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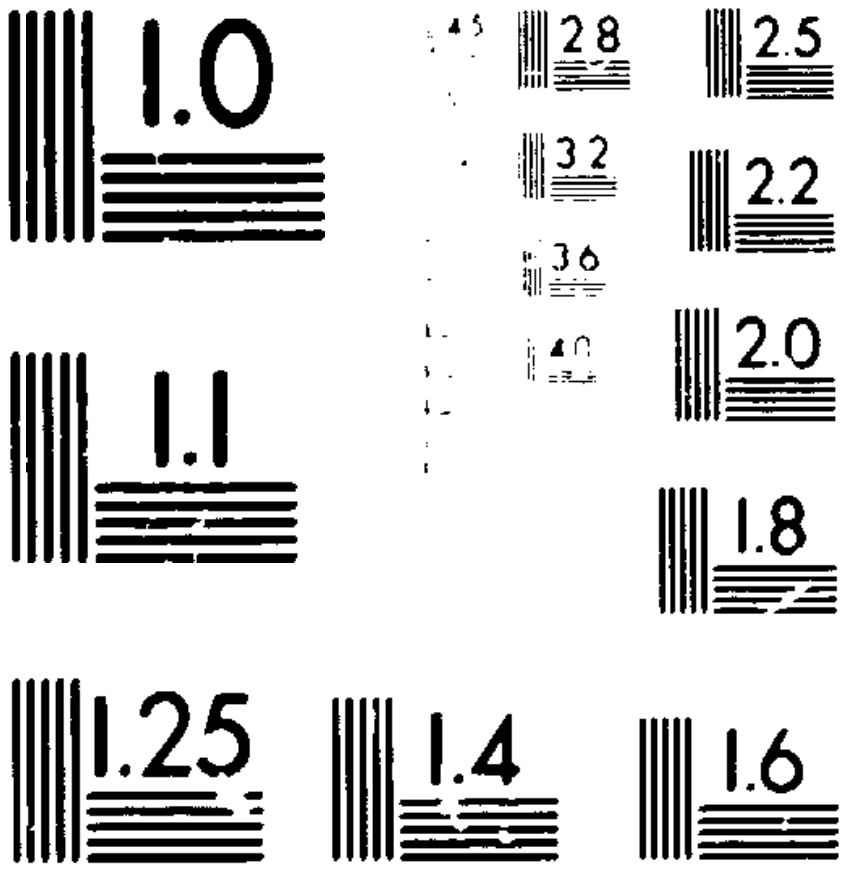

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INDUSTRY AND DEVELOPMENT

No. 10

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Préface

Le présent numéro de Industrie et Développement/ consacre deux articles à l'analyse coûts/avantages de projets d'investissement, deux autres à celle des échanges intersectoriels de l'économie chinoise et un article au développement du Malawi, petit pays comptant parmi les moins avancés, qui a adopté une stratégie d'industrialisation fondée sur l'exploitation des ressources nationales.

A l'aide des mathématiques supérieures, Dominique compare et évalue les principales méthodes proposées au cours des deux dernières décennies pour examiner le rapport coûts/avantages de projets. Son propos est essentiellement d'évaluer l'applicabilité de ces méthodes dans les pays en développement où le chômage est chronique. Il estime que la méthode de Dasgupta, Marglin et Sen (DMS), que l'on appelle aussi souvent la méthode ONUDI, est préférable aux méthodes rivales (par exemple, la méthode Little-Mirrlees; voir les références correspondantes). Cela tient surtout au fait que le monde auquel s'applique la DMS est un monde où les considérations de croissance et d'efficacité sont souvent concurrencées par d'autres objectifs (bon nombre sont autres qu'économiques), un monde où de nombreuses contraintes pèsent sur la formulation des politiques. Alors que la DMS tient compte de ces facteurs, la méthode Little-Mirrlees tend à évaluer les projets en se plaçant dans l'optique d'un système international optimal et d'après les prix franco frontière en vigueur à l'importation et à l'exportation. Toutefois, la DMS est plus difficile à pratiquer que la méthode Little-Mirrlees - c'est la raison pour laquelle son utilisation ne s'est pas généralisée. Dominique propose plusieurs modifications de la DMS - par exemple en ce qui concerne le calcul des taux de change et des taux de salaires virtuels - qui, à son avis, permettront de simplifier considérablement cette méthode sans en remettre en question les fondements théoriques 1/.

Kumar utilise la méthode Little-Mirrlees pour évaluer la rentabilité économique (en termes de coûts de substitution nationaux) d'un projet d'entreprise pharmaceutique en Inde, se trouvant pour l'essentiel sous contrôle étranger, et dont la production est largement exportée vers la société mère. Les transactions globales de ce type, qui visent à accroître les recettes en devises et à améliorer la balance commerciale du pays, sont relativement courantes en Inde. L'auteur estime que le projet n'est pas

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1/ Il ne traite pas des différentes études complémentaires visant à simplifier la méthode DMS. Voir en particulier le Guide pratique pour l'examen de projets : analyse du coût-utilité du point de vue de la collectivité des pays en développement [de J.P. Hansen] (Publication des Nations Unies, No de vente E.78.II.B.3), et Evaluation pratique de projets industriels ; application de l'analyse du coût-utilité du point de vue de la collectivité au Pakistan [de John Weiss] (Publication des Nations Unies, No de vente E.79.II.B.5).

rentable du point de vue économique. La principale raison qu'il invoque à cet égard est le prix relativement bas perçu pour le produit exporté (en comparaison avec son prix international). Il s'agit donc, semble-t-il ici, d'un cas particulier du problème des "prix de transfert" dont il est beaucoup question dans la littérature sur les sociétés multinationales. Sa conclusion tend à accréditer l'analyse du coût-utilité en tant que méthode permettant d'identifier les accords de ce type. Etant donné que le projet aurait été rentable si le prix à l'exportation avait été le même que le prix international, on peut en déduire que les projets devraient être évalués d'après les prix effectivement escomptés plutôt que sur la base de prix généraux franco frontière.

Il est difficile de se procurer des données sur la structure de l'économie chinoise. Cela pose des problème non seulement aux chercheurs s'occupant de ce pays, mais aussi, en raison de son immense étendue, à ceux qui s'intéressent à des questions plus générales. Ainsi, l'objectif de Lima a été fixé sans tenir compte du rôle de la Chine car on ne disposait pas des données nécessaires sur le secteur manufacturier de ce pays. La publication dans le présent numéro de Industrie et développement d'un tableau d'entrées-sorties concernant huit secteurs de l'économie chinoise pour l'année 1975 représente à cet égard un apport substantiel de données nouvelles. L'établissement de ce tableau, grâce aux efforts conjugués de l'Institut d'économie industrielle, de l'Académie chinoise des sciences sociales et du secrétariat de l'ONUDI était une tâche difficile, notamment parce que le système chinois de comptabilité nationale diffère de celui des autres pays. Ce tableau n'est certes pas parfait (comme tous les tableaux de ce genre) mais, utilisé avec circonspection, il se prêtera sans doute à de nombreuses applications.

Il ressort de l'étude de M. Skolka que la planification en Chine a évolué rapidement ces dernières années; on note une tendance croissante à utiliser les prix comme moyen d'équilibrer l'offre et la demande et à décentraliser les décisions en matière d'économie. L'auteur présente un système de planification des entrées et sorties que l'on se propose de mettre en place en Chine (d'après les entretiens qu'il a eus là-bas) et indique comment on entend se procurer les données nécessaires à ce système. Il analyse divers problèmes concernant la fixation des prix et la gestion, problèmes que la Chine devra résoudre si elle veut mener à bien sa réforme économique.

L'article de Livingstone s'appuie sur un rapport encore plus détaillé, publié par l'ONUDI dans le cadre d'une série consacrée aux possibilités de développement industriel fondé sur l'exploitation des ressources nationales dans les pays les moins avancés 2/. Malawi est l'un des pays du monde les

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2/ Des rapports (que l'on peut obtenir sur demande) ont également été publiés sur le Botswana, le Burundi, le Mali et la République-Unie de Tanzanie. D'autres doivent paraître prochainement.

plus pauvres en ressources, ce qui rend très difficile un développement de ce type. Il présente un intérêt particulier à cet égard, car la politique économique suivie par son gouvernement a été beaucoup moins interventionniste que celle de la plupart des autres pays pauvres 3/. Cette politique a consisté à concentrer le développement industriel sur le traitement des matières premières et à établir des liens particulièrement étroits avec l'agriculture. Bien que le Malawi souffre actuellement, comme tous les autres pays en développement, des effets de la récession mondiale, Livingstone montre que cette politique a généralement donné de bons résultats : taux de croissance élevé du PIB, développement équilibré de l'industrie et de l'agriculture et expansion raisonnable de l'emploi. L'auteur indique de nombreux secteurs où un changement d'orientation est nécessaire, mais de manière générale il semble que, compte tenu de son patrimoine naturel limité, le Malawi ait obtenu des résultats très satisfaisants en suivant une politique d'industrialisation fondée sur l'exploitation des ressources nationales.

3/ Selon l'"indice composite de distorsion" - qui permet de mesurer l'intervention des pouvoirs publics dans la vie économique - calculé par la Banque mondiale pour 31 pays en développement, le Malawi est le pays ayant le niveau de distorsion le plus faible. Voir le Rapport de développement dans le monde 1983 (Washington D.C., Banque mondiale), chap. 6.

Prefacio

En el presente ejemplar de Industria y Desarrollo aparecen dos artículos sobre el análisis de costos-beneficios de proyectos de inversión, dos sobre el análisis de insumo-producto de la economía china y uno dedicado a la evaluación del desarrollo en un país pequeño y menos adelantado que ha adoptado una estrategia de industrialización basada en los recursos, a saber, Malawi.

Sirviéndose de algunos métodos de matemáticas avanzadas, el Sr. Dominique compara y evalúa las principales metodologías del costos-beneficios de proyectos que se han postulado en los dos últimos decenios. Se ocupa principalmente de su aplicabilidad en los países en desarrollo afectados por un desempleo crónico. El autor sostiene que el método de Dasgupta, Marglin y Sen (DMS), que suele mencionarse como el método de la ONUDI, es preferible a sus competidores (v.g.: el de Little y Mirrlees; véanse las referencias del autor). Ese argumento parte de que en el mundo del método DMS hay múltiples objetivos (muchos de los cuales son no económicos) que compiten con metas crecimiento y eficiencia, y existen numerosas restricciones a la formulación de políticas. El método DMS ha sido concebido para tener en cuenta tales factores, mientras que el Little y Mirrlees tiende a evaluar los proyectos desde el punto de vista de un sistema internacional óptimo y en función de los precios existentes en frontera de las importaciones y las exportaciones. No obstante, el método DMS es más difícil de aplicar que el de Little-Mirrlees, por lo cual no se ha extendido su uso. El Sr. Dominique propone varias modificaciones del método DMS, por ejemplo, para calcular el tipo de cambio de cuenta y los salarios de cuenta, que, en opinión del autor, simplificarán bastante el método en la práctica sin restar valor a sus fundamentos teóricos. 1/

El Sr. Kumar utiliza el método Little-Mirrlees para evaluar la rentabilidad económica (en función de los costos de oportunidad nacionales) de un proyecto farmacéutico en la India, cuya propiedad y control se hallan en gran parte en manos de una empresa extranjera y cuya producción se exporta en su mayor parte a la empresa matriz. En la India se dan con bastante frecuencia tales arreglos de conjunto, que tienen por objeto aumentar los ingresos en divisas y mejorar la balanza comercial del país. El autor llega a la conclusión de que la rentabilidad económica del proyecto es negativa, basándose para ello principalmente en que el precio recibido por el producto exportado es

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1/ El autor no se ocupa de varios estudios complementarios llevados a cabo con la finalidad de simplificar el método DMS. Véase en especial Guía para la evaluación práctica de proyectos: El análisis de costos-beneficios sociales en los países en desarrollo [preparado por J.R. Hansen] (publicación de las Naciones Unidas, Número de venta S.78.II.B.3), y Evaluación práctica de proyectos industriales: Aplicación del análisis de costos-beneficios sociales en el Pakistán [preparado por John Weiss] (publicación de las Naciones Unidas, Número de venta S 79.II.B.5).

relativamente bajo (en comparación con su precio internacional). Por lo tanto, este caso parece ser un ejemplo típico del problema del "precio de transferencia" que tanto se menciona en las publicaciones relativas a empresas transnacionales. Las conclusiones destacan el análisis de costos-beneficios como un método para identificar tales arreglos de fijación de precios. Dado que el proyecto habría sido económicamente rentable si el precio de exportación hubiera equivalido al precio internacional, también aparece que los proyectos deben evaluarse a base de los precios reales previstos y no de precios generales "en frontera".

Es difícil obtener datos acerca de la estructura de la economía de China, lo que plantea dificultades no sólo a los que estudian ese país, sino también, dada su gran extensión, a los interesados en cuestiones más globales. Por ejemplo, el objetivo de Lima se estableció sin tener en cuenta el papel de China, porque no se disponía de los datos necesarios sobre el sector manufacturero chino. La publicación en el presente número de Industria y Desarrollo de un cuadro de insumos-productos de ocho sectores correspondiente a China en 1975 representa un considerable avance en la disponibilidad de datos. La preparación del cuadro, en la que se aunaron los esfuerzos del Instituto de Economía Industrial, la Academia China de Ciencias Sociales, y la Secretaría de la ONUDI, resultó difícil, especialmente porque el sistema contable de dicho país es distinto del de otros. No es en modo alguno perfecto (dichos cuadros nunca lo son), pero, si se utiliza con prudencia, es probable que tenga muchas aplicaciones.

La monografía preparada por el Sr. Skolka indica que la índole de la planificación ha evolucionado rápidamente en China en los últimos años, haciéndose hincapié de forma creciente en los precios como medio de equilibrar la oferta y la demanda y en la mayor descentralización del mecanismo de toma de decisiones económicas. El autor presenta un sistema de planificación por insumo-productos que se tiene en estudio en China (según las conversaciones que mantuvo durante su estancia en dicho país) e indica la forma en que se obtuvieron los datos para el sistema. Aborda también diversos problemas de fijación de precios y de gestión que será preciso resolver para que la reforma económica china tenga éxito.

El artículo del Sr. Livingstone se fundamenta en un informe incluso más amplio publicado por la ONUDI como parte de una serie sobre el potencial de desarrollo industrial basado en los recursos en los países menos adelantados. 2/ Malawi es uno de los países con mayor escasez de recursos del mundo, factor que dificulta sumamente ese tipo de desarrollo. Malawi resulta particularmente interesante porque su caso muestra lo que puede lograrse en dichas condiciones al haber adoptado su Gobierno una política económica mucho menos

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2/ Se han publicado también informes (se enviarán a quienes lo soliciten) sobre Botswana, Burundi, Malí y la República Unida de Tanzanía. Actualmente hay otros en preparación.

intervencionista que la de casi todos los demás países pobres. 3/ En virtud de esta política, el desarrollo industrial se ha concentrado en la elaboración de materias primas, estableciéndose vínculos especialmente firmes con la agricultura. Pese a que Malawi sufre en la actualidad, al igual que todos los países en desarrollo, las consecuencias de la recesión mundial, el Sr. Livingstone muestra que esa política ha dado frutos en líneas generales, aportando tasas elevadas de crecimiento del PNB, un desarrollo equilibrado de la industria y la agricultura y una expansión razonable del empleo. El autor indica muchas esferas concretas en que es preciso aplicar un cambio de política, pero, en general, parece que Malawi, pese a lo limitado de sus recursos, ha conseguido mucho mediante la adopción de una política de industrialización basada en sus recursos.

3/ Un "índice de distorsión compuesta", esto es, una medida de la intervención económica gubernamental, calculada por el Banco Mundial para 31 países en desarrollo, indica que Malawi es el país que tiene el nivel de distorsión más bajo. Véase World Development Report 1983 (Washington, DC. Banco Mundial), capítulo 6.

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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

This issue of Industry and Development contains two articles on cost-benefit analysis of investment projects, two on input-output analysis of the Chinese economy and one assessing development in a small, least developed country that has adopted a resource-based industrialization strategy, namely Malawi.

With the aid of some advanced mathematics, Dominique compares and evaluates the main project cost-benefit methodologies that have been proposed over the past two decades. His major concern is applicability in developing countries facing chronic unemployment. He argues that the method of Dasgupta, Marglin and Sen (DMS), also often referred to as the UNIDO method, is preferable to its rivals (e.g., that of Little and Mirrlees; see his references). This is basically because the world of DMS is one where multiple objectives (many of which are noneconomic) compete with aims of growth and efficiency, and where there are numerous constraints on policy formulation. DMS is designed to take such factors into account, whereas Little and Mirrlees tend to evaluate projects from the viewpoint of an optimal international system and in terms of existing border prices for imports and exports. DMS is operationally more difficult than the Little-Mirrlees method, however - the reason why it is not in widespread use. Dominique proposes several modifications of DMS, e.g. in calculating shadow exchange and wage rates, which he believes will considerably simplify the method in practice without detracting from its theoretical foundations.1/

Kumar applies the Little-Mirrlees method to evaluate the economic profitability (in terms of national opportunity costs) of a pharmaceuticals project in India largely owned and controlled by a foreign company and where output is largely exported to the parent company. Such package deals, with the aim of increasing foreign exchange earnings and improving the country's trade balance, are relatively common in India. The author finds economic profitability of the project to be negative. The main reason given for this result is the relatively low price received (compared to its international price) for the exported product. This therefore seems to be an example of the "transfer price" problem much discussed in the literature on transnational corporations. The result suggests cost-benefit analysis as a method of identifying such pricing agreements. Since the project would have been economically profitable if

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1/ He does not discuss several follow-up studies intended to simplify the DMS method. See in particular Guide to Practical Project Appraisal: Social Benefit-Cost Analysis in Developing Countries [prepared by J.R. Hansen] (United Nations publication, Sales No. E.78.II.B.3), and, Practical Appraisal of Industrial Projects: Application of Social Cost-Benefit Analysis in Pakistan [prepared by John Weiss] (United Nations Publication, Sales No. E.79.II.B.5).

the export price equalled the international price, it also suggests that projects should be evaluated on the basis of actual expected prices rather than on the basis of general "border" prices.

Data on the structure of the Chinese economy is hard to come by. This creates problems not only for students of that particular country, but also, because of its very large size, for those interested in more global issues. For example, the Lima target was set without considering the role of China because the necessary data on the Chinese manufacturing sector were not available. The publication in this issue of Industry and Development of an eight-sector input-output table for China as of 1975 represents a significant improvement in data availability. Preparation of the table, a joint effort of the Institute of Industrial Economics, Chinese Academy of Social Sciences, and the UNIDO secretariat, was a difficult task, especially since that country's accounting system differs from others. It is by no means perfect (such tables never are), but used with caution the table is likely to have many applications.

The paper by Skolka indicates that the nature of planning in China has been evolving rapidly in recent years, with increasing emphasis on prices as a means of balancing supply and demand and on greater decentralization of economic decision-making. The author presents an input-output planning system being considered in China (according to discussions he had while there) and indicates how the data for the system are obtained. He discusses various pricing and management problems that will need to be overcome if China's economic reform is to succeed.

The article by Livingstone is based on an even more comprehensive report published by UNIDO as part of a series on the potential for resource-based industrial development in the least developed countries.2/ Malawi is one of the world's most resource-poor countries, which makes such development very difficult. What makes Malawi particularly interesting in terms of what can be achieved under such conditions is that the Government has followed a much less interventionist economic policy than most other poor countries.3/ Under this policy industrial development has been concentrated on processing of raw materials, and links with

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2/ Reports (available upon request) have also been published on Botswana, Burundi, Mali and the United Republic of Tanzania. Others are forthcoming.

3/ A "composite distortion index", i.e., a measure of government economic intervention, calculated by the World Bank for 31 developing countries shows Malawi as the country with the lowest distortion level. See World Development Report 1983 (Washington, DC, World Bank), chapter 6.

agriculture are particularly strong. Although Malawi is now suffering, like all other developing countries, from the effects of worldwide recession, Livingstone shows that this policy has generally been successful, bringing high rates of GDP growth, balanced development of industry and agriculture and reasonable expansion of employment. The author identifies many specific areas where policy change is needed, but in general it seems that Malawi has, given its resource limitations, achieved much by following a resource-based industrialization policy.

Explanatory notes

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

A slash between dates (e.g. 1970/71) indicates a financial or academic year.

A hyphen between dates (e.g. 1960-1964 indicates the full period involved, including the beginning and end years.

In tables:

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

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

The following abbreviations have been used:

ADMARC	Agricultural Development and Marketing Corporation (Malawi)
BRD	International Bank for Reconstruction and Development
CSC	Cold Storage Company (Malawi)
DEG	Deutsche Gesellschaft für Wirtschaftliche Zusammenarbeit (Federal Republic of Germany)
DEVPOL	Statement of development policies (Malawi)
ESCOM	Electricity Supply Company of Malawi
FMO	Nederlandse Financierungs-Maatschappkj voor Ontwikkelungslanden NV (Netherlands)
GOPA	Gesellschaft für Organization, Planung und Ausbildung
GRAMIL	Grain and Milling Company (Malawi)
IFC	International Finance Corporation
IMEXCO	Import and Export Company of Malawi
INDEBANK	Industrial Development Bank
MALDECO	Malawi Lake Development Company
MDC	Malawi Development Corporation
NOIL	National Oil Industries Ltd. (Malawi)
NSO	National Statistical Office (Malawi)
ODA	Overseas Development Administration (United Kingdom)
SADCC	Southern African Development Co-ordination Conference
SEDOM	Small Enterprise Development Organization of Malawi
UNDP	United Nations Development Programme
WHO	World Health Organization

CHOOSING THE APPROPRIATE PROJECT APPRAISAL METHOD FOR A LABOUR SURPLUS ECONOMY

C. René Dominique*

Introduction

The most widely used technique for assessing the economic viability of investment projects is what is known as cost-benefit analysis (CBA). An old and imperfect procedure that has had its ups and downs, it reached a peak in the 1950s, but by the mid-1960s seemed destined for total eclipse by techniques that appeared more promising - systems analysis (SA), operation research (OR), cost-effectiveness (CE) and economy-wide optimizing modelling (EWOM).

The early 1970s saw a revival of CBA, albeit without fanfare, apparently because of general disappointment with the rival methods. The first three (SA, OR and CE) revealed themselves as seriously limited in scope, in particular with regard to the long-term considerations so important in development projects; EWOM proved exceedingly difficult for developing countries that lacked skilled manpower, computing facilities and adequate statistics. For now at least, CBA remains therefore the most useful tool of applied welfare economics.

The renewed interest in CBA has given rise to the development of more elaborate appraisal methods, but it has also brought additional problems. The attempt to eliminate past deficiencies, i.e. to become more encompassing, has transformed CBA from a partial to a general equilibrium exercise, leading to what many people still regard as an attempt to quantify the unquantifiable. For example, the heroic assumptions and value judgements that are necessary to account for the indirect effects of projects tend to undermine the very degree of precision sought by the new methods.

What is of concern here is the applicability of the new methods and their appropriateness: more competition in thoroughness tends to make them increasingly less applicable; claims (and counter-claims) of superiority distort the process of choosing the most appropriate method for a country's aims and policies. For the latter,

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many perceive the Little and Mirrlees (LM) criterion [1] as fully equivalent to the guidelines for project evaluation proposed by the United Nations Industrial Development Organization (UNIDO) and developed by Dasgupta, Marglin and Sen (DMS) [2]. Little and Mirrlees themselves claim superiority for their approach over those of not only Dasgupta, Marglin and Sen but also Bruno [3] and Balassa and Scbydlowsky [4].

Dasgupta naturally argues convincingly for DMS.[1/] Harberger [8], the main author of the "opportunity cost of public funds" criterion, referred to subsequently as the Harberger-Sandmo-Drèze (HSD) procedure, argues that this criterion is more legitimate than the others. Sjaastad and Wisecarver [9] and many participants in a recent symposium sponsored by the Oxford University Institute of Economics and Statistics think that the LM approach is flawed. Helmers [10] argues against them all, while Lal [11], in a recent comparative analysis of these methods, observes that theoretically they are similar, differing only in underlying assumptions. Lal then goes on to pick the LM approach as the most general method.

