industrial growth poles on NICs there might be less resistance of the labour force against the necessary experimenting with new forms of organizing the production process, particularly with regard to the gradual introduction of robots and flexible machining systems. In other words, relatively untouched industrial locations in NICs might be regarded by transnational corporations as excellent testing grounds for developing strategies and tactics for introducing new technologies into industrial production based in the OECD region;

(d) The availability of low-priced or highly subsidized infrastructure and a minimum of regulations with regard to environmental and labour standards are becoming of increasing importance, for instance, in wafer fabrication and silicon foundries.*

The second point is that there will undoubtedly be some positive effects with regard to technological spin-offs, training and international competitiveness. This would apply for instance to training for supervisory and technical support management functions. International competitiveness might be achieved in certain market areas, such as assembly subcontracting, silicon foundries and particularly wafer fabrication subcontracting for regional markets. However, three questions remain to be answered:

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*Contrary to a widely held belief, semiconductor manufacturing is not an environmentally clean industry. In fact, the production of semiconductor wafers, from which chips are made, and printed circuit boards, into which finished chips are stuffed, uses a wide range of toxic chemicals and generates a large amount of toxic wastes. For details, see "Project on Health and Safety in Electronics" [29].

(a) Will the new export markets be viable? In fact, demand on such markets tends to vary excessively, while the number of competitors rapidly expands. It is not at all certain that the markets will continue to exist. Further, the present pattern of international subcontracting, for instance with regard to assembly, are the result of certain technological bottlenecks, which, given the high speed of innovation in these areas, might soon be removed;

(b) What are the complementary social costs involved;

(c) What will be the impact for strategies of transition to a more self-reliant development pattern?

The available evidence would seem to suggest that all three questions should be answered in the negative.10/

The third point is that the scope for a policy of import substitution and export promotion in the field of complementary services, for instance software and computer services, seems to be limited. If developing countries are to pursue such a policy, a combination of selective protectionism and export promotion, either on a national scale or as part of collective self-reliance arrangements, would be required. However, pressure is increasing to make trade in services subject to the rules of the General Agreement on Tariffs and Trade (GATT), and a United States special trade representative has stated that "...free trade in services is a priority aim" [30].

Even assuming the existence of sufficient scope for promoting software exports, the question arises as to whether it would really pay to focus on such exports. It has been argued that instead of relying exclusively on software sales, real profits could only be reaped by including hardware, such as terminals [31].

International transfer of technology and industrial restructuring - prospects for the 1980s

Today it is more urgent than ever before to understand how control over technology and international restructuring in industry are interlinked. It has been shown elsewhere [32] that much depends on who are going to be the dominant actors in the game, and that without an analysis of the international economic crisis it will be impossible to link together technology, demand and structural change in world industry. It is within this context that prospects for the international transfer of technology and industrial restructuring for the 1980s will now be discussed. In particular, the following two questions will be dealt with:

(a) Is the consensus among the major actors in the international restructuring of industry becoming strained;

(b) What options are available for OECD countries and what is their scope for implementing these strategies?

Increasing difficulty of a consensus

During the 1960s and most of the 1970s, the major actors by and large viewed prevailing patterns of international transfer of technology and industrial restructuring as consistent with their goals and long-term

interests. In the case of firms based in OECD countries, for example, conditions were fairly positive: trade increased; surplus petrodollars were effectively recycled into demand for goods produced by OECD-based firms; offshore investment in low-labour-cost countries allowed them to compress labour costs and counter the decline of productivity growth in home locations; the capital goods sector was able to benefit considerably from technology transfers to developing countries; and, finally, the trade balances of the major OECD countries with non-OPEC developing countries improved.

However, the negative side effects could not be denied, even in the leading growth areas of OECD. In fact, the destruction of jobs, the devaluation of skills and the relative de-industrialization, both geographically and by sector, increasingly created serious economic and political problems for those countries and were thus seen as important constraints to the continuation of this type of international transfer of technology.

Conditions were even more negative for a growing number of regions in the third world, where increasing imports of technology originating in OECD countries, rather than initiating a process of modernization, caused great economic and social problems which, as in the case of Iran, led to chaos and socio-economic upheaval. Nevertheless, it remains true that the prevailing modes of international transfer of technology and international investment, that is, the dominant patterns of international industrial restructuring, were not hampered by basic contradictions between the major protangonists. However, this may rapidly change. In fact, the golden age of international transfer of technology, with its relative harmony among privileged actors, might soon be eclipsed by a series of new and basic contradictions.

From the point of view of the technology exporter, the process of transferring and disseminating technology, once started, could increasingly erode his capacity to control the technology, that is, to remain in a position of technological dominance.

Whether or not this will occur depends on factors influencing the international diffusion of technology and innovative capacities.

In a recent study, OECD [33] has identified the following three major concerns of technology exporters:

(a) To what degree has the international transfer of technology contributed to a strengthening of technological and innovative capacities in at least some NICs?

(b) Will third world markets continue to increase their importance for OECD-based firms and, if so, what role will transfer of technology have to play as a market penetration instrument?

(c) Will it be possible to generate the financial resources needed to transform the potentially infinite import needs of developing countries into effective demand? In other words, under what conditions and for what type of countries will it be possible to secure a sufficient capacity to import technologies from OECD-based firms?

In the context of the present crisis, it is difficult to give an unequivocal answer to these questions. But it is possible to outline three major trends which might change considerably the international distribution of economic and political power: a qualitative intensification

of international trade competition; few challenges to the technological dominance of OECD-based firms; and recent changes in the factors conditioning the export of capital goods and technologies to developing countries.

Intensification of international trade competition

Trade competition from the third world during the 1970s came from countries which were relatively unimportant customers for capital goods and technology originating in the OECD area. For example, the four most important export platform locations of the third world, namely Hong Kong, the Republic of Korea, Singapore and Taiwan Province of China, have provided roughly two thirds of manufactured imports from developing countries in recent years, but their share in total exports of capital goods from the OECD area to developing countries remained low during the whole period. In 1968 this share was 8.1 per cent and in 1977, the last year for which figures are available, it had increased to only 8.9 per cent. During the same period, five major OPEC countries, namely Algeria, the Islamic Republic of Iran, Nigeria, Saudi Arabia and Venezuela, increased their share in OECD capital goods exports to the third world from 12.2 to 28.1 per cent.[11/]

The study is probably right in concluding that "...OECD countries have so far been able to protect and even strengthen threatened industries without risk of direct retaliation as the countries importing most technology did not produce on a very large scale for export (OECD [33], p. 77)." In other words, the major receivers of technology transferred from the OECD area, such as Argentina, Brazil, India, Mexico and OPEC countries, are still not important competitors for world export markets. But this is bound to change, since growing export orientation is inevitable, if only because of the inherent tendency of technology to encourage economies of scale. The OECD study (OECD [33], p. 77) further states the following: "There are no guarantees that this favourable situation will continue. As industrial development advances in countries with large domestic markets, the need for sophisticated technologies will increase and there will be increasing pressures to pay for such imports by exporting manufactured products, or further increasing international borrowing with attendant debt-servicing problems. A renewed swing towards export promotion policies is one way of financing imports of technology. The exact effects of this evolution will depend on whether increases in exports and income outweigh losses of markets and imports and how success fully the adjustment process works in OECD countries.

In other words, even the most powerful transnational corporations might frequently be confronted with situations where trade competition becomes an increasingly tricky affair, full of trade-offs for which practically no reconciliation would seem possible. This is due to the fact that at least a few of the new competitors, like some OPEC countries and NICs, cannot be so easily pushed around as was the case with the traditional export platform countries.[12/]

On the other hand, the position of OPEC countries and NICs seems recently to have deteriorated considerably. This is due to the combined impact of a softening world petroleum market and the debilitating effects of the current economic crisis even on those NICs which, like Brazil and the Republic of Korea, only a few years ago seemed to possess unlimited vitality. It is hard to judge how this will influence patterns of international trade competition for specific industrial sectors. Suffice it to

say that, on the whole, the multipolarization of international trade competition for industrial products can no longer be stopped, and that this is a considerable challenge for OECD-based transnational corporations.

New challenges to the technological dominance of OECD-based firms

Apart from mature and standardized technologies, OECD-based firms have been able to keep effective control over technology transfers and integrate them into their world-wide trade and production strategies.

According to OECD, this technological dominance of OECD-based firms is bound to be increasingly challenged: "It will become more difficult to control technology as the number of sources increases and the diffusion of technology accelerates both vertically and horizontally" (OECD [33], p. 77). The reasons are obvious. In spite of the extremely high social costs of technology transfer, the process of learning how to receive and adapt technology imports is under way in a number of growth regions in the third world. The development of the required engineering skills would make it possible to lower the real cost of imported technologies and enable local firms to reap economies of scale that may facilitate entry into new domestic and foreign markets [36]. There has also been some improvement in the ability of local engineering firms to participate in more complex engineering tasks, particularly in resource-based industries. Potentially at least, this could mean that for a growing number of technologies, the speed of international transfer might increase, and that the former technological advantages of OECD-based firms could be eroded. This in turn, according to the OECD study, would mean that losses of export markets when restructuring of industrial activities would be involved and industries in member countries might not expect major increases in export shares in such industries. Furthermore, the possibility of keener competition in OECD and third markets would exist (OECD [33], p. 79).

Capital goods exports to developing countries and transfer of technology - possible future trends

During the 1970s, capital goods manufacturers in the OECD region, particularly the producers of infrastructural equipment and of large-scale equipment and turnkey plants, were increasingly compelled to look for new growth markets outside the OECD region.[13/] Capital investment in industrialized market economies slowed down considerably at the same time as OPEC countries began importing huge amounts of infrastructure, capital goods and turnkey factories. In addition, a handful of non-oil-exporting developing countries with rapidly expanding industrial activities, the so-called NICs, continued to rely heavily on the import of capital goods by borrowing extensively on the Eurodollar and the Asia-dollar market.

This internationalization of the capital goods business has been particularly important for the huge and highly diversified transnational corporations that dominate the markets. The example of a leading United States transnational corporation is instructive in this respect. In five of the last seven years prior to the preparation of this paper, the company in question had topped the United States league of exporters. In 1980, it earned 38 per cent of its $24.6 billion sales and 42 per cent of its $1.5 billion in net profits from international business. Total exports in 1980 by its domestic businesses were $4.3 billion, giving the company a $1 billion positive trade balance.

The economics of penetrating the potentially huge markets for infrastructure, heavy equipment and complete industrial complexes in a handful of OPEC countries and NICs has been rapidly changing in recent years. From the viewpoint of transnational corporations, three questions are of key importance:

(a) Does the company have the capacity to organize the export of whole systems of infrastructure and industrial production, including those segments of technical knowledge needed to run and maintain them?

(b) Is the company capable of showing sufficient flexibility with regard to contractual arrangements, particularly for subcontracting patterns and for devising compensatory trade schemes (counter-trade arrangements)?

(c) Is it possible to mobilize sufficient credit, both private and public, and can one count on government support?

The executive responsible for the international operations of the company feels strongly that technology is the key to its future as an overseas manufacturer. "Where we have special strengths in technology, we feel most confident about entering markets", he says. Turbine technology has in the past provided just such a lead. In fact, the company remains extremely well positioned to take the lead in the industrialization of developing countries. It is able to offer products and technology useful to an economy from the earlier stages of industrialization (light bulbs and power generation) through an intermediate stage (locomotives) and on to consumer society sophistication (appliances and perhaps information processing). In applying these strengths, the company also has a well-established pattern of moving from a position of direct exporter to joint venture to domestic manufacturer.

Since technological strength is a highly perishable good, huge amounts of money have to be constantly invested to upgrade and restructure it. In fact, leading capital goods firms have been making increasing use of their enormous financial strength to improve their overall technological capacities, particularly in micro-electronics and robotics.

A good illustration of financial and structural flexibility is provided by a recent agreement by the above-mentioned company to sell steam turbine generating equipment worth $142 million for a nuclear power station in Romania. The agreement provides for an 8 per cent export-import loan, which the company will finance from its own resources so as to offer credit at 7.45 per cent to Romania.

In addition, the company was able to obtain United States government authorization for a $120.7 million Export-Import Bank loan for Romania at a time when the Government was proposing a 32 per cent drop in the 1982 budget of the agency, which clearly demonstrates the importance of this type of complementary funding. With regard to barter counter-trade, the company agreed to sell a large quantity of Romanian industrial goods over an 11-year period, mainly in third world countries. In the final analysis, the company was able to match competing offers, particularly from French firms, not because of superior technology, but because of available finance and its willingness to undertake counter-trade arrangements.

Other factors which, during the 1970s, weighed heavily in decisions on large-scale capital goods exports to the third world, such as the availability of large numbers of skilled and semi-skilled manual workers

originating in the home country and willing to join the on-site work-force abroad, have been rapidly losing in importance. In fact, the hiring patterns of contractors seem likely to continue to shift away from expatriates, not only for skilled and semi-skilled manual workers, but increasingly for middle-level engineers and other professional staff, except for a handful of engineers and project managers controlling the key co-ordinating functions. There are three reasons for this:

(a) First and foremost, transnational corporations based in the United States and Western Europe are facing increasing difficulties in finding skilled and disciplined workers and engineers who would be willing to accept the harsh working and living conditions of a globally mobile on-site workforce, at least at the wage levels companies are prepared to pay;

(b) Second, a growing number of developing countries are competing in the export of cheap and docile workers. The pioneers have been some firms of the Republic of Korea, which, based on their experience during the Viet Nam War as contractors to the United States Army, have exported low-priced construction labour crews, mostly organized in a kind of military fashion, to sites in the Middle East, but also to Africa and Latin America. Those firms are now under increasing pressure from even lower-range countries such as the Philippines, Thailand and India, which have also entered the labour-export business. The latest development has been the entrance of China, which is offering crews of trained workers for monthly wages (based on a 48-hour week with no holidays) of from $300 to $450 ([37], p. 53);

(c) Third, some of the NICs and OPEC countries, which for economic or geo-political reasons were able to strengthen their bargaining power, have been increasingly insisting on foreign contractors to hire and train national engineers and workers.

The above-mentioned changes in the economics of penetrating the markets for large-scale equipment in some growth areas of the third world have one basic common denominator: increasingly such markets have become closely watched government procurement markets. This would apply in fact to a number of the high-growth countries of the third world, with the exception of Argentina and Chile in Latin America, and some extremely open-door export platform areas in South-East Asia, particularly Hong Kong. From the viewpoint of transnational corporations, such problems have been a feature of doing business in Western Europe for years, but it is now obvious that the same conditions are fast developing in some of the more important markets in the third world [38].

Strategic options for OECD-countries

What strategic implications have been drawn by OECD, in other words, what priorities are suggested for innovative policies and industrial restructuring?

The two basic documents on this subject prepared for the OECD Meeting of the Committee for Scientific and Technological Policy at Ministerial Level [33, 39] are very outspoken on the role of innovation for international competitiveness: "A capacity for innovation in manufacturing and related services will be vital for competitiveness among OECD countries in the 1980s" (OECD [39], p. 98). Technological competition will intensify, with regard both to intra-OECD rivalry and to the NICs. Technological protectionism will have a role to play, but it should be implemented in a

very selective way, focusing on key technologies and basic know-how. In addition, it needs to be complemented by a revitalization of innovative capacities. If firms originating in the OECD region are to retain their technological dominance, "the rate of renewal of technology held by the North must offset the acceleration of technological obsolescence coming from transfers to the South" (OECD [33], p. 101).

The following priority areas and prerequisites are identified: "a strong base in capital goods, process engineering, fine materials, or automatic assembly, dependent on formally established research and development and design, and on the ability to mobilize and assimilate technologies from a wide range of sectors, especially electronics; strong links with academic research and with the market; highly trained managers, engineers and workers; the continuing commitment of resources to innovative activities, even in unfavourable conjunctural circumstances" (OECD [39], p. 99). Thus, it is expected that "the degree of flexibility of the industrial system to respond to changing opportunities and constraints" (OECD [39], p. 99) will considerably increase, which in turn would improve the chances to overcome the present economic crisis. The main actors behind this revival of innovation would be private firms and "one of the main objectives of government policy must be to create a framework in which market incentives stimulate the innovative capacity and performance of firms" (OECD [39], p. 99).

If the OECD proposals could be effectively implemented, a slow-down in the multipolarization trends of international economic relations might take place. This would not only apply to relations between OECD countries and NICs, but also to OECD-CMEA relations and intra-OECD rivalry. However, it remains to be seen whether such a strategic concept of interlinking innovation and industrial restructuring would really work. In fact, the author of this paper would tend to be rather sceptical because of the constraining impact of the current economic crisis on innovation, and the incapacity of major OECD countries to implement a concerted approach.

Impact of the economic crisis

The current economic crisis has had an important constraining impact on innovation. In fact, the OECD secretariat is very clear on this point: "Obviously, technological renewal can only take place if economic conditions are favourable. But the outlook at present is not conducive to taking the risks associated with uncertain innovation" (OECD [33], p. 112). There are two main constraining factors involved, namely the high and growing rate of inflation and stagnant investment, particularly investment in machinery and equipment. According to C.T. Hill [40], in a capitalist economy the rate of inflation is probably the best indicator of uncertainty about the future. With high rates of inflation (the latest figures for the OECD area put them at approximately 14 per cent) [41], potential investors in general will hesitate to invest their money in new technology issues, with their inherent high uncertainty and risk. It could be argued that the recent run of United states venture capital into high technology issues counterdicts this argument, and that it will prove to be more than just a passing phenomenon (Ernst [1], chap. VI). In any case, high inflation rates are bound to provoke restrictive monetary policies with high interest rates, which has already happened in all major OECD countries, particularly the United States. High interest rates in the context of crisis can in fact become an important constraint on non-speculative investment, as amply borne out by the experience of the first half of 1981.

This brings us to the problem of stagnant investment. Innovation in fact requires huge investment outlays, but private investment has been virtually stagnant since the first oil price rise (see table 9).

According to the OECD-Interfutures project [42], the slack in the private investment, which exists despite a relative abundance of savings, is due to insufficient demand for investment funds. There is not yet any convincing theory on factors mainly responsible for the insufficient propensity to invest, but the following three are definitely involved:

(a) Declining real profitability of industrial investment, at least for important sectors;

(b) The increasing difficulty of avoiding very costly excess capacities which are mainly due to the inherent technological inflexibility of existing production structures and their resulting inability to adapt to market fluctuations;

(c) The perception of a majority of potential investors that investment risks are rapidly becoming uncontrollable, not only because of inflation, energy prices and variable exchange rates, but also because of changes in industrial relations and in political power structures.

Table 9. Private investment performance in eight OECD countries, 1960-1978

Country	Average growth of business investment (percentage)		Share of private machinery and equipment in total private investment[a/] (percentage)			
	1960-1973	1973-1978	1960	1968	1973	1978
Canada	6.0	2.4	34.1	37.7	40.0	41.3
France	7.2	0.2	43.6	46.1	50.3	52.5
Germany, Federal Republic of	4.2	-0.2	34.7	39.1	42.9	48.6
Italy	4.6	-1.2	38.8	37.6	46.7	48.0
Japan	14.3	0	50.0[b/]	51.7[b/]	59.7[b/]	55.6[b/]
Sweden	4.1	-2.8	40.6	41.9	46.3	47.2[c/]
United Kingdom	4.0	3.5	47.4	46.7	51.3	52.3
United States	4.9	0.7	36.9	43.8	44.9	48.0

Sources: OECD National Accounts: "Annual report on national income statistics of Japan", Economic Outlook, December 1979. Quoted from North-South Technology Transfer: The Issue of Feedback Effects (Paris, OECD), p. 113.

a/ Data not comparable between countries. For France, Italy, Sweden and the United Kingdom, total machinery, transport and other equipment expressed as a percentage of gross fixed capital formation in industries. It is assumed that government investment is in non-equipment items.

b/ Japanese figures are on a fiscal year basis.

c/ The ratio reached almost 52 per cent in 1977.

There is good reason to believe that stagnant investment is not just a conjunctural, but a structural phenomenon.[14/] The conclusion drawn by OECD sounds convincing: "There is thus a great risk that firms will not innovate at an adequate rate, but that they may prefer to wait until the business outlook clears. Furthermore, it is not evident that measures being taken to stimulate innovation are suited to the slow and difficult economic situation which confronts us" (OECD [33], p. 112).

Constraints on intra-OECD co-operation

Even assuming that a healthy investment climate for such a strategy existed, there would remain the problem of whether at least the major countries of the OECD region would be able to work out a concerted approach and achieve effective intra-OECD co-operation [44]. It seems hardly realistic to expect such co-operation. In fact, intra-OECD rivalry is strong with regard to both innovation and international restructuring of industry, and this rivalry is also reflected in the increasing difficulty of achieving workable compromises, at least for short-term crisis management, among OECD countries. The dimensions of the problem are borne out by two recent examples:

(a) The refusal of the Government of the United States to associate itself with the attempt by the OECD secretariat to promote government intervention in science and technology policy and to strengthen intra-OECD co-operation [45];

(b) The failure of a summit meeting of heads of State and Government of OECD countries held at Ottawa, Canada, in July 1981, to reach a minimum consensus on how to proceed with anti-crisis management and its complete silence on problems of industrial restructuring.