Most of these claims are wrong and pernicious. Firstly, the constraints imposed on decision-makers, the justification of the various methods and hence their operative aims, are different; these aspects are ignored in previous comparisons and yet they have important implications for the appropriateness of each approach. Secondly, some are flawed in their shadow-price computation, either for failing to recognize the wide implications of surplus labour on values and prices, or for making untenable assumptions as regards savings. And thirdly, any case for superiority should not be based on algebra or on untested propositions, but rather on how operational they are and how well they agree with the general policy orientation of a particular Government.

This paper focuses on the questions of appropriateness and applicability, but it will not make the usual distinction between general and partial equilibrium measures: by accounting for direct and indirect effects, all the measures considered in the paper become per force general equilibrium frameworks. Instead, the matter of appropriateness and applicability will be examined along the lines of values and prices, and on the availability of data. It starts with a very brief review of the theoretical justification of CBA, justifying thereby the exclusion of methodologies that do not use a full set of shadow prices. This brief review is immediately followed by a fuller discussion of methods that appear as serious contenders for adoption by policy-makers. By focusing on theoretical and data limitations, it is hoped not only to confirm or invalidate various claims to superiority, but also to clear the path for selecting the most appropriate method for a planned developing economy. The last part of the paper will be devoted to simplifying and conforming shadow-price computations to data that are likely to be available in a plan document.

I. Non-labour surplus investment criteria: review and synthesis

The similarities and dissimilarities between investment criteria vary according to the features that are stressed. As usually done, these measures are classified as general and partial equilibrium frameworks, depending on their ramifications for the economy as a whole. This classification is itself somewhat misleading, however, since criteria that are to all intents and purposes equivalent may be classified differently. Classification by numéraire might appear to be more appropriate, for the numéraire used by any method has important implications on its theoretical validity. The numéraire, however, links criteria with very different aims and purposes. This paper seeks to avoid this kind of confusion by classifying according to the effects of unemployment (a) on shadow prices and (b) on the kind of value judgements that are permissible.

In line with this approach, part I examines the relative merit of three investment criteria that ignore problems of surplus labour and institutional savings constraints: the rate of return on capital (RRC), the domestic resource costs (DRC), and the effective rate of protection (ERP). They can all be presented as single period criteria, which are best analysed with input-output techniques.

The discussion starts with a brief outline of some preliminary claims of welfare economics - to show why two other approaches, presently used in some quarters, are excluded from consideration.

Preliminary theory

According to the basic tenets of welfare economics, if the Pareto conditions[2/] are fulfilled and there are no externalities and no uncertainty about the future, then the effects of a marginal investment project are assessable at observed market prices. In other words, for a given endowment market prices are equal to the marginal social benefits (MSB) of consuming any goods or factors and are also equal to the marginal social costs (MSC) of production; hence market prices are so-called "first-best" prices in any period. At the same time, intertemporal equivalences are derived by treating dated outputs and inputs as different outputs and inputs; the absence of externalities ensures that the market rate of interest is the optimal rate for discounting future costs and benefits into an index of net present value. If, on the other hand, the effects of a project are non-marginal, in the sense that they affect market prices, the decision rule is arrived at by calculating the relevant changes in consumers' and producers' surpluses brought about by the implementation of the project.

While the above is a fair summary of what project appraisal methods reduce to in a perfectly competitive economy, in the presence of externalities, increasing returns, monopoly power, and distortions, such as subsidies, rationing and taxes, market prices no longer equate MSB and MSC. Consequently first-best prices needed to

evaluate projects do not obtain. If, in addition, the Government is unable to eliminate these obstacles through appropriate fiscal and monetary measures, the allocative efficiency necessary for welfare maximization will be seriously impaired - unless project evaluators are able to compute the "second-best" shadow prices, i.e. those corresponding to the existing distortions, before attempting to assess the economic effects of projects.

That being the case, methodologies that, for whatever reasons, partially or completely shun second-best shadow prices, such as the UNIDO/IDCAS procedure [12] and the effects method developed by Prou and Chervel [13], may be ruled out owing to their inherent weakness in terms of allocative efficiency.[3/]

There is no unique approach to calculating shadow prices. For example, the problem posed by large-scale unemployment is pervasive enough to warrant a broad distinction between procedures that do account for it and those that do not. The remaining sections of part I will therefore use input-output techniques to examine a single year's full-capacity operation of criteria in which, among other things, labour does not receive any special treatment. Part II will deal with multi-period criteria in which some value judgements are required to handle all the ramifications of persistent large-scale unemployment.

The rate of return on capital (RRC) criterion

Following Bruno [3] or Srinivasan [33], consider a project described by (n + m) coefficients that are fixed and independent of prices. If it produces 1 to h commodities with h+1 to n commodity inputs and m primary factors, then a_1 to $a_h > 0$, a_{h+1} to $a_n < 0$, and b_j (j = 1, 2, 3..., m) stand for outputs, commodity inputs and primary factors, respectively. Also, the direct and indirect amounts of primary factors j needed to produce one unit of good i are denoted by b_{ji} and the direct and indirect amounts of factor j used by the project become $V_j = b_j + \sum_{i=h+1}^{n} (-a_i) b_{ji}$.

With shadow prices u_i for good i, and u_j for a unit service of factor j, one may posit the social productivity of an acceptable project B* as

$$B^* = \sum_{i=1}^{h} a_i u_i - \sum_{j=1}^{m} V_j u_j \geq 0 \qquad (1)$$

$$= \sum_{i=1}^{h} a_i u_i + \sum_{i=h+1}^{n} a_i \left(\sum_{j=1}^{m} b_{ji} u_j \right) - \sum_{j=1}^{m} b_j u_j \geq 0$$

Eq. (1) can be put into a more recognizable form [4/] by observing that: (a) if the shadow price u_i is consistent with the whole investment programme, it is equal to the direct and indirect costs of factor inputs used in the production of a unit of good i,

i.e. $u_i = \sum_{j=1}^{m} b_{ji} u_j$, and; (b) any one of the m primary factors can be isolated for the purpose of calculating its rate of return. Substituting for $\sum_{j=1}^{m} b_{ji} u_j$, and taking capital whose shadow price and shadow rate of return are p_k^* and r_k^*, respectively, Eq. (1) can be rewritten as

$$B^* = \sum_{i=1}^{n} a_i u_i - \sum_{j=1}^{m-1} b_j u_j - b_k P_k^* r_k^* \geq 0 \qquad (2)$$

The RRC criterion is therefore

$$r_k^* \leq \frac{\sum_{i=1}^{n} a_i u_i - \sum_{j=1}^{m-1} b_j u_j}{b_k \cdot P_k^*} \qquad (3)$$

In other words, the RRC criterion implies that, for the project to be acceptable, the shadow rent earned (the numerator) divided by a given amount of capital invested in the project (the denominator) must at least be equal to the shadow rate of return on capital.

This criterion is very convenient for planned economic structures with a pre-existing input-output matrix, but its application is bound to pose a number of problems in most developing countries. First, being a full general equilibrium measure, the shadow prices u_i and u_j must be obtained from an economy-wide intertemporal optimizing (EWO) model, which owing to lack of skilled manpower and adequate statistics only a handful of developing countries are able to build. Even where such a model exists (possibly built with foreign assistance), the generation of shadow prices is always a costly iterative process. The reason being that when the projects are of sufficient size, the model must first be run to give a preliminary set of shadow prices, which are used to pick projects with positive B*s. Once these projects are inserted in the investment programme, shadow prices will be altered, and all candidate projects must again be re-examined. The process is repeated as many times as necessary to ensure that all projects with positive B*s are consistent with the shadow prices of the last iteration.

Unfortunately matters do not necessarily become simpler for a bundle of small projects to which shadow prices remain insensitive: whether projects are big or small, shadow prices generated by EWO models are in the words of an expert, "unrealistic under any test of reasonableness".[5/] This is due to a number of difficulties, ranging from non-linearities and limited (or the complete lack of) factor and commodity substitution, to the complex task of defining the "control areas" of government. A second reason that militates against the use of the RRC criterion arises from the reasoning behind the EWO models themselves. Built in Keynesian tradition, these models often fail to recognize the implications of the two kinds of labour marginal productivities that characterize economies with large reserve armies of unemployed; as will be shown in part II,

labour implications have important bearings on social values. Finally, by singling out capital, the criterion automatically assigns a special rôle to that factor. Therefore planning ministers or directors of offices of project analysis would be justified in choosing this criterion over others when (a) they can get correctly calculated shadow prices, (b) capital is the scarcest factor, and (c) their economy is not plagued with massive unemployment.

The domestic resource cost (DRC) criterion

The so-called Bruno [3] or domestic resource cost (DRC) criterion can be rationalized either in a linear-programming general equilibrium approach or, as below, in an input-output structure. The latter approach has given rise to some objections,[6] but if it can be shown that fully-traded goods can be produced by a particular project, then foreign exchange f can be singled out as a scarce resource, and the shadow rate of foreign exchange r_f^* can be used as a standard against which to measure the merit of the project. As before, if there are h fully-traded goods produced, then

$$M_f = \left[b_f + \sum_{i=h+1}^{n} (-a_i) b_{fi}\right] r_f^*$$

is the social value of the direct and indirect amounts of foreign exchange spent on executing the project arising from the tradable contents of non-tradables.

Also
$$E_j = \left[b_j + \sum_{i=h+1}^{n} (-a_i) b_{ji}\right] u_j$$

is the social value of the direct and indirect amounts of domestic factor j used, arising from the domestic factor contents of non-tradables utilized by the project. The social value of the project is therefore:

$$B^* = \sum_{i=1}^{h} r_f^* a_i u_i^w - M_f - \sum_{j=1}^{m-1} E_j \geq 0 \qquad (4)$$

where u_i^w = world price of commodity i.

The DRC criterion is then:

$$r_f^* \geq \sum_{j=1}^{m-1} E_j / \left\{ \sum_{i=1}^{h} a_i u_i^w - \left[b_f + \sum_{i=h+1}^{n} (-a_i) b_{fi}\right] \right\} \qquad (5)$$

According to Eq. (5), the project is acceptable if the ratio of domestic resource costs (the numerator) over the net foreign exchange earned or saved (the denominator) by the project is less or equal to

the shadow rate r_f^*. Normally, this criterion is used as an ex-ante measure of comparative advantage in situations where it is supposed that only the prices of fully-traded goods and foreign exchange are distorted.[7] According to Bruno [17], it can also be used as an ex-post measure of the effective rate of protection of various goods, although the results of recent tests seem to cast doubt on this assertion (see below).

Whether these claims are valid or not is immaterial when distortions abound. First, it should be observed that this criterion suffers the same weakness as the RRC criterion on account of shadow price calculation. Quite apart from the problem of ascertaining whether or not most goods produced in developing countries are fully-traded (see later), if trade policy is non-optimal then the free trade shadow rate obtained from optimality conditions (see Bacha and Taylor [18]) used by this criterion would not even be the appropriate one; this point will be taken up later in connection with the approach proposed by Little and Mirrlees. Second, the criterion assumes that domestic input-output coefficients are fixed; this can be misleading when projects have a long life. Finally, it makes neither allowance for the inadequacy of savings nor for disequilibrium in the labour market. In summary, the DRC criterion is a crude general equilibrium device with which to take a quick look into the relative inefficiencies of actual industries. It may also be considered a short-cut measure of social productivity based on a single year's full capacity operation of projects with no multiple objectives in an economy widely open to foreign trade.

The effective rate of protection (ERP) criterion

The effective rate of protection (ERP) criterion is associated with Barber [19], Corden [20], Balassa [21] Balassa and Schydlowsky [4], among others. It gives the same result as the DRC measure under optimal trading conditions, but Balassa and Schydlowsky point to its superiority also in non-optimal situations.

The ERP approach assumes, as above, that input-output coefficients are fixed and insensitive to price changes. The relative merit of a project that produces h outputs with n inputs is measured, however, by its ERP, an index derived as follows by letting commodity i (i=1, 2, 3...,h) and intermediate input j (j=h+1, h+2, ..., h + n) be tradables at world prices u_i^w and u_j^w, and t be the ad valorem tariff rate on commodity i. At an official exchange rate $r_0=1$, the value added under protection (VAP) is:

$$VAP = \sum_{i=1}^{h} a_i(1 + t_i)u_i^w - \sum_{j=h+1}^{h+n} a_j(1 + t_j)u_j^w \qquad (6)$$

The value added under a free trade regime (VAFT) is, by the same reasoning,

$$VAFT = \sum_{i=1}^{h} a_i u_i^w - \sum_{j=h+1}^{h+n} a_j u_j^w \qquad (7)$$

The ERP index is simply the change in value added over the free trade value added, i.e.

$$ERP = \frac{VAP - VAFT}{VAFT} \qquad (8)$$

In using fixed input-output coefficients, the measure avoids what has become known as the problem of "functional separability" between domestic and tradable inputs in the production structure.[8/] Then, supposedly, the ERP would measure the distortion of a particular activity relative to the free trade situation. In other words, the lower the ERP of a project the more it should be preferred.

However, the main asset of this criterion is its supposed ability to measure resource pull of protected industries. The extent of protection in activity i is measured by the tariff t_i, which is also equal to the ratio of the gap between domestic and world prices over the world price. Thus if one tariff is raised while others remain unchanged, the output of the activity whose tariff is raised is expected to go up. But nothing can be gauged from ERP when a number of tariffs are raised simultaneously, since the result may be either perverse or insignificant.[9/] In other words, the criterion loses its specificity in complex tariff modifications or in situations where dynamic adjustments (changing coefficients) are taking place. In fact when two of its major assumptions - namely, the unresponsiveness of the coefficients to price changes, and border prices as the relevant shadow prices - are dropped, what exactly the measure would indicate is anybody's guess.

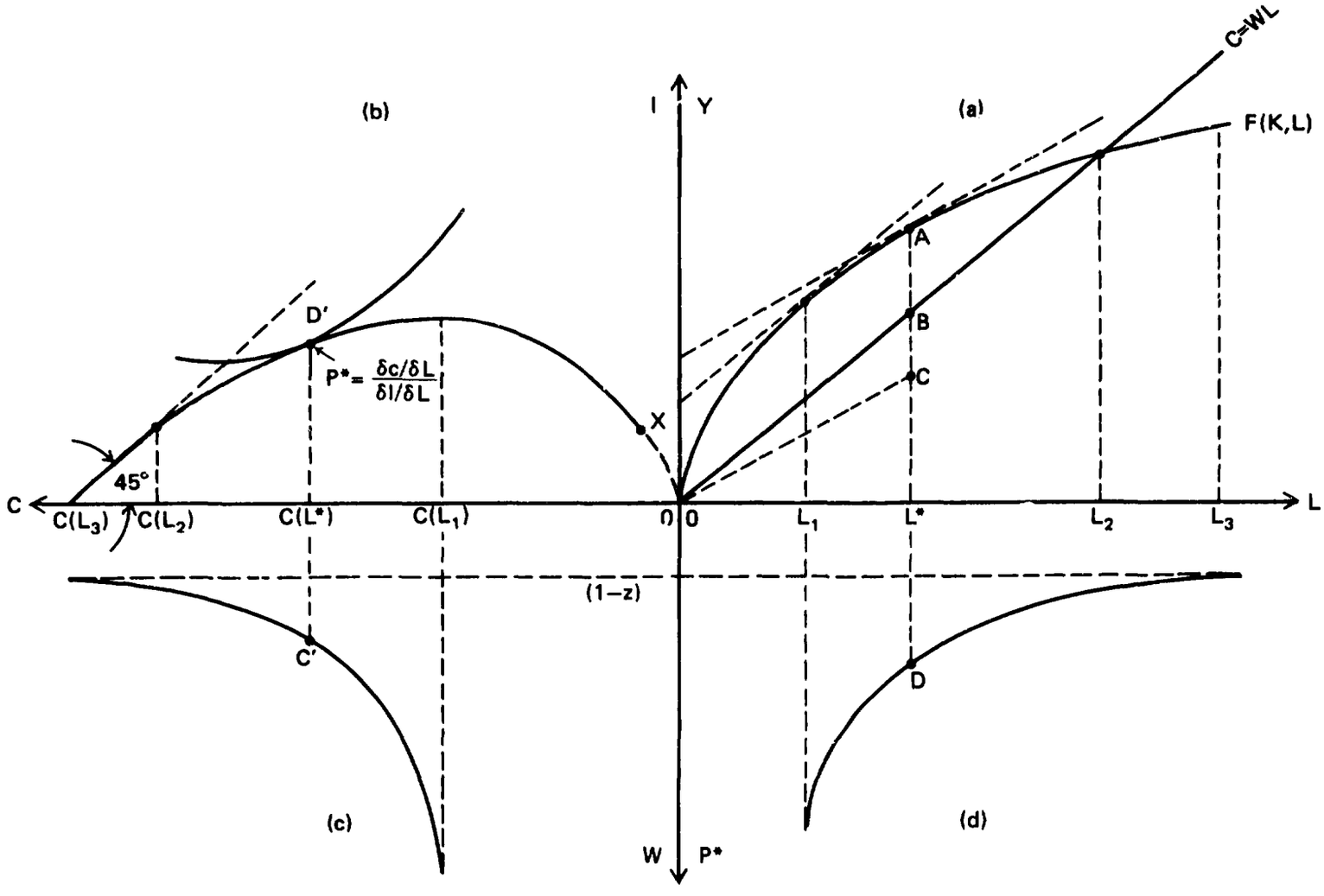
II. Labour-surplus multiperiod investment criteria

This part considers three further investment criteria. One is closely related to the social marginal productivity doctrine; the others are streamlined versions of Lewis' [26] and Sen's [27] models, cast in an illuminating format by Marglin [7]. By making the appropriate assumptions, mostly concerning prices of capital and unskilled labour, all three can be termed labour-surplus investment criteria. It is appropriate to start by recalling the basic tenets of a labour-surplus model.

Prices of resources in a labour-surplus economy

In analysing a labour-surplus economy, the following assumptions (see also the figure) are usually made:

(a) The economy's modern sector hires labour at a fixed wage rate w, greater than the wage rate z paid elsewhere in the economy (agriculture, services etc.);



Consumption, investment, output and employment relationships in a labour-surplus economy

(b) Output in the modern sector can be described by a well-behaved concave production function $Y = F(K,L)$, using capital K and labour L services, and displaying constant returns to scale; since the output is homogeneous, the investment I is the difference between the output Y and the consumption C generated in the modern sector;

(c) Capital is assumed to be infinitely durable and I is non-negative; gross and net investment are therefore identical and the capital stock cannot be consumed;

(d) The fixed wage requirement presupposes that the terms of trade between industry and the rest of the economy are fixed by international trade or by some other mechanism;

(e) All wages are assumed consumed, and the entrepreneurs' surplus I is divided between their consumption [(1-s)I] and their investment sI, where s is their marginal propensity to invest.

Section A of the figure indicates that the socially desirable level of employment lies between L_1 and L_2. (The capitalists' consumption and output of the rest of the economy are not shown.) Below L_1 both I and C increase concomittantly with employment, so utility-maximizing planners would never choose to be there. Furthermore, the selection of L_1 (referred to as the Galenson-Leibenstein point [28]), where $Y/L = Y_L = w$, would imply that consumption is valueless in the eyes of planners. On the other hand, the fact that $I > 0$ precludes employment beyond L_2, while the choice of L_2 itself, where $Y = wL$ (usually called the Chenery-Khan point [29] [30]), would imply that I and C are equally valuable. Hence the level of employment is at some L^* between L_1 and L_2, determined by the relative weights planners (or the technique adopted) put on investment and consumption now, which are clearly in conflict. Hiring an additional worker beyond L_1 increases consumption by w, but since past L_1, $w > Y_L$, investable surplus decreases by $(w - Y_L)$. At the margin, the value of this loss in surplus must be equal to the utility benefit gained by the employed worker. The Marglin rule, derived from this cost-benefit relationship, specifies that the current value of additional investment in terms of consumption utility is greater than unity. This rule is behind the premium put on investment when it is felt that savings are inadequate, and when it is obvious that the government is unable to increase savings through fiscal and monetary policies.

The Marglin rule affects all other values, and is derived as follows: the sum of entrepreneurs' and workers' consumption and investment in the modern sector are given by:

$$C = (1-s)(Y - wL) + wL > 0 \tag{9}$$

$$I = s(Y - wL) > 0 \tag{10}$$

The comsumption-investment mix depends on the level of employment and on the capital stock. Within the modern sector, the price at which the economy sacrifices consumption for one additional unit of investment is the shadow price of capital P_k^*, i.e.

$$P_k^* = - \frac{\partial C/\partial L}{\partial I/\partial L} \tag{11}$$

Substituting from Eqs. (9) and (10) for C/ L and I/ L, the limits of P_k^* are

$$1 < (P_k^* = \frac{(1-s)Y_L + sw}{s(w-Y_L)}) < \infty \tag{12}$$

To see this in the simplified version of section A of the figure, imagine that the output curve is drawn so that $Y_L = 0$ at L_2 (where institutional unemployment vanishes); the shadow price of capital is infinite at $Y_L = w$, and approaches 1 as $Y_L \to 0$.

Since output is split between consumption whose price is unity (being the numéraire) and investment whose price is P_k^*, the shadow price of a unit of output is therefore:

$$P_y^* = (1-s) + sP_k^* \tag{13}$$

As far as the shadow price of labour w* is concerned, it is made up of two parts: the direct opportunity cost of transferring a worker to the modern sector z and the redistribution cost of employment. The latter part is arrived at by observing that by paying w as nominal wage to an additional worker, entrepreneurs sacrifice sP_k^*w units of investment and (1-s)w units of their own consumption; but at the same time, the worker's consumption goes up by w. The indirect cost is:

$$- \{- [(1-s)\, w + sP_k^* w] + w\}$$

Adding direct and indirect costs of employment and making use of Eq. (13) gives

$$w^* = z + (P_y^* - 1)w = P_y^* \cdot Y_L \quad \underline{10/} \tag{14}$$

Finally, if capital is fully utilized, the shadow rental rate R*, expressed in terms of consumption, is the value of profits lost to enterpreneurs due to the withdrawal of one unit of capital from the modern sector, i.e.

$$R^* = P_y^* R \div (w-z)\frac{L}{K} = P_y^* \cdot Y_k \quad \underline{11/} \tag{15}$$

where R = nominal rate of profit.

Eqs. (13), (14) and (15) provide the accounting prices needed to assess the effects of a marginal project whose output is y, and whose inputs are capital service k and labour service ℓ. Most projects, however, require an intertemporal commitment of capital; measurement of their social productivity must therefore be cast in a dynamic framework. This is considered next.

The Dasgupta-Marglin-Sen (DMS) criterion

As indicated at the outset, the purpose of the project selection procedure is to provide a decision rule for accepting or rejecting a project. The time stream of benefits and costs must, therefore, be translated into an index of social merit; for example, net present value (NPV). Making use of Eqs. (13), (14) and (15), the NPV of a marginal project that uses respectively, k(t) and ℓ(t) amounts of capital and labour, to produce an output y(t) over the time interval (0,T) may be written as:

$$NPV_c = \int_0^T [P_y^*(t)\cdot y(t) - P_y^*(t)\cdot Y_L(t)\cdot \ell(t) - P_y^*(t)\cdot Y_k(t)\cdot k(t)]\, d_i(t)\, dt \geq 0 \qquad (16)$$

This is the DMS measure. It first transforms outputs and inputs into a common unit by means of shadow prices derived in terms of current consumption, and then converts current consumption into present consumption by using the consumption discount factor $d_i(t)$.

DMS' salient features are:

(a) The social valuation of output and inputs is based on the principle of willingness to pay;

(b) Its numéraire being a unit of aggregate consumption, investment receives a premium P_k^* greater than unity;

(c) From the social point of view, the weights put on consumption equivalents at time t must reflect the relative marginal utility of consumption to society; hence the relative rate of decrease of the weight $d_i(t)$ is equal to the ratio of the marginal social utility of consumption U_c at time t to that at time t = 0. But the rate of change of the weight, or the consumption rate of interest i_c, is also the difference between the internal rate of return on capital r_k^* and the rate of change of the shadow price of capital:

$$i_c(t) = -\frac{\dot{d}_i(t)}{d_i(t)} = -\frac{U_c(t)}{U_c(0)} = r_k^* + \frac{\dot{P}_k^*}{P_k^*} \qquad (17)$$

where the dot indicates differentiation with respect to time. However, as shown in Eq. (12), the price of capital P_k^* falls over time; so the last term in Eq. (17) is therefore negative. Hence the consumption rate of interest is strictly less than the internal rate;

(d) Instead of the free trade exchange rate, the DMS approach uses an exchange rate that is purely a welfare measure - on the grounds that government trade policy is neither optimal nor about to become optimal in the conventional sense;

(e) It recognizes the variability of the marginal utility of income of those who pay and receive benefits from a project; but given data limitations, it compromises between theoretical rigour and operational feasibility by considering the distributive effects of a project on regions or on major groups.[12/]

As with any measure the DMS approach has some limitations. For example, at $Y_L = w$, the shadow price of capital is not defined. It cannot, without modifications, handle projects involving increasing returns to scale and linkages. Nor can it deal with the appropriateness of technology and the need for good management, which is so important to a project's success. This is not to suggest that it should not be improved. Its weaknesses are those common to all project appraisal methods. On the other hand, since it does make full allowance for almost any objective alongside the growth that a Government might wish to consider as a national priority (and offers explicit guidance on how to include them in the welfare maximand), it should be a prominent contender for adoption. Indeed, it is no exaggeration to say that because its major premise is that economic development is best achieved through planning, the DMS approach stands in a symbiotic relationship with the national plan.

The Little-Mirrlees (LM) criterion

Theoretically, consumption, output and investment or capital may be used as a unit of account; the rate of discount must however be commensurate with the unit of account chosen. The aggregate-consumption measure given by Eq. (16) can easily be converted into an investment measure by multiplying and dividing through by the current price of capital, $P_k^*(t)$, and by dividing the entire expression by the present price of capital $P_k^*(0)$. Thus:

$$NPV_I = \int_0^T \left[\frac{P_y^*(t)\, y(t)}{P_k^*(t)} - \frac{P_y^*(t) \cdot Y_L(t) \cdot \ell(t)}{P_k^*(t)} - \frac{P_y^*(t) \cdot Y_k(t) \cdot k(t)}{P_{k(t)}^*} \right] \frac{d_i(t) \cdot P_k^*(t)\, dt > 0}{P_k^*(0)} \tag{18}$$

The discount rate being by definition the percentage rate of change of the weight (assigned to current units of the numéraire) over time, the appropriate rate of discount for Eq. (18) is found by differentiating $[d_i(t) \cdot P_k^*(t)]/P_k^*(0)$ with respect to time, i.e.

$$\rho(t) = -\frac{\dot{U}_c(t)}{U_c(0)} - \frac{\dot{P}_k^*}{P_k^*} = i(t) - \frac{\dot{P}_k^*}{P_k^*} \tag{19}$$

but since $P_k^* < 0$, $\rho(t) > i(t)$ until $P_k^*(t)$ falls to unity. Eq. (18) may be recognized as the procedure recommended by Little and Mirrlees [1] for project evaluation, in which uncommitted foreign exchange in the hands of the government or simply investment is the numéraire. As already noted, there is nothing wrong with investment as numéraire in theory. In practice it may pose problems serious enough to affect the validity of the criterion itself. To see why, one must look into how it is used in practice.

Within the context of countries in development, the LM criterion makes the bold assumption that most goods are fully-treated, i.e. their foreign demand (for exports) and supply (for imports) are perfectly elastic; hence their relevant shadow prices are observable border prices. It does admit, however, that a handful of goods are not fully-traded because domestic transport costs make their prices fall between c.i.f. and f.o.b. values. These must be disaggregated into their constituent inputs, which will fall into three categories: fully-traded, labour and non-tradables. Fully-traded inputs are again valued at border prices; labour's marginal product is converted into consumption equivalents, so that it can be valued at border prices; non-tradables are valued at their marginal costs of production (assuming no excess capacity). If information on production costs is hard to come by, a standard conversion factor (the reciprocal of the shadow rate) may then be used. Ultimately, every item is converted into foreign exchange, which is the numéraire of the system.

The choice of investment as the numéraire has the advantage of avoiding the problem caused by the indefiniteness of the price of capital at $Y_L = w$; even when $P_k^* \to \infty$, the shadow rental and wage rates are defined (although one should be there in the first place). Another advantage is that by supposing that all profits are saved (under conditions of optimal growth), the accounting rate of return with respect to investment becomes the physical marginal productivity of capital, regardless of the choice of utility function;[13/] therefore, the application of the criterion requires the calculation of one less parameter, namely the rate of discount.

However, these advantages are only apparent, for they rest on somewhat unrealistic assumptions. Theoretical structures sometimes require heroic assumptions, but at the same time they cannot be, as in this case, completely devoid of realism. For example, the assumption that all entrepreneurs' surplus is invested is certainly farfetched. As regards the valuation of outputs and inputs, it has been convincingly argued that if terms of trade are variable due to imperfect trading conditions, if goods are not fully-traded, and if government trade policy is not optimal, then border prices (including the "first-best" Bacha-Taylor exchange rate used by the criterion) are not the relevant shadow prices to use (see Dasgupta and Stiglitz, [31]. In addition, the criterion assumes that after a few rounds of disaggregation it will be found that only a handful of commodities are really non-tradables. But in reality, because of poor transport systems and poorly integrated markets, because of excess capacity (due to deliberate anticipation of market expansion

or due to inefficient demand) and because of quantitative and non-quantitative trade restrictions, a substantial portion of goods produced in developing countries are in fact non-tradables.[14] These goods can be correctly evaluated only by the principle of willingness to pay.[15]

On the practical side (as discussed in some detail in Scrinivasan [33], it must be borne in mind that due to numerous leads and lags in transaction recordings, different accounting practices among trading partners, illegal transactions, overand under-invoicings by multinational firms attempting to overcome capital outflow restrictions etc., true border prices are not even available in practice. Moreover, it can be seen from Eqs. (19) and (14) that the discount rate, the shadow price of capital and the shadow wage rate are all related. In practice, one must (heroic short-cuts excluded) first start by calculating one of them, and then look for consistency with the others. One may start for example by approximating P_k^*, using the formula given by Little and Mirrlees [34], pp. 166-167). This approximation will carry over the calculation of the discount and wage rates. If P_k^* is obtained by the formula given by Little and Mirrlees ([1], pp. 261-265) it will be developed with greater uncertainty since the functional form assumed for the utility function is nothing but a mathematical convenience. If all three parameters are calculated simultaneously by trial-and-error, then the whole investment plan must be known at the time of computation. The discount rate then assumes the rôle of a rationing device that must be adjusted upward when the value of good projects exceeds available funds, or downward when the opposite occurs.

The clever choice of numéraire thus leads to unrealistic assumptions and crude approximations. One may well wonder therefore on what grounds do the authors of this criterion base its superiority? No doubt its sympathizers will continue to sweep its deficiencies under the rug, but when it comes to the question of selecting the appropriate project appraisal method for a country, policy makers should bear in mind two important points as regards this criterion: (1) although it may appear more attractive than procedures that totally fail to account for the special feature of a labour-surplus economy, its underlying assumptions and short-cuts make it much less sophisticated than it purports to be; and (2) its main premise is that international market solutions are the best guide to applied welfare. Preferring it over the DMS measure, for example, would imply that (1) entrepreneurs save and invest all their surplus, (2) c.i.f. and f.o.b. prices are true border prices for an economy that produces mostly fully-traded goods (i.e. the country is or will follow an optimal trade policy), and (3) that policy makers view international trade not as the lubricant but as the engine of economic development itself.

The Harberger-Sandmo-Drèze (HSD) criterion

The Harberger-Sandmo-Drèze (HSD) procedure is also referred to as the opportunity cost of public funds criterion, first proposed by Harberger [35]. It is at variance with the other two measures dis-

cussed in this section, in that it compares the internal rate of return of a project with the opportunity cost of the capital sum invested. On the assumption that capital market distortions drive upward the investment rate of interest (ρ) (defined by Eq. (19)) and drive downward the consumption rate of interest (i_c) (defined by Eq. (17)), the opportunity cost (δ) of funds drawn from the private sector by a public project is a weighted average of ρ and i_c. The theoretical validity of this assumption was later confirmed by Sandmo and Drèze [36]; this is referred to here as the HSD criterion.

The criterion can be derived from Eq. (16) by assuming, as in the marginal productivity doctrine, that the shadow price of capital P_k^* is unity. If additionally we assume for simplicity a one-shot investment K_0 in year zero, the HSD criterion becomes:

$$NPV_c = \int_1^T [y(t) - Y_L(t)\cdot\ell(t)] \exp(-\delta t)dt \geq K_0 \qquad (20)$$

Output and inputs are valued by the principle of willingness to pay. For the shadow wage rate, it is assumed that unskilled agricultural workers are first absorbed in the so-called unprotected urban labour market where public projects do their hiring. It makes a long detour into the probability of rural workers finding jobs, and arrives in the end at the conclusion that the shadow wage rate (w^*) is a fraction of the modern-sector's wage rate (w); i.e. the same conclusion reached by Harris and Todaro [37]. The discount rate (δ), assumed constant, boils down to a weighted average of the after-tax yield on private savings (i_s) and the gross before-tax rate of return on private investment ρ, the weights being the marginal propensities to consume and to invest, respectively; that is:

$$\delta = (1-s)i_s + \rho s \qquad (21)$$

Although appealing at first sight, many of the assumptions behind this criterion cause it to be limited in any economy, and seriously deficient in a labour-surplus one. Starting with the discount rate, taxes on interest earnings and/or institutional restrictions on deposit-rates paid to small savers drive a wedge between what they receive and what they require to compensate them for postponing consumption at the margin; often they are not even compensated for inflation.[16] Also, both restrictions on capital markets for private investment funds, and rationing (which is common in developing countries), do not support the assumption that ρ is a market-determined value. In addition, the weighted average rate presupposes automatic displacement of both private investment and private consumption, no reinvestment of the investment earnings and no political constraints on the use of public funds. These assumptions are limiting enough to deprive δ of its practical use.

Another deficiency is that, contrary to the DMS measure for example, this criterion makes no allowance for changes in the marginal utility of income on the grounds of negligible income effects and the lack of consensus on income distribution weights.[17] But as regards income effects, Gramlich [40] reports that, after taking account of price changes in secondary markets, the recent conclusions of two of his colleagues (who use different analytical tech-

niques) are at variance with Harberger's findings; the issue therefore remains unsettled. Harberger also bases his position on the assumption that project effects represent a small fraction of a normal year's growth in GNP. This assumption is also at variance with the realities of developing countries, where the public sector investment, despite the marginality of individual projects, accounts for a substantial share of GDP. In short, if the marginal utility of income is not constant, the consumer-surplus concept should be weighted with income distribution weights in order to evaluate the petinent change in welfare.

Harberger's point would be valid if project participants constituted a homogenous income group, or if the income distribution pattern behind the Marshallian demand curve was considered equitable by community standards; unfortunately both of these conditions are at variance with observations.[18/] Another drawback of this criterion in a labour-surplus economy stems from its heritage - based on the social marginal productivity doctrine as regards the price of capital. By assuming $P_k^* = 1$, it automatically assumes that the government can deal with the inadequacy of savings. In a perfect capital market, the social return from a unit of current savings at the margin is equal to the social value of a unit of current consumption. This means the marginal rate of transformation (MRT) is equal to the marginal rate of substitution (MRS), and both are equal to the social rate of discount or the rate of interest (i). But because of externalities (Marglin [42]), distortions and capital market segmentations, MRT $\neq$ MRS $\neq$ i; there may even be a multiplicity of interest rates. Most likely, the savings rate will be suboptimal and MRT > MRS.

Observations show that governments, having imperfect control over savings, are incapable of eliminating the divergence between MRT and MRS simply by legislating the optimal rate of savings.[19/] As long as MRT > MRS, current savings are socially more valuable than current consumption, hence governments must go around institutional and political obstacles by choosing techniques or the weights put on savings relative to consumption. Depending on the numéraire used, this is done either by putting a premium on savings as in the DMS method, or by penalizing consumption as in the LM measure. Unfortunately, the HSD criterion considers that savings and consumption are equally valuable; this is a grave weakness in a labour-surplus economy.

One final point requires clarification. In a recent paper, Sjaastad and Wisecarver ([9], pp. 513-528) argue that for infinite streams of net benefits the HSD measure is equivalent to the Marglin criterion (a side case of the DMS criterion), and that their observed divergence for finite streams stems from the way the two procedures handle depreciation. This has been erroneously interpreted in some quarters as equivalence between the two. Here is not the place to demonstrate the fallacy of this argument; suffice to say that under the most strenuous assumptions, the two are not equivalent. Marglin's special case and the HSD measure might give the same ran-

king for projects with non-crossing time profiles or when full employment obtains ($P_k^* = 1$) under the same underlying assumptions. Otherwise, their rankings will not be identical and the HSD measure will always favour projects with short life span.

Admittedly the HSD criterion is widely discussed, and it seems to be preferred in certain parts of the developing world. The reason for this preference, so far as can be deduced, can either be the need to sanctify market decisions under any circumstances or the thought that economic planning must necessarily be pernicious. At any rate, it would seem that both views stem from some sort of misguided reasoning.

Preliminary conclusion

Three conclusions that can be safely drawn from parts I and II are:

(a) Project analaysis is still the most useful tool of applied welfare economics in any economy;

(b) Project appraisal methods that account for all the implications of labour-surplus are the most appropriate ones for countries in development;

(c) The DMS approach (UNIDO) provides the general framework for project analysis in labour-surplus economies by virtue of its theoretical rigour, relative realism of its assumptions, and the ease with which it can incorporate the multiplicity of objectives encountered in national planning.

The other procedures considered appear to sanctify either national or international market decisions in line with the dictates of the neo-classical paradigm. Accordingly, the message of the DRC, ERP and the LM approaches, for example, is clear: a country would lose welfare if it did not respect world prices, regardless how they are determined, since they represent opportunity costs. The gist of this line of thought and counterargument are succinctly summarized by a perceptive theorist as follows:

> "A country can choose to accept this theory and its implications... but it can also reject it.... But in the past large countries like the United States and the Soviet Union, which had enough natural resources to generate exports to pay for essential imports, carried off an autarchic industrialization strategy quite successfully. In their cases, and given their strategy, a reasonable procedure in project evaluation would have been to accept internal prices for inputs produced at home, even if they did exceed their imports costs. That way, a fully integrated industrial structure could be built up, even if it was (temporary) inefficient in part." (Taylor [44], p. 210).

These words are not in support of protection; they simply imply that a country should be aware of various development alternatives. In a world in which market imperfections, externalities and value judgements abound, market decisions are always marginal. What can be safely identified here as primary planning decisions, e.g. more equitable income distribution, reduced dependence (in order to resist political pressures or the nefarious effects of ideological decisions of influential economic partners), the promotion of industrialization through learning-by-doing, the level of employment etc. are never left to the market. Their implementation most likely would carry a cost, but, being important national objectives, many view them as a form of investment for the future. The very fact that the DMS methodology is flexible enough to accommmodate them is a plus, although their merit-want weights might have to remain arbitrary for some time to come. The third and last part of this paper therefore looks into ways and means of making the DMS method even more operational.

III. The DMS measure: simplifications and adjustments

The DMS framework recommended by UNIDO in the Guidelines for Project Evaluation [2] is an operational version of Marglin's model [7]. Critics of the approach seem to be ill at ease with the assumptions underlying the calculation of some of its shadow prices. Some of its practioners have also observed that local adjustments of the framework would be easier if its theoretical parent had been better understood. Both these points are considered in the formal derivation and discussion of adjustments given below. The analysis should not be seen as advocating standardization, however, since the socio-economic setting in which project analysis takes place varies a great deal. But given the crude nature of project appraisal, practioners in labour-surplus economies with inadequate data-gathering facilities may save time and effort by making intelligent use of these simplifications and adjustments.

A more formal derivation

As indicated in part II, the main task is to analyze the effects of a marginal modern-sector project that uses capital (k) and labour (ℓ) services to produce an output (y) over the time interval (0-T). The problem faced by planners is to maximize consumption in the modern sector subject to labour restrictions and capital accumulation. Following Marglin [7], the problem is formally:

$$\text{Max!} \qquad \int_0^T U[C(t)]\,dt \qquad (22)$$

subject to the constraints:

$$C(t) = [(1-s(t)]\ \{Y(t) + y(t) - w\ [L(t) + \ell(t)]\} + w\ [L(t) + \ell(t)] \geq 0 \tag{23}$$

$$I(t) = s(t)\ \ \{Y(t) + y(t) - w\ [L(t) + \ell(t)]\} \geq 0 \tag{24}$$

$$L_1 \leq [L(t) + \ell(t)] \leq L_2 \tag{25}$$

$$K(t) + k(t) = K_0 \tag{26}$$

$$0 \leq s(t) \leq \tilde{s} \tag{27}$$

Here $Y(t) = F[K(t), L(t)]$ displays constant returns to scale and diminishing marginal productivities; $\tilde{s}$ is the upper limit of the ratio of savings to profits, and the equation of capital accumulation is $I = \dot{K}$ (i.e. dK/dt). But one characterization of the optimal path is the assumed constant absolute value ($-\eta$) for the elasticity of marginal utility of consumption with respect to consumption (i.e. dU/dC with respect to C). This arises from the mathametical form of the concave utility function assumed by planners:

$$U(C) = \begin{cases} \dfrac{b^{\eta}\ C^{1-\eta}}{1-\eta} & \text{for } \eta \neq 1 \\ \log(c) & \text{for } \eta = 1 \end{cases} \tag{28}$$

Defining the problem's Hamiltonian as:

$$H(C,I) = U(C) + \P I \tag{29}$$

where $\P$ = asset price of capital, it can be shown that the Pontryagin path of employment and savings that satisfied:

(a) The static optimality conditions

$$\begin{aligned} \partial H/\partial L &= 0 \\ \partial H/\partial \tilde{s} &= 0 \end{aligned} \tag{30}$$

(b) The intertemporal consistency requirement

$$-\dot{\P} = \partial H/\partial K \tag{31}$$

and the transversality condition:

$$\lim_{t \to \infty} \P(t) \cdot K(t) = 0 \tag{32}$$

maximizes the sum of consumption utility over time and over the feasible paths defined by the constraints when Eq. (28) holds.[20/] Substituting from Eq. (23) to Eq. (27) into Eq. (29), the general results of the Marglin's model obtain. They are summarized in table 1 for various values of entrepreneurs' (s^c) and workers' (s^w) savings ratios.[21/] These parameters are examined more closely below to see if some at least could be made more operational.

Table 1. Social values in the Marglinian world

	Entrepreneur's and worker's savings ratios		
	$s^c=1,\ s^w=0$	$s_c<1,\ s^w=0$	$s^c<1,\ 0<s^w<s^c$
Capital $(P^*_{k=\frac{\Pi}{U_c}})$	$\frac{w}{(w-Y_L)}$	$\frac{(1-s^c)Y_L+s^c w}{s^c(w-Y_L)}$	$\frac{(1-s^c)Y_L+(s^c-s^w)w}{s^c(w-Y_L)-s^w w}$
Profit income (P^*_y)	$P^*_y = P^*_k = \frac{w}{w-Y_L}$	$(1-s^c)+s^c P^*_k = \frac{w}{w-Y_L}$	$(1-s^c)+s^c P^*_k$ $= \frac{(s^c-s^w)w}{(s^c-s^w)w-s^c Y_L}$
Wage income P^*_w	1	1	$(1-s^w)+s^w P^*_k$ $= \frac{(s^c-s^w)(w-Y_L)}{(s^c-s^w)w-s^c Y_L}$
Wage rate (w^*) (direct and indirect)	$(P^*_y-1)w+z =$ $P^*_y Y_L$	$(P^*_y-1)w+z =$ $(P^*_k-1)s^c w+z =$ $P^*_y Y_L$	$(P^*_y-P^*_w)w$ $= \frac{(s^c-s^w)Y_L}{s^c(w-Y_L)-s^w w} = P^*_y Y_L$
Rental rate (R^*)	$P^*_y R+(w-z)\frac{L}{K} =$ $P^*_y Y_k$	$P^*_y R+(w-z)\frac{L}{K} =$ $P^*_y Y_k$	$P^*_y R + P^*_w(w-z)\frac{L}{K} =$ $P^*_y Y_k$

z = direct opportunity cost of unskilled labor

R = nominal rate of profit

An operational discount rate

As indicated by Eq. (17), the consumption rate of return i(t) is:

$$i(t) = -\frac{\dot{U}_c(t)}{U_c(0)}$$

If because of ignorance of the future, planners discount marginal utility by a pure rate of time preference θ, and supposing that the rate at which marginal utility falls over time is constant, after using Eq. (28), the discount factor:

$$U_c(t) = \exp[-(\frac{\eta\dot{C}}{C} + \theta)t], \text{ for } U_c(0) = I \qquad (33)$$

Eq. (33) is still not operational enough since the elasticity of marginal utility with respect to consumption (η) is a normative element. This is why the DMS methodology treats i(t) as an unknown in project evaluation, and recommends that it be obtained from a bottom-up procedure ([31], pp. 164-168); nevertheless eliciting i(t) surreptitiously from politicians has been widely criticized by practioners for being impractical.

One way of going around the normative judgement as regards η would be to use an old short-cut suggested by Fisher [45], recently resuscitated and refined by Fellner [46].[22/] But given the crudeness of η, if data is scarce a value of 2.5 appears reasonable for a typical labour-surplus economy.[23/] As regards θ, typical values used by planners vary from 2 to 5 per cent. Then making use of the assumptions of constant i (hence a constant rate of growth of per capita consumpiton $\frac{\dot{C}}{C} = g$) over the planning period, and a value of 2.5 for θ:

$$i = 2.5\ (g + 1) \qquad (34)$$

Certainly Eq. (34) can be improved with specific and detailed surveys, but it is doubtful whether the additional precision would be worth the additional cost. In fact, no precision at all is claimed for Eq. (34); its advantages are rather its reasonableness and its objectivity.

The link between the shadow price of investment and the plan document

Suppose a unit of investment adds $Y_k\tau$ to the initial capital stock $\P(t)$ during an interval of time τ; suppose further that its utility values are $(1-s^c)Y_kU_c$ and $\P sY_K$. The intertemporal consistency requirement then requires[24/] that:

$$\frac{\P(t)}{U_c} = \int_0^T \{[1-s(\tau)]Y_k(\tau) + \frac{\P(\tau)}{U_c(\tau)}\, s(\tau)Y_k(\tau)\}\, d\tau + \P(T) \qquad (35)$$

By letting T go to infinity (assuming infinite life for capital), the shadow price of investment becomes the present value of an infinite stream of aggregate-consumption increments, plus the terminal value of the capital stock, both discounted at the consumption rate of interest (i). Since, from Eq. (32), the present value of the terminal stock approaches zero, if constant values are assumed throughout, and for the case where $s^c < 1$, $s^w = 0$, Eq. (35) becomes:

$$\frac{\P(0)}{U_c} = \int_0^\infty \left[(1-s^c)Y_k + \frac{\P(0)s^cY_k}{u_c}\right] \exp(-it)dt \qquad (36)$$

Eq. (36) can be brought more in line with available data by first normalizing the variables with capital (K), and by making use of the relation introduced in Eq. (15) above,[11] that is:

$$P_y^*Y_k = \left[(1-s) + \frac{\P s}{U_c}\right] R + (w - z)\frac{L}{K}$$

$$= \left[(1-s) + \frac{\P s}{U_c}\right] (y - wx) + (w - z)x$$

where $y = Y/K$
$R = (y-wx)$
$x = L/K$

Substituting these in Eq. (36) and solving for $\P/U_c$, obtains the formula given in the Guidelines for Project Evaluation ([2], p. 205):

$$\frac{\P}{U_c} = P_y^* = \frac{(1-\bar{s})(\bar{y}-w\bar{x}) + (w-z)\bar{x}}{\left[i-\bar{s}(\bar{y}-w\bar{x})\right]} \qquad (37)$$

where the bar indicates common values for the modern public and private sectors.[25] Indeed, a project may be financed from increased taxation, duties, long-term tied or untied foreign loans. Given the crude nature of the whole exercise, the best that practioners could probably do is to use average values for y and x, and the national average propensity to save (s), a figure which should be between 10 and 20 per cent in most cases.