In conclusion, the failure of concerted action to regain technological dominance along the lines recommended by the OECD secretariat will put individual OECD countries under increasing pressure to search for individual short-term gains. Rather than accepting the transformation of existing international economic and political power relations, at least the major OECD countries will try to "fight it out on their own" and increasingly resort to cutthroat technological competition and protectionism. Thus, from a third-world point of view, the future of international restructuring of industry and of the related international flows of technology looks rather bleak. It remains to be seen whether developing countries, both collectively and individually, will be able to anticipate these developments and increase industrial co-operation among themselves in the fields of trade, technology and finance.

Notes

1/ For a theoretical treatment, see Ernst [1].

2/ However, Rada seems to have become more skeptical with regard to the relocation-back-to-the-North hypothesis (Rada [3]).

3/ For an in-depth discussion of constraints to applying microelectronics to industrial production, see Ernst [1], chapter V.

4/ For background information on the garment industry, see Salomon Associates [8].

5/ For an account of the constraints to automation in the United States garment industry up to the late 1970s, see Brender, Chevallier and Pisani-Ferry [9], chapter V.

6/ For example in the petrochemical and steel industries, see UNIDO [11] and UNIDO [12].

7/ Sutton and others [13], volume 4.

8/ For a discussion of the constraints upon the establishment of full-scale automated factories, see Forester [14] and Wintersberger and others [15].

9/ For a list of th se countries, see OECD [28].

10/ Case-studies on the viability of strategies geared to specifi parts of the world market would deserve high priority in future research.

11/ Calculated from [34].

12/ For attempts to analyze these recent trends in international trade competition, see Fouquin and others [35] and Turner and Woolcock [6].

13/ For empirical evidence, see OECD [28] and OECD [33], chap. VI.

14/ Lorenzi, Pastré and Toledano [43], chapters I and VI.

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COMPUTER-AIDED-DESIGN: AN ASSESSMENT OF THE CURRENT INTERNATIONAL ECONOMIC SETTING AND POLICY IMPLICATIONS

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Computer-aided design (CAD) technology - basically the use of computers for design and drafting purposes - has been chosen as an example of electronics technology. This sector is particularly well-suited for it exposes copious links with the rest of the technologies in the field of electronics. Further, CAD has been recognized as giving rise to a synergistic effect leading to the automation of other production sectors. Lastly, it is reckoned that, owing to the role CAD plays in the production process it is bound to have a significant impact on the comparative advantage of numerous manufactures.

Basically, CAD is the use of computer technology for design and drafting purposes. CAD equipment enables engineers or draftsmen to make precise, elaborate and detailed drawings of any piece of machinery or industrial product to be manufactured (aircraft, circuit boards, shoes, garments, industrial plants etc.), by interacting between an alphanumeric keyboard and a changing display on the screen. They can simply draw free-hand with an electronic pen right on the screen, and the computer gives the rough shapes, the precise tolerances requested, even rendering them in three dimensions or creating solid forms, thus allowing the CAD operator to examine the drawing from any angle; three-dimensionality is the main advantage of computer-based drawings as compared to paper-based ones.

With the help of CAD, designers can enlarge details, apply colours, change shapes, test them under mathematically simulated conditions and edit and modify them. When the work is finished the computer then stores the results in its memory, which can be retrieved later on a touch of a button and brought back to the screen for subsequent examination or revision, thus eliminating tedious and costly repetition for designers and draftsmen.

CAD technology, hardly known 10 years ago, has now become one of the fastest growth areas in the computer industry.

The current international economic setting

Developments in the global economy over the past 35 years since the end of the war can be viewed in a variety of contrasting ways. At one extreme, little appears to have changed; the mass of the world population continues to subsist at, or near, the bread line, and most of the poor live in developing countries. Further, developing countries continue to rely on technology received from developed countries; indeed, the flow of trade consists predominantly in the exchange by developed countries of

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manufactured goods and technology for primary products from developing countries. Yet within this overall trend, important changes have been taking place in the international division of labour. By 1975 over 40 developing countries each exported manufactures worth over $100 million, while the manufactured exports of developing countries increased in the aggregate from $4.6 billion in 1965 to $55 billion in 1977 [1]. The share of developing countries in global manufacturing value added has grown from around 7 per cent in 1965 to nearly 10 per cent in 1979 [2].

The growing participation of developing countries in global industrial output and trade reflects two interrelated tendencies in the world economy. The first concerns the specific attempts made over the years by newly independent developing countries to foster industrial production. This involved protecting and subsidizing production, at first mainly for local consumption and then subsequently destined for global markets. The growing presence of transnational corporations, actively seeking new markets in the face of fiercely competitive oligopolistic markets [3], is another factor contributing to the industrialization of developing countries.

Associated with these changes there has been a growing capability by developing countries in the realm of science and technology. In the early post-war period educational facilities in almost all developing countries were minimal; their expansion and upgrading became a priority for most of them. The resulting increase of skilled manpower in developing countries fostered and facilitated the transfer of technology. An indication of this has been that the manufactured exports of developing countries have progressed beyond the mature labour-intensive traditional industries [4], and have increasingly come to encompass a variety of technology-intensive goods [5, 6, 7].

As a consequence of these developments, there has been optimism that developing countries will be able to maintain the pace of their growing industrial role in the international division of labour. The Second General Conference of UNIDO, held at Lima in 1975, for example, set a target for developing countries of 25 per cent of global value-added in manufactures by the year 2000 [8].

But this horizon has in recent years become clouded both by the persistent and worsening recession in the world economy and by the rapid diffusion of efficient electronics-related technologies in the manufacturing enterprises of developed countries. These technologies not only tend to save labour, the source of the comparative advantage of developing countries, but also provide other substantial benefits to innovating enterprises. Their differential diffusion in the world economy is therefore likely to affect significantly the ability of non-innovating enterprises to compete in global markets. If this differential diffusion takes the line of a split between developed and developing countries, then the existing technological gap between them may widen, in which case, the anticipated industrial share of developing countries is likely to be smaller than current prospects suggest.

The role of electronics in the modern economic context

It has been argued that over the course of the last 200 years there have been a series of major "heartland technologies" which have fuelled "big wave effects". The first of these, beginning in the late eighteenth century, was based upon textiles and the diffusion of the steam-engine; the second, with its onset in the mid-nineteenth century, was fuelled by the combined expansion of railways and the diffusion of steel; the third,

with its origins at the turn of the twentieth century, was based upon the internal combustion engine, electricity and the chemical industry; and the fourth, has been fuelled by electronics tech- nology, beginning with the use of the valve in the 1930s, and proceeding with the invention of the transistor in the 1940s, the integrated circuit in 1959 and the microprocessor in 1971. The present heartland technology continues to be the field of electronics, which is the frame encompassing this study on computer-aided design.

During the first 25 years after the Second World War economic growth reflected a combination of two sets of factors. The first of these was the reconstruction which followed the devastation of war. The second concerned the expansion associated with the introduction of new products based upon the heartland technology. Such products can be divided into four major categories, namely consumer electronics (radio, television, record-players, tape recorders etc.), electronic capital goods (radar, computers, communication equipment, process control etc.), electronic components (valves, transistors, integrated circuits, resistors etc.), and military equipment (radar, missile control systems etc.). In each subsector the introduction of new products was associated with rapid expansion of production, employment and trade.

By the end of the 1960s, reconstruction was largely complete, markets had begun to be saturated* as more imitative firms had entered the sector, attracted by high profits and the rapid growth of markets. Besides increasing competition, the power of organized labour began to grow after a period of sustained near-full employment, and changes in technology were forcing investment in more capital-intensive technologies.

The consequence was that the 1970s saw a significant decline in the rate of profit in almost all economies [10], increasing overcapacity in most major markets such as steel, shipbuilding and cars [11, 12], growing unemployment, inflation and low or negative rates of economic growth.

In the latter period further fuel was added to the flames of stagflation by the increase in energy costs. Next to the increase in energy prices, perhaps the most important development was the decline in the rate of growth of world trade, which had expanded rapidly when the developed economies were experiencing rapid economic growth and near-full employment, but fell off as these conditions faded. In the late 1960s and early 1970s, CAD was a new product, largely being used within the expanding electronics sector as an essential component in the design and manufacture of integrated circuits and printed circuit boards. More recently, CAD has begun to filter down to established manufacturing subsectors where, in the face of growing competition, innovating enterprises are using it to increase productivity, optimize designs, reduce costs and shorten lead times.

Thus the CAD sector, rather than following the current recessionary trend, is one of the few experiencing a high growth rate. In fact, despite a general capital shortage and lack of new engineering graduates, more venture capital is available and more new electronic companies are being formed than ever before.

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*For example, by the late 1970s, there was one car on the road in the United States for every 1.2 licensed drivers, with 84 per cent of households owning at least one car. In Western Europe there was one car for every two adults. See Transatlantic Perspectives [9].

Impact of CAD on the comparative advantage of developed and developing countries

CAD is representative in many ways of other electronics-related technologies, but it must be stressed that it is only one of the many advanced electronics-based technologies which are spreading to the manufacturing industry. It would therefore be mistaken to place too great an emphasis on the sole potential impact of CAD on the exports of manufactures of developing countries. The use of CAD, however, provides firms with substantial benefits; it is of importance, therefore, to assess the impact of CAD on comparative advantage, so as to be able to foresee any changes in the competitiveness of individual firms or of specific sectors and take appropriate measures.

Given that socio-economic conditions within the developed world are rather similar, the introduction of CAD may be decisive in stemming off rival products unless the competition also adopts CAD technology, in which case efficiency increases but relative mutual competitiveness remains unchanged.

A different picture emerges when the industries of developed and developing countries are compared. In many sectors developing countries enjoy a comparative advantage which is chiefly based on a cheap and abundant labour supply. CAD technology, however, may partially erode this labour-based comparative advantage, for its introduction in developed countries will increase profits, thus provoking a deterioration in the comparative advantage of developing countries. It is of crucial importance for firms from developing countries to evaluate the extent to which their comparative advantage vis-à-vis rival firms in developed countries would be eroded. A substantial erosion might, in the short term, compromise the procurement of badly needed foreign currency and, in the long term, the very industrialization efforts pursued so far, unless developing countries also adopt CAD technology.

Table 1 shows the extent of growth and the value of all developed countries imports of manufactures from developing countries between 1970 and 1978, and relates their ranking by size and growth to design and drafting intensity.

A number of relevant observations can be drawn from this table. First, the growth in overall manufactured exports (7.3 per cent) over the eight years was remarkably high. Second, exports of higher-technology manufactures grew more rapidly than those of traditional manufactures, although the difference between these two groupings was not as large as some observers suggest (for example, Lall [5]). Third, textiles and garments remained the largest group, accounting for 48 per cent of all developed countries imports of manufactures from developing countries in 1978, but down from 55 per cent of the total in 1970. Finally, it is to be noted that traditional manufactured products are of low design and drafting intensity; by ranking they fill the last four places in each case.

The major export-oriented industrial sectors of most developing countries have very low drafting and design intensities, which might lead one to expect that it will take quite some time before they introduce CAD. Rival firms in developed countries, however, might quickly snatch CAD equipment in order to stop losing competitiveness and even regain comparative advantage. Thus, the redeployment of non-competitive industries to developing countries might be delayed or discontinued, especially since the high rates of unemployment in developed countries increase the pressure in favour of protectionist measures.

Table 1. Imports by developed countries of manufactures from developing countries in relation to design and drafting intensity

	Value (millions of dollars)			Rankings (scale of 15)			
	1970 (a)	1978 (b)	Growth (b)/(a)	Value 1978	Growth	Drafting intensity	Design intensity
Traditional manufactures							
Semi-finished textiles	1 815	9 610	5.3	1	13	11	11
Leather	183	950	5.2	9	14	13	12
Clothing	1 181	9 502	8.1	2	10	12	14
Shoes	151	2 033	13.5	7	6	14	13
Higher-technology manufactures							
Chemicals	588	2 282	3.9	5	15	9	6
Metals and metal products	319	2 223	7	6	12	10	9
Machinery except electrical and business	81	1 136	14	8	5	4	3
(Farm machinery)	2	29	14.5	15	4	7	7
Electrical machinery	372	4 463	12	3	7	1	1
Business machines	81	600	7.4	12	11	2	5
Scientific instruments	24	359	15	13	3	3	4
Motor vehicles	23	603	26.2	11	2	8	10
Aircraft	18	737	40.9	10	1	6	2
Shipbuilding	40	355	8.9	14	9	5	8
Consumer electronics	214	2 391	11.2	4	8	a/	a/
Total manufactures	5 493	40 195	7.3				
Total traditional manufactures	3 330	22 095	6.6				
Total higher-technology manufactures	2 163	18 100	8.4				

Source: Calculated with data on International Standard Industrial Classification (ISIC) sectors from Tomorrow's Manpower Needs, Statistics Bulletin No. 1606 (Washington, DC, Department of Labour, 1969) and with data on Standard International Trade Classification (SITC) sectors from Developed Country Imports of Manufactures from LDCs (Washington, DC, Central Intelligence Agency, 1980) (ER-80-10476).

a/ Figures are not available; it can be indicated, however, that the design and drafting intensity of this sector is high.

Furthermore, although some products may have low drafting and design intensities, they or some adjacent complementary products may be design-intensive, or they might greatly benefit from the downstream uses of CAD. Thus, electronic toys, for example, are particularly sensitive to changes in design; food products in turn, although they are neither draftingnor design-intensive, their packaging frequently is. Further, the use of CAD cutting and nesting techniques has had a crucial impact on the garments sector, which is a design-sensitive sector.

Several of the most industrialized developing countries have recently developed drafting to a capacity for the production of more sophisticated products which are highly drafting- and design-intensive. In the electrical machinery sector, for example, one in six of the labour force are in the design category, and in process plants design costs can be as high as 20 per cent of total fixed capital costs. Hence these industries are likely to be most affected by CAD equipment; the developing country firms involved should therefore examine the possibility of adopting CAD without delay, lest they be forced back to the export of more traditional manufactures.

Redeployment to developing countries

Redeployment of industries from developed to developing countries has so far taken place as a response by large companies, mainly transnational corporations (initially United States and subsequently, though to a lesser extent, Japanese and European), to growing competition in the world market and large wage differentials; production processes were decomposed and the labour-intensive elements were transferred to low-wage economies.*

In the case of electronics, requirements for labour are substantial and have prompted location in developing countries. Manufacturing the silicon chip, for example, is cheap when provided in sufficient numbers; marginal labour costs are almost insignificant. By contrast the labour costs of packaging these chips in plastic containers and the insertion of connecting wires are high, with little difference between marginal and average unit costs. Consequently there was intense pressure to reduce these assembling costs, which were predominantly labour costs, by using low-wage labour in developing countries.

Another driving force of OECD based companies to redeploy was the securing of market access in some of the large developing countries.

The confluence of these factors explain the great increase in the growth of the manufacturing capacities and exports of developing countries over the past fifteen years. It also explains why so many developing countries began to institute policies designed to emulate the success of these economies.

The factors wich have underlain previous redeployment to developing ccuntries now seem to be affected by the increased automation of production processes in developed countries.

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*But, as Scriberras [13] shows, this strategy placed firms in the television sector at a disadvantage. Although the United States firms were able to cut costs by taking advantage of cheap labour in export processing zones, manually assembled sets were less reliable than those assembled in automated plants. As a result Japanese firms were able to capitalize on automated assembly and dominate the United States market.

As unemployment rates in developed countries have begun to rise, mainly due to the general recession but also resulting from electronics-related innovations both in the manufacturing and services sectors, so have protectionist barriers, beginning in the most labour-intensive sectors (e.g., garments) and now spreading to other consumer goods (e.g. cars and television) and intermediate goods (e.g. steel). Further, the downstream use of electronics in other sectors has begun to undermine the comparative advantage of developing country firms producing with traditional technology and low-wage labour, for developments within the electronics sector, such as the automated insertion of integration circuits onto printed circuit boards, the packaging of the circuits themselves and the reduction of the number of circuits in many products due to the development of more powerful very-large-scale integration, have increased productivity and diminished the requirement for cheap labour.

It seems, therefore, that the redeployment process which has been a major element in speeding up the industrialization of developing countries is undergoing drastic changes. The increasing application of CAD in industrialized countries will contribute to these changes.

Development of endogenous CAD production capacity in developing countries

To the best of the author's knowledge only one set of developing country CAD equipment exists and this was produced by the Tata Institute of Fundamental Research in India. The Tata Institute had in the 1950s already built its own digital computer* and was then abreast of technological developments in the United States. The total stock of software input for the Tata applications programmes is however, less than 30 person years, which is very small by comparison with the major turnkey vendors.

There are currently four imported turnkey systems in India, three of which are predominantly for electronic applications. Working with the basic graphics software of these turnkey systems, the Tata Institute has assembled four further systems, two of which have been sold to research institutes. Their basic operating systems and graphics software do not appear to be as sophisticated as the turnkey counterparts. The Tata CAD systems only run two terminals off a minicomputer whereas most of the turnkey minicomputers are able to drive between four and eight terminals each.

Nevertheless, despite these deficiencies, the Tata systems do work. The major obstacle to wider diffusion probably relates more to lack of demand from an unsophisticated industrial base than to the inadequacy of their own software. Indeed there is a relative stagnation of demand for industrial goods in India itself. In 1976 for example, the average unweighted coefficient of capacity utilization in 307 engineering sectors was only 53.7 per cent and in industrial machinery industries only 55.4 per cent [7].

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*The Indian version, however, was non-electronic and worked with vacuum cubes.

Socio-economic and technological constraints of developing countries

Developing country producers wishing to maintain or increase their competitiveness in the markets of developed economies will have to use electronics-related technologies such as CAD. However, a number of factors which handicap the introduction of such technologies are discussed below.

Most developing countries enjoy an abundant supply of labour and therefore wish to take advantage of this factor by fostering labour-intensive industries in their territories. But the introduction of CAD changes the nature of design, transforming this traditionally labour-intensive activity (with a cost per work-place of less than $2,000) into a capital-intensive one (frequently involving capital costs per work-place of over $80,000). Developing countries faced with capital and foreign exchange constraints (CAD systems will probably have to be imported) and high levels of unemployment will find themselves using a seemingly inappropriate technology. It is a technology, however, that by virtue of its performance, renders manual design techniques suboptimal. This is not the first time that developing countries have been faced with a trade-off between technological efficiency and economic appropriateness. Nor is the dilemma confined to developing countries, since many developed countries currently face balance of payment constraints and untypically high levels of unemployment. Despite the undesirable characteristics of such technologies it seems that if developing, or even developed country producers wish to maintain their competitiveness in world markets they will be forced to make more active use of CAD-type technologies, however inappropriate in the context of existing conditions they might seem.

Another particular feature of developing countries might seem to be the lack of skills required to operate a CAD system. Actually, the skills required are certainly lower than those needed in the traditional drawing and design offices. From this point of view, therefore, there are no grounds for arguing that developing country firms will be unable to utilize the new technology. However, the implications for management are more fundamental than those for operators. Managers have to ensure that the design and drafting offices are organized in different ways and have to be aware of the systems gains which CAD technology permits.

In fact there are many reasons to suppose that it is easier to implement systems reorganization in developing than in developed countries. In part this is because of the difference in the relative powers of labour and capital in the two environments. Moreover, it can also be argued that such systems will be more easily introduced in green-field sites in developing countries, for in developed countries existing enterprises will have to struggle with established procedures and interest groups and with the implementation of changes in the existing work practices. Probably, in the latter case, the power of labour to inhibit the efficient introduction of electronics technologies will be significant, especially when the survival of whole categories of activity such as draftsmanship are at stake.

Further, CAD equipment might act as a synergetic agent favouring the automation of the factory. High wage costs have provided developed country enterprises with an incentive to introduce complementary downstream technologies in order to capture systems gains. This incentive however, is not present in developing country enterprises, which might therefore have less motivation to introduce complementary electronics techniques and would thus fail to capture these external economies.

Another constraint for developing country users is the distance from suppliers. As has been previously indicated, the immaturity of particular CAD applications programmes usually leads to a hand-holding relationship between suppliers and users. As the major mode of competition moves in the 1980s from strength in specific applications software to price and servicing, most CAD suppliers are now offering users the capability to respond to their problems within four to eight hours. From the users point of view, this rapid response is essential not only because the high capital cost of CAD requires high utilization rates, but also because their reliance on a centralized data base makes them highly dependent on the unhindered functioning of their CAD system. From the suppliers point of view this rapid response can only be provided if service centres are near, but most developing countries lack the service base required to service the CAD systems.

For all the foregoing reasons, and on the basis of the experience of developed country users visited, this isolation must be seen as a disadvantage despite the possibility that isolated users will be forced to learn more about the CAD software itself than their more pampered counterparts. The disadvantages of distance are probably acutely felt in relation to the extension of the CAD systems to wider uses outside the particular application programmes for which the systems were initially intended. Given that the most effective United States and United Kingdom users had achieved their major design gains by widening applications in this way, such a restriction in use is likely to be a major disability.