As indicated in Eq. (12), the shadow price of investment falls over time at a rate given by β, since at any time:

$$\frac{\P(t)}{U_c(t)} = \P_0 \exp(-\beta t)$$

where $\beta = \rho - (\eta g + \theta)$

and $U_c(0) = 1$

But if ignorance of the future has already forced the assumption of constant ρ and i, it is surperfluous to seek greater precision than that allowed by available data. A compromise between theoretical rigour and operational feasibility leads however to a constant approximated value computed directly from the plan document. For example, denoting the change in output over the planning period by ΔY, the level of investment by I, the change in employment level by ΔL, $y = \Delta Y/I$, $x = \Delta L/I$, and

$$\bar{s} = \frac{1}{2} \frac{\left[\Delta\Pi_{rp}(\Delta C_g) + \Delta I_g(\Delta\Pi_{atp})\right]}{\Delta C_g(\Delta\Pi_{atp})}$$

where:

$\Delta\Pi_{rp}$ = change in retained earnings in the private sector

$\Delta\Pi_{atp}$ = change in after-tax profits in the private sector

ΔI_g = change in net capital formation in the public sector

ΔC_g = change in government purchases of goods and services

Eq. (37) can be solved after using Eq. (34).

An operational shadow wage rate

From Eq. (14) or from table 1, the shadow wage rate (w^*) is the sum of the direct opportunity cost of withdrawing a worker from the traditional sector (z) and the indirect cost of employment $[P_y^* - 1)w]$, i.e.

$$w^* = z + (P_y^* - 1)w = z + (P_k^* - 1)sw$$

From section A of figure 1, it can be seen that at any level L, w^* is the slope of the output curve Y_L; at L^*, for example, it is the slope at point $A(=CL^*/OL^*)$. Reflecting this in section C of the figure, w^* is the distance from the C-axis to C'. The DMS methodology recommends, as an approximation, that z be equated with the wage rate of landless labourers, on the assumption that displaced unskilled workers are ultimately withdrawn from agriculture.

The industrial wage rate (w) is well documented; it is widely disseminated in labour statistics publications, or it may even figure in the plan document. But a realistic value for z, short of a detailed survey of existing situations, may be more difficult to come up with. Since unskilled workers hired in the modern sector may come from different rural areas, a better short-cut for w^* that accounts for this and other infrastructural costs is:

$$w^* = \alpha + \sum_{i=1}^{n} h_i c_i + (P_k^* - 1)sw \qquad (38)$$

where:

h_i = proportion of workers withdrawn from region i

c_i = yearly average wage of landless workers in region i

α = the yearly cost of urban services provided by the government to transferred workers, such as health services, trans- portation, housing etc.

$i = 1, 2, 3, \ldots, n.$

The important difference between Eq. (38) and the dictates of the social-marginal-productivity doctrine is that prior to full employment P_k exceeds unity, and therefore w^* in this procedure may well exceed w rather than being zero or a mere fraction of w.

An operational shadow rate of foreign exchange

In most developing countries, balance of payments considerations figure prominently in the calculation of national economic profitability. The DMS methodology views foreign exchange earnings at the margin only as a component of aggregate consumption. Projects may earn foreign exchange (export-promoting), or may save foreign exchange (import-substituting). However growth, skewed income distribution, imported intermediates and political uncertainties all too often expand the demand for foreign exchange far beyond most developing countries' productive capacity. This imbalance, coupled with the inability of governments to take effective measures to curb the demand, leads to recurrent devaluations and/or to a series of trade distortions such as tariffs, export subsidies, quotas, outright prohibitions etc. These in turn lead to an overvalued domestic currency which causes the official exchange rate to be a bad welfare indicator. Like the other shadow prices discussed earlier, the shadow exchange rate (r_w^*), appropriate for project evaluation, is a constrained second best measure.

In supposing that an additional unit of foreign exchange is used to increase the quantity imported $i(\Delta M_i)(i = 1, 2, 3, \ldots h)$ and also to relieve the pressure to export the quantity $j(\Delta X_j)(j = h + 1, \ldots, h + n)$, in conformity with the principle of willingness to pay, the methodology posits the shadow exchange rate at:

$$r_w^* = \sum_{i=1}^{h} \frac{P_i \Delta M_i}{(\Delta M + \Delta X)u_i^w} + \sum_{j=h+1}^{h+n} \frac{P_j \Delta X_j}{(\Delta M + \Delta X)u_j^w} \qquad (39)$$

In Eq. (39) a fall in export j (ΔX_j) is treated as an increase in import i, $P_i(P_j)$ is the domestic price of import i (export j), u_i^w (u_j^w) is the c.i.f. (f.o.b.) price, and $\frac{\Sigma \Delta M_i}{(\Delta M+\Delta X)} + \frac{\Sigma \Delta X_i}{(\Delta M+\Delta X)} = 1$.

The procedure goes on to remove capital goods from M on the grounds that capital formation depends on domstic incomes rather than on the availability of foreign exchange. It also envisages the possibility that in most developing countries exports might not be responsive to foreign exchange, hence $\Sigma \Delta_j X_j = 0$.

While some critics have taken issue with the DMS authors on these deletions, the view of the present author is that if the allocation of foreign exchange does not reflect the usual conflict between interest groups, then capital goods imports should be included in (ΔM); however it is reasonable to assume $\sum_j \Delta X_j = 0$ for labour-surplus economies. Most likely X will consist of raw materials exported under bilateral agreements, and which cannot be consumed locally. After making these adjustments Eq. (39) may be simplified to:

$$r_w^* = \sum_{i=1}^{n} \frac{P_i M_i}{M u_i^w} \qquad (40)$$

where $\frac{M_i}{M}$ = the share of import i in the marginal import bill (over the life of the project).

Before ending the discussion on the shadow rate of foreign exchange, it is worthwhile contrasting Eq. (40) with two other proposed methods, as well as the so-called "first-best" rate.

The first, proposed by Hansen [48], assumes that the divergence between domestic prices and c.i.f. or f.o.b. prices is solely due to taxes and subsidies on traded goods. This means the domestic price of import i exceeds u_i^w by the ad valorem tariff rate t_m (a subsidy s_m being entered as a negative tax), and the domestic price of export j is below u_j^w by the amount of the export tax (a subsidy on export being entered as a positive tax). Therefore, if the official rate of exchange is r_0:

$$P_i = r_0 u_i (1+tm), \text{ and } P_j = r_0 u_j^w (1-tx)$$

If additionally it is assumed that the elasticities of import demand and export supply are infinite, i.e. u_i^w and u_j^w are constant, Eq. (39) reduces to the basic tariff-cum-subsidy formula:

$$r_w^* = r_0 \frac{[M(1+m) + X(1-tx)]}{M + X}$$

For this formula to have operational significance, however, it would have to account for all other distortions and the evolution of internal demand; the country's share in world trade would also have to be small.

The second method posits r_w^* as a weighted average of import tariffs (less subsidies) added to r_0 (see Dornbush [49], Taylor [44], and Dominique [50]). But it involves the calculation of elasticities of import demand and supply of foreign exchange. In the present author's view, such calculations are fraught with too many uncertainties to be of any value in practice; consequently they cannot improve on Eqs. (39) or (40).

The LM method, for example, uses the free trade (r_f^*) or the Bacha-Taylor [18] rate. Traded goods are valued at border prices and home goods prices are marked down in terms of world prices at r_0 by multiplying them by a conversion factor $r_0/r_f^* < 1$. For that procedure to be correct, trade policy would have to be optimized by removing or reducing existing tariffs and subsidies to bring internal relative prices of imports and exports to the level of the world price ratio. The r_0 would rise or the price of home goods relative to traded goods would fall. When traded goods are valued at border prices, the price of home goods are revised downward, and the free trade rate r_f^* obtains. However, it is evident that in the real world such an optimal situation does not obtain; hence the use of r_f^* is strictly inappropriate. In contrast, the DMS method, recognizing the hard facts of international trade, uses r_w^*, which is a welfare measure of an extra unit of foreign exchange; this is the appropriate parameter to use in the presence of trade distortions.

Income distribution weights

According to the evidence gathered by Ahluwalia ([41], pp. 6-10), the average income share of the lowest 40 per cent in all developing countries as a group was 12.5 per cent as late as the early 1970s; and there has been no noteworthy improvement since. It seems therefore that the DMS methodology is quite justified in making allowance for the inequality of income either on a personal or regional basis. Also an increasing number of theorists are now rallying to the view that a government that is not insensitive to income inequality ought to trade off some market efficiency for some equity through the process of project selection. Once the need for more equity is accepted, the question of income redistribution comes to hinge on merit-want weights. This section therefore focuses on a more operational approach to the quantification of income distribution weights.

Since actual utility functions are not known, there will always be some arbitrariness involved in determining the numerical weights attached to net income changes accruing to different groups. Therefore what is really at stake is the quantification of governments' value judgements. A given utility function could be used for that purpose and Freeman [51] has catalogued a number of them that appear equally appropriate.[26/] Here, for consistency's sake, the utility function given in Eq. (28) will be maintained - hence $U_c = (b/y)^{\eta}$. The constant b is income per capita, Y is the level of income, expressed as a multiple of b, and the value of η is taken to be 2.5. Various values of η are used in table 2 to assess their effect on the weights.[27/]

What is of special interest in table 2 is the fact that the higher the government's commitment to income equality, the higher is its value for η. For example, for values $\eta = 0.5$ and $\eta = 2$, the consumption gain or loss of someone with half the national per capita income is weighted at 41 and 300 per cent higher, respectively, than that of someone at the national average. Another im-

portant point is that the social weight (ν) may well reflect an additional value judgement. Differences in education, ability and personal efforts, among other things, will always induce differences in income. Indeed, there is no indication that a government or society as a whole is striving for complete income equality, since clearly the resulting loss in efficiency could turn out to be excessive. If the main concern centres around the poorest and the richest groups, then the marginal utility function $U_c = (b/Y)^{\eta}$ can be used only as a guide in deriving the social weights (ν) given in the last column of table 2.

Two additional qualifications should be noted in conection with table 2. First, it is assumed that at the level of per capita income prevailing in most developing labour-surplus economies, the average savings rate is likely to be zero. The level of consumption therefore coincides with the base level income, and a unit of average consumption is the numéraire. Second, a point that is not sufficiently clear to many users of the DMS method is that, to account for the equity objective, the social weight (ν) must be applied only to the direct consumption gain or loss of various groups; applying ν inadvertently to the whole net benefit in Eq. (16) would affect the premium put on investment.

Table 2. Individual and social income distribution weights of the gain or loss of a person with an annual income of k times the per capita national income

Income level	Marginal utility function[a/]						Hypothetical social weight (ν)[b/]
	$\eta=0$	$\eta=0.5$	$\eta=1$	$\eta=1.5$	$\eta=2$	$\eta=2.5$	
b/10	1.00	3.16	10.00	31.62	100.00	316.22	316.22
b/2	1.00	1.41	2.00	2.82	4.00	5.65	5.65
b	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3b/2	1.00	.81	.67	.54	.44	.36	1.00
2b	1.00	.71	.50	.35	.25	.17	1.00
4b	1.00	.50	.25	.12	.06	.03	1.00
6b	1.00	.41	.16	.07	.03	.01	1.00
8b	1.00	.35	.13	.04	.02	.005	.60
10b	1.00	.32	.10	.03	.01	.003	.40
15b	1.00	.26	.06	.02	.004	.001	.15
20b	1.00	.22	.05	.01	.003	0.0005	.00

a/ $U_c = (b/Y)^{\eta}$
where b = national income per capital
Y = consumption level per head
η = constant elasticity of marginal utility with respect to Y.

b/ Derived from $U_c = (b/Y)^{2.5}$.

Notes

1/ See Little ([5], pp. 61-65), Little and Mirrlees ([1], pp. 167, 253, 358-366) and Little and Mirrlees ([6], pp. 153-168). The most convincing arguments for the DMS measure are by Dasgupta [6], and by Marglin ([7], pp. 70-78).

2/ Three Pareto conditions are that: (1) marginal rates of substitution of any two goods (or services) are the same for all individual consumers consuming them; (2) marginal rates of technical substitution of any two factors are the same for all individual producers using them; and (3) marginal rates of transformation of different goods are equal to their marginal rates of substitution in consumption. If these conditions are met for a given income distribution, the existing economic configuration cannot be improved upon without causing a decrease in the welfare of at least one economic agent.

3/ The effects method sees no need for second-best shadow prices, while the UNIDO/IDCAS procedure argues that the complexity of the socio-economic environment and the lack of data in developing countries preclude the computation of shadow prices other than what is called the "adjusted" rates of discount and foreign exchange. But what both methods fail to recognize is that commercial appraisal in which the opportunity cost of labour is overvalued in the presence of unemployment leads to an underestimation of the true cost of capital, hence to a higher nominal rate of return to capital and to a greater use of capital than a proper social accounting would recommend.

4/ Eq. (1) is quite general. It can be extended to cover the multiperiod case by properly dating inputs and outputs, and by discounting to provide a decision rule for accepting or rejecting a project. Nevertheless for simplicity the question of timing and discounting is ignored until part II.

5/ See Bruno in Blitzer ([14], pp. 203-211); for other first hand accounts of the shortcomings of economy-wide models, see Duloy ([15], pp. 195-208) and L. Taylor, "Multisectoral models in development planning: A survey", Economic Development Discussion Paper No. 230 (Cambridge, Massachusetts, Center for International Affairs, Harvard University, 1973).

6/ Objections include the treatment of domestic inputs as non-tradables, the input-output method of splitting of domestic and foreign resources, and the assumption of fixed coefficients in expanding industries.

7/ Note that most developing countries with infant industries may find that they have little need to measure their comparative advantage if the view that international trade is better explained by economies of scale and intra-industry specialization is confirmed. For more details on this view see Krugman [16].

8/ Functional separability means that domestic inputs are related to output (Q) through the funcion $h(X_i)$ and tradable inputs are linked to output through $g(X_j)$, such that $Q=F[h(X_i), g(X_j)]$ becomes a sufficient condition for the validity of ERP. See Grubel and Johnson [22] and Corden [23].

9/ See the results of experiments carried out by Evans [24], and by Taylor and Black [25].

10/ $z = \partial C/\partial L + P_k^* \partial I/\partial L = (1-s)Y_L + sw + sP_k^*(Y_L - w)$, after substituting from Eqs. (9) and (10); substituting for z and using Eq. (13): $w^* = P_y^* \cdot Y_L$.

11/ From the assumption of constant returns to scale: $Y_k = (Y-Y_L \cdot L)/K$; substituting Y_k in Eq. (15) gives $R^* = P_y^* Y/K - P_y^* \cdot Y_L \cdot L/K$.

Subtracting and adding wL/K gives $R^* = P_y^*(Y-wL)/K + P_y^*(w-Y_L)L/K$.

Noting that $(Y-wL)/K$ is the nominal rate of profit R, and using Eq. (13) in the second term on the right hand side, gives Eq. (15) with corrections for output forgone outside the modern sector.

12/ Assuming a one-shot investment in year zero and a constant P_y^*, equation (16) can be written in terms of the definitions of part I as:

$$NPV_c = \left[(1-s) + P_k^*(0)s\right] \sum_{t=1}^{T} \frac{\left(\sum_{i=1}^{n} a_i u_i - \sum_{j=1}^{m} b_j u_j\right)}{(1+i)^t} \geq \left|(1-s) + P_k^*(0)\right| K_o$$

Here the initial investment, K_o, represents displaced surplus in the private sector.

13/ If all profits are saved, and expressing all relations as a function of the labour-capital ratio $v = L/K$, the planners' problem is simply to maximize total welfare Z, generated by consumption in the modern sector over time, i.e.

(i) Max $Z = \int_0^T U(wvd)dt$, subject to $v_1 < v^* < v_2$ and the capital stock

$dK/dt = [f(v) - wv]K$

The Hamiltonian of the problem is:

(ii) $H = U(wvk) + P_k^*[f(v) - wv]K$

The optimality conditions are:

(iii) $\partial H/\partial v = U_c wk + P_k^*[f'(v) - w]K = 0$

(iv) $\partial H/\partial K = -dP_K^*/dt = U_c wv + P_k^* [f(v) - wv] = 0$

substituting $P_k^*[w - f(v)]$ for $U_c w$ (from iii) into (iv) yields:

(v) $-\frac{P_k^*}{P_k^*} = [f(v) - f'(v) \cdot v] = Y_k$

14/ For a detailed study of excess capacity in developing countries, see Little, Scitovsky and Scott [32]; for the problem of trade restrictions, see United Nations Conference on Trade and Development, Restrictive Business Practices, Preliminary Report by the UNCTAD Secretariat (TD/B/C.2/104, 1971).

15/ For more on the views of sympathetic and hostile critics, see Bulletin of the Oxford University Institute of Economics and Statistics, vol. 34, February 1972, pp. 1-168.

16/ For the econometric evidence for the United States, where capital markets function reasonably well, see Howrey and Hymans [38].

17/ Harberger discards income distribution weights by arguing that the change in utility stemming from a change in a policy variable, say, from v_0 to v_1 is:

(i) $$\Delta U = \int_{v_0}^{v_1} \Sigma U_i(V) \cdot \frac{\partial X_i dv}{\partial v}$$

where X_i = number of units produced by activity i.

ΔU is expressed in utils and so is not invariant to a monotonic transformation. But if (i) is transformed into money terms through the integration process, at the marginal utility of money (λ) prevailing at that point, i.e.

(ii) $$\Delta Z = \int_{v_0}^{v_1} \frac{\Sigma U_i(V)}{\lambda(v)} \cdot \frac{\partial X_i dv}{\partial v}$$

where U_i/λ = price of i

it becomes invariant under any transformation of the original utility function, which leaves unchanged the relevant behavioural reactions to changes in v. Therefore, according to Harberger, the argument that the consumer-surplus concept has validity only when the marginal utility of income is constant must be rejected. For more details, see Harberger [39].

18/ For more details, see Ahluwalia ([41], pp. 209-235).

19/ According to Gramlich ([40], pp. 103-120), in the United States, which is a high capital-intensity country, whether one uses national account data or Denison values [43] the evidence shows that there has been undersaving since World War II. To assume either savings adequacy in low capital-intensity countries or the ability of a local government to remedy the savings inadequacy through neutral tax-subsidy measures is therefore not as naive as it sounds; in this author's view, at least, it is a strategic value judgement.

20/ The infinite-horizon problem is defined by letting T go to infinity, and less and less weight is put on the post T future, then $\P(\infty)=\lim \P(t) = 0$. For a proof of these heuristic arguments, see Marglin ([7], pp. 110-115).

21/ From here onward the shadow price of capital (or investment) for the case $s^c < 1$, $s^w = 0$, defined by:

$$\partial H/\partial L = U_c \{[(1-s)Y_L - w] + w\} + \P s(Y_L - w) = 0, \text{ and}$$

$$\partial H/\partial s = -U_c [F(K,L) - wL] + \P[F(K,L) - wL] = 0$$

is written $\P/U_c$, where U is the utility function introduced in Eq. (28). If it is assumed further that entrepreneurs allocate income between C and I according to long-term utility maximization, income changes produce equal changes in current investment; hence $\P/U_c = P_k^* = P_y^*$.

22/ If it is observed that the marginal utility of food is the same for two consumers with identical taste in food but having different levels of income (Y), and if it is observed that consumers 1 and 2 pay P_1 and P_2 for the same bundle of food, then from Gossen's second law: $\eta = (P_1 - P_2)/2 \cdot [Y/dY]$. Another way would be to calculate the reduction in real income q due to a rise of 1 per cent in the price of food and the income elasticity of demand (prices held constant) η_y. The value of η is then approximated by the ratio: $\eta = \eta_y / [1 |\eta_p| - q \eta_y]$, (the denominator is the price elasticity of demand for food corrected for the real income effect. The first method gave a value of 1.8 for the United States in 1959; the second gave 1.5.

23/ Lal ([47] appendix II) has estimated that for all India $\eta_y = 0.56$, $\eta_p = -0.46$, the average propensities to consume food out of total consumer expenditure as 0.429 for rural areas and 0.246 for urban areas. The weighted average q calculated for all India was 0.4, the weights being the percentage of the total population in rural and urban areas. Substituting these values in the second formula in footnote 22/ above yields: $\eta = 0.56/[0.46 - 0.4(0.56)] = 2.3$.

24/ For the complete discussion see Marglin [7].

25/ The source of displaced funds is crucial in the calculation of the shadow price of investment. If the government budget is fixed independently of project choice, it is reasonable to assume that in the absence of the project the funds would remain at the disposal of the government; in that case, the parameters s, y and x are those of the public sector. However, in practice, the technology used is the same in both public and private sectors, hence average values would do equally well. For more on this, see Dasgupta in H. Schwartz and R. Berney, eds., Social and Economic Dimensions of Project Evaluation (Washington, DC, Inter-American Development Bank, 1977), pp. 282-292.

26/ Pertinent original discussions appear in Chenery [52], Weber [53], Tinbergen [54], Theil and Brooks [55], among others. They are elegantly synthesized by Helmers [10].

27/ Various values for η generate functions that have already been proposed by some theorists. For example, $\eta = 0$ gives the function implicitly used by Harberger; $\eta = 0.5$ gives the function proposed by Cramer; $\eta = 1$ gives one preferred by Fechner, Weber, Chenery and Tinbergen; $\eta = 1.5$ could be associated with Fellner, while $\eta = 2$ could be assigned to Frisch.

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SOCIAL COST-BENEFIT ANALYSIS OF AN EXPORT-ORIENTED PROJECT WITH FOREIGN COLLABORATION IN INDIA

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Introduction

Social Cost Benefit Analysis (SCBA) has been used to evaluate direct foreign investment projects in several studies. Lall and Streeten [1] employed it to evaluate the operations of a sample 159 firms selected from five developing countries. Lal [2] applied it to appraise operations of four foreign-controlled firms in the Indian chemical industry and several more in Kenya. Recently Weiss [3] undertook an ex-ante appraisal of a foreign industrial project in a developing country. Lall and Streeten's exercise was a crude application of the Little-Mirrlees (LM) methodology [4] in that it derived net social benefits as a percentage of sales turnover for one year. Also it had too many simplifying assumptions. The studies by Lal and Weiss, however, were based on standard cost benefit analysis. A common feature of all these studies is that they were concerned with import substitution projects. SCBA has not yet been applied to evaluate export-oriented projects set up with foreign capital. However, the Government of India is now pursuing a policy of encouraging, by means of direct and indirect incentives,[1/] foreign investors to establish export-oriented projects in the country. Evaluating export-oriented projects established with foreign capital thus becomes important as a means of reviewing the efficacy of this policy. The present paper therefore attempts to evaluate the social benefits and costs of one such project as an illustration.

The project

The selected project belongs to a company that was promoted by an Indian party in collaboration with a state-owned firm of an Eastern European centrally planned economy during the late 1960s.[2/] This company signed a collaboration agreement with its foreign parent for the supply of know-how, plant and machinery and obtained a licence from it to manufacture two basic drugs and related formulations in India from the human placenta and its serum. The firm was also granted a licence by the Government of India to produce the same drugs under the Industrial (Development and Regulation) Act, 1951. The foreign partner guaranteed to buy back fifty per cent of the production of the Indian plant.

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The foreign partner not only provided process technology and the licence but also supplied the entire plant, erected on a turnkey basis. A local firm of consulting engineers was also involved. In return, the foreign partner received a project report fee of 0.75 lakh rupees ($10,000 in foreign exchange) and a royalty at a rate of 3 per cent on the value of production for a period of seven years. It was also allotted 49 per cent of total equity capital issued of the company in lieu of a portion of the payment of plant and machinery. The rest was covered by a suppliers credit against a bank guarantee at 2.5 per cent interest.

According to the collaboration agreement the foreign partner assigned two technicians for five years to supervise and control the Indian plant and, since it was also to purchase bulk of the output, to ensure product quality. The remuneration of the foreign technicians was to be paid by the Indian company. The foreign partner also undertook to train one or two Indian technicians in its home country.

Being the single largest shareholder, the foreign partner could easily have had its nominee appointed as managing director. But in order to avoid any unforseen risk it was specifically provided for in the co-operation agreement that the foreign partner had the right to appoint one of the two joint managing directors, in addition to their other nominees on the board.

The company manufactures the two drugs mainly in bulk form. These are basically proteins separated from placenta blood and its serum. One of them is used as a preventive medicine, the other in treating hypo-proteinemic patients.

The company's plant, which is located in a well-developed industrial town in north India, went into production in 1972 using raw materials from local hospitals. The Indian products are found to be of high quality because of high protein content of these materials. Perhaps because of this, the foreign partner consistently imports the products in quantities larger than its obligations under the agreement.

Since the company's exports are non-traditional goods, it receives a cash subsidy of 20 per cent and an import entitlement to the tune of 15 per cent of the value of its exports. It also earns a premium on the sale of import licences. Thus export incentives become a significant part of the company's cash flow. The company took four years to declare its first dividend on equity shares but since then it has been consistently distributing dividends at 15 per cent.

Methodology and analysis

Where most of the inputs and outputs of a project are traded goods, the LM method [4] has advantages over the alternative methods such as the one proposed by UNIDO [6]. Since the project selected for the study belongs in this category,[3/] the LM methodology is considered appropriate for its evaluation.

The net social benefits of the project in year t can be expressed as

$$NSB_t = P_{xa}X_t - \sum_i P_{ia}A_{it} - \sum_j W_{ja}L_{jt} + E_t + F_t \qquad (1)$$

where

X_t is total output of the project in year t
P_{xa} is border price of output
A_{it} is input of ith good in year t
P_{ia} is the border price of ith input
L_{jt} is labour input of jth type
W_{ja} is shadow wage rate of jth type of labour
E_t is net social valuation of externalities
F_t is net inflow of foreign exchange on account capital inflow and servicing outflow

Equation (1) is comprehensive enough to include: the income and indirect balance of payment effect represented by social value added $P_{xa}X_t - \sum_i P_{ia}A_{it}$ [4/] the employment and income distribution effect (both interas well as intra-temporal) through the shadow wage rate W_{ja} [5/] and the direct balance of payments effect of capital inflow and servicing outflow through F_t, and externalities through E_t.

To obtain one consolidated figure for the net social benefits of the project over its lifetime, Eq. (1) can be discounted at the accounting rate of interest, ARI (the rate at which the value of the numéraire declines over time). This gives its present value. Accordingly, the net present value of the social benefits of the project discounted to year zero (base year) may be written as

$$NPVSB_0 = \sum_{t=0}^{T} \frac{NSB_t}{(T+r)^t}$$

where r is the ARI
T is the life of the project

Data on the working of the firm were obtained from its prospectus, annual reports and three interviews with the company secretary. The major area requiring clarification concerned product export prices. These were in fact transfer prices. It was also learned that one of the two major products has no domestic demand and is solely exported, while the other is sold in both markets. The transfer price of the latter is fixed by the foreign partner and is about one third of the domestic market price. Since these transfer prices are the commodity values the country actually receives in foreign exchange, the whole output is valued at these prices.

Raw materials and other inputs of the project are non-traded goods. A set of accounting multipliers for various industrial non-traded goods was estimated for India under the auspices of the

OECD.[6/] These multipliers are used to convert values of non-traded goods into corresponding values in accounting prices. Since the company receives its raw materials largely free from various hospitals, what is shown as expenditure on raw materials in the profit and loss accounts is mainly their collection and transportation charges. Thus this item has been converted in accounting prices by using an accounting ratio for transportation.

For the national parameters such as shadow wage rate (SWR) and accounting rate of interest (ARI), the estimates derived in Lal [9] are used. These are: SWR as 62 per cent of market wage and ARI, 10.75 per cent.

According to the company, the life of the project is about 10 to 12 years. However in the present exercise the life of the project is assumed as 15 years from the date of first production.

Depreciation is not considered because the fixed cost is treated as sunk cost. This has been justified in the UNIDO book Guidelines for Project Evaluation [6] and other studies, although some researchers, e.g. Lal [2], seem to take depreciation into account.

The official exchange rate used in the study is $1 = 7.5 rupees (Rs). For lack of requisite data, externalities and intra-temporal distribution of income effect have not been included.

Two sets of results are derived, (1) at market prices i.e. without any correction to market prices for trade distortions, and (2) at accounting prices.

The analysis is carried out in three stages. Firstly, present value of all capital costs including working capital in the base year is computed. Working capital is considered to comprise cash and inventories. The inventories are valued using accounting multipliers for miscellaneous industrial materials while cash is considered as fully tradable i.e. valued at an accounting ratio of one. The full accumulated working capital is treated as scrap at the end of the project. Since land is a relatively unimportant input and the project is located in an urban developed area, its market value is considered to reflect its opportunity cost and hence no correction is made. Apart from the imported component of plant and machinery, which is valued at its import price, all other capital expenditures have been valued at the accounting prices derived using OECD accounting multipliers. The stream of all these capital costs is discounted at 10 and 20 per cent to the base year to get C, the present value of capital cost in the base year.

Secondly, a stream of net social benefits is prepared for 15 years from 1972, the year in which the plant started production. This is done by substracting the accounting values of all inputs except taxes and subsidies (since these do not involve any social benefit or cost) from the output value (at f.o.b. transfer price). Two assumptions have been made for this: (1) the plant will continue to operate at the same level as in 1977, i.e. with a high capacity utilization of 105 per cent; and (2) in future years,

prices will affect both inputs and output to the same extent - so that most of the price effect will be cancelled out. On the basis of this assumption, no allowance is made for price changes in the future years.

This stream again is discounted to year 0 at 10 and 20 per cent discount rates to give P, the net social benefit over the whole period.

Finally, the present value of net foreign inflow is calculated taking into account inflow of capital and outflow in the form of royalty, dividend (net of Indian taxes) payments etc. This is F.

Now the $NPVSB_0$ for the project will be $NPVSB_0 = P - C + F$, and the results, expressed in millions of dollars for both sets of prices, are as follows:

Kind of price	Discount rate 10%	20%
Market price	-0.838	-0.835
Accounting price	-0.560	-0.633
Accounting price if output price (f.o.b.) is higher by 20 per cent	+0.245	-0.246

It can be seen that for both sets of prices and at both discount rates $NPVSB_0$ is negative. This implies that in social terms the project is not viable. The results are therefore in sharp contrast to the direct balance of payment effect which is highly positive on account of the project's export orientation. One reason for negative social profitability is that the transfer price the firm receives from its parent is too low even to cover the opportunity cost of national resources. The country thus loses in terms of resource cost, although the project is made financially viable by the Government through export incentives.

To check whether the project would be socially viable at higher transfer prices, they were raised by 20 per cent, i.e. the rate of cash compensatory support. The result of such a sensitivity analysis, shown in the table and figure, is that, if the transfer price is higher by this amount, the project is socially justifiable with an internal rate of return of about 14.5 per cent.

Evidence that profits from the host countries are transferred through transfer pricing is increasing.[7/] Certainly in this case, where the entire trade is of an intra-firm nature, the possibility of transfer price manipulation cannot be ruled out. However, the extent of such manipulation could not be ascertained since the firm is the only exporter of these products from India. The Indian firm is bound to export its products to its parent because of (a) the domination of the foreign partner at management level; (b) a probable clause in the technical collaboration agreement;[8/] and (c) lack of demand of these products in the international market in the form in which they are manufactured in the country. The foreign partner may in fact be exporting these products to a third country after reprocessing.

What the case study therefore reveals is the possibility that the host country may lose even if the foreign firm is producing for export. Thus the current policy of encouraging foreign firms to establish export-oriented ventures may prove to be disastrous in view of the fact that most of the exports generated by this policy will be intra-firm transfers.9/ In order to take full advantage of the policy of export promotion there is a need to ensure that at least marginal social cost of production is realised. The absolute value of export earnings may thus be a highly misleading index of a firm's real balance of payment benefits to the host country. The case study therefore illustrates how a poor country could be exploited by a developed country through international production.

Conclusion

In evaluating social benefits and costs of an export-oriented foreign direct investment project from host country's point of view, using the wellknown LM methodology, the net present value of social benefits are found to be negative. The reason for this unfavourable social profitability is the low transfer price which does not cover even the opportunity cost of domestic resources consumed. An increase of 20 per cent in transfer price can however make it socially profitable.

This suggests that in cases like the one presented, where the foreign parent company is attracted not only by low price but also the high quality of the product, the host government can bargain with the parent firm for a higher transfer price. Though the findings of this case study cannot be generalized, it does emphasize the need for ensuring social viability before the host government allows a foreign company to set up an export-oriented project.

Notes

1/ For instance, the general limit on foreign equity holding in a company to 40 per cent is being relaxed and even 100 per cent foreign ownership is allowed for export-oriented projects. For a review of recent export promotion measures the government has undertaken, following the submission of the report of the Tandon Committee in May 1980, see India, Ministry of Commerce [5], p. 169.

2/ Specific details are avoided to preserve anonymity.

3/ Historically most foreign direct investment projects have been either export-oriented in raw materials or import substitution projects.

4/ See Little [7] p. 207.

5/ See Schneider [8].

6/ See Lal [2], p. 124.

7/ For theory and evidence on transfer pricing see Lall [10] and Vaitsos [11]; see Kumar and Chenoy [12] for cases of transfer pricing in the Indian drug industry.

8/ This impression was gained during an interview with the company secretary. It could not, however, be confirmed because the firm was not willing to disclose the collaboration agreement.

9/ United States Tariff Commission [13] has shown that 63 per cent of exports of the majority-owned foreign affiliates of United States transnational corporations were to affiliated customers.

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AN INPUT-OUTPUT TABLE FOR CHINA 1975

Secretariat of UNIDO

Introduction

In the closing months of 1981, a team of economists from the Institute of Industrial Economics, Chinese Academy of Social Sciences,[1/] came as consultants to UNIDO. This was a follow-up to the co-operation established as a consequence of a mission undertaken to China by UNIDO staff in 1980 at the request of the Chinese authorities. Both sides had an objective in pursuing such co-operation. On the one hand, the Global and Conceptual Studies Branch of UNIDO recognized the need to incorporate data on China into its modelling analysis at a fuller level than had hitherto been possible. It was felt that the exclusion of China, which accounts for about a quarter of the world's population, from both economic analysis of the future of the world economy and, indeed, from analysis of the Lima target, had to be remedied. On the Chinese side, there was an interest in studying the model systems developed by UNIDO, and thus deriving indications as to appropriate lines of development for models to be used in the planning process in China. Accordingly, agreement in principal was reached that these objectives could best be furthered by a visit of Chinese consultants to UNIDO, who would both acquaint themselves with the UNIDO model systems and also provide data and advice for improving the treatment of China in UNIDO models.

It was decided that a first task would be to construct an input-output table for China in a suitable form for use in the UNIDO models. Such tables are important components of both the LIDO and UNITAD models [1]; more generally, they provide valuable information on the interrelationships between the different parts of the economy and thus provide insights into the nature of questions such as agriculture-industry interdependency. The first task, therefore, after the group familiarized itself with the UNIDO World Industry Co-operation and the LIDO models, was to compile a table, based on unpublished data, in the form used in the UNITAD model. This is a table in which economic activity is divided into eight sectors.

The next task was more general improvement of the UNITAD model itself, in so far as it relates to China. The UNITAD model has Centrally Planned Asia as one of its eleven regions. The lack of first-hand data for this region, however, had meant that this part of the model was open to considerable improvement. Accordingly, using the constructed input-output table for China as the basis,

further data for including it in the UNITAD model were then estimated. In fact, a new form of regional model was developed. Up till then, the eleven regions of UNITAD could be distinguished, according to theirtreatment in the model, as one of three types: developed market economies, developed centrally planned countries, and developing countries. The new form of regional model combines elements of the last two. Another innovative feature is the distinction between rural and urban activity on the production side. This is partly for statistical reasons, but it also allows some consideration of the very different productivities exhibited by rural and urban industry, these being captured by estimating parallel production functions for each of the sectors in the Chinese regional model. In order to complete this model, it was also necessary to estimate a number of other functional relationships in order to study the relationship between investment and production, the consumption patterns, the behaviour of trade and other aspects.

Experiments with the completed model are still continuing, and further changes can be expected, in particular to make it more representative of the whole region of Centrally Planned Asia, rather than China alone.[2/] In the meantime, however, it is felt that much of the information compiled during the construction exercise would be of wider interest. In particular, the input-output table for China represents a new and potentially valuable insight into the internal relationships of the Chinese economy.

Form of the table

Sectoral classification

In preparing an input-output table, one basic question is the criteria for sectoral classifications. Where such classification criteria are different, they directly determine both the different structural characteristics of the input-output table and the type of economic analyses and forecasts. They also determine both the different requirements of data used to prepare the input-output table and the methods employed to adjust existing data to adapt them to the sectoral classification criteria.

In the UNITAD model system, the flow matrix (first quadrant) in the input-output table is divided into eight production sectors.[3/] In line with ISIC (International Standard Industrial Classification), the eight sectors are: agriculture, food processing, energy, basic products, light industry, equipment, construction, and trade and services.

The final demand part (second quadrant) of the input-output table is divided into five sectors: private consumption, public consumption, total investment (including stocks), exports and imports (expressed as negative values). Of these, the commodities comprising the export and import vectors are classified according to ISIC.

Methodological problems in constructing the table

The construction of the input-output table for China presents two methodological problems: (a) the comparability of the principles of the Chinese economic statistics with those of the System of National Accounts (SNA) [2]; and (b) the comparability of China's industrial classification system with the one used in most other countries and applied in defining the other eight sector tables prepared for the UNITAD Model.

Most regional input-output tables of UNITAD (excepting the table for the centrally planned economies of Europe) are based on input-output tables for individual countries, all of which organize their economic statistics according to the rules of the System of National Accounts recommended by the United Nations. Countries with centrally planned economies use the Material Product System (MPS) [3]. The major difference between those two systems is the treatment of the so-called "non-productive" activities, which include all public services and a majority of private services, including most activities in trade and in personal transportation. The non-productive activities in the SNA system are treated in the same way as other economic activities. Thus the value-added created in these activities is a component of gross domestic product, which is the aggregate measure of the level of economic activity in a given country. In centrally planned economies, however, no value is created by the non-productive activities; they make no contribution to the net material product of the country and would thus not be considered in the input-output tables.

China uses a statistical concept which is close, if not identical, to the MPS system. However, the present statistical system has its own characteristics reflecting its formation and development in the context of China's industry and its economic system. Statistical indices also differ, both from the ISIC system used by the majority of market economy countries and from the systems used by certain centrally planned economy countries.

These differences are particularly evident in the treatment of gross agricultural product which in China generally includes five component parts: agriculture (cultivation), forestry, animal husbandry, sideline products, and fishing. In sideline products, the industrial output of China's rural production brigades is particularly important. Enterprises owned by rural communes, production brigade and small-town collectives are divided, according to their nature and their products, into five main sectors: cultivation, fishing and animal husbandry, industry, construction, transport, trade and services.[4/] Each of these main sectors can be further divided into various industries. For instance, the industrial sector can be divided into industries such as metallurgy, power, coal and coke, petroleum, chemicals, engineering, construction materials, forestry, food, textiles sewing and leather, paper making, culture, education and sports, handicraft, weaving and embroidery. In China's statistics, the enterprises of rural communes and production brigades can also be divided according to their size and ownership: commune enterprises can be treated under industrial statistics but production brigade enterprises are included in the statistics of gross agricultural product.

Since China's gross agricultural product includes the output of rural production brigades, and since the industrial enterprises of production brigades include a great variety of the products mentioned above, data on gross agricultural product cannot be used directly as the agriculture section of the input-output table. "Agriculture" is also not agriculture in a strict sense, since it involves many aspects of the rural economy. Taking conditions in 1975 as an example, sideline production was 9.1 per cent of total gross agricultural product. Similarly, industrial output of production brigades was 6.4 per cent of the gross agricultural product. By 1979, the share of industrial product of rural production brigades had nearly doubled, reaching 12.5 per cent of gross agricultural product. Conversely, in 1980, the share of the industrial output of rural production brigades in the gross industrial product of rural communes and production brigades was 42.1 per cent.

This example of gross agricultural product is only one difficulty. There are many others. To prepare the input-output table, adjustments to reconcile China's statistics with the desired framework affect almost all sectors.

The input-output table

Following a detailed analysis of individual statistical difficulties outlined above, final adjustments to achieve a balanced input-ouput table were made by means of the RAS method [4]. This is a well-known technique for reconciling row and column totals of input-output tables when these are separately estimated. The completed table is given in table 1.

Two sets of coefficients, derived from table 1, are also presented. Table 2 gives the technical coefficients, or direct input coefficients. Thus element a_{ij} shows the input required from sector i for a unit of output of sector j. Each of the column totals for each sector is therefore equal to unity. Table 3 shows the so-called Leontief inverse where each element incorporates the direct and indirect effects of final demand on production. Thus element c_{ij} of the Leontief inverse shows the total output of sector i needed to meet a unit of final demand for sector j. The matrix is obtained by subtracting the technical coefficient matrix A from the identity matrix (in which the diagonal elements equal 1 and all other elements are zero) and then inverting the result. The Leontief inverse is used in the well-known equation

$$X = (I - A)^{-1}D$$

where X is total output, $(I - A)^{-1}$ is the Leontief inverse and D is final demand. However, when imports are included in the inter-industry transactions (as in the present case) then the Leontief inverse would over-estimate the effects, since it would imply links between the sectors that may not exist domestically.

Table 1. Input-output table for China in 1975 (after RAS)
(Millions of dollars using 1970 constant prices)

Producing sector	Receiving sector: Agriculture	Food processing	Energy	Basic products	Light industry	Equipment	Construction	Trade and services
Agriculture	8 426	6 590	92	126	5 921	61	74	251
Food processing	292	1 666	0	141	218	62	46	105
Energy	1 157	816	3 268	3 303	1 810	2 093	1 535	2 489
Basic products	1 101	729	1 696	11 374	1 566	11 635	9 848	613
Light industry	1 151	1 626	939	535	14 021	733	962	1 110
Equipment	847	1 198	2 107	3 527	2 422	8 148	2 893	4 229
Construction	502	601	795	1 589	1 183	1 266	634	700
Services	903	1 691	2 009	2 753	2 752	2 217	2 304	1 015
Total	14 379	14 917	10 906	23 348	29 893	26 215	18 296	10 512
Value added	45 475	5 871	10 236	15 463	12 970	16 292	5 371	15 560
Total input	59 854	20 788	21 142	38 811	42 863	42 507	23 667	26 072

Producing sector	Final demand: Total intermediate output	Private consumption	Public consumption	Investment	Exports	Imports	Total	Total output
Agriculture	21 541	35 550	119	2 317	1 922	1 595	38 313	59 854
Food processing	2 529	16 092	112	1 955	909	809	18 259	20 788
Energy	16 470	1 370	653	937	1 712	0	4 672	21 142
Basic products	38 562	357	86	3 573	704	4 471	249	38 811
Light industry	21 078	14 010	3 563	2 529	1 737	54	21 785	42 863
Equipment	25 372	1 073	1 513	15 018	87	557	17 134	42 506
Construction	7 269	491	360	15 547	0	0	16 398	23 667
Services	15 644	4 866	3 934	1 435	193	0	10 428	26 072
Total	148 465	73 809	10 340	43 311	7 264	7 486	127 238	275 703
Value added	127 238	0	0	0	0	0	0	0
Total input	275 703	0	0	0	0	0	0	0

Table 2. The technical coefficient matrix A for China, 1975
(a_{ij}, Input per unit of output)

Producing sector i	Receiving sector j: Agriculture	Food processing	Energy	Basic products	Light industry	Equipment	Construction	Services
Agriculture	0.14078	0.31701	0.00434	0.00326	0.13814	0.00143	0.00313	0.00961
Food processing	0.00488	0.08016	0.00000	0.00363	0.00507	0.00145	0.00193	0.00402
Energy	0.01932	0.03923	0.15458	0.08510	0.04222	0.04924	0.06487	0.09546
Basic products	0.01840	0.03506	0.08020	0.29306	0.03654	0.27373	0.41610	0.02352
Light industry	0.01924	0.07822	0.04441	0.01378	0.32712	0.01725	0.04066	0.04257
Equipment	0.01416	0.05764	0.09967	0.09087	0.05652	0.19168	0.12223	0.16222
Construction	0.00838	0.02892	0.03759	0.04094	0.02760	0.02978	0.02677	0.02684
Services	0.01508	0.08133	0.09505	0.07095	0.06419	0.05215	0.09737	0.03893

Source: Table 1.

Table 3. Leontief inverse $(I - A)^{-1}$ for China, 1975
(c_{ij}, Output per unit of final demand)

Producing sector i	Receiving sector j: Agriculture	Food processing	Energy	Basic products	Light industry	Equipment	Construction	Services
Agriculture	1.17443	0.43383	0.02940	0.02414	0.25387	0.02160	0.03353	0.03290
Food processing	0.00701	1.09225	0.00325	0.00816	0.01180	0.00592	0.00783	0.00691
Energy	0.04447	0.12138	1.25891	0.20663	0.13975	0.16901	0.21689	0.17183
Basic products	0.06865	0.19827	0.29507	1.60165	0.22509	0.60879	0.81148	0.20546
Light industry	0.04334	0.16946	0.11235	0.07078	1.52777	0.07457	0.12119	0.09768
Equipment	0.04730	0.17494	0.24386	0.25880	0.19656	1.37482	0.33649	0.28193
Construction	0.01859	0.06361	0.07688	0.09036	0.07103	0.08082	1.09033	0.05754
Services	0.03583	0.15314	0.17555	0.16766	0.15533	0.15026	0.21936	1.10142

Source: Table 2.

The input-output structure

Tables 1, 2 and 3 are capable of providing a considerable amount of information - not just on inter-industry relationships in China in 1975, but also on the structure of the traditional national accounting concepts of value added and final demand. With due regard to some observations to be made in the concluding section of this paper, which are comments on some statistical differences compared to other sources of information on China's economy in that year, the main features of the Chinese economy as seen through the input-output table can be summarized as follows.

Final demand

The column totals of the second quadrant in table 1 give aggregates for the components of final demand, i.e. private consumption, government consumption, investment, exports and (negative) imports. Together they sum to GDP. Of the total, they form the following percentages: private consumption, 58.0; government consumption, 8.1; investment, 35.0; exports, 5.7; and imports 5.9. This represents an MPS-type approach to the table: part of private services and all public services are excluded, the shares of public and private consumption are therefore low, and the share of investment is consequently high. Another source gives the share of gross fixed capital formation in GDP for 1974 as 25.5 per cent [5]. However, the investment figure from the table (35.0 per cent) must be taken as including net additions to stocks, which in centrally planned economies can be very high.

The export and import shares of GDP are very low, indicating the lack of openness of this economy, at least in the observation year.

Value added

The breakdown of value added given by the input-output tables gives a percentage distribution of GDP as follows: agriculture, 35.7; food processing, 4.6; energy, 8.0; basic products, 12.2; light industry, 10.2; equipment, 12.8; construction, 4.2; and services, 12.2. The low share of services reflects the MPS approach: a similarly constructed table for eastern Europe, however, shows a share there of 18.4 per cent. Nevertheless even a correction for the missing services would still leave a very high share in GDP for agriculture - one characteristic of a developing economy.[5/]

Tentative indications are that transforming the structure of value added to reflect the missing services might yield an agricultural share of 28 per cent, with other shares as follows: food processing, 3.6; and services, 30 per cent.[6/] The purpose of doing this is to see to what extent the structure of value added in China differs from that in other developing regions that use SNA accounting. On this basis, the agricultural share is in fact a good

deal lower than that of the Indian sub-continent (42.7 per cent) and much nearer to that of South East Asia (24.1 per cent). The share also contrasts with the concentration of the labour force in rural communes in China (78.5 per cent in 1975). There are of course differences in productivity between agriculture and non-agriculture. In addition rural commune output includes non-agricultural output. It must be remembered, however, that each sector's share of total output depends on the relative sector prices as well as the physical output: what may be regarded as a low share of agriculture could be explained by low (relative) prices for agricultural products.