Policy considerations

The stage is now set for an assessment of the wider issues involved, and for the prescription of policies to enable developing countries to adapt successfully to the rapidly changing economic and technological environment.

At a higher level of abstraction, for example, within the framework of neo-classical economic theory, some would conclude that policy intervention is unnecessary, and that market forces will lead to the rapid diffusion of CAD-type technologies to developing countries. But the evidence so far suggests that CAD type technology has been very slow to spread to developing countries. Only 32 systems, out of more than 6,000 systems sold, have gone to developing countries and Yugoslavia. Moreover, many of these were for the use of non-manufacturing sectors (see table 2). With regard to the possibility of developing countries producing their own CAD equipment, only India seems to have an embryonic capability, and its systems have barely penetrated the industrial market. Developing countries are not only slow in introducing CAD technology, but CAD suppliers report that developing countries are largely ignorant of the existence of this technology, let alone its potential.

Furthermore, the present oligopolistic CAD market structure is unlikely to speed up the diffusion of this technology to developing countries. The competitive pressures which might lead to its active marketing in developing countries are currently focusing on the developed countries, the markets of which are just beginning to be exploited and therefore offer enormous scope for expansion. Indeed CAD suppliers are experiencing

Table 2. Sales of CAD systems to developing countries by United States turnkey suppliers up to July 1981[a/]

Number of systems	Country or territory	Use	Type of user
1	Argentina	ACE	Local firm
1		Mechanical	Transnational corporation
1		Military	Government
7[b/]	Brazil	Mechanical (aircraft)	Government
1		Mechanical (automobiles)	Transnational corporation
3	Brueni, Sarawak, Oman	Oilfield mapping	Transnational corporation
1	Chile	Mapping	Government
1	Honduras	Mapping	Government
1	Hong Kong	Electronics	Local bureau
2	India	Electronics	Post Office
1		Mechanical	Local firm
1		Unknown	Unknown
2	Iran	Out of operation	Unknown
1	Mexico	Mapping	Government
1		Unknown	Unknown
2	Korea, Republic of	Unknown	Unknown
1	Taiwan Province of China	Ironwo[illegible]	Local firm
3	Venezuela	Oilfield mapping	Government
3	Yugoslavia	Unknown	Government
3		Unknown	Unknown
1	Zaire	Unknown	Unknown

Source: Interviews.

a/ It is important, here, to emphasize that this data on the numbers of CAD systems used by developing countries refers only to the sales of the major United States and United Kingdom turnkey vendors which are visited, and who account for the overwhelming share of global turnkey systems sales. It is possible, therefore, that a number of isolated sales of small dedicated microcomputer-driven terminals or of pure software-based systems have been made to developing countries.

b/ Comprises 14 per cent of 1980 sales of around 50 systems.

difficulties in coping with the pace of market growth in developed countries.* Moreover, the extra costs of servicing developing country users add to the relative state of neglect in which the markets of developing countries are held.

Indeed, even the Governments of developed countries recognize the limitations of the market in producing the incentive required to spread CAD technology as rapidly as competitive conditions require. Thus, the United Kingdom Government heavily subsidizes the CAD centre in Cambridge which is designed to spread CAD to industry. It also provides aid to firms which pioneer the use of the technology. Similarly, the Government of the Federal Republic of Germany provides tax incentives to firms using CAD [14], and the Norwegian Government heavily aids CAD supplying firms. More recently the Canadian Government has established a special programme of action for the introduction of CAD technology which, inter alia, notes that: "Productivity will be especially important to the Canadian manufacturing industries in the 1980s if traditional markets are to be retained and new ones gained. . .". "In this context, the rapidly emerging use of computer-aided-design and computer-aided-manufacturing (CAD/CAM) technology is of special importance". [15]

Consequently the Governments of developing countries cannot remain passive if they are to stem a deterioration of their current pattern of trade and maintain or increase their share of the markets of developed countries.

It is pertinent therefore to evaluate other methods of increasing the rate of diffusion. Two come to mind: transnational corporations using these technologies and government intervention.

Transnational corporations and CAD technology

Since between 30 and 40 per cent of total world trade in manufacturing occurs within transnational corporations, and a substantial proportion of the rest also involves transnational corporations as buyers or sellers, their locational decisions in the context of changing technological, economic and political environments are of critical importance.

During most of the 1970s the market structure of the CAD supplying industry was dominated by new, specialized firms. By the end of the decade three new forms of concentration were becoming apparent in the CAD supplying sector. First, in addition to IBM, a number of existing electronics firms producing main-frame computers, mini-computers and terminal screens were beginning to penetrate the industry. Second, there has been an increasing tendency for established engineering firms supplying automated technologies to industry to include CAD technology. Third, despite the recent trend towards new small firms supplying dedicated microprocessor systems, there is at an aggregate level an increasing tendency towards the production of CAD technology within transnational corporations.

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*As one CAD supplier reported, market shares in the 1980s will depend upon the extent to which CAD supplying firms can actually manage, that is, provide the organizational facilities to cope with, compound growth rates of over 70 per cent.

More importantly, it appears as though there is also a trend towards transnational corporations becoming heavy users of CAD technology. Unlike the early 1970s when CAD supplying firms operated on a low scale and sold to any knowledgeable firm able to use the new technology, the growing importance of the market is forcing CAD suppliers to regard transnational corporations, which are the largest potential purchasers of multiple systems*, as their prime target.**

Transnational corporations in developing countries are therefore becoming suppliers and users of the new CAD technology. How will they then react to the new technological environment in their future locational decision-making process? There are two alternative scenarios. The first is that the advantages of CAD and other electronics-related technologies reduce the incentive to site production in developing countries, because CAD diminishes the comparative advantage of the low-cost labour in the latter. In addition, by locating in developing countries, transnational corporations will suffer the disadvantage of distance from the main markets and from technology-supplying firms. The alternative view is equally tenable: forthcoming developments in communications technologies will make it feasible for transnational corporations to locate design in advanced countries and, by direct electronic transmission of design parameters, to maintain productive facilities in developing countries. Moreover, as already mentioned, the weaker power of labour in developing countries will make it easier to establish green-field sites which, as the move to the automated factory quickens, will allow for systems gains. In this way, by locating design in developed countries and production in developing countries, TNCs might get the best of both worlds. It is premature to judge which of these two alternative paths TNCs will take.

Action-oriented policies

Government intervention by developing countries is likely to prove necessary if they are to acquire CAD technology. In addition to specific measures for particular industries (e.g., shipbuilding), a series of more wide-ranging policies, as described below, will have to be implemented.

Increasing awareness

Local firms, government and privately-owned, will need to be informed of the potential benefits associated with the use of CAD-type technologies and of the problems and skills they involve. Since the non-governmental induced international flow of information does not suffice to convey vital technological information to developing countries, an active government programme to raise awareness is essential.

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*For example, by the end of 1978, one United States transnational corporation alone possessed more than 300 CAD terminals in the United States; by 1983 it was estimated that it would be using over 3,000.[16] Another United States transnational corporation had over 100 systems in use in 1980, each of which comprised a number of terminals, and expected to purchase another 25 systems in 1981 alone.

**Thus, one CAD supplier reported that he followed the strategy of working his way down the list of 500 leading United States firms published by Fortune.

Training

It will be necessary to train manpower for the technologies, both at the operator and management levels. Of particular importance here, is the awareness by management of the potential systems gains which automation in general and CAD in particular permit. Specific measures should also be taken, as is currently being done in most developed countries, to incorporate CAD and other electronics technologies in the syllabus of engineering and related courses.

Aid

Just as the Governments of many developed countries are doing, developing countries will have to help indigenous firms to acquire CAD equipment and related technologies by providing financial subsidies and access to scarce foreign currency resources. In most developing countries, electronics equipment sells for between two and three times the price prevailing in developed countries. This is due to a variety of reasons, including the low level of sales (which does not allow suppliers to spread out unit overhead costs), tariffs and local sourcing policies.* Such assistance will not only speed up the purchase of the technologies by particular firms, but will also help to promote the dissemination of information. Thus, the experience of the United Kingdom government has been that the provision of aid to certain key users has provided fairly open access of these systems to other United Kingdom firms which have been exploring the introduction of CAD technology.

Service centres, research centres and bureaus

In developing countries the establishment of service centres lies in the hands of the CAD supplying firms. However, developing country users are usually a high-cost operation, which is one reason why CAD suppliers have been slow in marketing in developing countries. There are two major options open to Governments of developing countries: either they duly subsidize supplying firms wishing to establish service centres, or, as an alternative, they can themselves establish "machine-transparent service centres", that is, service engineers and software specialists** who are sufficiently knowledgeable to service a variety of different systems. The latter path presents immediate difficulties because some servicing problems (involving, for example, specific sets of hardware) are highly firm-specific. But on the other hand, it will allow developing countries to take advantage of the software strengths of a variety of different supplying firms, and at the same time increase their knowledge of electronic technologies, particularly if the machine-transparent service centres are linked to universities and research centres. Associated with

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*Brazil and India both virtually prohibit the import of minicomputers and microcomputers in order to protect their indigenous electronics industries.

**Some United States firms use a number of different CAD systems which are managed centrally. Hence there are some levels at which machine-transparent software and organizational skills are interchangeable between different CAD systems.

this strategy of establishing service centres there is the possibility of establishing bureaux to service a number of users and thus spread the costs.*

Indigenous firms as producers of CAD systems

Given the nature of the origin of CAD technology, it is unlikely that developing countries will become viable producers of analogous CAD technologies in the near future. However, there is no reason why the Government of a particular developing country (or perhaps a group of Governments) should not buy up an existing CAD supplier in the United States or Europe. Purely as a speculative investment, there may well be substantial gains in a judicious purchase of this sort, but even more importantly, there may be a number of other spin-offs which might result from such a bold step, including the greater likelihood that CAD technology will be actively marketed in the developing countries concerned.

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INDUSTRIAL CO-OPERATION BETWEEN THE COUNCIL FOR MUTUAL ECONOMIC ASSISTANCE AND DEVELOPING COUNTRIES

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Co-operation in industry features prominently in the extensive system of trade, economic, scientific and technical relations between the countries of the Council for Mutual Economic Assistance (CMEA) and developing countries. Of the total economic and technical contribution of CMEA member countries to developing countries, more than 75 per cent is devoted to the development of industry and energy. A study of agreements concluded in recent years shows that, in the long term, while co-operation has been extended in other areas, particularly agriculture, industry will remain paramount.

At first glance the concentration of effort on establishing and strengthening industry cannot be reconciled with the shift in the centre of gravity of national plans and programmes of economic development towards the growth of agricultural production, as has been the case in a number of developing countries since the mid-1970s. This, however, is only an apparent contradiction. Industry is regarded not as an isolated sector of the economy, but as the essential condition of a balanced economic take-off and of the development of agriculture and the other branches of the economy as a whole. In our view, it is only on this condition that economic development strategy can be directed towards satisfying the domestic needs of the majority of the population of the third world by making maximum use both of internal resources and of the opportunities and advantages of the international division of labour. This in no way implies that adjustments cannot be made in the industrial development strategy in response to changes in conditions at home and abroad.

The International Development Strategy for the Third United Nations Development Decade, adopted by the United Nations General Assembly at its thirty-fifth session, emphasizes the importance of industrialization, which must be directed towards a many-sided solution of the common development problems of the national economies of developing countries. The paramount role of industry in the economic development strategy derives from various factors. From the long-term point of view, in a diverse economy only industrialization can dismantle the outdated structures hampering socio-economic development and ensure the integration of sectors and individual economic structures in a national economy which is able both to solve internal problems and to participate on an equal footing and a mutually advantageous basis in the international division of labour. The introduction of modern industry acts as a stimulus to the development of branches which are linked horizontally and vertically, thus accelerating the build-up of production and the spread of employment and ensuring a more balanced national economy. The industrial development strategies of developing countries gives special emphasis to the role of industry as a stimulus to economic growth.

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From this point of view, industrial co-operation with CMEA countries is of special importance, since it is primarily oriented towards prospecting, the ferrous and non-ferrous metal industry, and the extraction and refining of petroleum. These branches form the base of the national industry and create the infrastructure for developing the branches of the modern industrial complex in accordance with the specific conditions of developing countries. Enterprises already built or under construction in developing countries with CMEA assistance will make possible an increase in industrial capacity of 30 million tonnes per year for steel production, almost 70 million tonnes in petroleum extraction and more than 50 million tonnes in petroleum refining.1/

Petroleum and ore-prospecting projects have been carried out and are continuing with the participation of CMEA specialists in 38 developing countries.2/ Co-operation in this field takes many forms, ranging from assistance in geological surveys and the preparation of geological maps, the organization of national geological services etc., to detailed evaluation of deposits and assistance in developing them. In many developing countries, the findings of geological studies carried out in co-operation with specialists from CMEA countries have served as a basis for establishing new branches of national industry which have become some of the most important elements in the national economic complex. Examples are the petroleum industry in Syria and India, and the extraction and processing of gas in Afghanistan and of phosphates in Syria.

In the African countries alone, 425 construction projects relating to energy and the energy infrastructure were carried out in 1980 with the co-operation of CMEA countries. On the African continent 33 enterprises working with iron and steel and with non-ferrous metals have been built or are under construction. Among the largest of these are the following: the Helwân complex in Egypt, which has a capacity of 1.5 million tonnes per annum; the El-Khodja complex in Algeria, whose capacity after completion of the second unit will reach 2 million tonnes of steel per annum; and a plant under construction in Nigeria, with the assistance of the USSR, which will have a complete metallurgical cycle when the first unit is finished and will produce 1.3 million tonnes of steel annually. The last-mentioned plant will be the largest in tropical Africa.

CMEA countries have provided assistance for the construction of more than 200 engineering works and metalworking plants have been built or are under construction in developing countries.2/,3/ The enterprises built or under construction in developing countries with the assistance of the Union of Soviet Socialist Republics in just three economic sectors, namely energy (capacity of 19.4 million kW), iron and steel (capacity of 25.2 million tonnes of pig-iron, 25.4 million tonnes of steel and 21.8 million tonnes of rolled products), and petroleum extraction (capacity of 65 million tonnes), account for an annual production valued at $25 billion at world prices in 1981.4/ This illustrates the importance of co-operation between CMEA and developing countries in the development of pilot branches.

In the mid-1970s unemployment in developing countries affected approximately 300 million people and, according to forecasts, 550 million new jobs will be needed in those countries by the year 2000.5/ Thus far the increase in industrial production in the third world has not perceptibly reduced unemployment, primarily because of the huge numbers involved. Such a complex socio-economic problem cannot be solved by short-term planning. In the long term, as world-wide trends show, industry is in a better position than any other branch to absorb labour, particularly labour forced out of agriculture. The construction of major

industrial and power-producing facilities leads inevitably to the rapid development of similar branches, thus increasing the number of jobs. According to estimates made in the mid-1970s, each person employed in the metalworking industry would provide work for 16 or 17 workers in related branches.6/

It is not difficult to gain an idea of the opportunities for increasing the number of jobs in the extraction and processing branches if one takes into account such projects as the following: the construction, with the assistance of the USSR, of the iron and steel complex at Helwân, Egypt, where, by the mid-1970s more than 20,000 people were employed; the metallurgical plants at Bhilai and Bokaro (India), where a total of 94,000 are employed; the metallurgical plant in Pakistan which, operating at full capacity, can provide work for 50,000 people; or the El-Khodja metallurgical aggregate, where more than 7,000 were already working at the beginning of the 1970s.7/

Major construction projects carried out in key areas in co-operation with CMEA countries increase the number of jobs in the modern sectors of the economy which require the most highly skilled labour, thus helping to improve the employment structure and involving the work-force in activities aimed at ensuring sustained growth on a self-sufficient basis in the conditions created by the scientific and technological revolution. For example, in Algeria approximately 60 per cent of the new jobs created during the co-operation programme with the USSR were in iron and steel and in non-ferrous metal enterprises as well as in energy-related undertakings. The influence of industrialization on employment thus makes itself felt both in the creation of new jobs in industrial enterprises and related branches and in the fact that it perceptibly changes the structure of the economy, affects the economic conditions of agricultural production and makes new demands on various categories of employed people.

It should be borne in mind that the cumulative effect of the increase in the number of jobs brought about during the establishment of large-scale modern enterprises in the capital-intensive industries is not limited to those industries alone. Many new jobs are also created in medium- and small-scale enterprises in neighbouring branches. In our view this makes it preferable in certain circumstances to concentrate external assistance on highly capital-intensive branches, since such a concentration combines the advantages of, on the one hand, the most effective transfer of modern techniques and technology obtained in large industrial units and, on the other, the chain effect of the increased number of jobs deriving from the modernization of small and medium-scale enterprises created through the national effort.

Industrialization must also be promoted because rapid industrial production is essential for the success of agricultural development programmes, which are currently given top priority by many developing countries in order to meet their food needs as quickly as possible. Whatever agricultural development strategy is chosen by a country, the most comprehensive mobilization of internal resources for solving the problem of food supply as a matter of priority cannot be achieved without the creation and development of branches of industry oriented towards the needs of agriculture. In the majority of developing countries much of the land, which is already subject to limitations because of natural factors, cannot be cultivated without large-scale irrigation and improvement works and the use of fertilizers and chemical products to protect the plants. This requires a technical infrastructure. Even in the most advanced third world countries, there is a lack of agricultural machinery and tools, fertilizers and chemical products for protecting plants, most of which are

imported, thus placing a further burden on already unfavourable balances of payments. Mineral fertilizer factories with a total capacity of approximately 2 million tonnes have been built in developing countries with the assistance of CMEA countries. These include such major enterprises as the following: a nitrogenous fertilizer factory at Mazar-i-Sharif, which has an annual capacity of 110,000 tonnes and is the outcome of co-operation between the USSR and Afghanistan; two factories in Syria producing triple superphosphate with an annual capacity of 450,000 tonnes, built with the participation of Romania; a nitrate fertilizer factory in Syria, the construction of which involved the co-operation of USSR and Czechoslovak organizations together with Italian companies; and a triple superphosphate factory in Turkey, with a capacity of 220,000 tonnes per annum, and a phosphorous concentrates factory in Egypt, with an annual capacity of 660,000 tonnes, both built in co-operation with Romania.8/

The creation or expansion, in co-operation with CMEA countries, of enterprises engaged in the manufacture and assembly of tractors, agricultural machinery and tools is also important for the development of the infrastructure for agricultural production in developing countries. Such enterprises have been built or are under construction in many developing countries, including the following: Brazil, Burma, Democratic Kampuchea, Ethiopia, Ghana, India, Iraq, Islamic Republic of Iran, Nepal, Pakistan, Syrian Arab Republic and Zambia. When commissioned, they will provide the agriculture of the partner countries with more than 80,000 additional tractors per year, not counting other machinery including basic tools.

The growing role of industry in establishing an infrastructure and in ensuring the growth of agricultural production is due, in particular, to the adoption by developing countries in recent years of a policy aimed at according priority to agro-industry. The importance attached to agro-industry makes it possible to find a more sophisticated solution, taking into account the socio-economic aspects of the development of villages, to the complex problem of raising agricultural production in order to provide the population with sufficient food and national industry with raw materials and also to expand export potential.

To ensure the success of industrialization and to speed up the pace of economic development it is necessary to create favourable conditions at both the national and international levels, and to introduce a strategy which makes the best use of the internal and external factors of industrial development. It should be particularly stressed that this is a long-term strategy, since current measures and criteria regarding industrial development will not always be valid. Only over the long term will it be possible to determine the real effect of the creation and development of the industrial infrastructure, including its implications for national economic growth and social progress and for the international division of labour.

The countries with centrally planned economies, guided by their fruitful experience of industrialization and of 25 years of industrial co-operation with developing countries, and taking as their premise the need for industrialization as the basis for balanced economic development, have set out their long-term view of the industrialization of the third world, which they see as a socio-economic phenomenon requiring an integrated approach. Their basic aims - socio-economic and technical progress, guaranteed employment, improvement of the living standard of the masses of the population and the abolition of exploitation by foreign capital - were set forth at the Third General Conference of UNIDO, held at New Delhi in February 1980. The long-term strategy advocated by the centrally planned economies is principally designed to meet the require-

ments for self-sufficient economic development, to ensure high growth rates, particularly in the agricultural sector, and to solve the food problem. One of the most important aspects of the strategy is the creation and development of national scientific and technical potential and the training of specialists. Determining the social aspects of industrialization is an integral part of the strategy.

The centrally planned economies believe that foreign assistance, however important it may be, still does not create the conditions for rapid economic development and for radical changes in the economic structure, which can only come about through a combination of internal and external efforts, in which the flow of financial and material resources from abroad helps to mobilize national resources on behalf of the people as a whole and to exploit those resources in a more rational manner. Merely stepping up the pace of industrial production, without accompanying socio-economic reforms, will not serve to lessen inequality in the distribution of national wealth, nor will it improve the lot of the population at large or increase employment. The idea of a link between high growth rates and socio-economic reforms in developing countries has also been reflected in the International Development Strategy for the Third United Nations Development Decade.