It is not possible from the eight-sector classification to derive a manufacturing value added total explicitly. This is because some manufacturing is found in the energy sector (oil refining) and because non-energy mining is included in the basic products sector. However, the revised shares of value added given above can be aggregated to yield the following pattern: agriculture, 28 per cent; industry, 42 per cent; and services, 30 per cent.[7]

Inter-industry structure

It is beyond the scope of the present paper to carry out a detailed examination of the inter-industry structure of China as disclosed by the input-output table and in particular by the technical and Leontief inverse coefficients. A summary analysis may be made, however, by calculating so-called backward and forward linkages.[8] A sector is said to have high backward linkage if the ratio of intermediate inputs to total inputs is above average, and high forward linkage if the ratio of intermediate to total outputs is above average. This considers the degree to which a sector is linked to others, either as a consumer of their output or as a supplier of inputs to them.

The measures of backward and forward linkage used are those of Chenery and Watanabe ([8], pp. 487-521):

$$U_j = \frac{\sum_i x_{ij}}{X_j}$$

$$W_i = \frac{\sum_j x_{ij}}{X_i + M_i}$$

where

U_j = backward linkage of sector j
W_i = forward linkage of sector i
x_{ij} = total flow from sector i to sector j
X_j = domestic input or output of sector j
M_i = imports of type i

Thus U_j is the ratio of intermediate to total inputs, and W_j the ratio of intermediate to total output. It can be seen that U_j will be equal to 1 minus the total of technical coefficients for the column in question, which is again equal to 1 minus the ratio of value added to output of that sector.

Table 4. Backward and forward linkages in China's economy, 1975

Sector	Backward linkage (U)	Forward linkage (W)
Agriculture	0.240	0.351
Agro-food	0.718	0.117
Energy	0.516	0.779
Basic products	0.602	0.891
Light industry	0.697	0.491
Capital goods	0.617	0.589
Construction	0.773	0.307
Services	0.403	0.600
Average	0.462	0.449

Source: Tables 3 and 4.

Applying these measures to the table for China yields the figures given in table 4 for each of the eight sectors. The average figures refer to the economy as a whole and are the weighted averages of the individual sectoral linkages:

$$\text{Average } U = \frac{\sum_{i,j} x_{ij}}{\sum_{j} X_j} \qquad \text{Average } W = \frac{\sum_{i,j} x_{ij}}{\sum (X_i + M_i)}$$

These averages show how individual sectoral linkages compare with one another. Taking the four-way classification, it can be seen that agriculture is the only sector with low backward and forward linkages. This is characteristic of a relatively underdeveloped state. The intermediate inputs to this sector (e.g., in the form of chemicals) are at low levels, and the forward linkages are also weak. Both linkages can be expected to increase as development takes place. Sectors with high linkages are energy, basic products, light industry and capital goods. These form an interdependent complex. The sectors, which include all manufacturing apart from food processing, act as consumers of each other's output to such an extent that transactions between and within these four sectors alone amount to over 46 per cent of total intermediate activity, and 25 per cent of all activity (intermediate and primary or final).

The capital goods sector, however, might be thought to have too high a forward linkage. Machinery and equipment intended for investment purposes should be treated as an entry in the investment column (i.e. in final demand) irrespective of the investing sector and thus one would expect forward linkage of this sector to be low. It is possible that this results from using a broad definition of capital goods, and the extensive use of handtools for small-scale production.

The remaining part of manufacturing, agro-food, shows high backward but low forward linkage. The first characteristic is explained by its heavy dependency on the agriculture sector for its inputs, and the second by the final nature of its products: they go overwhelmingly to private consumption, which absorbs 80 per cent of its output. Intermediate use, and thus forward linkage, is low. Another sector with similar characteristics is construction: this activity needs significant inputs from other sectors, but it delivers mainly to final demand, where it is treated as investment. The intermediate output of this sector, whose low level results in low forward linkage, can be taken as reflecting repair and maintenance activities.

Finally, the service sector is seen as one which has low backward and high forward linkage. It thus exhibits very characteristic features for China; the exclusion of non-material services, already referred to, has not affected this broad classification.

Conclusion

One conclusion with respect to the input-output table presented here has already been mentioned: the fact that the different sectoral classifications used in China have made the conversion of data to a form suitable for the input-output table very difficult, in particular the separation of non-agricultural activities in rural areas. Estimating the diagonal element in the agricultural sector (the use of agriculture output by agriculture itself) is a problem in almost every country, since tracking down the use of agricultural products in agriculture at the farm level is a large task. The particular statistical difficulties of Chinese agriculture already referred to would exacerbate the problem. It would be better for analytical purposes to eliminate this element in the table, as indeed is often done in other countries.

A second point is that the absolute values given in table 1 should be treated with a certain amount of caution, since the conversion to 1970 United States dollars has been carried out by applying the official exchange rate for 1975, with the assumption of no domestic inflation in China between 1970 and 1975. Even if this latter assumption is correct, relative price changes for the sectors may still have taken place.

Notes

1/ The team was led by Professor Chen Li, and included Chen Yuan, Ge Wei, Li Po-Xi, Wang Hui-Jiong, Yuan Jia-Xin.

2/ China's role in this region, looking from any aspect, is considerable. In foreign trade, in 1975, the gross export value of Chinese commodities accounted for 93.18 per cent of the gross export commodity value of the region; the gross import commodity value accounted for 89.61 per cent. Consequently, the accuracy of China's input-output table is of crucial importance to the process of preparing the Centrally Planned Asia region's input-output table.

3/ The sectors are defined in terms of ISIC codes as follows:

Agriculture:	111, 112, 113, 121, 122, 130, 1, 3132
Agro-food:	311/2, 313, 314
Energy:	210, 220, 353, 354, 410, 420
Basic products:	230, 290, 341, 351, 352, 361, 362, 369, 371, 372
Light industry:	321, 322, 323, 324, 331, 332, 342, 355, 356, 381, 390
Equipment:	382, 383, 384, 385, 390
Construction:	500
Services:	6, 7, 8, 9

4/ Judging from the incomes of the enterprises, the shares of the five sectors in the gross income of the rural communes and production brigade in 1980 are: cultivation and fish and animal husbandry, 6.5 per cent; industry, 76.3 per cent; construction, 7.5 per cent; transport, 4.1 per cent; commerce and services 5.6 per cent.

5/ According to Rawski, [5] China's 1974 GDP (valued at 1957 constant Yuan and probably not including the non-productive services) had the following structure: agriculture, 25.2 per cent; industry and transport, 52.1 per cent; construction, 5.2 per cent; and services 17.4 per cent.

6/ The transformation has been carried out by estimating the share of non-productive services in public and private consumption, leading to a revised estimate of total output for services as a whole which is then adjusted by removing estimated intermediate inputs to give a new valueadded. The proportions used derive from other developing regions.

7/ One independent source gives a breakdown for 1975 as follows: agriculture, 37 per cent; industry, 38 per cent; and services, 32 per cent. Another source ([6] p. 364) gives 23 per cent, 45 per cent and 32 per cent respectively. The shares given by the input-output table, although on a later price base, thus lie between these two estimates, which are based on prices from the 1950s.

8/ In contrast to the original concept, empirical study through input-output data tends to concentrate on existing linkages, rather than the potential ones that Hirschman discussed [7].

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USE OF INPUT-OUTPUT MODELS IN THE PREPARATION OF PRICE REFORM IN CHINA

Jiri Skolka*

Introduction

In the late 1970s, after almost three decades of strict central planning and after the turbulent period of the Cultural Revolution, the Chinese leadership faced serious economic problems. The share of investment and of heavy industry in the domestic product was too high, consumer goods supply low, housing was short and there was a lack of modern technology. To overcome these difficulties, policies of "readjustment, restructuring, consolidation and improvement" were inaugurated in 1979. Their short-term effects were impressive: outputs of agriculture and the consumer goods industry were raised,[1] equilibrium in the consumer goods market was approached and imports and exports were balanced. In addition, the unemployed in cities are being absorbed in a kind of informal sector of small private and co-operative enterprises. At the same time, there are still difficulties in co-ordinating and rapid completion of the large number of investment projects; there are also severe bottlenecks in energy and transportation.

Planning in China

Most of the present economic difficulties of China are due to the existing economic management system. This is not of original Chinese design but was modelled after the Soviet one adopted during the Stalin era and is characterized by overcentralization.[2] In the coming years, this highly centralized economic system should be changed into a relatively decentralized one, in which plan directives and market signals complement each other.[3] The new system is at present only roughly designed. Discussion is still going on,

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and a full implementation of the reform of economic management is envisaged for the second half of the 1980s. Important (and successful) decentralization measures have already been adopted in agriculture. In industry rather modest decentralization experiments are being carried out in a large number of enterprises.[4] One of the main obstacles to more profound changes however are the existing prices, which reflect neither relative costs nor relative scarcities. Enterprise losses or profits say nothing about their efficiency, and relative prices cannot guide decisions on output volumes. Evaluation of investment projects is also impossible.

Profound price distortions exist not only among individual products, but also at aggregate sectoral levels, i.e. between agriculture and industry, and, within industry, between basic and final products. The terms of trade between agriculture and industry were in fact much worse in 1950 than in the pre-war period. The position of agriculture improved up to 1957, but worsened again afterwards.[5] It improved again in recent years with prices of agricultural products increased by 6 per cent in 1981, 7 per cent in 1980, 22 per cent in 1979 and 4 per cent in 1978.[6] This price shift, together with simultaneous decentralization of decision-making in agriculture, had a very positive effect on the level of agricultural production, with the result tnat Chinese cities now have a sufficient supply of food.

Large differences between prices of basic and final industrial products are an old Chinese legacy.[7] They are caused mainly by profound differences in profit (and also tax) rates. In the state-owned industry, profits and taxes amount on average to about two-thirds of value-added, wages to about one quarter. In 1979, the average return on capital in state industry was 12.3 per cent, but deviations from this average were large. For example, the profit rate for watches was 61.1 per cent and for chemical fertilizers 1.4 per cent.[8]

Some changes in this irrational price structure have already been carried out, for example prices of coal and of steel were increased in 1979. But prices of industrial products are interdependent; unco-ordinated price shifts may not always give the expected results and may even start an inflationary spiral. It was soon clear that a systematic price reform must be carried out. In the broad discussion[9] of both theoretical and practical aspects of such large scale adjustment of prices two topics are of particular interest: shadow prices and input-output.

Decisions on investment cannot be postponed until the new price system is put into operation. In the meantime, shadow prices (at least for key items like labour, building materials, energy, large machines etc.) should be used in the evaluation of investment projects, but it is not clear how to determine them. Methods applied in developing countries[10] assume that the country is a market economy and that price distortions are due to government interventions in foreign trade relations. But this is not the case for China, where distortions are caused by the command economy system in fixing domestic prices. Another type of shadow prices could be pro-

vided by an economy-wide optimization model, but this cannot by constructed quickly for lack of both data and experience in this field. China could borrow prices from other countries and recalculate them by a (shadow) exchange rate into domestic prices. But price relations are different in different countries[11/] and it is not clear which foreign prices would best reflect the relative production costs and the relative scarcities in China.

The approach to price reform follows roughly the lines of similar actions carried in the past in some countries in central Europe, in particular in 1967 in Czechoslovakia and during the 1970s in Hungary. Discussion concentrates now on the choice of a theoretical price formula, that is on the choice of a rational principle according to which value-added, or surplus value, or profits, should be distributed among industries. Attention is given in particular to the so-called production price (the terminology used is based on Marx treatment of the transformation problem[12/]), i.e. to a price at which the rate of profit on capital is uniform in all industries[13/]. (The production price is also an equilibrium price in a market economy in which all markets are cleared and capital is the only scarce factor). In order to see what would be the consequences of introducing (implementing) prices determined according to a certain theoretical principle, it was decided to estimate them quantitatively. Artificial (i.e., shadow) input-output prices, used under similar circumstances in a few centrally planned economies, are well suited for this purpose. In order to understand the nature and the purpose of research now going on in China, the theory of artificial input-output prices will be briefly explained.

Artificial input-output prices

The input-output model has the following two basic forms:

(1) A single model for volumes:

$$(I-A)X = Y \tag{1a}$$

or

$$(I-A)^{-1}Y = X \tag{1b}$$

(2) A dual model for prices:

$$p'(I-A) = f'A_v \tag{2a}$$

or

$$f'A_v(I-A)^{-1} = p' \tag{2b}$$

where

X = a vector of gross output values

Y = a vector of final demand

p = a vector of product prices

f = a vector of prices of production facotrs

A = a matrix of input coefficients

A_v = a matrix of input coefficients for production factors

For the calculation of various types of artificial input-output prices, additional data are needed:

(a) A matrix B of capital-output ratios which are defined as

$$b_{ij} = \frac{B_{ij}}{X_j} \tag{3}$$

where B_{ij} = capital goods produced in industry i and used in industry j;

(b) A vector l of labour-input coefficients, which is defined as

$$l_j = \frac{L_j}{X_j} \tag{4}$$

where L_j = employment in industry j;

(c) A vector c of consumption per unit of labour, the elements of which are defined as

$$c_i = \frac{\bar{C}_i}{L} \tag{5}$$

where

$\bar{C}_i$ = private consumption of the output of industry i

L = total employment

(d) A matrix C combining the data on the pattern of private consumption and on labour inputs by industry, defined as follows:

$$C = c \cdot l' \tag{6}$$

(e) A scalar ω, which is the wage rate, uniform in all industries.

That these elements are sufficient for calculating most types of the artificial input-output prices will be demonstrated using the example of the production price.[14/] The production price assumes a uniform rate of profit on capital in all industries. A few

slightly different formulations (depending on the definition of capital in particular of the circulating capital) are possible. One of them is as follows:

$$p' = p'A + \omega l + \gamma p'B \qquad (7)$$

the production price is thus composed of material costs p'A, wage costs $\omega l'$ and profits, defined as the value of capital p'B multiplied by the profit rate γ.

It is assumed that material inputs, consumer goods and capital are valued at the new artificial input-output prices p'.

If there is equilibrium between employment, wages and total private consumption in the given commodity composition, this means that

$$\omega = p'c \qquad (8)$$

Substituting in Eq. (7) gives

$$p' = p'A + p'C + \gamma p'B \qquad (9a)$$

or

$$\gamma p'B = p' - p'A - p'C \qquad (9b)$$

whence

$$p' = \gamma p'B\ (I-A-C)^{-1} \qquad (10)$$

With the definition

$$\lambda = \frac{1}{\gamma} \qquad (11)$$

Eg. (10) becomes

$$\lambda p' = p'B\ (I-A-C)^{-1} \qquad (12)$$

Solving the equation

$$\left|I\lambda - B\ (I-A-C)^{-1}\right| = 0 \qquad (13)$$

gives for λ the maximum left-hand characteristic root (eigenvalue) of the matrix $(I-A-C)^{-1}$. The related eigenvector is the vector p of the price indices for repricing the original flow table into the artificial input-output production prices. If these price indices are used directly for such repricing, levels of various aggregate measures of economic activity are changed. The general price level can then be fixed by an additional exogenous rule; e.g. that total gross output, total value added (GDP) or total private consumption has the same level after repricing with the artificial input-output prices as in the input-output table before repricing.

Several different types of artificial input-output prices can be derived by this procedure. Since material, labour and capital are the basic inputs into the production, the following three types of artificial input-output prices are building elements, from which various solutions can be:

(a) Material value price: in this type of price, the profit rate is distributed among industries according to the material inputs. (One could imagine such pricing in a small family enterprise, where profit is surcharged on material costs and includes also the income of the self-employed and return on capital). The formula of the material value price is as follows:

$$p'_1 = (1 + \alpha)p'_1 A \tag{14}$$

the equation is solved for λ_1, which is the maximum eigenvalue of the matrix A, and the profit rate is given by:

$$\alpha = \frac{1}{\lambda_1} - 1 \tag{15}$$

(b) Labour value price: the profit rate β is distributed among industries according to the wage costs. The formula of the value price is as follows:

$$p'_2 = \beta p'_2 C(I-A)^{-1} \tag{16a}$$

or, if $\omega = p'_2 \cdot c$

$$p'_2 = p'_2 A + \beta\omega l' \tag{16b}$$

The equation is solved for λ_2 which is the maximum eigenvalue of the matrix $C(I-A)^{-1}$. The profit rate is then given by

$$\beta = \frac{1}{\lambda_2} \tag{17}$$

(c) Capital value price: the profit rate γ is distributed according to the capital used by industries; it also includes wages. The formula of the capital value price is as follows:

$$p'_3 = p'_3 A + \gamma p'_3 B \tag{18a}$$

or

$$p'_3 = \gamma p'_3 B (I-A)^{-1} \tag{18b}$$

The equation is solved for λ_3, which is the maximum eigenvalue of the matrix $B(I-A)^{-1}$. The profit rate is given by:

$$\gamma = \frac{1}{\lambda_3} \tag{19}$$

The general form of the artificial input-output price considers the three alternative bases for the distribution of profits simultaneously: a part of the profits is proportional to material costs, a part to wage costs and a part to capital value. This artificial input-output price is also called the three-channel price[15] and is defined by the following equation:

$$p'_0 = \alpha p'_0 A + \beta p'_0 C + \gamma p'_0 B \qquad (20)$$

The values of the parameters α, β, and γ must be in the range between zero (or one) and their maximum values given by equations (15), (17) and (19) above. If one of the three parameters has its maximum value, the other two parameters must be equal to zero. Two of the parameters can be fixed exogenously within the given intervals, and the third one calculated. (Nevertheless not all combinations of the two exogenous parameters allow for a positive value of the third one.)

A variant of three-channel prices frequently found in the literature of centrally planned economies, is the two-channel price. One of the three parameters is exogenously fixed at its minimum level (zero or one), one is determined exogenously and the third one calculated. Among the six possible combinations for the three parameters, the following, in which profits are distributed partly in relation to the value of wages and partly in relation to capital, is the most interesting:

$$p'_{23} = p'_{23} A + \beta p'_{23} C + \gamma p'_{23} B \qquad (21)$$

If the value of β is fixed exogenously, the equation can be then solved for its given value:

$$p'_{23} = \gamma p'_{23} B(I-A-\beta C)^{-1} \qquad (22)$$

the solution for λ_{23} is the maximum eigenvalue of the matrix $B(I-A-\beta C)^{-1}$ and

$$\gamma = \frac{1}{\lambda_{23}}$$

If β is fixed equal to 1.00, γ reaches its maximum value given by Eq. (19), so that the two-channel price is a pure capital value price as defined by Eq. (18). If a profit rate on wages, however small, is introduced, the value of γ declines sharply. Wages, not considered in the capital value price, enter into the production costs. As β increases, γ declines. When β reaches its maximum value as given by Eq. (17), γ is equal to zero and the two channel price degenerates into pure labour value price. The general formula of the three-channel price thus offers a broad scope for simulations or introducing artificial input-output prices. In such calculations, the assumptions concerning the parameters α, β, and γ can be related to tools used in economic management, e.g. various profit or tax rates.

Preparations for calculating artificial input-output prices in China

The theory of artificial input-output prices, as outlined above, is the basis for the empirical work now going on in China. Its centre is a team of some 40 economists at the Price Research Institute of the State Council, which was established in mid-1981. The ultimate goal is to prepare an economy-wide price reform but, as it seems at the moment, this will probably be implemented by successive steps and not as an instantaneous reconstruction of the whole price system. The immediate goal of the work now under way is to analyse empirically the likely consequences of choosing certain types of price.[16]

The work is severely restricted by data availability. China does not have an imput-output table suitable for the construction of theoretical price models. The relatively outdated table for 1971 is in physical terms and is broken down by 61 product groups.[17] A more recent input-output table in value terms is too small for such a purpose.[18] A special compilation of data needed for the price calculations was therefore organized. Information was obtained using special questionnaires from the accounting files of some 10,000 enterprises (a sample from around 350,000 medium-size and large enterprises, i.e., independent accounting units). A detailed breakdown of costs was requested, in particular of material costs, for 1,000 products or product groups. Financial reports of the enterprises provided data on the gross and net value of fixed capital and on the circulating capital. (Fixed capital was allocated to particular products according to the depreciation allowances, and circulating capital according to the breakdown of stocks of unfinished products.) The data were collected and checked in the autumn of 1982 by the Price Research Institute. Some minor methodological problems still remain open. For example it is not yet decided whether items such as interest on bank loans, bonuses of workers and staff, welfare fund contributions or insurance premiums should be included in production costs or in profits, or if the artificial input-output prices should include taxes or not.

Once the data are checked, a matrix of input coefficients A, a matrix of capital-output ratios B and a vector of labour input coefficients l, reflecting a recent (i.e. roughly 1981) production technology, broken down by 1,000 product groups, will be constructed. The products covered by the matrix represent a substantial part of the output of the Chinese economy. (Goods for own consumption were, however, systematically excluded.) This data will then allow calculation of alternative artificial input-output prices. One focus will be on the production price, others on variants of the two channel price and the consequences of alternative profit and tax rates related to capital and labour inputs. For example, a two-channel wage-capital price will be tested under the constraint that 30 per cent of total profits is related to wages and 70 per cent to capital. The labour value price will be investigated for agriculture, which is labour-intensive and uses little capital. Little attention will be given to the material value price. The calculations are planned for the first half of 1983.

Future problems in preparing the price reform

Calculations of several types of artificial input-output prices will be an important phase in preparing the general price reform in China. The use of models and computers will make the discussion about prices more realistic and future decisions on changes of prices better founded. However, artificial input-output prices cannot solve all problems of price formation.

In China, the revision of the whole price system will be an important element of the general reform of the system of economic management. Parameters used to calculate artificial prices must be consistent with the economic policy tools, such as tax or profit rates that the reform of the management system will introduce. But economic reform is now under discussion and its final shape is not yet fixed. The work on price and management reform should therefore be co-ordinated: calculation of artificial input-output prices may help, for example, to select some tools of economic policy.

The validity of data used in the calculations can be limited. Even if data submitted in 1982 by enterprises are accurate, they still may not reflect those production costs that in the Marxist literature are called socially determined or socially appropriate costs. If incentives are changed by economic reform, then enterprises could put much more effort into reducing material imputs, raising labour productivity or improving capacity utilization. Reduction of various inputs per unit of output will probably be different in various industries and could be increased by shifts in relative prices caused by the price reform (for example energy savings may be stimulated by higher energy prices on one hand and wage bonuses related to cost reductions on the other). Most of such effects would no doubt be beneficial for the economic development of China. But they would quickly outdate the coefficients used in price calculations and thus create conditions for relative prices different from those originally calculated.

Two other open questions also relate to the concept of socially determined costs. One is the choice between marginal and average costs (the input-output price model considers average costs only), and consequently price differentiation among enterprises (e.g. between small, middle and large ones) and, what is very important in a country of the size of China, among regions. Another problem is the relation between domestic prices and prices earned for Chinese exports or paid for Chinese imports. Although the volume of Chinese foreign trade is small in relation to the total output, China may soon increase both its involvement in joint ventures with foreign firms and its participation in certain stages of processing of manufactured products.[19] It would therefore be useful to fix a uniform realistic exchange rate for the Chinese currency and to apply it generally in the pricing of traded goods. However, foreign trade prices may differ strongly from domestic prices. This is certainly the present situation and it is not clear how far the future price reform will reduce discrepancies between domestic and world market prices.

The input-output price model does not properly consider equilibrium between supply and demand. It assumes that it exists and that new prices would not change the structure of demand, both final and intermediate. In the substantial price reform, short-term market disequilibria will not, of course, be taken into account: they will probably be left for the market to remove. But certain bottlenecks are real obstacles to further economic growth (e.g. in energy and transportation) and will need more time to be overcome. Also some permanent disequilibria on the consumer goods market could be solved by differentiation of tax rates. The Chinese tax system has all important elements used in other countries. An indirect turnover tax is paid by enterprises but with different rates for raw material and energy (around 5 per cent) and manufactured products (between 10 and 20 per cent). Because the burden of the turnover tax accumulates over successive stages of manufacturing as semi-finished products pass from one enterprise to another, the advantages of value-added tax are being studied. At present cigarettes are taxed at 40 per cent and alcohol at 50 per cent and a progressive income tax is levied on the net income of small private and co-operative shops.

Taxes, however, cannot alone secure long-term equilibrium between supply and demand for exhaustible energy or raw materials. Prices of such products should take into account not only the existing situation, but also future markets, future technology and future substitution possibilities. Determination of prices of exhaustible resources is a typical problem for long-term planning, and it can be based on solid theoritical foundations.[20] Scarcity may also be considered in the formation of prices for agricultural products: land in China is in short supply (0.09 hectares per capita).[21]

Again, the input-output model cannot help in understanding price dynamics. Like other countries, China would like to have stable prices. But some Chinese economists, who are aware of the price effects of differential productivity growth rates, of the dangers of structural disequilibria (in particular in the readjustment period) and of the consequences of deficits of state budgets and excessive money creation, admit that a slow increase in the overall price level cannot be avoided. Price stability will also depend on the mix of various levels of freedom in the price formation. Most prices are now fixed by administrative decisions, which may also define ranges in which prices of some products may fluctuate (floating prices). Some prices are agreed in consultations among enterprises, some are negotiated between the seller and the buyer. Prices on local markets (rural fair prices) are free.

Overall price reform in China will most probably be implemented in several stages. At any rate it will be an integral part of the profound reform of the system of economic management which should be finalized in the second half of the 1980s. Only after a few years of working of the new system will it be possible to judge if China has succeeded in solving the contradiction between central administration of prices, on one hand, and a flexible and rational price development on the other. Until now no centrally planned economy

has been able to create a system of economic management that would endogenously create prices that could serve as a reliable basis for economic decisions.[22] In trade among the centrally planned economies the reference price bases are not their internal prices, but five-year moving averages of the world market, i.e., capitalist prices. Hungary, which has been rather successful in improving its system of economic management by a skillful combination of planning and market decisions, at first relied on input-output calculations in shaping its prices. But it is now becoming more and more dependent on foreign trade prices and less on internal factors. (In 1980 Hungary introduced a uniform, realistic exchange rate for its currency and is using it to recalculate relations between domestic and foreign prices). Any small country dependent on foreign trade must adjust its prices to developments in the world market. But such a wide import of prices as that practiced by Hungary is hardly possible for a country of the size of China. China faces the problem, unresolved until now, of how to design a system of economic management that would combine planning and aspects of a market economy and would also produce endogenously, in daily economic life, prices that would meet both the requirements of economic theory and the practical needs of economic policy making.

Notes

1/ The share of heavy industry in total industrial output declined from 56.9 per cent in 1979 to 48.6 per cent in 1981. F. Levcik, "Die chinesische Wirtschaft nach der Kulturrevolution", Wirtschaft und Gesellschaft, No. 3, 1982, pp. 663-678.

2/ Xue Muquiao, China's Socialist Economy (Beijing, 1981), p. 204.

3/ Tian Jianghai and Li Guang'an, "How should an overall balance be attained in planning the national economy?", Social Sciences in China, No. 3, 1981, p. 13.

4/ The experimenting enterprises produce 60 per cent of the total output of the state-owned industry. H.G.J. Kosta, Die gegenwärtigen Reformdebatten chinesischer Oekonomen" (Frankfurt, Johann-Wolfgang-Goethe Universität, June 1982).

5/ Huang Da, "Some problems concerning pricing", Social Sciences in China, No. 1, 1981, pp. 136-156.

6/ Products delivered over planned targets are paid an additional premium (grain 30 per cent, cotton 50 per cent). Consumer prices of the (mostly rationed) cereals remained stable, prices of some other foods (for example meat, eggs, milk) were increased by 20 per cent. This increase in the costs of living was compensated by a salary supplement of 5 yuan renmin bi per month. (The cost of living index increased according to official figures by 1.7 per cent in 1979 and by 5 per cent in 1980; it is, however,

estimated that the increase in the urban areas was over 10 per cent.) See A. Chieng, "L'inflation en Chine: Un bien ou un mal", Chroniques d'actualité de la S.E.D.E.I.S., No. 10, 1981, pp. 641-645.

7/ Huang Da, loc. cit.

8/ The return was high for industrial rubber (49.4 per cent), knitted goods (41.1 per cent), bicycles (39.8 per cent), paints and dyestuffs (38.4 per cent), petroleum (37.7 per cent), crude oil (34.1 per cent), sewing machines and pharmaceuticals (33.1 per cent for both). It was low for coal (2.1 per cent), shipping (2.8 per cent), cement (4.4 per cent), semi-mechanized agricultural tools (3.1 per cent), lumber (4.8 per cent) and farm machinery (5.1 per cent). He Jianzhang, Kuang Ri'an and Zhang Zhouyuan, "Reform of the economic structure requires industrial pricing based on production price", Social Sciences in China, No. 1, 1981, p. 121.

9/ Wang Zhenzi, Wang Yongzhi and Jia Xiuyan, "A summary of the discussion on price theory during the past few years", Social Sciences in China, No. 3, 1982, pp. 16-34.

10/ See, inter alia, L. Squire and H. van der Tak, Economic Analysis of Projects (Baltimore, Johns Hopkins University Press, 1976); W.W. Schohl, Estimating Shadow Prices for Colombia in an Input-Output Framework, World Bank Staff Working Paper No. 357, (Washington, D.C., IBRD, September 1979).

11/ I.B. Kravis, A. Heston and R. Summers, World Product and Income: International Comparisons of Real Gross Product (Baltimore, Johns Hopkins University Press, 1982).

12/ K. Marx, Capital (New York, Random House, 1906).

13/ He Jianzhang, Kuang Ri'an, Zhang Zhouyuan, loc. cit.

14/ The presentation follows closely that used by G. Fink in Preisverzerrungen und Unterschiede in der Produktionsstruktur zwischen Österreich und Ungarn (Vienna, Springer Verlag, 1982).

15/ See for example B. Sekerka, O. Kyn and L. Hejl, "Price systems computable from input-output coefficients", in A.P. Carter and A. Bródy, eds., Contributions to Input-Output Analysis (Amsterdam, North Holland Publishing, 1970), pp. 183-203.

16/ See also Bela Balassa, "Economic reform in China", Banco Nationale del Lavoro - Quarterly Review No. 142, September 1982, pp. 307-333.

17/ See Chen Xikang and Sun Shizeng, "A non-linear input-output model in physical units and its application in China", Proceedings of the Seventh International Input-Output Conference on Input-Output Techniques (United Nations publication, forthcoming).

18/ A small version of this table, classified by the 8 sectors of the UNITAD World Model, adjusted to the output levels of 1975 and valued at US dollars, was prepared for UNIDO at the end of 1981 by a team of Chinese economists.

19/ Such experiments are carried out in four special zones. Three are close to Hong Kong; the largest is the Shenzen zone, the other two are the Zhouhai and Shanton zones. The fourth zone is Xamen in Fujian province. See also Kosta, op. cit.

20/ See, inter alia, H. Hotelling, "The economics of exhaustible resources", Journal of Political Economy, April 1931; or R.M. Solow, "The economics of resouces or the resources of economics", The American Economic Review, May 1974.

21/ Present prices of raw materials do not cover prospecting costs, and no rent is charged for the use of land in urban areas.

22/ The Soviet economist Belkin has applied the input-output price model to the 1966 USSR and the 1947 and 1958 United States input-output data. The United States prices, which are of course not shaped according to any theoretical price formula or based on input-output calculations, have proved to be much closer to the relations of the artificial input-output producer price than the USSR prices, which are centrally administered.

RESOURCE-BASED INDUSTRIAL DEVELOPMENT: PAST EXPERIENCE AND FUTURE PROSPECTS IN MALAWI*

Ian Livingstone**

I. General economic background

Malawi is one of the poorest countries in the world, with a per capita GDP in 1979 of $200. It remains primarily agricultural with a large non-monetary sector. So far it has not been thrown a lifeline by the discovery of any high-valued mineral deposit yielding incomes, tax revenue or linkages into industrial development. It is disadvantaged in the pursuit of an import-substituting industrial strategy by its small domestic market comprising under six million people with a partricularly low level of rural purchasing power and a quite small urban sector. And disadvantaged in respect of an export-oriented industrial strategy by being entirely land-locked, with poorly organized communications to the sea through Mozambique. A further potential disadvantage, although adding to an already plentiful supply of cheap labour which in the past has migrated for work to other countries, has been the high rate of population growth, equal to an estimated 2.86 per cent per annum over the period 1966 to 1977.

Yet Malawi has been praised for its economic performance in general, and for its industrial development in particular, as something of a success story in Africa. The recent World Bank report on development in sub-Saharan Africa includes at different points illustrative case studies intended as a message for other countries; in the case of industry it is Malawi that is picked out:

> Malawi is a good example of how a small African country with little apparent industrial potential can enjoy a high rate of manufacturing growth while following an agriculture-oriented development strategy.... The approach to industry has been far from laissez-faire - the Government has provided protection for infant industries and has actively promoted industry through parastatal investment -

*This paper is an abridged version of the author's report on the potential for resource-based industrial development in Malawi commissioned by UNIDO [1].

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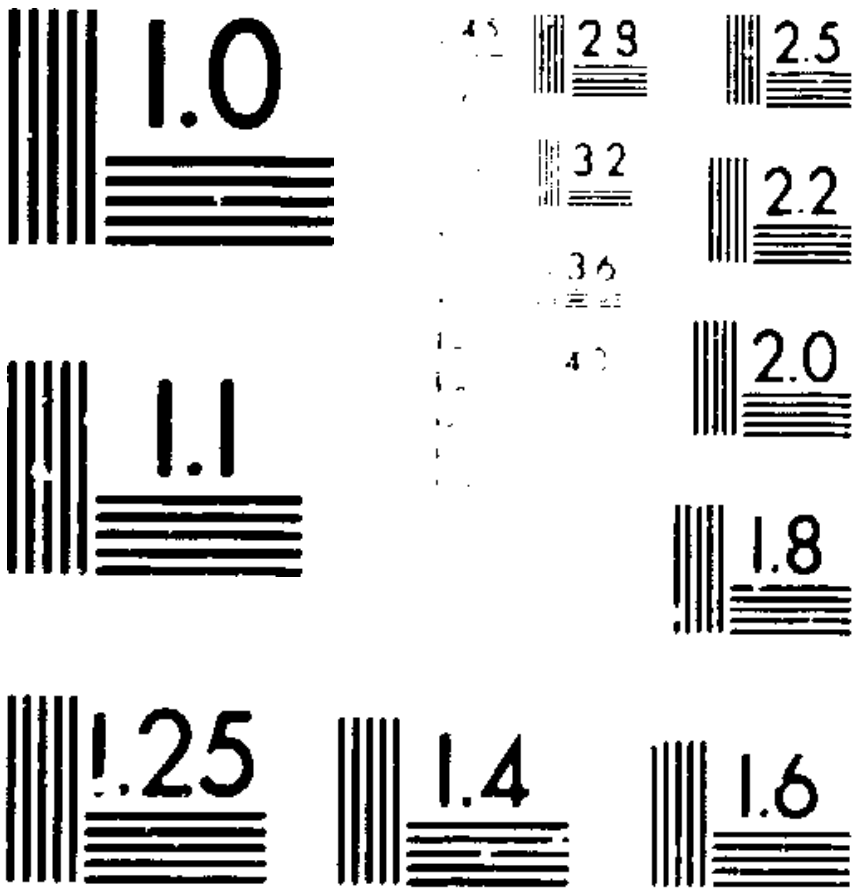

> but strict limits have been set on industrial promotion. There is a moderate tariff, which ranges from 7.5 to 40 per cent ... quantitative restrictions have not been used to restrict imports nor to protect industry, and the exchange rate has been kept at a level that not only encourages exports growth but also maintains external balance.
>
> These policies help explain why manufacturing has grown even faster than agriculture in Malawi. During 1968-1977, total industrial value-added in real terms grew at an annual average rate of 6.5 per cent, while agriculture grew at 4.5 per cent. Equally important, because of the kind of industry that has developed, and because of a wage policy that has held down urban wages, manufacturing employment also grew at 6.5 per cent per year during 1968-1977. Few African countries have had a higher rate of growth of employment in manufacturing [2].[1/]

Domestic savings increased from almost zero in 1964 to 11.5 per cent of GDP in 1976. By 1979, the share of investment in GDP had risen to 29 per cent and domestic savings to 17 per cent. Data for investment (including inventories) as a proportion of GDP at constant 1970 prices shows an even higher peak of 37 per cent in 1978 and of 20 per cent for savings in the same year; savings, however, fell away subsequently in 1979 and 1980. At constant 1970 prices, GDP grew by 80 per cent over the decade 1970 to 1980 with a similar 83 per cent increase in manufacturing and mining.[2/] Monetary GDP grew by 112 per cent.

This economic growth may be described as export-led, based particularly on the three main export crops, tobacco, tea and sugar, which between them currently contribute an average of nearly 80 per cent of Malawi's domestic exports. Total domestic exports at current prices grew from 40.6 million Malawian kwachas (K) in 1970 to K 226.0 million in 1980 (in October 1979, K 1 = $1.25); this increase was due especially to the expansion of estate agriculture. Though government policy towards agriculture in Malawi is said to have been two-pronged - in that efforts have been made through integrated agricultural development projects to promote smallholder agriculture - the major impact has clearly been on the estate side, with tobacco, tea and sugar being developed primarily as estate crops. As a result, the position changed between 1969, when smallholder crops accounted for 49.5 per cent of domestic exports, compared to 44.3 per cent for estate crops, and 1980, when the relative percentages were respectively 18.3 and 68.2 - a remarkable transformation. Associated with this change was an increase in the share of tobacco from 34.4 per cent in 1969 to 56.3 per cent in 1979. While the performance of the estate sector has undoubtedly been impressive, and has also directly contributed to a very satisfactory rate of growth of manufacturing value-added over this period, it will be argued later that the emphasis on large-scale agriculture could prove to have disadvantages for development in the long run.

Malawi is unusual for a developing country of its size in never having had a formal four- or five-year development plan. Devpol, the Statement of Development Policies 1971-1990, is a comparatively short document setting out the Government's intentions and proposed policies, but does not contain detailed sectoral capital and recurrent allocations for four or five years ahead. It is put forward as a statement of intent, to be supplemented by a much more flexible three-year rolling public sector investment programme, the first year of which is revised annually to take into account developing circumstances.

The most prominent features of development policy in Malawi over the decade, consistent with Devpol, may be said to have been: (a) encouragement of the private sector (including the development of an indigenous Malawian entrepreneurial class), and of foreign investment - although parastatal organizations have probably been used as vehicles for promoting local and foreign enterprise to a greater extent then originally envisaged;[3] (b) a two-pronged agricultural development policy combining expansion of the estate sector with promotion of smallholders through rural development projects - a policy that may be said, however, not to have been applied sufficiently even-handedly in practice; (c) a low-wage policy; and (d) maintenance of an open economy and avoidance of excessive protection of industry. These are interrelated, so that, taking into account the scarcity of local entrepreneurship largely absent at independence, there has been a deliberate attempt to provide a climate that would encourage foreign investment through maintenance of low wages, liberal trade and external payments policies and moderate tax levels.

Malawi is unusual also in having deliberately eschewed the conventional import-substituting industrialization strategy. Devpol makes explicit reference to the disadvantages of such a policy, given a market the size of Malawi's, and argues the need therefore to adopt an export-oriented strategy based on utilizing comparative advantages and resource availabilities. There is specific reference, for instance, to the Viphya forests as an important natural resource alongside Malawi's agricultural resource base. The policy subsequently pursued for more than a decade has been in line with this. Since independence, Malawi has thus been pursuing a strategy of resource-based industrial development.

This article considers what further opportunities can be identified for specific resource-based activities and assesses the prospects for further resource-based activity as a whole. The question, in other words, is how much steam remains in the resource-based industrial development strategy that has clearly met with a great deal of success so far. This may throw light more generally on the usefulness or limitations of such a strategy.

II. Structure and evolution of the industrial sector

Revised figures recently issued by the National Statistical Office (NSO) (table 1) indicate the need for more caution in assessing manufacturing development in Malawi than in some recent reports. Manufacturing value-added increased by 61 per cent over the period 1973-1979. However, 45 of the 61 per cent were over the period 1973-1975, with only a further 11 per cent during 1975-1979. Because the world economic recession and the effects of continued oil price increases on foreign exchange availability have adversely affected the situation in Malawi since that time, it would appear that the annual rate of growth of manufacturing over the entire seven-year period 1975-1982 will prove to have been quite low. Even if to an important extent external factors have contributed to this, this suggests a distinct loss of earlier momentum. According to a latest economic report, the percentage increase in GDP at constant 1978 factor cost was just under 3.6 per cent over the three years 1979-1982. The estimate for the increase in manufacturing, likely however to be revised downwards in line with the figures given above, was 12 per cent. The NSO Index of Manufacturing Output (1970=100) shows the same pattern: an 80 per cent increase from 1970 to 1975, followed by only a 24 per cent increase from 1976 to 1980. There was however a significant forward spurt in 1981 associated with food, beverages and tobacco, in particular with sugar.

This picture does not tally fully with that of the recent IBRD Report on the development of manufacturing. This refers to the manufacturing sector having grown at an annual rate of 11 to 13 per cent between 1964 and 1975 and states that although "in 1976, output declined for the first time, due mainly to constraints in the external sector ..., in 1977/78 growth resumed at an annual rate of 10-12 per cent"[3]. It is of some importance whether 1976 is seen as a temporary abberation in otherwise continuously rapid growth, or whether there is indeed a detectable loss of momentum in industrial development after 1975, inviting the question already raised of how much steam there is left in the resource-based industrial strategy. The facts will become clearer when revised figures are available for value added in manufacturing at constant prices for the years after 1979. Even then, it would be inadvisable simply to project the growth rates up to 1976, or up to 1982, into the 1980s. The prospects for the 1980s must also be assessed after scrutiny of specific industrial project possibilities and examination of the resource base now existing in each of the different sectors of the economy, which is the subject of the present study. Thus, following the tobacco boom, it has been particularly the expansion of sugar production that has carried manufacturing value-added forward, a boost that cannot be further projected at historical rates.

The expansion of manufacturing employment (table 2) and the effect of wage policy on this will be discussed later. However, if the structure of manufacturing is examined, it is found that about 61 per cent of manufacturing value-added and 77 per cent of employment were in agro-processing, including forest products; this covers food and beverages (particularly sugar), tea, tobacco, textiles and leather, and wood and wood products (table 3).[4/] The importance

Table 1. Manufacturing value added at constant 1978 factor cost

	Number of firms in 1979	Manufacturing value added (millions of kwachas)							Increase 1973-1979 (millions of kwachas)	Increase 1973-1979 (% of total)	Percentage increase 1973-1979	Percentage increase 1973-1975	Percentage increase 1975-1979
		1973	1974	1975	1976	1977	1978	1979					
Food processing including sugar	9	5.1	5.0	6.0	7.0	7.7	7.6	8.8	3.7	15.3	72.5	17.6	46.7
Tea manufacturing	18	3.5	2.9	4.0	4.0	4.5	3.9	4.4	0.9	3.7	25.7	14.3	10.0
Beverages	4	2.7	4.4	6.5	5.4	4.9	6.1	6.6	3.9	16.1	144.4	140.7	1.5
Tobacco manufacture	6	4.1	5.1	6.2	6.9	8.8	8.8	8.2	4.1	16.9	100.0	51.2	32.3
Textiles, netting and blanket manufacture	8	3.4	4.7	4.9	5.3	5.1	5.6	5.7	2.3	9.5	67.6	44.1	16.3
Clothing, leather goods and footwear	15	1.7	1.9	2.2	1.8	2.2	2.1	2.4	0.7	2.9	41.2	29.4	9.1
Sawmill and wood products	7	2.0	2.2	2.6	2.3	2.3	2.4	3.2	1.2	5.0	60.0	30.0	23.1
Packaging materials, printing and publishing	9	1.4	2.2	3.7	2.8	3.1	3.8	3.2	1.8	7.4	128.6	164.3	-13.5
Chemicals and fertilizers	3	1.0	1.3	2.2	1.7	1.7	2.2	2.8	1.8	7.4	180.0	120.0	27.3
Pharmaceuticals, paints, soaps and cooking oils	7	5.3	5.2	4.9	4.8	4.2	4.7	4.5	-0.8	-3.3	-15.1	-7.5	-8.2
Tyre retreading and plastic products	7	0.7	0.9	1.2	1.1	1.1	1.3	1.7	1.0	4.1	142.9	71.4	41.7
Non-metallic mineral products	4	3.1	3.5	3.9	3.4	3.1	3.9	5.3	2.2	9.1	71.0	25.8	35.9
Metal products other than machinery	12	2.1	3.0	4.1	3.2	3.5	3.3	4.0	1.9	7.9	90.5	95.2	-2.4
Machinery and motor vehicle assembly	3	2.5	2.9	4.2	3.9	2.7	2.4	2.0	-0.5	-2.1	-20.0	68.0	-52.4
All other manufactures	5	1.2	1.4	1.1	1.3	1.1	1.5	1.3	0.1	0.4	8.3	-8.3	18.2
All manufactures	117	39.9	46.4	57.8	54.7	56.0	59.7	64.1	24.2	100	60.7	44.9	10.9
All activities	417	178.6	204.7	233.0	235.4	232.9	276.8	291.5	112.9				

Source: NSO.

Table 2. Employment in manufacturing

	Employment							Increase 1973-1979		Percentage increase 1973-1979
	1973	1974	1975	1976	1977	1978	1979	(thousands)	(% of total)	
	(thousands of persons)									
Food processing, including sugar	2.3	3.6	4.1	4.2	3.8	4.1	4.4	2.1	17.6	91.3
Tea manufacturing	3.5	4.0	4.1	4.2	4.5	4.3	4.8	1.3	10.9	37.1
Beverages	0.9	1.0	1.2	1.4	1.4	1.5	1.6	0.7	5.9	77.8
Tobacco manufacture	6.7	6.3	6.1	7.5	8.2	8.6	8.9	2.2	18.5	32.8
Textiles, netting and blanket manufacture	2.9	3.0	3.1	3.2	3.7	3.9	4.1	1.2	10.1	41.4
Clothing, leather goods and footwear	1.4	1.5	1.5	1.6	1.8	1.9	2.0	0.6	5.0	42.9
Sawmill and wood products	1.1	0.9	1.4	1.4	1.5	1.7	1.8	0.7	5.9	63.6
Packaging materials, printing and publishing	0.7	0.8	1.2	1.0	1.0	1.0	1.2	0.5	4.2	71.4
Chemicals and fertilizers	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.2	1.7	200.0
Pharmaceuticals, paints, soaps and cooking oils	0.8	0.8	0.9	1.0	1.0	1.0	1.1	0.3	2.5	37.5
Tyre retreading and plastic products	0.3	0.2	0.3	0.4	0.4	0.5	0.6	0.3	2.5	100.0
Non-metallic mineral products	1.4	1.5	1.6	1.7	1.9	1.9	2.0	0.6	5.0	42.9
Metal products other than machinery	1.0	1.4	1.3	1.4	1.5	1.5	1.7	0.7	5.9	70.0
Machinery and motor vehicle assembly	0.3	0.3	0.3	0.3	0.3	0.5	0.4	0.1	0.8	33.3
All other manufactures	0.5	0.5	0.8	0.7	0.7	0.7	0.9	0.4	3.4	80.0
All manufactures	24.0	26.0	28.1	30.2	31.7	33.3	35.9	11.9	100	49.6
All activities	132.6	139.9	154.3	171.7	184.1	201.0	205.3	72.7		54.8

Source: NSO.

of domestic natural resource-based manufacturing will be larger than this since, for example, non-metallic minerals will stimulate use of other domestic resources. The difference in the percentages demonstrates the high labour-intensity of agro-processing compared to other types of manufacture. This composition therefore is likely to explain a significant part, though not necessarily all, of the labour-intensity nature of Malawian manufacturing activity.

Similarly, about 70 per cent of the increase in manufacturing value-added over the period 1973-1979 was in agro-processing and wood products. Tobacco, sugar and beverages were the most important items, followed by textiles and, outside this category, non-metallic minerals. About 74 per cent of the increase in manufacturing employment was in the same category. This confirms the idea that Malawi has been pursuing a policy of resource-based industrial development.