A reorganization of the structure of the economy and an improvement in the situation of the population at large requires a package of measures involving government participation. The role of the public sector and national planning is growing, due to the tense socio-economic situation in the third world and worsening contradictions in the external economic sector.

While there is fruitful co-operation with private companies in a number of cases, co-operation between CMEA and developing countries concentrates on the public sector, which, in a diversified economy, offers the best opportunities for mobilizing national resources in order to achieve major economic objectives. It is the most effective means of transforming outdated structures into a modern system of production and of establishing an independent national economy. In 1981 more than 5,000 industrial and other plants had been built or were under construction in developing countries, primarily in the public sector, with the assistance of CMEA countries.[9] In a number of developing countries the plants concerned form the nucleus of the public sector. They are responsible for a substantial share of production, an appreciable increase in jobs and a considerable growth in budgetary income. For example, more than 70 enterprises built with the assistance of the USSR in the public sector in India annually produce approximately 40 per cent of its steel, extract 50 per cent and refine 30 per cent of its petroleum, manufacture much of the heavy equipment used in the metallurgical and energy sectors, and generate more than 20 per cent of its electrical energy.[10] In 1979 industrial plants built with the assistance of the USSR in Afghanistan accounted for 60 per cent of production in the public sector and approximately 35 per cent of industrial production.[11] In Egypt, where the public sector, established during the period of expanding co-operation with the centrally planned economies, maintained a strong position in industry, and the cost of products from plants set up with the assistance of the USSR in the industrial and energy sectors represented around 9 per cent of industrial production in the public sector in 1977. While average profits in the national industry were slightly more than 5 per cent, in the USSR-Egyptian co-operative enterprises they were almost 22 per cent. The profit from enterprises built with the assistance of the USSR represented more than a third of the total profits from all the national industrial enterprises in Egypt.[12]

Given the operational difficulties faced by national enterprises in developing countries, not all of them can be equally profitable. Profitability, however, is not the sole criterion of efficiency in the public sector, although it is one of the most important. The temporary abandonment of the principle of economic return does seem to provide a justification for underestimating the role of the public sector, which is an essential regulator of balanced economic growth. Furthermore, as production experience builds up, as trained specialists become more numerous and techniques and technologies from abroad are assimilated, enterprises in the public sector which were not profitable in the early stages of operation usually improve their performance and become profitable.

The aim of the strategy of industrial co-operation by centrally planned economies with developing countries is to help the latter to set up a rational and modern economic system capable of achieving sustained growth, taking into account the specific conditions and particular features of the developing country. The integrated development strategy, which incorporates the advantages of models that dispense with imported products and are geared to exports, differs radically from those models in that it enables the most serious development problems to be solved by linking medium- and long-term goals with economic development and social progress, while making maximum use of both internal and external resources. The main features of the integrated strategy involve the creation of a modern economic structure adapted to the specific conditions of each country, the construction of sectoral and territorial production aggregates (industrial and agro-industrial), the establishment of a scientific and technical infrastructure and of effective national education and specialist training systems, and the intensified participation of the least developed countries in international industrial specialization and in co-production and scientific and technical exchange. Implementation of the long-term economic development strategy would establish an effective material basis for strengthening the national sovereignty of developing countries and help them to participate actively in world economic relations on an equal footing.[13/] The setting-up of modern aggregates incorporating ancillary technical enterprises provides the opportunity for a more rational use of investments and for control of resources and raw materials. This will ultimately lead to more rapid economic development. Large-scale industrial aggregates generally have their own research and development departments which enable them to make more effective use of technical know-how and production experience and to disseminate it throughout an entire group of related sectors and enterprises. The integrated strategy of industrial development and co-operation with foreign countries provides a more consistent approach to all economic initiatives while taking into account their social implications.

The economic planning of CMEA countries places the long-term industrial co-operation between centrally planned economies and developing countries on a stable basis which is not dependent on short-term economic considerations. The new industrial capacities established through the assistance of CMEA countries form an integral part of the national industrial development plans and programmes. The contribution made by CMEA countries to basic industries (metallurgy, energy, manufacture of heavy machinery and power-generating equipment, geological prospecting, ore mining, the food and textile industries) facilitates an integrated solution of social problems, thus benefiting the majority of the population and not merely the élite. Of 280 projects executed in Africa with the assistance of the USSR, 100 were of an industrial nature, including 24 electricity-generating stations, 15 industrial enterprises in the iron and

steel, metallurgical and mining sectors, eight projects relating to the petroleum and gas industry, 26 in metal machining and repairs, and 14 enterprises in the foodstuffs industry.14/

In the context of international co-operation, the USSR sees the task of national planning as consisting of, on the one hand, a combination of the industrial projects included in development plans and programmes and executed with external assistance, and, on the other, the construction, through domestic initiative, of small and medium-scale enterprises which are interconnected either in a single technological cycle or horizontally. This approach helps to ensure that industrial co-operation is directed primarily towards meeting domestic needs while maintaining a stable division of labour and increasing the proportion of manufactured and finished products in the exports of developing countries. In 1979, finished industrial products and food products represented almost 32 per cent of USSR imports from developing countries, while for certain countries this figure was much higher, reaching 90 per cent and above.15/

The practice of co-operation on a basis of compensation and of assisting, within the framework of intergovernmental agreements, in the establishment of enterprises producing partly for export - a practice that has become more widespread in recent years - has contributed to the increase in industrial exports from developing countries to centrally planned economies. In the period 1976 to 1980 alone, enterprises established with the assistance of the USSR delivered to the USSR finished products valued at 2.8 billion roubles.16/

The purpose of this article is to outline some of the principles governing industrial co-operation between CMEA and developing countries. Problems relating to international co-operation in industry and its role in the industrial development strategy of developing countries and in their general socio-economic development are regarded as crucial both within developing countries and at international level, and remain for the most part unresolved. For this reason, a wide-ranging discussion of questions concerning the strategy, methods, forms and direction of industrial co-operation could not fail to be of value.

Notes

1/ Bulletin of Foreign Commercial Information (in Russian), 28 August 1982.

2/ Foreign Trade (in Bulgarian), No. 2, 1981, p. 6.

3/ Bulletin of Foreign Commercial Information (in Russian), 31 August 1982.

4/ P. Koshelev, Soviet-African Economic Co-operation: Record and Prospects, Report presented to the Soviet-African Scientific-Political Conference, Moscow, October 1981, pp. 9-10; Foreign Trade (in Russian), No. 6, 1982, p. 9.

5/ Industry 2000 - New Perspectives (ID/237), p. 13.

6/ Asia and Africa Today (in Russian), No. 7, 1975, p. 20.

7/ Ibid., pp. 19-20; Foreign Trade (in Russian), No. 1, 1980, p. 6; Pravda, 1 November 1974.

8/ Co-operation between Socialist and Developing Countries: New Types of International Economic Relations (in Russian) (Moscow, 1980), p. 78; Rumanian Foreign Trade (in Russian), No. 3, 1979, p. 21; Czechoslovak Foreign Trade (in Russian), No. 12, 1973, p. 33.

9/ Bulletin of Foreign Commercial Information (in Russian), 4 November 1982.

10/ Foreign Trade (in Russian), No. 7, 1981, p. 20; Bulletin of Foreign Commercial Information (in Russian), 20 October 1981.

11/ Foreign trade (in Russian), No. 2, 1979, pp. 39-40.

12/ Ibid., p. 39.

13/ Questions relating to the integrated development strategy have for some years been dealt with by the USSR Academy of Sciences Institute of the Economy of the World Socialist System. For details concerning these questions see, inter alia, L. Zevin, New Tendencies in Economic Co-operation between Socialist and Developing Countries (in Russian) (Moscow, 1970); Socialist Economic Integration and Co-operation with Developing Countries (in Russian) (Moscow, 1976); Economic Co-operation of Socialist and Developing Countries: New Trends (Moscow, 1976); Co-operation between Socialist and Developing Countries: New Types of International Economic Relations (Moscow, 1980).

14/ Koshelev, op.cit., p. 16.

15/ Foreign Trade of the USSR; Statistical Handbook (in Russian) (Moscow, 1980), pp. 196-282.

16/ Economic Journal (in Russian), No. 17, 1981.

PATTERNS AND PROSPECTS FOR EAST-SOUTH TRADE IN THE 1980s

UNIDO secretariat

Introduction

In order to assess the prospects for the development of the foreign trade of the European members of the Council for Mutual Economic Assistance (CMEA)* in the 1980s, this paper first briefly summarizes the characteristics of the trade flows during the 1970s and then examines the available data on the planned development of exports and imports during the period 1981-1985. This is followed by an outline of a number of features of the pattern of trade flows of CMEA countries and an analysis of the trends observed. The paper then examines a scenario for CMEA trade as a whole for the 1980s. Against this background, an Eastern European scenario for East-South trade is presented and then a scenario for East-South trade within the framework of accelerated industrialization in developing countries. The paper ends with conclusions on the challenges and potential for expanded East-South trade in the 1980s.

The development of CMEA foreign trade

The general pattern of development of CMEA exports to developing countries during the 1970s was a very rapid growth, with exports to developed countries rising slightly more rapidly from 1971 to 1975 and less rapidly over 1976 to 1980. Exports to other European CMEA countries on the other hand grew somewhat more slowly than non-CMEA trade from 1971 to 1975, and over one third slower from 1976 to 1980.

For CMEA imports from developing countries, growth was initially very rapid, and then slowed down considerably, but still remained higher than for any country grouping during the period 1976-1980. Imports from developed countries initially grew even faster, and then fell more quickly, than imports from developing countries, while imports from other centrally planned economies grew at the same rate as exports, which in turn was the lowest of all country groupings. Data in value terms for the period 1970 through 1980 are given in table 1, but data on East-South trade flows in volume terms are not available.

Examining East-South trade flows at the one-digit Standard International Trade Classification (SITC) level, the broad picture of the commodity structure of East-South trade in manufactures, though subject to fluctuations, remained essentially unchanged during the 1970s. There is, however, a very important difference in the nature of trade flows in machinery and transport equipment (SITC 7) and in manufactured goods classified by material and miscellaneous manufactured goods (SITC 6 and 8, respectively). In the case of the former flows, the share in Eastern exports (to the South) is approximately 60 per cent and in Southern exports to the East just 1-5 per cent, whereas the two latter flows taken

*Unless otherwise specified, throughout this document the terms "European CMEA", "CMEA", and the "East" are synonymous, and refer to Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, Romania and the Union of Soviet Socialist Republics.

Table 1. Foreign trade of the socialist countries of Eastern Europe, 1970-1980
(Millions of dollars f.o.b.)

Item	Value						Average annual growth rate (percentage)		Rate of change over previous year (percentage)			
	1970	1975	1977	1978	1979	1980	1970-1975	1975-1980	1977	1978	1979	1980
Destination					**Exports**							
World	30 895	75 730	99 786	112 415	135 300	155 615	19.7	15.5	17.7	12.7	20.4	15.0
Developed market-economy countries	6 774	19 387	24 848	27 362	38 095	44 854	23.5	18.3	9.1	10.1	39.2	17.7
Developing countries	4 754	12 404	17 015	20 171	23 180	30 069	21.0	19.4	27.3	18.5	14.9	29.7
Socialist countries of Eastern Europe	18 363	42 075	52 805	61 887	70 225	76 393	18.1	12.6	13.8	17.2	13.4	8.8
Origin					**Imports**							
World	30 177	86 632	100 266	117 364	133 502	150 805	23.3	11.8	9.2	17.0	13.8	13.0
Developed market-economy countries	7 800	30 580	32 502	36 763	44 640	49 786	31.2	10.2	-1.6	13.1	21.4	11.5
Developing countries	3 493	11 372	13 328	15 109	17 195	23 918	26.0	16.1	13.0	13 4	13.8	39.1
Socialist countries of Eastern Europe	18 393	42 426	52 781	63 422	69 395	77 098	18.2	12.6	15.2	20.1	9.4	11.1
Destination and origin					**Turnover**							
World	61 072	161 362	200 052	229 780	268 802	306 420	21.4	13.6	13.3	14.9	17.0	14.0
Developed market-economy countries	14 574	49 967	57 350	64 125	82 735	94 640	28.0	13.7	2.8	11.8	29.0	14.4
Developing countries	8 247	23 776	30 343	35 280	40 375	53 987	23.9	17.9	20.6	16.3	14.4	33.7
Socialist countries of Eastern Europe	36 756	84 501	105 586	125 310	139 620	153 491	18.1	12.6	14.5	18.6	11.4	9.9

Source: TD/B/859/Add.1 (from national statistics of the socialist countries of Eastern Europe).

together make up under 30 per cent of Eastern exports to the South but 80-90 per cent of manufactured exports from the South to the East. Since SITC 6 and 8 include goods of a lower degree of processing and goods of a lower level of technology than SITC 7, this indicates that the commodity composition of exports of manufactures from the South to the East is less developed as compared with total manufacturing exports of the South, whereas the commodity structure of manufactured exports from the East to the South is more developed than that of total Eastern exports of manufactures.[1/]

The limited data on foreign trade plans for 1981-1985 contained in table 2 clearly shows that, with the exception of only the German Democratic Republic, the planned average annual growth rates in total foreign trade are markedly lower than the rates attained over the last half of the 1970s or in 1980. This is particularly notable in the case of Czechoslovakia - a country which some suggest[2/] is actually in a particularly favourable position for expanding its exports to developing countries - and the Soviet Union, where the planned growth rates are less than half those attained during the period 1976-1980. This in turn means that East-South trade flows will remain a fraction of West-South trade flows.

It is important to note, however, that foreign trade is one element in a planned economy that is difficult to plan in value terms. The experience of the 1976-1980 period in the CMEA countries was that, in general, exports grew more slowly than planned and imports more rapidly. This can in turn perhaps be tied, on the export side, both to economic difficulties and increased competition (particularly from newly industrializing countries (NICs) and from the countries of southern Europe) in developed market economies, and, on the import side, to the ready availability of external credit. The former side of this relationship at least may well repeat itself during the first half of the 1980s, suggesting the possibility of a lower than planned growth of exports. Import growth cannot, however, be expected to be stimulated by an easy availability of credit, but rather constrained by the debt servicing burden and unfavourable developments in the terms of trade.

The role of foreign trade in the CMEA

An assessment of the prospects for the trade of the European CMEA countries with developed market economies and with developing countries must start from a number of considerations regarding the nature of foreign trade in the CMEA. The first is the general nature of the role of foreign trade in a planned economy of the type characteristic for the European CMEA countries. In this case foreign trade is primarily seen as an equilibrating mechanism for meeting the excess demand generated when the economic plans prescribe input levels for production of intermediate goods or products for final demand which exceed the levels available in the domestic economy.

The second, and allied, guiding principle is that the Eastern economies should not become too dependent on imports from outside the CMEA. This primacy on security of supply leads the planners to risk avoidance patterns of behaviour, which in turn constrain the level of participation in international trade. The third role for foreign trade comes into play when levels of production that have been planned are not attained. Then foreign trade can play a lubricating role and fill the gaps between the planned and actual levels of production.

Table 2. Foreign trade plans and performance in the socialist countries of Eastern Europe
(Percentage increase over preceeding year)

Country	1976	1977	1978	1979	1980		Planned annual average 1981-1985
	Actual				Plan	Actual	
Bulgaria							
Exports	14.5	15.8	10.4	15.4	7.5[a]	16.3	7.0[a]
Imports	3.8	11.5	12.2	7.4		11.7	
Czechoslovakia							
Exports	11.8	13.4	14.6	10.3	6.6[a]	19.5	4.6[b]
Imports	10.4	11.8	7.7	11.3		7.6	
German Democratic Republic							
Exports	14.0	7.0	9.9	13.0	12.0[a]	10.3	11.2[c]
Imports			1.8	12.0			
Hungary							
Exports	8.0	16.5	0.9	17.0	5.5[a]	9.3	6.6
Imports	4.0	16.2	12.6	3.0		6.5	3.4
Poland							
Exports	7.1	11.4	9.8	12.2	9.1[a]	7.6	..
Imports	10.4	5.5	4.7	6.3		10.9	
Romania							
Exports	14.9	14.6	5.7	18.0	14.8[a]	25.8	8.5-9.5[a]
Imports	14.1	15.1	14.6	20.1		20.9	
USSR							
Exports	16.6	18.7	7.2	18.9	4.7[a]	18.4	7.0[a]
Imports	7.8	4.7	14.8	9.6		18.8	

Source: TD/B/859 (from national statistics of the socialist countries of Eastern Europe).

a/ Total trade turnover.

b/ Trade with CMEA member countries.

c/ Exports only.

The fourth consideration is the fact that the planned economies of the CMEA countries, and particularly their international financial systems, are not fully integrated into the international monetary system, and in particular the fact that only the Hungarian forint approximates a convertible currency. Finally, foreign trade - and here one is particularly referring to trade with developed market economies - is seen as a means of injecting technological progress into the domestic economic system and for boosting the weaker sectors of the economy generally.

On the basis of an examination of the historical data on trade flows between the CMEA countries and other countries, and in light of the nature of the foreign trade system characterizing these countries, it is possible to hypothesize that for domestically produced goods that are potential exports there was a rough hierarchy of markets which, while not holding for all goods at all periods, nevertheless appears as a leitmotiv in the marketing of CMEA export goods. First, goods which were potential exports to developed market economies were exported to earn hard currency on Western markets, in intra-CMEA trade, or on the markets of the South. The exports were subject to the constraint that an absolute minimum level of domestic demand, related to the minimum needed for subsistence and to insuring minimal levels of performance of the labour force, had to be met. But this constraint was very lax and set low enough to make it generally inoperative.

For goods which were not objects of potential domestic private consumption, such as industrial machinery and equipment, as much was first sold for hard currency as possible and then used to acquire goods which potential sellers were not willing to trade for less marketable goods (such as incremental increases in oil and gas deliveries from the Soviet Union to the smaller Eastern European countries). The residual of such goods was then allocated among the home market, intra-CMEA trade, and trade with the South according to existing long-term plans and trade agreements.

For agricultural products and consumer goods, the larger share of the residual was devoted to reducing the excess demand on the home market. Particularly when it included agricultural goods, a small share of this residual was often retained for export to other CMEA countries (including non-European CMEA countries). Though small, this residual was not unimportant. The Soviet Union, for example, often maintained the value of this small residual even when it meant importing the agricultural goods required to do so.

As a general rule, then, exports to the South came fifth in the hierarchy, after satisfying the minimum needs of the population, providing exports to developed market economies, meeting the above-subsistence needs of the domestic population, and supplying other CMEA countries. There were, however, two major exceptions to this pattern, and these came into existence whenever the South either paid in hard currency or supplied energy or other raw materials in payment for imports from the East. In these cases the priority of trade with the South rose markedly.

Given these features of the foreign trade system of CMEA countries, the resulting implications for the pattern of foreign trade that may be expected in future can be drawn. First, because of a common economic - and particularly international financial - system that is differentiated from the system under which the vast majority of international trade and financial transactions take place, the share of intra-CMEA trade in total trade flows is very high. This share has, however, been falling, and can be expected to continue to show a decreasing trend over the 1980s.[3/]

Secondly, the intra-CMEA flows are planned over the medium-term (and hence for a market that is only open at certain times for certain products) and increasing imporance is being given to long-term plans for intra-CMEA specialization in production and trade during the 1980s, in particular the framework of the long-term programmes. This in turn will further reduce the flexibility in trade between the CMEA and other groups of countries.

Thirdly, the equilibrating nature of the foreign trade system leads to the concentration on raw materials and fuels in trade with developing countries and the consequent reduction in the share of manufactured imports, a feature which planners in the CMEA countries have indicated will be retained over the medium-term.[4/] This is the reason why, when examining data on the world flow of manufactures, the only case where one does not notice a substantial flow of manufactures in all directions and between all country groupings besides the very low level of manufactured exports from OPEC is that of manufactured exports from the South to the East (see tables 3-5 below).

Fourthly, the increasing importance being given in the 1981-1985 plans to capital-intensive (as opposed to labour-intensive) methods of production means that the high priority given to the import of high technology imports from developed market economies will have to be continued, though under appreciably tighter financial constraints. As a recent UNIDO study pointed out,[5/] this feature of CMEA-trade will also be retained, but at a reduced level, even under the pressure of very heavy external debt as in Poland.

Because production in many areas in several CMEA countries is becoming increasingly capital-intensive, the East would gain appreciably from increased imports of highly labour-intensive products. For the smaller Eastern European countries the same would hold for highly raw-material-intensive products. But this greater degree of participation in international trade is inhibited by, among other factors, the reluctance to incur the greater degree of potential risk the CMEA countries associate with higher import dependence.

Fifthly, CMEA trade, like CMEA foreign aid, is very highly concentrated among developing countries. Thus, trade with Cuba dominates European CMEA trade with Latin America, trade with Viet Nam dominates trade with South-East Asia, and trade with Yugoslavia dominates trade with Mediterranean countries. When one excludes trade with the non-European developing countries which are members of the CMEA (for example, Viet Nam), as well as with Yugoslavia, trade with other developing countries is even more concentrated. If Cuba is excluded, Argentina and Brazil accounted for 83 per cent of Soviet-Latin American trade turnover in 1979.

In trade in manufactures the pattern is even more concentrated: Yugoslavia accounted for 48 per cent of all exports of manufactured goods from the South to the East in 1979. Trading with large developing countries such as Brazil or India, is clearly a preference of the CMEA, and can be associated with the security of supply argument above, along with, at least in the case of India, political considerations. The evidence from a number of UNIDO studies is that there is no reason to expect this pattern to change during the early 1980s.

A final feature relating to trade with the South is the role of historical tradition in determining the pattern of trade flows, and, specifically, the lack of a strong tradition on the part of the CMEA and develop-

ing countries. Psychological factors on both sides may also contribute to keeping these trade flows at a low level, a state of affairs engendered by the lack of a strong historical tradition of contact.

Prospects for East-South trade

In the exports of developing countries to the CMEA, agricultural products dominate, followed by fuels and then by crude materials, with the share of manufactures being small and actually decreasing (from 9.6 per cent of total CMEA manufactured exports of the South in 1970 to 4.8 per cent in 1979).* In exports of the South excluding Yugoslavia and the non-European CMEA, the percentage of manufactured exports going to the East actually fell to as little as 1.3 per cent at the end of the 1970s, though for the non-European CMEA it was as high as 17.5, and for Yugoslavia 43.8 per cent.

Looked at from another perspective, 61.3 per cent of total CMEA imports in 1979 were manufactured imports, whereas only 8.4 per cent of CMEA imports from developing countries were manufactures. For an important trading partner like Brazil, therefore, of $975 million in total exports to the European CMEA in 1979, only $66 million were manufactured goods. The data suggest that the most difficult challenge to East-South trade relations in the 1980s will be the attempt of developing countries to increase the share of such exports to CMEA countries (see table 3).

A constant feature of East-South trade is that manufactured goods dominate the imports of developing countries from the CMEA, as do the imports of developing countries from developed market economies. As a percentage of the total manufactured exports of the East, the distribution of these flows remained roughly constant during the 1970s, with one-seventh accounted for by exports to Yugoslavia and slightly less than one-fifth by exports to the centrally planned economies of Asia (see table 4). The relative constancy of these flows stands in marked contrast to the changing composition of manufactured exports from the South to the East just mentioned above, suggesting that the East's objective of long-term stability has been attained much more in manufactured exports than in manufactured imports.

The problem is all the more complex, and all the more important from the point of view of efforts at international industrial restructuring, because many of the potential exports of the developing countries to the CMEA (such as clothing, leather goods, carpets, metal goods, wood products, simple electronic products and some steels) are also proudcts in which the CMEA countries are direct competitors of developing countries. But because of the tendency towards increasing restrictions on the import of such goods by developing countries into developed market economies, the CMEA market is crucial for the expansion of exports of these products.

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*For comparison, the share of fuel exports in the total exports of the South to the East rose from 2.0 per cent in 1970 to 16.6 per cent in 1979, while the share of crude materials (excluding fuels, oils and fats) fell from 27.4 to 14.2 per cent.

Table 3. Manufactured exports from the South to the East[a/]

Year	Manufactured exports from the South to the European CMEA: Value[b/] (millions of dollars) (I)	Manufactured exports from the South to the European CMEA: Percentage of total manufactured exports of the South	Manufactured exports from centrally planned economies of Asia[c/] to the European CMEA: Value (millions of dollars) (II)	Manufactured exports from centrally planned economies of Asia[c/] to the European CMEA: Percentage of total manufactured exports from the South to the European CMEA	Manufactured exports from Yugoslavia to the European CMEA: Value (millions of dollars) (III)	Manufactured exports from Yugoslavia to the European CMEA: Percentage of total manufactured exports from the South to the European CMEA	Manufactured exports from other developing countries to the European CMEA: Value (millions of dollars) (IV)	Manufactured exports from other developing countries to the European CMEA: Percentage of total manufactured exports from the South to the European CMEA
1970	1 113	9.6	266	23.9	392	35.2	455	40.9
1971	1 292	9.6	306	23.7	502	38.9	484	37.5
1972	1 533	8.7	349	22.8	558	36.4	626	40.8
1973	1 862	6.9	444	23.9	726	39.0	692	37.2
1974	2 472	6.8	524	21.2	1 079	43.7	869	35.2
1975	2 817	7.1	606	21.5	1 108	39.3	1 103	39.2
1976	3 347	6.8	704	21.0	1 640	49.0	1 003	30.0
1977	3 458	6.0	818	23.7	1 537	44.5	1 101	31.8
1978	4 171	5.6	1 079	25.9	1 935	6.4	1 157	27.7
1979	4 571	4.8	1 262	27.6	2 199	48.11	1 110	24.3

Sources: For Yugoslavia: United Nations, Commodity Trade Statistics, 1970-1979; for other country groupings: United Nations, Monthly Bulletin of Statistics, August 1976, June 1978 and May 1981.

a/ SITC 5 + 6 + 7 + 8 - 68.

b/ I = II + III + IV.

c/ Centrally planned economies of Asia include China, Mongolia, the Republic of Korea and Viet Nam.

Table 4. Manufactured exports from the East to the South

Year	Manufactured exports from the European CMEA to the South: Value (millions of dollars) (I)	Manufactured exports from the European CMEA to the South: Percentage of total manufactured exports of the European CMEA	Manufactured exports from the European CMEA to centrally planned economies of Asia: Value (millions of dollars) (II)	Manufactured exports from the European CMEA to centrally planned economies of Asia: Percentage of total manufactured exports from the European CMEA to the South	Manufactured exports from the European CMEA to Yugoslavia: Value (millions of dollars) (III)	Manufactured exports from the European CMEA to Yugoslavia: Percentage of total manufactured exports from European CMEA to the South	Manufactured exports from the European CMEA to other developing countries: Value (millions of dollars) (IV)	Manufactured exports from the European CMEA to other developing countries: Percentage of total manufactured exports from the European CMEA to the South
1970	3 435	19.0	710	20.7	403	11.7	2 322	67.6
1971	3 662	18.6	772	21.1	536	14.6	2 354	64.3
1972	4 070	16.8	933	22.9	504	12.4	2 633	64.7
1973	4 826	15.8	1 052	21.8	608	12.6	3 166	65.6
1974	6 376	17.8	1 203	18.9	848	13.3	4 325	67.8
1975	7 871	18.0	1 438	18.3	1 108	14.1	5 325	67.7
1976	8 609	18.4	1 645	19.1	1 129	13.1	5 835	67.8
1977	9 595	17.9	1 662	17.3	1 360	14.2	6 573	68.5
1978	11 250	18.0	2 085	18.5	1 622	14.4	7 543	67.0
1979	13 828	18.3	2 603	18.9	1 953	14.1	9 272	67.1

Notes and sources: See table 3.

The country-specific outlook

If the trade of the individual Eastern European countries is examined, the most notable feature in the share of developing country exports to the imports from CMEA countries is found to be the marked growth in Romanian imports from developing countries. From a share of 8.6 per cent in the total imports of Romania in 1970 (and a value of $169 million), imports from developing countries rose to a share of 32.6 per cent in 1980 (and a value of $4,298 million) (see table 5). This partly reflects the rise in world oil prices for Romanian imported oil, and even though the country is attempting to increase imports of lower-priced Soviet oil, the trend can be expected to continue. Romania financed the increase in the value of imports from developing countries partly by reducing imports from developed market economies, but also by sharply increasing its borrowings from those economies. The dampening effect of the resulting debt repayment will clearly continue to hold down imports of manufactured goods from developing countries into Romania over the medium term.

Up to 1979 Czechoslovakia and Bulgaria had been successful in holding the growth rate of imports from developing countries below that of total imports, as part of an attempt to maximize their trade surplus in East-South trade in order to help finance deficits in trade with developed market economies. In both cases the policy of maximizing trade surpluses in trade with developing countries is matched by policies of minimizing trade deficits in trade with developed countries by reducing or keeping constant the growth rates of imports from developed countries.

The clear policy of Bulgaria, in attempting to reduce the growth of its debt, which on a per capita basis is the highest in the CMEA, and of Czechoslovakia, in refusing to allow its indebtedness to grow excessively, can be expected to continue throughout the 1980s, thus ruling out sharp expansions in the share of manufactured imports from developing countries. On the export side, exports of technologically intensive industrial machinery and equipment to developing countries are planned to play a particularly important role in Czechoslovakia.[2/] Czechoslovak planners argue that such prospects are strengthened by the fact that the country already has established very strong trade ties in products of this kind with developing countries such as Brazil, Egypt, India, Iraq, the Islamic Republic of Iran and the Syrian Arab Republic.

For Hungary and the German Democratic Republic the value of annual trade flows with developing countries was roughly in balance during the 1970s, with only small surpluses for the CMEA countries in most years. The trend data for the German Democratic Republic do not give grounds for suggesting a major increase in its level of trade (its share of trade with developing countries is the lowest of all CMEA countries), while the data suggest a much stronger increasing trend in Hungarian imports from developing countries.

Poland is the exception among Eastern European countries, in that imports from developing countries have in recent years exceeded exports to those countries. Due to the severe balance of payments problems and the net foreign debt to developed market economies of over $22 billion, the new stabilization plan of Poland aims at limiting imports primarily to crucial raw materials, spare parts, equipment, and agricultural products, abandoning high-import-content investment projects, and reselling machinery and equipment ordered for such projects.[3/] This in turn suggests that prospects for non-critical manufactured imports from developing countries during the 1980s will be dim.

Table 5. Geographical distribution of foreign trade of the socialist countries of Eastern Europe, 1970-1980
(Millions of dollars f.o.b.)

Country	Exports					Imports				
	1970	1975	1978	1979	1980	1970	1975	1978	1979	1980
Bulgaria										
Total trade breakdown	2 004	4 682	7 557	8 425	9 800	1 831	5 398	7 728	8 091	9 041
Developing countries	187	649	1 067	1 103	1 561	138	362	439	493	568
Percentage of total	9.3	13.9	14.1	13.1	15.9	7.5	6.7	5.7	6.1	6.3
Developed market economy countries	285	474	781	1 337	1 655	350	1 289	1 176	1 258	1 558
Percentage of total	14.2	10.1	10.3	15.9	16.9	19.1	23.9	15.2	15.5	17.2
Socialist countries	1 532	3 559	5 709	5 985	6 584	1 343	3 747	6 113	6 340	6 914
Percentage of total	76.5	76.0	75.6	71.0	67.2	73.4	69.4	79.1	78.4	76.5
Czechoslovakia										
Total trade breakdown	3 792	7 814	10 655	13 198	15 766	3 695	8 495	11 403	14 252	15 340
Developing countries	510	1 009	1 249	1 531	2 324	378	819	893	1 143	1 387
Percentage of total	13.4	12.9	11.7	11.6	14.7	10.2	9.6	7.8	8.0	9.0
Developed market economy countries	783	1 563	1 986	2 696	3 600	916	2 098	2 674	3 483	3 809
Percentage of total	20.6	20.0	18.6	20.4	22.8	24.8	24.7	23.5	24.4	24.8
Socialist countries	2 499	5 242	7 420	8 971	9 852	2 401	5 578	7 836	9 626	10 143
Percentage of total	66.0	67.1	69.7	68.0	62.5	65.0	65.7	68.7	67.6	66.1
German Democratic Republic										
Total trade breakdown	4 581	10 088	13 267	15 063	..	4 847	11 290	14 572	16 214	..
Developing countries	340	770	1 194	1 310	..	291	789	1 137	1 103	..
Percentage of total	7.4	7.6	9.0	8.7		6.0	7.0	7.8	6.8	
Developed market economy countries	1 003	2 263	2 614	3 134	..	1 295	3 281	3 715	4 994	..
Percentage of total	21.9	22.4	19.7	20.8		26.7	29.0	25.5	30.8	
Socialist countries	3 238	7 055	9 459	10 619	..	3 261	7 220	9 720	10 117	
Percentage of total	70.7	70.0	71.3	70.5		67.3	64.0	66.7	62.4	
Hungary[a/]										
Total trade breakdown	2 317	4 189	6 345	7 939	8 677	2 505	5 573	7 902	8 674	9 235
Developing countries	208	577	886	1 041	1 154	246	616	846	938	1 108
Percentage of total	9.0	13.8	14.0	13.1	13.3	9.8	11.0	10.7	10.8	12.0

continued

Table 5 (cont'd)

Country	Exports					Imports				
	1970	1975	1978	1979	1980	1970	1975	1978	1979	1980
Developed market economy countries	627	1 368	1 928	2 642	3 046	673	1 917	3 042	3 322	3 712
Percentage of total	27.0	22.7	30.4	33.3	35.1	26.9	34.4	38.5	38.3	40.2
Socialist countries	1 482	2 244	3 531	4 256	4 477	1 586	3 040	4 014	4 413	4 414
Percentage of total	64.0	53.5	55.6	53.6	51.6	63.3	54.6	50.8	50.9	47.8
Poland										
Total trade breakdown	3 548	10 289	14 114	16 249	16 800	3 607	12 545	16 089	17 584	18 870
Developing countries	326	1 083	1 440	1 665	2 062	260	802	1 207	1 847	2 226
Percentage of total	9.2	10.5	10.2	10.2	12.3	7.2	6.4	7.5	10.5	11.8
Developed market economy countries	1 024	3 278	4 418	5 070	5 723	938	6 199	6 452	6 541	6 472
Percentage of total	28.9	31.9	31.3	31.2	34.0	26.0	49.4	40.1	37.2	34.3
Socialist countries	2 198	5 928	8 256	9 514	9 015	2 409	5 544	8 430	9 196	10 172
Percentage of total	61.9	57.6	58.5	58.6	53.7	66.8	44.2	52.4	52.3	53.9
Romania										
Total trade breakdown	1 851	5 341	8 077	9 724	12 230	1 960	5 342	8 910	10 916	13 200
Developing countries	235	1 115	1 583	1 891	2 685	169	820	1 693	2 041	4 298
Percentage of total	12.7	20.9	19.6	19.5	22.0	8.6	15.4	19.0	18.7	32.6
Developed market economy countries	596	1 873	2 722	3 700	4 520	776	2 260	3 475	4 694	4 148
Percentage of total	32.2	35.0	33.7	38.1	37.0	39.6	42.3	39.0	43.0	31.4
Socialist countries	1 020	2 304	3 772	4 133	5 025	1 015	2 210	3 742	4 181	4 754
Percentage of total	55.1	43.1	46.7	42.5	41.0	51.8	41.3	42.0	38.3	36.0
USSR										
Total trade breakdown	12 500	33 328	52 400	64 701	76 630	11 732	36 989	50 760	57 771	68 619
Developing countries	2 948	7 201	12 752	14 648	16 818	2 011	7 164	8 894	9 631	13 481
Percentage of total	23.0	21.6	24.3	22.6	22.0	17.1	19.4	17.5	16.7	19.7
Developed market economy countries	2 456	8 568	12 913	19 515	25 045	2 852	13 536	16 229	20 350	24 437
Percentage of total	19.2	25.7	24.7	30.2	32.7	24.3	36.6	32.0	35.2	35.6
Socialist countries	7 396	17 559	26 735	30 538	34 767	6 868	16 289	25 637	27 790	30 701
Percentage of total	57.8	52.7	51.0	47.2	45.3	58.6	44.0	50.5	48.1	44.7

Source: TD/B/854/Add.1 (from national statistics of the socialist countries of Eastern Europe).

a/ Imports c.i.f.

Data from the late 1970s show an uneven but decreasing trend in the share of developing countries in exports and imports of the Soviet Union during the 1980s, while the trend in the share of developing countries in total imports of the Soviet Union show a steady and stronger decrease. Indications of the possible commodity structure of trade can be gained by noting that the most important growth point in imports of the Soviet Union from developing countries is in the value of mineral fuels, while the historical data suggest a decrease in the share of, most importantly, non-fuel inedible raw materials, followed by manufactures and then agricultural products. In absolute terms, the value of Soviet imports of both agricultural goods and manufactures from developing countries rose during the latter part of the 1970s, but fell in volume terms, whereas the import of raw materials minus fuels fell in both value and volume terms.[3/] (See tables 5 and 6).

Data submitted by the Soviet Union to the Economic Commission for Europe suggest that the export pattern of the USSR is expected to stabilize during the first half of the 1980s, with a decline in the share of fuel and electric power in exports of the Soviet Union during the last half of the 1980s and into the 1990s. The decrease of oil and oil products in its exports is planned to be offset by increased deliveries of gas and electric power. On the import side, it is planned that the trade pattern should remain steady, the only notable fluctuations being in machinery and transport equipment, particularly for the construction of natural gas pipelines.*

The general outlook

With the exception of Poland and the USSR, the European CMEA countries are generally resource poor and, apart from Romania, they have traditionally seen the Soviet Union as their most important supplier of oil and of raw materials. From the end of the 1970s it became clear that the supplies of oil from the Soviet Union would not be sufficient to completely meet the growing demand of the Eastern European countries for oil, a view underlined by the fact that Soviet oil production fell by 15 per cent in 1977, 6 per cent in 1978 and 15 per cent in 1979.[6/] This new realization will be a crucial factor in shaping the relationship of these countries with developing countries, particularly the oil-exporters, during the 1980s.

The reasons that led to this situation are the fact that the price the Eastern Europeans pay for their oil through the working of the five-year moving average formula has progressively become closer to the world market price, the nature of the quantitative restrictions imposed by the Soviet Union on oil exports, and the requirement imposed on the Eastern Europeans increasingly to participate in the investment cost required in the Soviet Union for the production of oil from new, less favourably

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*Data on the commodity breakdown of Soviet trade must, however, be treated with caution, since official data is not published on the commodity composition of approximately one-third of Soviet foreign trade (predominantly commercially traded strategic items). Since much of the export side of this latter trade flow is widely assumed to represent trade in armaments, and since exports of armaments are increasing, their inclusion would increase both the share of manufactures in Soviet and Eastern European exports to developing countries as well as the slope of the trend line for the 1980s.

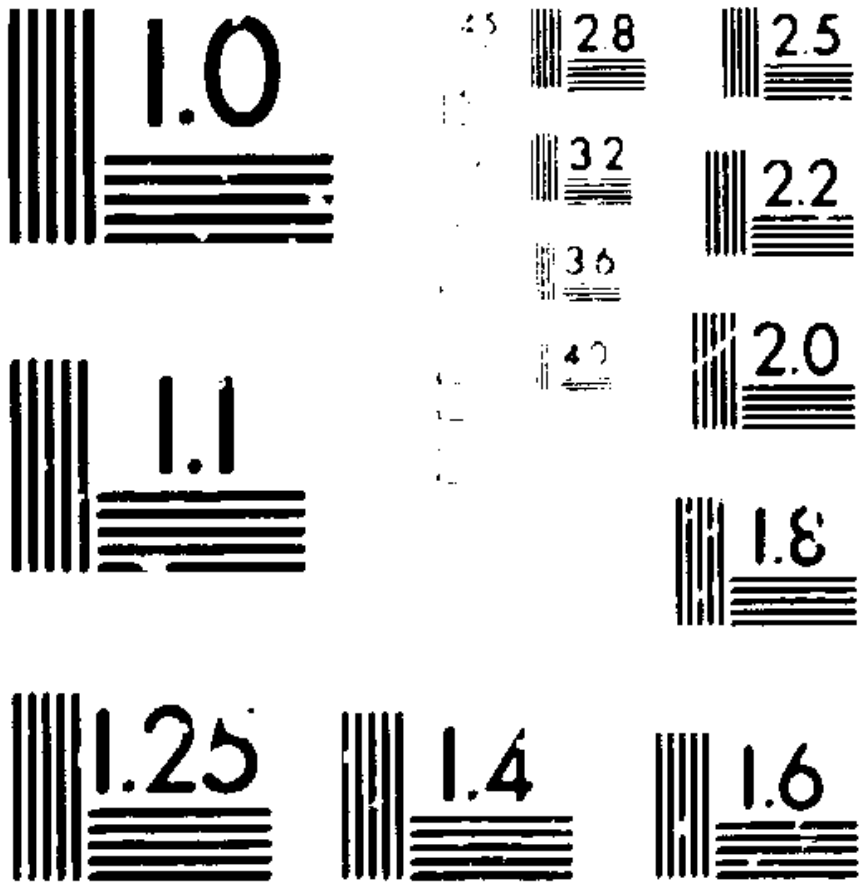

Table 6. Commodity structure of trade of the USSR with selected developing countries by SITC sections, 1977, 1978 and 1979
(Millions of dollars f.o.b.)

A. Exports

Item	1977 Value	1977 Percentage of total	1978 Value	1978 Percentage of total	1979 Value	1979 Percentage of total
Trade with world	44 580		52.400		64 701	
Trade with developing countries	10 713		12 752		14 648	
Breakdown by SITC Sections						
(0) Food and live animals	369	5.4	317	4.1	460	4.4
(1) Beverages and tobacco	0	0.0	0	0.0	0	0.0
(2) Crude materials, inedible, except fuels	527	7.7	448	5.8	511	4.9
(3) Mineral fuels, lubricants and related materials	1 683	24.6	1 768	22.9	3 006	28.8
(4) Animal and vegetable oils and fats	48	0.7	46	0.6	73	0.7
(5) Chemicals	178	2.6	177	2.3	198	1.9
(6) Manufactured goods classified chiefly by material	411	6.0	455	5.9	501	4.8
(7) Machinery and transport equipment	2 252	32.9	2 641	34.2	3 330	31.9
(8) Miscellaneous manufactured articles	62	0.9	77	1.0	104	1.0
(9) Commodities and transactions not classified according to kind [a]	1 314	19.2	1 792	23.2	2 254	21.6
Total [b]	6 845	100.0	7 722	100.0	10 439	100.0

B. Imports

Item	1977 Value	1977 Percentage of total	1978 Value	1978 Percentage of total	1979 Value	1979 Percentage of total
Trade with world	40 344		50 760		57 771	
Trade with developing countries	7 640		8 894		9 631	
Breakdown by SITC Sections						
(0) Food and live animals	3 413	45.1	3 913	49.1	4 512	47.0
(1) Beverages and tobacco	144	1.9	143	1.8	125	1.3
(2) Crude materials, inedible, except fuels	900	11.9	693	8.7	845	8.8
(3) Mineral fuels, lubricants and related materials	568	7.5	717	9.0	1 008	10.5
(4) Animal and vegetable oils and fats	76	1.0	96	1.2	192	2.0
(5) Chemicals	136	1.8	151	1.9	211	2.2
(6) Manufactured goods classified chiefly by material	560	7.4	558	7.0	691	7.2
(7) Machinery an transport equipment	598	7.9	733	9.2	745	7.8
(8) Miscellaneous manufactured articles	393	5.2	374	4.7	394	4.1
(9) Commodities and transactions not classified according to kind[a/]	779	10.3	590	7.4	874	9.1
Total[b/]	7 567	100.0	7 969	100.0	9 600	100.0

Sources: TD/B/859/Add.1 (from national statistics of the USSR); United Nations, Draft Conversion Key between the United Nations Standard International Trade Classification, Revised, and the Standard Foreign Trade Classification of the Council for Mutual Economic Assistance.

a/ Including not allocated.

b/ These data cover trade only with those developing countries for which the Foreign Trade Yearbook of the USSR provides a commodity breakdown.

located, oil fields. Oil deliveries from the Soviet Union to the small Eastern European countries from 1981 to 85 were planned to rise by approximately 30 million tons over the level delivered from 1976 to 80, an increase of nearly 8 per cent. Later these planned deliveries were forecast to equal the average level for 1976-1980, which represented a very serious problem in light of the difficulties experienced in attempts at reducing energy consumption during the late 1970s in Eastern Europe as well as growing levels of demand for energy inputs generated by the high annual rates of growth of the CMEA economies projected for the 1980s.

Combined with this is the fact that incremental increases in oil deliveries to the European CMEA countries from the Soviet Union must increasingly be paid for in hard goods (that is, those that could be sold in developed market economies). In addition, it has been announced that the projected oil deliveries for 1981-1985 from the Soviet Union will be reduced by 10 per cent below the 1976-1980 level.* Since realistic possibilities for major increases in extraction at acceptable cost levels do not exist in the Eastern European countries, these countries can therefore be seen to have little choice with regard to the structure of their imports from the South and the nature of their trade policy with developing countries. The result of this new realization is that countries of Eastern Europe are concluding an increasing number of delivery contracts with the countries of OPEC for oil deliveries in the 1980s, thereby reducing further the possibilities for importing anything other than goods that for geological or economic reasons cannot be domestically produced.

There are nevertheless a number of influences that will be working to reduce the energy imports of the East, and hence potentially lead to changes in the pattern of imports of the East from the South. The first is the cost (in terms both of transferable roubles and foreign exchange) that the smaller Eastern European countries are being required to pay for their energy imports,** and the second is the new emphasis being placed on the old arguments for reducing the costs of material and energy inputs in speeches by prominent planners form the CMEA countries. Both of these factors could contribute to a degree of energy conservation in the East that would be appreciably more successful than the experience of the past.

Further, the East is embarking on a vigorous programme of nuclear energy development. The programme is behind its planned schedule, but is nevertheless still ambitious and, moreover, it is not facing the types of delays that environmental considerations would put in its way in the developed market economies. Supplemental to this is the set of programmes for expanding hydroelectric capacity, especially in Bulgaria, Romania and Yugoslavia. These programmes are less ambitious than in the nuclear sector, but also face less difficulties in their attainment. Finally, there is the question of the degree of plan fulfillment. As is known, the

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*More recent reports suggest that, in the case of the German Democratic Republic, the cuts will be at least 12 per cent (Business Eastern Europe, 12 February 1982, p. 52).

**Even with stagnating world oil prices the intra-CMEA price for imports, which is calculated as a moving average of the oil price on world markets for the previous five years, is still rising as the effect of the second oil shock is fully incorporated in the price.

new plans set targets that are markedly below both the plans and the actual results of the recent past. But it is still not clear that these plans will all be fulfilled; and to the extent that they are underfulfilled, this is a positive factor from the point of view of increased energy demand.

The prospects for energy demand in the CMEA countries will therefore depend on the interaction of a complex set of factors and will have to be set against the expected actual deliveries received form the Soviet Union. It is this resultant new supply and demand picture that will determine the nature of the demand of the East for energy imports, which will in turn be a critical factor in determining the degree to which the demand of the East for imports from the South will be able to deviate from its historical pattern.

A fundamental question for the 1980s will be how East-South trade flows will be affected by the new pattern of development of trade between the East and the developed market economies. In 1981 the value of these trade flows, when calculated on a dollar basis, fell for the first time for almost two decades: the exports of the East to developed market economies were approximately 5 1/2 per cent below the 1980 level and the imports of the East from those economies nearly 10 per cent below the 1980 level.[7]. Conventional wisdom suggests that the most important explanation for this development is the economic downturn in the developed market economies. But the effect of this downturn found such a loud resonance in trade flows between the East and the developed market economies only because of the fact that the Eastern countries were marginal suppliers to those economies, and as such were the first to be affected by a fall in their level of demand. Similarly, the East does not seem to be in a good position to benefit fully from any upturn in the developed market economies.

The severity of the situation arises from the fact that the loss in revenue from export sales to developed market economies was combined with a sharp cutback in the volume of credit available for imports from those economies. Moreover, in the face of this reduced volume of funds for imports, the demands on export earnings to service the foreign debt rose appreciably due to the rise in international interest rates. In contrast to the earlier situation in which the potential hard goods exports of the Soviet Union isolated it from such pressures, the size of the food bill for meat, sugar and, most importantly, grain, the cost of direct (hard currency) aid to Poland, and the fall in the world price for exports such as gold and diamonds led to a serious, although temporary, depletion of Soviet foreign exchange resources by over 75 per cent between 1979 and 1981.

The combination of these factors puts markedly greater pressure on the Eastern economies to export to the South and demand hard currency in payment, while further strengthening the need to keep non-essential imports from the South at a minimum and reducing the possibilities for altering the structure of the imports so as to increase the share of manufactured goods. Thus, the current pattern of trade between the East and the developed market economies and the extremely high levels of foreign debt (relative to hard currency exports) incurred to finance previous trade flows between those two groups reduces the potential of the East to co-operate with the South.

A factor that could be crucial in determining the future pattern and level of East-South trade and the relative bargaining strength of the two sides would be a decision by the East that, on the basis of considerations of international policy on both trade and finance flows as well as on producer and consumer cartels, their long-term interest is more closely identified with the North than with the South.[8/] An agreement in these areas within the framework of trade between the East and the developed market economies would reduce the bargaining position of the South in East-South trade and in international trade negotiations in general.

In all such East-South trade deals the fact that the smaller CMEA countries have in recent years suffered a sharp deterioration in their terms of trade means that they will be forced to drive harder bargains in dealing with the South, while the stipulated objective of reducing the share of raw materials and increasing the share of value added in production will adversely affect the prospects of exports of even primary commodities from the South to the East. This is compounded by the nature of the structural forces in the centrally planned economies, such as the pace of technical progresss, which can be expected to push in the direction of more trade between the East and the centrally planned economies during the 1980s, rather then East-South trade.[9/]

Finally, the future course of East-South trade could be affected by attempts by the developed market economies to put trade with the East back on its previous growth path. Two of the possible measures that business enterprises in developed market economies could take to induce further trade would be to accept Eastern goods and then either to encourage the dumping of the goods in those economies or, alternatively, to market the Eastern goods in the South. The first course of action would have a disastrous effect on the export market for NICs and other developing countries, and the second would appreciably increase competition for developing countries with similar industries.

The net effect of these factors is that the dichotomy both in trade between the East and the developed market economies and in East-South trade will be increased and the mirror images created by the two trade patterns in the past will be even sharper in future.

One factor that could bode well for the exports of developing countries to the CMEA market is the demand generated within the CMEA by the new measures in the 1981-1985 plans to increase the standard of living. This could not only lead to increased imports of citrus fruit, cacao and similar goods, but also, in the absence of a history of production within the CMEA of a correspondingly wide range of consumer goods, there will be a market opening for developing countries to export manufactured consumer goods.*

A second factor that may lead to an increase in exports of manufactured goods from the South to the East is the growth of trade restrictions in the developed market economies. Thus, in 1980 Indian exports to the Soviet Union increased by 72 per cent, with the largest increase in precisely those types of manufactured goods that are facing increasing restrictions in the developed market economies.[10/] But the motivating force in this case will be the force of compulsion on the side of the

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*A separate question is the one of the degree to which these will in fact be primarily exports produced by affiliates of transnational corporations established in developing countries.

exporter rather than a new demand created on the side of the importer. And, with the recovery of the developed market economies from recession, the combination of the increased demand and the reduction in pressure for further increases in protection may well create the conditions for a re-orientation of the exports of developing countries back to the former markets.

Finally, there is the opportunity created for developing countries to increase their exports of agricultural products, especially grain, to the CMEA market. This is a result of restrictions on trade in agricultural products imposed by the developed market economies, and the resultant attempts of the CMEA countries, and especially the Soviet Union, to broaden their range of suppliers, as well as of recent harvest failures in the Soviet Union and some other Eastern European countries. Thus both Argentina and Brazil recently signed five-year trade agreements with the Soviet Union for the export of maize, soya, sugar, meat, cacao, coffee and oil-seeds in return for the import of oil and machinery (including particularly turbines for hydroelectric generating stations).

The longer-term potential for such developing country exports depends very much on the nature of the new grain agreements between the United States and the Soviet Union, as well as on the nature of grain harvests in Eastern Europe and the Soviet Union. Despite some reasons for suggesting the opposite, the probability is that the grain agreement will eventually be renewed for more than a one-year period, both because of a feeling in the United States that an embargo on grain hurts the United States more than the Soviet Union, and because of the very successful 1981/82 grain harvest in the United States. Particularly poor harvests in a number of countries in 1981, on the other hand, contributed to a net decline of 6 per cent in wheat production in the major importing countries,[11/] and this in turn will create increased opportunities for grain-exporting developing countries.

Turning to the prospects for exports from the East to the South, the markets where the East might well be best able to increase trade flows in these circumstances would perhaps be those where the products are produced using moderately capital-intensive production techniques and middle-level know-how. But here a serious threat to the exports of the East to the South could well come from an expansion of South-South trade following from a more vigorous programme of economic co-operation among developing countries.

Another area that could prove very promising for the small Eastern European countries in the CMEA would gradually come into existence as the Soviet Union develops its own light industry sector, with the implication that small Eastern European countries would no longer need to export the present volume of their light industry output to the Soviet Union. The small Eastern European countries could, using the same resources, reorient their production in the light industry branch in the direction of higher quality and more stylish products which could then be exported to the South (and, to a certain extent, to the West), with the lower quality and less sophisticated products being imported from the South.[12/]

Such a trade flow is perceived in the East as being in keeping with the pattern of comparative advantage in the East and the South, and is particularly appealing to those countries in the East where the labour shortage is most marked, as in Hungary. The chief constraint on the further development of a pattern of specialization in which the East imports highly labour-intensive products from the South and exports to the South products whith a relatively higher capital intensity is simply that of the balance of payments.

Whatever the size of the flows, they will clearly be increasingly carried out on the basis of long-term trade agreements, since these confer the relatively high degree of stability and security in trade desired by the CMEA side. These were among the important factors which led the CMEA in 1975 to conclude the first framework agreements with developing countries. Increasingly, the trade of the individual countries of the European CMEA has become specialized in supplying equipment and services for specific branches of the economy: Bulgaria, for agriculture (e.g., trade agreements with Iraq); Poland, for coal mining; and the Soviet Union for the iron and steel industry and hydroelectric technology (e.g., trade agreements with Argentina and Brazil).

Recent years have also seen a marked increase in the flexibility of the types of trade arrangements and multilateral operations concluded with developing countries, one example being special tripartite agreements concluded between enterprises in a CMEA country, a developing country, and a developed market economy. Under such agreements, a firm or a developed market economy enters a project as a subcontractor and is paid in the developing country currency earned by the Eastern country as part of its trade surplus with the developing country. Another example is where an Eastern country engages in trade with firms of developed market economies and pays them with goods that the former has purchased with its surplus inconvertible currency held in a developing country.

An indication of how such agreements may look in the future is an interesting new swap agreement recently concluded between the Soviet Union and Mexico, where Mexico will supply Cuba with oil and the Soviet Union will then supply traditional Mexican customers (such as India, Spain, and Yugoslavia) which are in much closer geographical proximity to the Soviet Union. Mexico and the Soviet Union will, of course, retain their pre-existing financial arrangements for financing with their own traditional customers, the contracted delivery of oil simply having been physically made by a third party.[13/]

There are also clear indications that future relations between the CMEA and developing countries will extend far beyond trade in goods, examples being the recent agreements of the Soviet Union to assist in the exploration for oil in Ethiopia and India, not only supplying equipment but also training personnel. The nature of the long-term dimension of these commitments is underscored by the example of the recent master plan that the Soviet Union has prepared for the development of Libyan gas production to the year 2000.[14/]

A scenario for CMEA trade for the 1980s

With this background on the nature of foreign trade in the CMEA countries and on both the general and the country-specific outlook for trade flows between the East and the South, one can turn to the development of a scenario for CMEA trade in the 1980s. On the basis of the policy statements of the Soviet Union and its Eastern European allies before international forums, there is abundant evidence of a desire to promote long-term co-operation, with the greatest potential for such long-term co-operation being seen in the mineral and fuel extraction industries. As proposed by the CMEA countries, such agreements would allow developing countries access to an increased volume of investment funds and assist them in their attempts to develop processing industries, and are claimed to be beneficial for the world as a whole since they would increase market stability (although they could only do so by reducing the size of the peaks in the cycles, which could also serve to deepen the troughs).

The view that developing countries should participate in international trade and development primarily through the production of raw materials, which they should make available at stable and equitable prices, flows as a strong current through Soviet economic discussions.[15] In this respect, Soviet relations with developing countries would develop as a mirror image of the trade relations between the East and developed market economies, in which the Soviet Union receives credit from those economies for the purchase of technologically sophisticated machinery and equipment in return for supplies of primary materials and other goods in repayment of the credit granted.[16]

For the CMEA countries, a programme of industrial co-operation with developing countries reduces the amount of industrial restructuring of their domestic economies which CMEA countries would have been forced to carry out if additional sources of raw materials and fuels had not become available or had had to be extracted, at increasingly high cost, at home. Such a policy of long-term industrial co-operation does not, however, contribute appreciably to the attempts of developing countries to restructure their economies and strengthen their manufacturing base, and is in essence a view of international interdependence and global co-operation oriented towards the preservation of the status quo in terms of the distribution of world manufacturing capacity. A major challenge in East-South industrial relations during the 1980s, then, will be to attempt to reconcile the perspectives, needs and demands of the East and the South.

The scenario for the future pattern of trade relations among the East, the South and the developed market economies, based on a detailed examination of the development patterns of the CMEA countries during the 1976-1980 period, their current development and the medium-term plans for the individual countries during the 1981-1985 period, would envisage a pattern of trade in which the developed market economies would provide technologically sophisticated machinery and equipment plus long-term credit for the development of CMEA raw materials, oil and gas. Within the European CMEA there would also be elements of a similar pattern of trade between the small Eastern European countries and the Soviet Union. The European CMEA would in turn provide its technology and allied machinery and equipment to developing countries.

Developing countries would then concentrate on the production of natural resources to fuel the development process in the CMEA countries, as well as in the developed market economies. Developing countries would, in return, benefit from assistance from these countries in the further development of their extraction industry and of their local processing industry. This international co-operation would include not only bilateral deals between the CMEA and developing countries, but also joint ventures of CMEA and developing countries in third countries, as well as tripartite co-operation agreements among CMEA and developing countries and the developed market economies.

In the case of joint CMEA-developing-country projects in third countries, CMEA would be the technologically more advanced partner, whereas in tripartite agreements the developed market economies would provide the advanced technology, the East the middle-level technology, and developing countries chiefly their labour and raw materials. Such arrangements would clearly also be differentiated according to economic conditions in different groups of developing countries, with programmes for tropical Africa emphasizing measures to increase the exploitation of its natural resources, those for middle-level developing countries stressing joint

ventures to increase local production and investment opportunities, and those for oil-exporting developing countries oriented towards the sale of machinery and entire turnkey plants for cash or oil deliveries.[17]

In general, this scenario, which in recent years has been developed in the literature on the subject in the Soviet Union and elsewhere in Eastern Europe[18], and which is in fact almost identical with the pattern of trade relations that existed in the latter part of the 1970s, is consistent with the pattern of static comparative advantage of both groups of countries. But the desire for the further development of such a pattern of trade on the part of the CMEA countries is in conflict with many elements of a development programme for developing countries based on their equally strongly expressed desire for accelerated industrialization. Moreover, as has been outlined above, the prospects for altering this pattern are worse in the early to mid-1980s than they were during the late 1970s.

It is also crucial to note that, in the view of some CMEA economists at least, the foreign trade relations of the East with developing countries have not become an organic component of the economic strategy of the CMEA countries. Rather, they "were regarded by the CMEA countries as a special case and as a certain sacrifice"[19], a situation which by its very nature limits the potential for such trade flows serving as a vehicle for international industrial restructuring.

A major challenge facing East-South trade relations in the 1980s, then, will be reconciling the needs of CMEA countries for the raw materials and fuels to dominate their imports from the South with the desire of the South for a very rapid development, in both absolute and relative terms, of their exports of manufactures to the East.

An eastern scenario for East-South trade

Turning to focus in more detail on prospects for East-South trade during the 1980s, the only quantitative scenario with a detailed East-South component currently available from authors in the CMEA appears to be that of Dobozi and Inotai.[20] These authors assume a propitious general development of international relations during the 1980s that is more favourable than the course of events during the late 1970s or at the beginning of the 1980s, and regard "accelerated modernization rather than the redeployment of declining branches of industry in developing countries as the principal area of industrial co-operation".[21]

The pattern of structural change prescribed for developing countries during the 1980s is one that will further develop the complementarity between the two groups of countries and should include not only light unskilled labour-intensive manufactures, but also some branches of engineering and of chemicals, as well as some raw-material-intensive goods branches, whereas the Eastern side will concentrate on more capital-intensive goods and those with a high technology content. Because of "growing world economic instability", the authors feel that comprehensive and long-term agreements at the branch and intra-branch level, with time horizons of 10, 15 and even 20 years, will have to be increasingly relied upon "as elements of stability in the international division of labour".[22]

The major conclusions of the Hungarian study are that trade between the European CMEA countries and developing countries will grow about twice as rapidly during the 1980s as overall world trade, and significantly faster even than the overall trade of the European CMEA countries; and

that the trade surplus of the European CMEA countries vis-à-vis developing countries will disappear, with the account being balanced at best (see table 7)

The conclusions require at least one basic comment, namely that a balanced, or even more a negative, trade balance in East-South trade from the side of the CMEA is only possible if one assumes a markedly improved climate for financial relations between the East and developed market economies, involving further credit, the rescheduling of existing debt, and lower interest rates on Eastern borrowings. The more pessimism there is as regards these factors, the more difficult it is to accept the forecast.

As was discussed above, Eastern economists writing on trade prospects generally take as their starting-point the assumption of the satisfaction of the growing import requirements of the CMEA region for fuels and raw materials by the South.[23] The composition of trade forecast for 1990 (see table 8) shows that in trade in fuels this standard assumption is maintained, with the result that petroleum imports will account for up to one half of the total import bill (of $41 to $49 billion) forecast for 1990. This in turn clearly restricts the possibilities for other imports.

Table 8. Forecast of the commodity structure of trade between developing countries and the European CMEA countries in 1990 (Percentage)

Item	European CMEA exports to developing countries		European CMEA imports from developing countries	
	1977	1990	1977	1990
SITC 0 + 1 - Food etc.	11.3	10	49.3	20-25
SITC 2 + 4 - Materials	6.1	10	18.9	10-12
SITC 3 - Fuels	13.7		20.5	35-45
SITC 5 + 6 + 8 - Other manufactures	26.8	25	11.0	
SITC 7 - Machinery and vehicles	42.2	55	0.3	20-25

Source: See table 7.

On the side of CMEA exports to the South, the general assumption of Eastern economists that machinery and equipment, and especially complete plants, will be the fastest-growing component is shared by Dobozi and Inotai. Indeed, the developments are forecast to proceed with even more intensity than previously: thus the engineering exports of European CMEA countries are to be increased from $4 billion in 1977 to between $22 and $27 billion in 1990. The result of this development is that the degree of concentration of Eastern exports to the South in manufactures would rise to as high as 80 per cent.

If production of manufactures is characterized by a programme of intra-branch specialization in production that utilizes those technologies and resources in which the respective countries have a comparative advantage, then it is possible that the CMEA countries will be able to attain this pattern of export growth and that developing countries will be

Table 7. Forecast of trade between developing countries and the European CMEA countries in 1990
(Constant 1977 prices)

Item	Value (billions of dollars)				Average annual growth (percentage)		Share of developing countries in total trade (percentage)	
	Total trade		Trade with developing countries		Total trade	Trade with developing countries		
	1978	1990	1978	1990	1978	1990	1978	1990
CMEA Exports								
Bulgaria	7.4	16.8	0.71	2.0	7	9	9.5	12
Czecholovakia	11.7	29.5-36.8	0.93	3.0-3.7	8.0-10	10-13	7.9	10
German Democratic Republic	13.3	30.0-33.4	0.64	2.1-3.3	7-8	10.5-14.5	4.8	7-10
Hungary	6.3	20.0-22.2	0.55	2.4-2.9	10-11	13-15	8.7	12-13
Poland	13.5	37.9-42.2	1.12	4.7-6.1	9-10	12-13	8.3	12-14
Romania	8.0	22.5-25.1	1.58	5.6-7.5	9-10	11-14	20.0	25-30
Soviet Union	52.2	118.2	8.24	20.4-23.2	7	8-9	15.8	17-20
European CMEA	112.4	274.9-294.7	13.77	40.2-48.7	8-8.5	9.5-11	12.2	14.5-16.5
CMEA Imports								
Bulgaria	7.6	17	0.31	2.1	7	17	4.3	12.5
Czechoslovakia	12.6	29	0.58	2.8-3.5	7-9	14-16	4.6	9.5-10
German Democratic Republic	14.6	31-35	0.73	2.5-3.5	6.5-7.5	11-14	5.0	8-10
Hungary	7.9	20-25	0.76	2.5-3.0	8-10	10.5-12	9.6	12-13
Poland	15.3	40-45	0.90	3.5-6.5	8.5-9.5	16-18	5.9	14-15
Romania	8.0	20-25	1.44	6-7.5	8-10	12.5-15	18.0	30
Soviet Union	50.5	118-109	4.04	20-23	7.5-6.5	14-15.5	8.0	18-20
European CMEA	116.5	275-291	8.76	41.4-49.1	7.5-8	14-15.5	7.6	15-17

Source: István Dobozi and András Inofai, "Prospects of economic co-operation between CMEA countries and developing countries", in C.T. Saunders, East-West-South (London, Macmillan, 1981).

able to raise their share in the imports of manufactures as planned. But these forecasts cannot be attained without a marked increase in specialization and rationalization in production and trade.

Moreover, it cannot be ignored that the East faces an ever-increasing challenge to its exports to the South both from intra-South trade and, even more, from trade between the South and developed market economies. In addition, the fuel, raw material and agricultural exports of the South that (even in this scenario) would still dominate imports in the CMEA in 1990 are hard goods that can command convertible currency. The East therefore faces the reality that the South can vote on the quality, design etc. of CMEA goods with its purse.

East-South trade and accelerated development in developing countries

As part of its programme of work oriented towards attempting to create a more conducive environment for the attainment of the targets of the Third United Nations Development Decade, the United Nations Industrial Development Organization has developed scenarios which explore the implications of the attainment of the objectives of the United Nations International Development Strategy during the decade of the 1980s.[24] For reference it will be recalled that the Strategy represents a comprehensive set of quantitative and qualitative targets for accelerating the development process in developing countries during the 1980s, including a 7 per cent average annual growth rate of GNP and a target investment level equal to 28 per cent of GDP by 1990. A key role in the development plans of developing countries is foreseen in the strategy for the industrial sector, where the average annual growth rate of manufacturing output is targeted at 9 per cent, and in the exports of manufactured goods, which serve as a vehicle for furthering the industrialization process.

The pattern, level, and balance of trade that the Third Development Decade scenario generates is markedly different from the Eastern forecast just discussed, though it is crucial to state clearly that the goals of the Third Development Decade achieved under this scenario could have been attained using different trade matrices, and hence different patterns of East-South trade. At the aggregate level the scenario (see table 9) shows a rate of growth of Eastern exports to the South well over twice that of Eastern imports from the South, a result which would insure a relatively massive surplus for the East to be employed for covering deficits on trade between the East and developed market economies and for servicing the Eastern external debt. It will be recalled that in the previous scenario the major increase in growth rates was for Eastern imports.

Three features stand out in the projected patterns of growth of CMEA exports to the South. First, as in the Hungarian scenario, it is assumed that the East will meet little opposition in forcing the export of machinery and equipment,[25] a development which limits the possibilities for the expansion of South-South trade in this area. The second marked feature in the development of Eastern exports to the South is the average annual growth rate of energy exports of over 15 per cent, an outcome that reflects the assumption of a successful CMEA policy of developing and exporting natural gas, maintaining high levels of oil production, conserving energy in the domestic economy, and exploiting new sources of energy, especially nuclear energy. The third feature that stands out is a trebling of the absolute volume of agricultural exports from the CMEA to the South. Even though, in view of the overall growth rate of Eastern exports to the South, this still represents a fall in the share of agricultural exports in CMEA exports, like the projected growth in energy exports it is an appreciably more optimistic projection than that of the

Table 9. Projected trade flows between developing countries and the European CMEA in 1990 under the assumptions of the Third United Nations Development Decade scenario of the UNITAD model

Item	CMEA exports to developing countries			CMEA imports from developing countries		
	Value (billions of dollars) at 1970 prices		Average annual growth rate 1975-1990 (percentage)	Value (billions of dollars) at 1970 prices		Average annual growth rate 1975-1990 (percentage)
	1975	1990		1975	1990	
Agriculture	640	1 940	7.7	2 [illegible]70	4 775	4.2
Processed agricultural products	33	173	11.7	241	409	3.6
Energy	295	2 476	15.2	329	90	-3.7
Intermediate products	889	2 388	6.8	570	1 778	7.9
Consumer non-durables	290	467	3.2	266	858	8.1
Equipment	2 292	7 658	8.4	428	309	-1.6
Consumer durables	300	712	5.9	621	359	-2.4
Total	4 741	15 814	8.4	5 026	8 579	3.6

Source: UNITAD model. See note 1 for sources.

Eastern European economists. And, even more so than in the case of the projected energy exports, it appears to make demands on the Eastern economies that would appear to be all but impossible to meet.

Despite the very high overall growth rate of trade, in terms of the branch structure of Eastern exports to the South, there was very little change outside the energy sector (see table 10). For Eastern imports from the South, the change in the commodity structure is somewhat more marked, but it is not clear that this is a reflection of a pattern of change in international trade that would strongly support the attempts of developing countries to accelerate their industrialization.

Table 10. Composition of East-South trade in 1990: the Third United NationsDevelopment Decade scenario

Item	Share in total CMEA exports to the South		Share in total CMEA imports from the South	
	1975	1990	1975	1990
Agriculture	13.5	12.3	51.1	55.6
Processed agricultural products	0.7	1.1	4.8	4.8
Energy	6.2	15.6	6.5	1.0
Intermediate products	18.8	15.1	11.3	20.7
Consumer non-durables	6.1	3.0	5.3	10.0
Equipment	48.3	48.4	8.5	3.6
Consumer durables	6.3	4.5	12.4	4.2
Total	100.0	100.0	100.0	100.0

Source: See table 9.

As a result of the very positive development of the energy sector assumed for the CMEA countries, it is possible to reduce energy imports. In part this allows appreciable growth in imports from the South of consumer non-durables - products where the South has an increasing comparative advantage in terms of labour costs. But it is also true that the strong roots of the traditional pattern of trade are also reflected by an absolute growth in the import of intermediate raw materials double that of the growth in consumer durables.

By requiring imports of agricultural products and raw materials to fall, the Eastern scenario left room for a very positive development of Southern exports of manufactured goods to the East (see table 6). Since the UNITAD scenario foresees strong to very strong growth in the imports of the former groups of goods, the share of manufactures from the South in total imports of the East from the South can only fall over the 1980s.

On balance, then, the UNITAD scenario foresees the maintenance of the traditional pattern of development of East-South trade and, from the point of view of the efforts of the South to strengthen its exports of manufactures, is not at all optimistic. What is very optimistic in the scenario is the development of CMEA exports of agricultural products to the South, and even more so the development of fuel exports. Were these developments not to take place, one could foresee a reduction in the big Eastern surplus on East-South trade currently projected, an increase in the share of food in total imports and, most disappointing for developing countries, a definite fall in the growth foreseen for consumer non-durables.

Conclusions

The arguments presented above suggest that the probable prospects for the expansion of East-South trade in the medium-term are rather limited. Both of the quantitative scenarios discussed point out areas with marked prospects for growth, but they also both make assumptions that could be judged as highly optimistic. Even where there is some prospect of expansion it is generally along very traditional lines and not in accord with the aspirations of developing countries for rapid industrialization.

The picture that evolves from the foregoing analysis is that East-South trade, like trade between the East and the developed market economies, appears at the end of the 1970s and beginning of the 1980s to have been approaching a modest, stable level, with only moderate real growth prospects, and with established partners dealing in established commodities. Such a generalization, in which East-South trade remains a "residuum in intention",[26] must be adjusted over time for changes in political realities that cannot presently be foreseen, but the very nature of such exceptions supports the argument for the generality of the rule. If such forecasts are to be disproven and if East-South trade is indeed to play a significant role in the attempts of the South to attain the objectives embodied in the Third United Nations Development Decade, then there must be a number of fundamental changes in the nature of this trade.

The traditional trade pattern has been based on a resource and endowment picture that emphasized high technology and a capital surplus in the West, intermediate technology and cheaper labour in the East, and a wealth of resources and the cheapest labour in the South. It has been emphasized for some years by the Economic Commission for Europe that major factors in impeding the more rapid development of such trade flows were the inappropriate pattern of specialization in the CMEA and the inadequate export structure in these countries.[27] Adaptation of the industrial structure on the CMEA side in accordance with the resource and factor endowments could, then, create conditions favourable to a more rapid expansion of East-South trade.

A further stimulus to East-South trade flows and thereby to the development of developing countries could come from attempts to take advantage of the potential comparative advantage of small countries in internationally standardized products in which they can benefit from the economies of scale in spite of the smallness of their markets. In addition, attention to product differentiation in exports, where the South would attempt to orient themselves more to consumer preferences with respect to standards and promotional factors, could also create expanded opportunities for East-South trade.[28]

This in turn could lead to the South attempting, in so far as technology, design capabilities, licensing agreements and the like permit, to focus more on non-essential consumer products of the type that have assumed growing importance in trade between the East and developed market economies because of (demonstration-effect stimulated) rising consumer tastes. The potential for exporting such goods - examples being sophisticated electronic consumer durables, certain types of clothing, textiles, cosmetics, and beverages - to the East will be markedly greater during the 1980s than for essential consumer goods such as basic foodstuffs, building materials, or fertilizers. Moreover, such products are highly "switchable", in the sense that developing countries could easily reorient their exports of such goods to other markets if conditions so dictated.

A further area of potential expansion in East-South trade is in the area of intra-branch specialization. Such developments have proceeded within the CMEA in recent years and could also proceed between the East and the South. This would provide a mechanism whereby economies that were all aiming at higher degrees of industrialization could nevertheless manage to increase their trade in manufactures and, not incidentally, the efficiency of their industrial production. A precondition for such a development would be the need for negotations between the East and the South to develop a programme of inter-branch specialization.

A fundamental precondition for these developments and for trade in general is that the East should recognize the implications of the process of international industrial restructuring and the industrialization of developing countries, something which they have thus far failed to do. This implies a need for the Eastern countries to modify their plans for continuing to import primarily raw materials and fuels from developing countries, since developing countries are rapidly building an industrial structure under which such products will progressively only be exported in a highly processed state.

Parallel to this is the fact that the evolution of East-South trade flows over the 1980s will see the development of an atmosphere of potential competition replacing the previous complementarity of import and export flows, this potential competition being between both Eastern and Southern exports of manufactures to developed market economies and between Eastern and Southern exports of manufactures to Southern markets. This competition will be stronger, the more successful the countries of the South are in their drive for industrialization; the more successful the Eastern countries are in attempting to reschedule their debt and obtain expanded credit facilities at lower interest rates; the more the import demand of the CMEA countries for fuels and, to a lesser extent, for raw materials is reduced as a result of high levels of production, successful conservation, and new exploration; and the lower the level of industrial growth in the CMEA countries during the 1980s.

A recent UNIDO investigation of the process of redeployment and structural change world-wide concluded that it is possible that, in the short- and medium-term, CMEA countries "will not increase significantly their division of labour with developing countries through the redeployment of industrial capacities. Rather, the CMEA countries may primarily aim at continuing to secure raw material supplies from developing countries through bilateral agreements".[29/] Such traditional patterns of trade, however, can neither transform the structure of production in the South nor make for a new international division of labour.

A fundamental reason for the failure of the Eastern countries fully to appreciate the implications of the process of international industrial restructuring on the structure of their production and trade is that this process is carried out in the spirit of the development process in the developed market economies and developing countries, where exports are often a motor of economic growth. In the East much more the case that imports are the motor of economic development, and economic policy focuses on the preservation of import supplies rather than on the stimulation of exports. This view is consistent with the conceptualization of East-South trade as a "stopgap" measure or as a residual source of supply. Substantial future development of East-South trade will require transgressing this role for trade with the South and co-operating with the South on evolving a new pattern and structure of trade corresponding to the new international development climate of the 1980s.

In conclusion, it appears that in trade flows between the East and the South, there could be a change in the attitudes of the 1970s, which the United Nations Centre on Transnational Corporations has characterized as a time during which a hermetic East confronted a passive South in a climate strongly influenced by expansive developed market economies.30/ But this will not happen automatically. It will only happen as part of an internationally agreed programme of industrial restructuring on a global level, which requires a willingness and ability on the part of all countries involved to adapt their industrial structure to the new economic realities of the 1980s, and particularly to the economic aspirations of the developing countries.

Notes

1/ For a detailed discussion of these points see Eva Palócz-Németh, Der Handel in Industriewaren zwischen Ost, West und Süd und seine Auswirkung, Forschungsbericht No. 67 (Vienna, Wiener Institut für Internationale Wirtschaftsvergleiche, 1981).

2/ "Structural changes in the Czechoslovakian industry and prospects of international division of labour with the developing countries" (ID/WG.357/1).

3/ ED.AC(XVII)/AC.1/R.2.

4/ Report on the Research Seminar on Structural Changes in Industry in European CMEA countries, Budapest, Hungary, 22-26 March 1982 (ID/WG.357/11).

5/ "Structural changes in the Polish industry" (ID/WG.357/2).

6/ Ekonomicheskaya Gazeta, No. 4, 1979, p. 1.

7/ Jan Stankovsky, "Ost-West-Handel 1981 und Aussichten für 1982", Monatsbericht (Vienna, Österreichisches Institut für Wirtschaftsforschung forthcoming).

8/ See the discussion in Richard Portes, "East, West, and South: the role of the centrally planned economies in the international economy", in The World Economic Order: Past and Prospects, S. Grassman and E. Lundberg, eds. (London, Macmillan, 1981) pp. 319-357.

9/ "Some reflections on East-South trade and the division of labour" (ID/WG.357/7).

10/ Aussenwirtschaft, No. 45, 4 November 1981, p. 4.

11/ Foreign Agriculture, January 1982, p. 12.

12/ See the discussion in "Salient features of structural changes in European CMEA countries" (ID/WG.357/6).

13/ G. Kornat, "Moskau zeigt Profil", Handelsblatt, Nr. 209, 30-31 October 1981.

14/ Tass, Daily Economic and Commercial News Service, 23 November 1981, 3 December 1981 and 10 December 1981.

15/ Moskovsky Gosudarstvennyy Institut Mezhdunarodnykh Otnoshenii, Mirovaya Ekonomika (The World Economy) (Moscow, Mezhdunarodnyye Otnosheniya, 1978); R. Ulyanovskiy, "The economic front of the struggle against neocolonialism", Narody Azii i Afriki, No. 4, 1978, pp. 3-17.

16/ V. Akhimov, "Bank's participation in Soviet Union's foreign trade", Foreign Trade, No. 6, 1978, p. 13, quoted in E.K. Valkenier, "The USSR, the third world, and the global economy", Problems of Communism, July-August 1979, pp. 17-33.

17/ V. Sheynis, "Socio-economic differentiation and problems of the typology of the developing countries, Mirovaya Ekonomika i Mezhdunarodnyye Otnosheniya, No. 8, 1978, p. 93; Joint Statement by the Socialist Countries at the Fourth Session of UNCTAD; N. Tret'yukhin, "New directions in the foreign economic relations of the USSR and deepening of its participation in the international division of labour", Vneshnyaya Torgovlya, No. 1, 1977, pp. 7-14.

18/ N.P. Shmelev, ed., Strany SEV v Mirokhozyaystvennykh Svyazyakh (Countries of the CMEA and their relations with the world economy) (Moscow, Nauka, 1978); L. Zurawicki, "The prospects for tripartite co-operation", Intereconomics, No. 7/8, 1978, pp. 184-187; Valkenier, loc. cit.

19/ Palóca-Nemeth, op. cit., p. 50.

20/ István Dobozi and András Inotai, "Prospects of economic co-operation between CMEA countries and developing countries", in C.T. Saunders, East-West-South (London, Macmillan, 1981), pp. 48-65.

21/ Ibid., p. 52.

22/ Ibid., p. 58.

23/ See also "Structural change in manufacturing industries in the European CMEA area and patterns of trade in manufactures between CMEA countries and developing areas" (ID/WG.357/5).

24/ For further details see the UNITAD team article "The UNITAD project: a world model to explore institutional changes over the long run", Industry and Development, No. 6 (United Nations publication, Sales No. E.81.II.B.4), pp. 37-64; and "Uses of the UNITAD model" (UNIDO/IS.305).

25/ SITC 695, 71, 72 (minus 724 and 725), 73 and 861.

26/ Michael Kidron, Pakistan's Trade with Eastern Bloc Countries (New York, Praeger, 1972), p. 14.

27/ Economic Commission for Europe, Economic Bulletin for Europe, vol. 33. Similar arguments are also presented in volumes 26-32.

28/ For an expansion and empirical test of such arguments in the context of West-South trade see P.K.M. Tharakan, L.G. Soete and J.A. Busschaert, "Heckscher-Ohlin and Chamberlain determinants of comparative advantage", European Economic Review, No. 11, 1978, pp. 221-239.

29/ "Redeployment of industries from developed to developing countries" (ID/B/282).

30/ Alberto Jiménez de Lucio, "The East, the South and the transnational corporations", CEPAL Review, 14 August 1981, pp. 51-61.

BOOKS

DEVELOPMENT PLANNING MODELS, volumes I and II
edited by S. Bhagwan Dahiya
New Delhi, Inter-India Publications, 1982

This extensive two-volume book contains 18 papers, 9 papers in each volume. The book has several purposes: to offer a representative and fruitful selection of planning models and techniques which are capable of explaining structural responses to policy changes in growth, trade and income distribution; to close the gap between theory and application in model-building; to illustrate the basic features of developing planning models; and to provide useful reference materials for various users of planning models, including planning agencies, students, researchers and policy-makers.

The first volume deals with the traditional problems of investment, production, consumption, trade and growth. The nature and scope of the model used to analyze these problems varies considerably, ranging from a relatively simple aggregative macromodel of Israel (chapter 1) to a complex dynamic multisectoral constraint optimization model (chapters 7 and 8). The sophistication of the multisectoral model also increases progressively from a static consistency test (chapter 2) through an intertemporal consistency framework (chapter 5) to a dynamic linear programming optimizing model mentioned earlier.

Six of the eight developing planning models contained in the first volume are concerned with the case of planning in India. Therefore, a survey article on development planning models in India given by the editor at the end of the volume is quite appropriate. It is understandable that the volume concentrates on planning in India, since most of the early pioneering works in multisectoral planning models originated and were refined in India and, so far as concerns data adequacy for the empirical implementation of a multisectoral model, few countries could match the data sources of India. However, a narrow focus on the application of planning models to the case of the Indian economy may not be consistent with one of the basic aims of the volume set forth at the outset, namely to provide a representative and fruitful selection from a bewildering variety of existing models for a wide range of potential users in many developing countries.

The point at issue is not the analytical capacity and empirical validity of development planning models in India but their general applicability in many different situations. Any model developed as an analytical tool for evaluating the structural characteristics of an economy and as a consistent and optimizing framework for formulating alternative development policies should capture the major socio-economic and institutional characteristics of the country concerend in the model specification. And these structural characteristics vary markedly among developing countries. It remains uncertain as to the extent to which development planning models suited to the unique circumstances of the Indian economy are relevant to other developing economies which are vastly different in terms of resource endowments and priority development issues (such as capital-surplus, labour-scarce oil-exporting countries in the Middle East, or small, resource-poor least developed countries with limited domestic markets). Also, it should be noted that most of the papers in this volume are reprints of articles which originally appeared in the 1960s.

The second volume contains a collection of studies which further expand the scope of previous models discussed in the first volume, along with some refinement and improvement in the model design. The most notable advances in the model capacity are an attempt to incorporate human resource planning into the traditional multisectoral model through a general equilibrium approach (chapters 1 and 2); and a semi-input output technique designed to facilitate the selection of priority sectors and projects based on the comparative advantage of a country (chapter 4, which was reprinted from Industry and Development, No. 5). An equally noteworthy extension of the traditional multisectoral model is the recent development of a computable general equilibrium (CGE) model, a technique which is now gaining increasing popularity among model builders. A CGE model was used to investigate the distributional impacts of alternative trade strategies (chapter 6). It is also worth noting that in contrast to the first volume, these models are applied to a number of different developing countries for illustrative purposes, thus enhancing the usefulness and relevance of the second volume to potential users.

Despite the above-mentioned widening of the scope of the model and some important methodological innovations, there appears to be room for further improvement in terms of a more balanced selection of priority development issues and problems for modelling exercises. For instance, it is well-known that energy shortages and the related decline in foreign exchange earnings of developing countries have combined to impede the development efforts of those countries. It appears, therefore, highly fruitful to incorporate the energy dimension of the development process into the traditional planning models. In particular, the issue of substitutability between capital and energy and between labour and energy in the long-term development process merits serious consideration in modelling efforts. In fact, there exists already a rapidly growing body of literature in this field.[1/] An equally important issue is the spatial dimension of development planning, such as the regional impact of a development programme and the optimal spatial distribution of income and employment at the sub-national level as the editor correctly pointed out in his overall assessment of development planning models in India (volume 1, chapter 9). It is true that regional planning in general and regional modelling in particular are still at the embryonic stages of development in developing countries. At the same time, the literature on regional and interregional planning models as applied to developed economies is quite extensive, and many of these models can be readily adapted to analyse regional problems in developing countries. In fact, this is already taking place. A recent work[2/] may typify such an effort. Another omission that strikes the reviewer as important is the treatment of uncertainty in development planning models, which is a difficult but critical aspect of economic planning. Some of the recent theoretical contributions to the economics of planning under uncertainty[3/] may facilitate the development of planning models in this direction.

The available space is too limited to cover all the planning models and development problems dealt with, and the selection of priority areas is a matter of subjective judgement. After reading the two-volume work, one is left with the impression that much more severe editorial selection would have improved it significantly. Nevertheless, the book contains a great deal of useful material and interesting ideas, and represents another valuable addiion to the growing body of literature on development planning models. Its price, however, may be within the reach of many potential readers in developed countries, but not of most of those in India and other developing countries.

SE-HARK PARK

Notes

1/ Se-Hark Park and Atif A. Kubursi, "The energy constraint and development: consistency and optimality", Energy Economics, vol. 5, No. 1 (January 1983), pp. 9-15.

2/ Mrinal K. Datta-Chandhuri, "Interindustry planning models for a multi-regional economy", in C.R. Blitzer, P.B. Clark and L. Taylor, Economy-Wide Models and Development Planning (London, Oxford University Press, 1975).

3/ L. Johansen, Lectures on Macroeconomic Planning: Part 2: Centralization, Planning under Uncertainty (New York, North-Holland Publishing, 1978).

TECHNOLOGY AND SECTOR CHOICE IN ECONOMIC DEVELOPMENT
by Gerard K. Boon
The Netherlands, Sijthoff and Noordhoff, 1978

The main theme of the book is simply stated in its title: sector and technology choice in economic development. Even though the author chose Mexico as a case study, certain research findings may be applied to other developing countries.

The book is divided into two parts. One part focuses on micro-economic analyses, using engineering and intercountry statistical production data, to aid in technology choice; and the other part deals with sectoral and macro-analyses, using data from the Mexican economy, to aid in sector (output mix) choice. Due to space limitations, only certain key aspects of the book are discussed below; it contains much more.

The method of research pursued in part one is called the DOS method. This method is merely the abbreviation of certain analytical tools relating to decomposition, optimality and sensitivity. This method originated in the concept of break-even analysis, which is widely used in managerial economics. The author believes that the method is operational and, if correctly applied, will allow the decision-maker considerable insight into the decision problem and facilitate the choice of an alternative technology based on optimal prices, cost and output. To put it simply, the DOS method is composed of various elements of known methodologies.

The method adopted in this study may be particularly useful when a country is confronted with the problem of choosing a certain technology at various levels of aggregation, including the most disaggregated, such as the task level. For example, through this methodology it will be possible to define various qualities, and if one can specify the existing range of technological alternatives, one can determine the sensitivity of the optimal technology to quality differences in the output, variations in the utilization level of equipment and factor price variations, as illustrated by the table below (quality differences excluded for simplicity).

Sensitivity of technology choice to production constraints

Factor price combination[a]	Technology choice[b] for different levels of equipment utilization			
	50%	75%	100%	200%
1	B	C	D	D
2	B	B	D	D
3	B	B	C	D
4	A	B	C	C
5	A	A	B	B,C
6	A	A	A	B
7	A	A	A	-

a/ Lower number means higher wate-capital ratio.

b/ A, B, C and D represent technological alternatives.

The table supposes four technological alternatives (A, B, C and D) and the best alternative is shown for each set of factor prices and utilization level (200 per cent represents a double shift). It can be seen, for example, that D is a technology suitable for countries with a high wage-capital ratio (typical of a developed country) and where a high capacity utilization can be achieved, A is suitable for countries with a low wage-capital ratio and where high capacity utilization may not be possible, and B and C represent intermediate cases. Thus the table provides a method of showing the sensitivity of technology choice to production constraints (quality and other factors could also be included).

As indicated earlier, the second part of the book focuses on analyses at the sectoral and macro-levels of aggregation and uses statistical data from the Mexican economy. In this part sectors are characterized quantitatively, using two sets of criteria. One is used in intersector comparison within the economy and constitutes factors such as the following: the capital and labour intensity of the sectors; the skill intensity; the foreign trade characteristic; and the backward and forward linkage potential of sectors. The second is used in the international comparison of a given sector and is based on factors such as the value added per establishment and per person and the wage per person. These two sets of criteria provide insight into the economic nature of sectors which might be useful to determine priorities for sectoral development. Input-output and semi-input-output analyses are also used.

The author, rightly so, seems to be disenchanted with the neoclassical conception of technology. The relevant variables in the neoclassical framework are essentially factor substitution possibilities and the relative price ratio. All other variables are of minor importance and may well be ignored. In reality, however, many other variables enter into the choice of technology.

The uniqueness of this study stems from its use of both engineering data and statistical data. Using both the technical approach and the economic approach, the researcher can be more objective in recommending policies as to what technology to choose.

The author has also written two closely related books, Technology and Employment in Footwear Manufacturing and Technology Transfer in Fibres, Textile and Apparel, also published by Sijthoff and Noordhoff (1980 and 1981, respectively). These extend the analysis developed in the book under review and provide interesting case studies. Taken together, these three works provide a very useful contribution to the field of technology assessment and industrial economics. An article based on the three books appeared in issue No. 9 of Industry and Development

H. BURKAN

HOW TO LEARN FROM PROJECT DISASTERS
True Life Stories with a Moral for Management
by O.P. Kharbanda and E.A. Stallworthy
Aldershot, England, Gower Publishing Co., 1983

The title is catching and the book lives up to its promise. It tells us why 20 major projects were late in completion and cost up to ten times as much as the original budget. Very few of the projects were real disasters - they were all completed successfully in the end; what was disastrous was the way they were managed. And the message the authors want to convey is that project costs can more carefully be estimated and controlled with better project management. That means learning from past mistakes, including the many pitfalls described in this book.

The important thing about this book is that it examines experience on projects in both developed and developing countries. And some of the real horror stories come from the North, not the South. The trans-Alaska pipeline cost the United States over $8 billion, compared to the $0.9 billion estimated at first. The development cost of the Concorde was £1,140 million compared to the first estimate of £95 million. A heavy-water plant in Canada cost 2.5 times the original budget and many nuclear plants in the United States have experienced long delays. The escalating costs were only in part due to inflation.

A striking lesson of this book is that when the project is in the public sector, delay and cost escalation is generally accepted and neither the project sponsor nor the project contractor go out of business. In the nuclear field, delays and cost increases were often due to a growing number of government regulations, resistance from environmental groups and the resultant slow decision-making. There were also excessive delays in some industrial projects - the book describes the case of paper and fertilizer projects in India - that were caused mainly by the indecisiveness of government bureaucracy and its numerous planning committees.

Life is tougher in the private sector. A British contractor needed a Government-guaranteed loan to survive when it needed to finance the cost overrun on the first oil refinery it built; but the lesson was well-learned and the company is now one of the largest process plant contractors in the world. Not so with a United States company, whose failure to complete a successful fertilizer plant passed unnoticed by a second developing country which ordered the firm to construct a high-technology process plant. When the contractor again failed to perform, the country cut its losses by firing the contractor and he was forced out of business; another contractor was found to complete the job successfully and almost on time. Decisive action saved the country millions of dollars.

In pointing out these lessons of project management, one must remember that all the projects described in the book were examined with the wisdom of hindsight. For example, while the designers of Concorde could foresee that it would use four times as much fuel as a Jumbo 747 to cross the Atlantic, they could not foresee the tenfold increase in fuel costs which helped to make it uneconomic. Hence to describe each and every project as a "disaster" would deprive the world of these super-projects or major advances in technology on which progress in our modern world is based. What this book can do perhaps is to help us manage such projects more wisely in the future rather than stop them going ahead altogether.

What lessons, then, can be learned from this broad survey of experience covering several continents and a range of technologies? There are many wise lessons highlighted in this book, but the ones that struck the reviewer were these:

1. Measure the value of the project's importance to the country and its timely completion; this will help in the battle against overregulation, bureaucracy and indecision.

2. Measure the cost of the project realistically, perhaps within an upper and a lower limit; for the estimate, do not expect everything to run smoothly - allow for some delays and inflation, which is still with us; and do not forget the impact of a sharp change in the value of currencies.

3. Do not start before there is a timetable for project completion which identifies time-critical actions and lists milestones; this will avoid many pitfalls and encourage regular monitoring of progress throughout.

4. When something goes wrong, be prepared to reassess the entire project; when circumstances change there is always room for discussion and accommodation between the purchaser and the contractor; and the need to replace the contractor could be the measure considered as a last resort.

5. Make the project manager on each side 100 per cent responsible to the highest possible authority for completion of the project on time and within the budget; do not dilute his responsibility by giving committees or advisers a muddling share in the overall responsibility.

6. Whenever possible use a proven technology and a proven contractor; this is particularly important if a country is building a type of plant for the first time; few customers can afford to risk the total failure of a pilot plant technology.

7. If the buyer does not have the knowledge to constitute a complete project management team, recruit expert consultants to provide the missing skills.

8. Recognize that project planning and execution is a specialized discipline. To be objective, recruit an outside consultant to ensure the guidelines are followed at the start and to assess the progress of the project every six months. The cost of his services will be small compared to the cost of a one-month delay in completion of the project.

R.J. LINE

INDUSTRY AND ACCUMULATION IN AFRICA
edited by Martin Fransman
London, Heinemann Educational Books, 1982

This book is a welcome and important addition to the Heinemann series of studies on the economics of Africa. It succeeds in converting a set of conference papers into an interesting book that is highly relevant to the 1980s, the years that have been declared the Industrial Development Decade for Africa. The book gives some clues to the underlying causes of the slowing down of industrial development in tropical Africa in recent years.

The first clue, as the title of the book suggests, is that rapid industrial development requires a sustained accumulation and investment of capital in productive industrial equipment and machinery. If this capital is to be accumulated in private hands, there must be other surplus sectors - agriculture, mining, trading - from which such accumulation can be drawn. An if such surpluses are not large enough, the Government itself must make a major contribution to financing investment in the industrialization programme. The book analyses the approach of 10 African countries to this problem and shows how capabilities to organize and finance industrial development programmes need strengthening if sustained rapid industrialization is to be achieved in the 1980s.

The second clue, as Ajit Singh notes in his introduction, is that the skills and capabilities of the people and not natural resources are the key factor. These were inadequately developed during the colonial period and 20 years is not a long enough period to overcome this handicap.

The third clue is that industrialization in tropical Africa has been most rapid when local circumstances forced such development, either by closing the border or by providing extensive protection from the competition of imported manufactured goods. Within this broad context, the first 80 pages devoted to a discussion of the Tanzanian approach to industrial development is most interesting. After the break with Kenya, semi-public bodies were given the major responsibility in industrial development and the price of manufactured goods was controlled so as to give an adequate return on the capital which the Government invested in the industrial sector. In this way Tanzania established its own set of institutions that could manage faster industrial growth. However, manufacturing output grew slower in Tanzania than in neighbouring Kenya during the 1970s, and it was a growing shortage of foreign exchange as much as the internal constraints that slowed down industrial growth in recent years.

The next 60 pages are devoted to Kenya, where industrialization has been spurred by a liberal approach to foreign investment. The authors consider the impact of this approach on the process of accumulation and consider whether there are already enough Kenyan entrepreneurs in manufacturing to make an impact on the dominant foreign ownership. It is an important question because whereas an estimated 50 per cent of the operating surplus created in agriculture in 1975 accrued to African private capital, and much of the rest presumably to the State, only 5 per cent of the surplus created in manufacturing did so. Another fundamental issue is how fast manufacturing industry can and should revert to Kenyan ownership. Between 1966 and 1976, there was an increase from 40 per cent to almost 60 per cent; and 90 per cent should eventually be achievable according to a Kenyan source quoted in the book. This model of using foreign investment in the early stages of industrialization and then buying back ownership and control of the industrial sector later on with capital surpluses generated elsewhere in the economy can be found in other

developing countries, for example Malaysia and Nigeria. Its main drawbacks are that foreign investment stifles local enterprise and that the task of increasing local ownership becomes more costly with each year that profits are re-invested in foreign-owned enterprises.

The next paper suggests that capital accumulation for building up the manufacturing sector in South Africa was based on the surplus of the mining and agricultural sectors. The low cost of African labour has aided the process of accumulation, but only marginally. Manufacturing took off after protective tariffs were imposed in 1925 and by 1975 it contributed 25 per cent of GDP. The structure of manufacturing output reflects South African continued dependence on imports of intermediate and capital goods based on its strong links with the North rather than with the rest of Africa.

The industrialization of Zimbabwe is described in one of the best papers of the book. The first impetus to industrialize came during the war-time shortages (1939-1946); then came the post-war recovery which attracted foreign capital because both agricultural and mining were booming; then industry benefited greatly for a few years from the Federation with Northern Rhodesia and Nyasaland; and soon after it lost these markets, economic sanctions provided a different basis for stimulating local industry. By 1975, output of the manufacturing sector was almost three times as great as that of farming and mining, and when Zimbabwe became independent in 1980 it had a broader industrial base than most countries in Africa.

Industrial development in Lesotho has been held back by the small size of the market and the liberal availability of manufactured goods from South Africa. Yet as Ajit Singh notes, the country possesses a labour force which is used to industrial discipline and industrial tasks. The export of labour has so far harmed the agricultural development of Lesotho more than in any other sector. This country could clearly use foreign aid gradually to absorb more of the experienced labour force in building its own infrastructure and industry.

Industrialization came late to Nigeria as compared with some other African countries because the emphasis was put on commodity production during the 1950s. However when industrialization started, foreign investment was encouraged. After independence, both the federal and state Governments entered the field and Nigerian ownership was encouraged. As a result, foreign ownership of large-scale manufacturing industry fell from 68 per cent in 1963 to 42 per cent in 1975, federal and state government ownership increased from 22 per cent to 38 per cent, and private Nigerian ownership from 10 per cent to 20 per cent. The two indigenization decrees of 1974-1978 extended local ownership of manufacturing industry still further. In the late 1970s, growing oil earnings allowed Nigeria to pursue a policy of import-substitution and large government investments in the industrial sector without running into foreign exchange difficulties. But this meant that rapid industrialization was achieved at the expense of developing a broader group of Nigerian entrepreneurs who could make capital accumulation in the industrial sector self-sustaining.

There is a brief paper on Ghana which examines the impact of constructing the Volta Dam. The author suggests that as a major part of the electricity generated was committed to a foreign-owned aluminium smelter at a low price for a long period, the remaining electricity generated had to be sold locally at a much higher price. This, and the fact that very few industries are as energy-intensive as aluminium smelting, worked

against the desired effect of stimulating industrial development. Hence there were insufficient benefits from the Volta Dam to compensate for the high cost of servicing the loans required to build it.

Two papers deal with small industry development in tropical Africa in general and the informal industrial sector in Togo in particular. The latter paper results from a study by the International Labour Organisation on skill acquisition and self-employment in French-speaking Africa. Both papers are an interesting contribution to this important aspect of capital accumulation and industrial development.

By examining the experience of 10 countries, the book makes a useful contribution to those who wish to consider the process of industrialization in Africa. Unfortunately the evaluation is made mainly by visitors to these countries. In future exercises one hopes that African scholars will make a major contribution either as authors or co-authors.

R.J. LINE

THE STRUCTURE OF WAGES IN LATIN AMERICAN MANUFACTURING INDUSTRIES*
by J. Salazar-Carrillo and others
Florida, Miami, University Presses, 1982

An important condition for the use of economics as a tool in fostering growth in developing countries is still to improve our empirical information about the relevant facts. In spite of a growing number of figures generated by a growing number of sources, a lack of precise observations is still responsible for the abyss existing between, on the one hand, the potential offered by rigorous reasoning and model-building, and, on the other, our capacity to diagnose and prescribe for the problems of the real world.

To a certain extent this book helps to bridge the gap, since it collects its own observations and transforms them into interesting data. The decisive step of data anlaysis and interpretation is however missing. A set of wage data is constructed but this study does not go as far as looking for an associational structure between the wage variables brought into light and other variables which theory suggests could have an explanatory power.

The main interst of the book therefore lies in the data provided. The observations have been assembled by surveys of firms operating in the modern sector of manufacturing industries - principally metallurgy, textiles and pharmaceuticals - established in developing countries belonging to the Latin American Free Trade Association (LAFTA). Two aspects of wages are measured: take-home pay (straight wages plus fringe benefits minus social security deductions) and labour costs (straight wages plus fringe benefits received by the employees plus contributions of the employers to social security). The measurements are taken over 20 job positions (positions differ from occupations since there can be several positions within an occupation; for example there usually are several levels of typists etc.).

All the observations refer to the same date, thus insuring cross-country comparability. Unfortunately, this date, November 1966, is far from recent,* a fact which will be seen by many researchers as a serious limitation.

The observations are transformed into data in parts 2 and 3 of the book. Part 2 provides cross-country comparisons of net wage differentials ("net" is here to be taken in the sense that the differentials are estimated after elimination of the effects of different industrial structures, size of firm, occupation or position of workers and various qualitative factors over the wage rate). Part 3 plus an annex presents the results of four country studies of Colombia, Mexico, Uruguay and Venezuela. In these country studies the emphasis is on inter-industry wage spread and on occupational wage differentials.

An interesting finding of the cross-country study is a ratio of 3.6 to 1 between the highest and the lowest level of labour costs in the overall industrial sample for LAFTA countries. The countries at the lower end of the wage scale, Bolivia, Ecuador and Paraguay were not known to perform particularly well as exporters of manufactures in 1966. Aware of this

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*The original Spanish edition, Estructura de los salarios industriales en América Latina, was published in 1979 by Ediciones S.I.A.P, Buenos Aires.

fact, the author stresses that labour cost advantages are not tantamount to trade advantages. This is worthy of consideration by those economic advisers and policy-makers who stipulate that low levels of wages are essential for export-oriented growth. Wages are not only an element of production cost, they are also an important contribution to domestic demand. Wages that are maintained at low levels would not necessarily provide the expected export impetus but could hinder domestic demand and ultimately the pace of capital accumulation.

G. ROBYN

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