As indicated earlier, one distinct element in Malawi's development policy has been its policy towards wages. The National Wages and Salaries Policy introduced in 1969 aimed at restraining wages in order to expand employment opportunities by encouraging the adoption and maintenance of labour-intensive techniques in manufacturing, and the use of estate labour. Under this, any employer who wished to increase his firm's general level of wages by more than five per cent in a year was obliged to apply to the Wages and Salary Restraint Committee for approval.

This policy has been commended by a number of observers, and it is possible to argue from available statistics that there has been a positive response in the form of wage employment increases. Comparing wage employment increases for 1973-1976, for instance, with changes in monetary GDP by sector for the same period, it is seen that employment elasticity exceeds unity overall, and approaches two for manufacturing (table 4). Comparing changes in real value-added with changes in employment, however, gives an employment elasticity of only 0.76 for the years 1968-1977. Although the overall elasticity reaches 1.13 in 1977-1979, the data reveals major variations between sectors; for manufacturing it equals only 0.47 (table 5).

Again, if calculations are made using the recently revised data on manufacturing value-added (table 6), the overall elasticity of 0.39 for 1973-1975 is very low and 2.55 for 1975-1979 is very high. This suggests caution in calculating the elasticity for shorter periods of two years and when the rates are derived from a rather heterogeneous aggregate, the composition of which is changing. Even the figure of 0.82 for 1973-1979 is too much the result of very different figures for individual industrial groups to permit identification of the consistent effect of low wage rates, and is in any case not particularly high. If this is true for specific value-added data, it must be more so for data relating to monetary GDP as above. Great care should be taken, therefore, in drawing conclusions from employment elasticity data concerning the positive effects of wage changes on employment. Other reasons for caution in ascribing beneficial effects arising from low wages are discussed later.

Table 3. The composition of manufacturing value added and employment in 1979

	Value added at constant 1978 factor cost		Employment	
	(millions of kwachas)	(%)	(thousands)	(%)
Food and beverages including sugar (excluding tea and tobacco)	15.4	24.0	6.0	16.7
Tea manufacturing	4.4	6.9	4.8	13.4
Tobacco manufacture	8.2	12.8	8.9	24.8
Textiles and leather	8.1	12.6	6.1	17.0
Wood and wood products	3.2	5.0	1.8	5.0
Total agro-processing	39.3	61.3	27.6	76.9
Paper and printing etc.	3.2	5.0	1.2	3.3
Chemicals, paints, tyres, plastic products etc.	9.0	14.0	2.0	5.6
Non-metallic minerals	5.3	8.3	2.0	5.6
Metal products, machinery and equipment	6.0	9.4	2.1	5.8
Other manufactures	1.3	2.0	0.9	2.5
All manufactures	64.1	100	35.9	100

Source: Tables 1 and 2.

Table 4. Increases in monetary GDP and wage employment, 1973-1976

Sector	Average annual percentage increase		Employment elasticity[a/]
	Monetary GDP	Wage employment	
Agriculture, forestry and fishing	7.9	10.3	1.30
Manufacturing	6.1	11.9	1.95
Construction	5.2	-0.2	-
Electricity and water	11.8	3.8	0.32
All other sectors	7.4	5.1	0.69
Total	7.1	7.4	1.04

Source: IBRD, Memorandum, p. 14.

a/ Wage employment divided by monetary GDP.

Table 5. IBRD calculations of formal sector employment elasticities, 1968-1977 and 1977-79[a/]

	1968-1977	1977-1979
Agriculture, forestry and fishing	b/	1.03
Manufacturing, mining and quarrying	0.98	0.47
Electricity and water	0.83	1.49
Building and construction	0.41	1.29
Wholesale/retail trade, hotels and restaurants	0.87	1.02
Transport, storage and communications	0.70	2.39
Financial, insurance and real estate	0.78	0.72
Community, social and personal services	1.72[c/]	0.64
Total employment elasticity	0.76	1.13

Source: IBRD, Basic Economic Report, 1982, table 15.

a/ Elasticity is defined as the ratio of the employment growth rate to the value-added growth rate Elasticities for 1968-1977 have been computed by taking averages for sectoral real value-added and for employment for the years 1968-1970 and 1975-1977 and then calculating the growth rate of the period averages for each. The elasticities for 1977-1979 were computed by taking the growth rates for employment and real-value added between these years. For 1968-1977, "old series" employment figures were used while for 1977-1979 "new series" figures were used.

b/ No estimate can be made because there is no time-series data on real value-added in the estate sector for the period.

c/ Elasticity is for the period 1968-1976.

Table 6. Employment elasticities in Malawian manufacturing, based on recent data[a/]

	Elasticities		
	1973-1975	1975-1979	1973-1979
Food processing, including sugar	...	...	1.26
Tea manufacturing	...	...	1.44
Beverages	...	...	0.54
Tobacco manufacture	...	...	0.33
Textiles, netting and blanket manufacture	...	...	0.61
Clothing, leather goods and footwear	...	...	1.04
Sawmill and wood products	...	...	1.06
Packaging materials, printing and publishing	...	...	0.56
Chemicals and fertilizers	...	...	1.11
Pharmaceuticals, paints, soaps and cooking oils	...	...	-2.48
Tyre retreading and plastic products	...	...	0.70
Non-metallic mineral products	...	...	0.60
Metal products other than machinery	...	...	0.77
Machinery and motor vehicle assembly	...	...	-1.67
All other manufactures	...	...	9.64
All manufactures	0.38	2.55	0.82

Source: Tables 1 and 2.

a/ Elasticities are calculated as percentage change in employment over the period divided by the percentage change in value-added, using the corrected data recently issued.

Other significant characteristics of manufacturing in Malawi include the important share of agro-industrial processing in the total, and the fact that manufacturing activity is subject to seasonal variation corresponding to agricultural cycles. As regards location, there are some opposing forces. Resource-based activities such as tea, tobacco and sugar processing are distributed throughout the country according to the agricultural areas involved. On the other hand, the remainder is heavily concentrated around Blantyre, which has the attraction of being the main market, and having an urban labour supply, infrastructural facilities and the usual factors tending to produce cumulative concentration of industry. Two major aspects of policy that may help to combat this tendency towards polarization are (1) the establishment of the capital city at Lilongwe, in the centre of the country, together with associated attempts to encourage location of new industries there, and (2) a reasonably positive attitude towards small and informal industries in Malawi, such as tailoring and brickmaking, which are spread throughout the country. The importance of rural industry in this respect is shown by the fact that in 1976 60 out of 69 per cent of employment in manufacturing located in Malawi's four main towns was

based in Blantyre; redistribution away from Blantyre was largely accounted for by the 31 per cent located in rural and small urban locations.

The contribution of small, informal industry is discussed in section IV. Examination of the size distribution of industrial plants shows that there are a handful of large plants employing 1,000 or more and a somewhat larger number employing 500 or more. Nearly 60 per cent of plants in the official statistics employ less than 40 people, and 40 per cent less than 10. Even so this omits large numbers of very small enterprises, such as tailors working on their own account, which if included would greatly outnumber all establishments included in the statistics. Among construction companies the position is similar, with about ten large firms and 33 per cent of firms with below ten employees: again there is probably substantial ommission of small, informal enterprises. Within the industrial sector the biggest plants, employing 1,000 persons or more, are in tobacco (three plants), sugar, textiles and cement; those employing 500 or more are tobacco, tea, beverages, clothing, saw-milling, soap making, grain-milling and printing and publishing. Nearly all of these are resource-based industries, mostly in agro-processing.

The manufacturing export industries, which account for a 20 per cent weight in the Index of Industrial Output (1970=100), are in fact predominantly in agro-processing (tea and tobacco); the surge in the index for food, beverages and tobacco under "consumer goods mainly for the domestic market" is due especially to increases in the volume and value of refined sugar.

Despite the emphasis on private enterprise and on encouraging foreign investment, the main vehicle for industrial development in Malawi, as in a number of other African countries, has been a number of parastatal companies, though there are also a few large foreign-controlled firms. These parastatals are particularly involved in agro-processing and indeed also participate in estate agriculture in a major way.

The most important parastatals are (1) the government-owned Malawi Development Corporation (MDC); (2) Press (Holdings) Ltd which is technically a private company but with shares held in trust by the Malawi president, and is thus in effect a parastatal; (3) the Agricultural Development and Marketing Corporation (ADMARC), which acts as a marketing board but also participates in manufacturing in the area of agro-processing; (4) the Import and Export Company of Malawi (IMEXCO), engaged as its name suggests in both sides of foreign trade, owned 51 per cent by MDC and 49 per cent by Press (Holdings); and (5) the Industrial Development Bank (INDEBANK), which is owned 22.25 per cent each by ADMARC, CDC, DEG (the Deutsche Gesellschaft für Wirtschaftliche Zusammenarbeit of the Federal Republic of Germany) and FMO (the Nederlandse Financierungs - Maatschappkj voor Ontwikkelungslanden NV), with 11 per cent by the IFC.

Press (Holdings) and MDC are operational holding companies involved directly in managing subsidiary companies as well as having financial interests in associated companies. ADMARC and IMEXCO are first and foremost trading companies, but ADMARC has considerable holdings in a range of agro-industrial enterprises, some of which it manages; IMEXCO has an interest in several industrial enterprises. INDEBANK is a traditional development finance company.

MDC and Press (Holdings), and also ADMARC, frequently combine to hold shares in the same company, so there is a network of connecting interests covering a substantial part of Malawian industry. This is accentuated by the fact that MDC, Press (Holdings) and ADMARC have controlling interests in the two commercial banks in Malawi. It should be noted that these investments are all in medium- or large-scale enterprises, as are those of INDEBANK and, for the most part, the commercial banks. The flow of capital is therefore extensively internalized within this sector.

In general the parastatal companies within Malawi appear to be well managed, and run according to sound commercial criteria. This is not to imply that there is no problem in developing high-level Malawian managerial and technological manpower. If anything, the criticism should be the opposite - that policy has erred on the conservative side, with investments concentrated in the safest areas where financial success is not difficult to achieve, and that a stronger developmental role should be accepted, even if this is constrained by the need to attract private investors into participation. For example, the MDC Annual Report for 1979 shows that the total of profits before tax for all the MDC companies, subsidiary and associated, was just under K 16 million. Of this 75 per cent came from just four enterprises, the Commercial Bank of Malawi (shareholding: MDC, 20; Press (Holdings), 40; ADMARC, 10 per cent), Carlsberg (Mwi.) (MDC, 27; Press (Holdings), 24 per cent), David Whitehead's (MDC, 29; Press (Holdings), 20 per cent) and IMEXCO (MDC, 51; Press (Holdings) 49 per cent). These areas, i.e. production of mass consumption goods (beer and cotton fabrics), foreign trade and banking, are solid areas for investment. Press (Holdings) has investments in popular newspapers, in a network of department stores throughout the country, as well as in large-scale estate agriculture, all of which offer comparatively safe sources of profit. Similarly, although these corporations have been successful in attracting foreign investment, this has also been mainly in safe and relatively lucrative areas. This may be problematic once the most obvious resource-based activities have been developed, and it becomes necessary to push risk capital into a more developmental role. The associated problem is the need to channel finance into small-scale and rural activities, given that such a large portion of the available finance being created in Malawi is internalized as already described. Even ADMARC, which derives most of its accumulated profit from smallholder farm produce, limits its industrial activities to medium- and large-sized firms.

III. Resource availabilities and industrial possibilities

Mineral resources[5/]

Malawi, unfortunately, does not appear to be well-endowed with high-value mineral resources. Mineral occurrences are generally small in quantity and not of obvious commercial interest[6/] owing to the smallness of the deposits and transport costs to export markets. Malawi does not appear likely, for instance, to join the ranks of the oil-producing developing countries. No exhaustive investigations have been carried out, but an evaluative study [5] in 1980, based on general geological considerations, was pessimistic and argued that low probability geological hypotheses did not justify embarking on any expensive petroleum programme.[7/]

Coal has been found in the Karroo sediments of Malawi, particularly at Ngana by the Songwe River in Karonga District, Northern Malawi. There is a possibility of extensive coal reserves beneath the lakeshore plain north of Karonga, coal having been intersected at depth at Lufira. The Livingstonia Coalfield further south is thought to have raw coal reserves amounting to 24 million tons. Unfortunately, these deposits are not of immediate economic interest because of their location in the remote areas where industrial demands for energy are limited. Exploiting them would necessitate expensive infrastructural investments in roads for which labour is scarce. Coal occurrences in the south are thin and of poor quality.

Marble and limestone are quarried at Changalume, near Zomba, for manufacture of Portland cement in Blantyre using imported gypsum. This is easily the largest mining and mineral processing operation in the country. More than 100,000 tons of cement per annum are produced, largely used for the production of brickwall and plaster mortar, entirely for the domestic market. Reserves of low-magnesia marble bodies, amounting to an estimated 10.8 million tons exist at Mayeka, north-east of Kasungu, which could be the site of a second cement plant in Malawi. It is questionable whether this is an immediate prospect, however, since the present cement factory is able to satisfy current needs, and the depressed state of the economy has produced a lack of buoyancy in the construction sector.

In addition, an important potential market exists in Malawi for lime, at present imported for use in the sugar industry. Imports in 1980 amounted to some 2,400 tons, costing over K 500,000. The Malawi industry, however, does not regard the local lime at present as being of sufficiently good quality for its purposes, so there is a need to improve production methods if that market is to be secured. Second, in a cement mix for brickwall and plaster mortar, lime can be substituted for cement up to a ratio of 15 or 20 per cent with improvement of quality, implying a market in Malawi of some 15,000 to 20,000 tons per annum. Marble bodies suitable for lime production occur in several parts of Malawi, and some of these provide the basis for some local small-scale production.

Traditional lime-burning is one of a number of valuable small-scale industrial activities in Malawi. One small company and half-a-dozen co-operative village groups are involved in the industry. These operate simple labour-intensive kilns, keeping costs down by operating on a seasonal basis; they are thus able to supply lime from dispersed sites at very competitive prices. Together they are thought to produce over 10,000 tons per annum.

Extensive deposits of nepheline syenite exist in several parts of Malawi: in the Mongolowe hills, at Junguni Hill (north of Zomba), at Songwe Hill (north of Mulanje), at Ilomba Hill, and in the Rumphi, Mphompha and Chikangawa igneous complexes. Nepheline syenite has a wide range of possible industrial applications - as a filler for plastics, rubbers and paints, as an aggregate, and in the manufacture of sodium carbonate, fertilizers, aluminium, glass and porcelain. The most important applications are in glass and ceramics, where there is Malawian potential, and as an enamel filler. These possibilities depend entirely on the chemical composition and nature of the minerals presented in the syenite. For ordinary flint glass, for instance, the iron content must be no more than 0.06 per cent (somewhat higher for coloured glass). Hence industrial application is limited to those deposits in which the iron-bearing accessory minerals can readily be removed. In addition there is the question of the market. There is some potential for reducing imports of soda ash for glass making if the chemical composition of the local substitute proves satisfactory. There is a comparatively small market within Malawi, possibly less than 2,000 tons per annum, which would probably not by itself justify mining and beneficiation of the raw material. This raises the question of export possibilities, which are thought to exist in Mozambique, the United Republic of Tanzania, Zambia and Zimbabwe. Apart from vast quantities processed annually in the USSR, the two major world producers for export at the moment are Canada and Norway, with Canada responsible for about three-quarters of the combined total for these two. The development possibilities for nepheline syenite thus require technical assessment of the chemical composition and extent of the deposits, and an economic assessment of markets and delivery costs.

One promising industrial possibility being actively pursued is production of glass based on extensive glass sand deposits found in Malawi. Discovered in 1978, these high-silicate glass sands are now estimated at one million tons or more. The intention is to produce ordinary flint glass, but not sheet and plate glass, for which the minimum viable-sized plant is many times greater than total Malawian demand. Since sheet and plate constitute no more than 10 per cent of glass imports, it is thought possible to substitute for about 85 per cent of all imports, of which the most important supplier is the Republic of South Africa. The plant would concentrate on producing containers, i.e. bottles and jars, including those for beer and soft drinks, for which there is a basic demand within Malawi; non-crystal glassware would also be produced. It may also be possible to press a one-size window panel for low-cost housing. The glass would be melted electrically, avoiding the need for imported oil commonly used. Demand for power may be up to 1 MW. Synthetic soda ash may

be imported for use as flux, but it should be possible to effect savings using nepheline syenite, which, as noted, is in plentiful supply.

A major industry in Malawi, and one which is based on local mineral resources, is traditional brickmaking. A recent survey suggested that about 400 small brickmaking enterprises employed over 15,000 (compared to 100, say, who might be employed by a large cement factory).[10] Output from these enterprises was estimated to be some 54 million bricks a year: a more recent assessment put output of handmade bricks at 70 million, compared to only one million of machine-made bricks in 1981. This implies that the machine-based industry produces less than 1.5 per cent of all bricks used in Malawi [7], and suggests that, if a project is successfully established for the supply of superior machine-made bricks to the Blantyre market, the main focus of interest should be the traditional industry.

The manual technology is simple in the extreme. A portable wooden mould is used to shape the bricks, which are fired in wood-fueled clamps or field kilns - simply stacks of bricks with open channels running through at ground level to accommodate fuel. The resulting bricks are often underfired and lack the life of the machine-made bricks. They have a major cost advantage, however. Selling prices are in the range of K 10-25 per thousand compared to K 50-250 for machine-made bricks.

The low costs of production achieved are accompanied by a number of advantages associated with small-scale, informal sector operations. The industry operates in a season lasting an average of 4.36 months, thus making use of seasonally surplus labour [6]. Associated with this, out of 15,240 employees in 400 brickmaking enterprises surveyed, 62 per cent were women (6,000) and young people (5,600) and 38 per cent (5,840) were men. The enterprises have a useful transport advantage in supplying rural centres, since transport of the raw material over long distances is generally uneconomic. Geography therefore favours a dispersed small-scale industry if suitable raw materials can be identified. A final advantage of dispersal within the rural areas is easier access to cheap wood fuel supplies, fuel representing a major input.

Agricultural resources and crop-based agro-processing industry

Despite the important contribution made by clays and other non-metallic mineral products, the fact remains that on the basis of evidence available up to now Malawi is unfortunately not endowed with deposits of high-value minerals - such as the diamonds or copper of other southern African countries - that might either provide the basis for mineral-linked industries or provide a source of abundant capital and foreign exchange to use in promoting industrial development in general. This means that even more than otherwise, Malawi must look to the agricultural and natural resource sectors to provide for the immediate needs of the people and the springboard for complementary industrial development. This emphasizes the argument made here for an agricultural development strategy that will be appropriate for this purpose.

In fact much of the rapid growth in manufacturing value-added in Malawi up to 1976 directly reflects the expansion of agriculture, and related agro-processing. Much of the growth came in tobacco production, and most of this from estates. The value of tobacco sold increased almost ten-fold over the period 1969-1977, and the volume almost four-fold. Dramatic falls in tobacco prices in 1978 reduced the value of sales by 1980 by 34 per cent, from K 89 million to K 59 million, although the volume actually increased, despite a large number of bankruptcies among smaller estates. Sharp rises in price in 1981 have done much to restore the balance. A positive feature has been the steady expansion of burley production, which since 1977 has increased by 80 per cent. Some expansion of output for processing should continue, but this is likely to be limited by the increasing fuel problem and by a desire to diversify estates away from tobacco production. Clearly this major component of resource-based industrial development in Malawi cannot be expected to make any significant contribution to future increases.

Tea is largely an estate crop. Despite relatively good management, the rate of return is much lower than for tobacco.[9/] Production increased from 16.9 million kg in 1969 to 31.6 million in 1977, an 87 per cent rise, but has remained stagnant since then. World Bank commodity projections suggest that in the long term prices will fall below even the present depressed levels, so that while smallholders might still find it profitable to come into tea, given the shortage of other opportunities, estates are more likely to deversify away from it. Overall, not much expansion of output and thus of tea processing can be expected.

Coffee is not a major crop in Malawi, extending in 1979 over only some 560 to 570 hectares, mostly in the north. Coffee in fact probably represents one of Malawi's big missed opportunities, given that coffee was originally introduced on estates in the 1890s and in 1901 covered an area as large as 6,900 hectares.

Processing of fruit and vegetables is limited at present to the canning of pineapples by ADMARC's Mulanje Cannery. Unfortunately, the supply of pineapples shows a marked seasonal peak, while supplies of other items are often not available when needed. As a result, lack of capacity in the limited pineapple season causes large quantities of fruit to be turned away, and at other times the cannery suffers from excess capacity, raising overhead costs per unit. Unfortunately Malawi does not have a comparative advantage in other lines that could support pineapple production.

Malawi has a rubber estate near Nkhata - the only one, in fact, in eastern and southern Africa. This is expected to yield some 3-5 million pounds of rubber at full development in some years' time. This rubber would be processed as ribbed smoked sheet and crêpe, which is at present imported. The bulk would be for export.

Cotton is a crop that deserves maximum attention in Malawi, being a smallholder crop that has been very successfully grown in different parts of Africa. It is grown by some 100,000 small farmers but unfortunately within a relatively circumscribed area, in

the Lower Shire Valley. Since 1970, however, there has been no increase in the volume of output; ADMARC purchases in 1981, for instance, were somewhat less than those in 1972. As discussed later, the recent IBRD report[14/] ([3] p. vi) has attributed this stagnation in production to the price policy pursued. It is likely that a more positive price policy could produce a significant response. This is urgent since, although cotton is by no means the most important crop in Malawi, it is one with important forward linkages, supporting first-stage agro-processing in the form of ginneries and second-stage textile and garment manufacture. About 80-90 per cent of cotton output is used for the domestic textile industry. At present Malawi has three ginneries with a combined capacity of about 32,000 tons per annum. There is scope for expansion of production, even though the area suitable for expansion is circumscribed geographically. Plans exist for a new ginnery at Liwonde which would cater for raw cotton output from the central region where there has already been growth. Elsewhere existing capacity should be adequate.

The cotton mill operated by David Whitehead's, producing basic cotton fabrics, forms the core of the second-stage textile industry, but a significant textile sector has been established involving also knitted fabrics production, garment manufacture, towels and towelling, blankets and net making (a subsidiary of Whitehead's). Over the short period 1971 to 1977, the value of industrial sector output more than tripled, so that in value terms some 67 per cent of textile output in the formal sector in 1977 was accounted for by cotton fabrics. However, while the production of cotton fabrics is entirely based on local materials, garments, towelling, blankets and fishing nets have an import content amounting to three-quarters or more.

Informal sector tailoring is important in most African countries but perhaps exceptionally so in Malawi - though this would require statistical verification. While an estimated 5,400 were employed in the modern textile sector in 1977, the number in the traditional sector[10/] was about five times as many, between 25,000 and 30,000. Tailoring is thus a significant employer. The value of output may have been around K 15 million. This thriving activity has received little or no attention from the Government and, while it is probably quite efficient, more information and analysis is required to discover what, if any, the constraints are and what assistance might be required.

The traditional sector uses imported materials also, but depends very closely on cotton fabric supplied by Whitehead's. Together the two constitute the most dynamic element in the textile sector: two-thirds of the 1971-1977 increase in end-use output in the modern textile sector was accounted for by cotton fabrics. Apart from the high import content mentioned, excess capacity exists in the knitwear, blanket, towel and net-making industries. The modern garment industry has expanded fairly rapidly, although most of its fabrics are imported. This low degree of integration with David Whitehead's is made a point of criticism in a GOPA study (Gesellschaft für Organisation, Planung und Ausbildung, [8]) which, however, fails to emphasize the very important forward linkage achieved with the much more important traditional tailoring industry. This should be maintained and indeed developed.

The GOPA study identifies one trend in Africa that will affect future prospects in the Malawian industry - the trend towards falling income elasticities for cotton textiles in favour of rising elasticities of man-made fibre and blended fabrics, which have advantages of working and durability. Despite the very low per capita consumption of fibre in Malawi, the proportion of man-made fibre in total was estimated in 1977 as 15 per cent. This fact has already led Whitehead's to establish polyester production. While this development does not directly represent "resource-based industrial development" it may permit local manufacturing industry to retain its control over the domestic textile market as it expands, absorbing whatever increased production of cotton becomes available.

The output of knitwear actually declined over the period 1971-1977. The difficulty as seen in the GOPA study is that the industry is not supported by broad local demand but caters to the rather narrow market provided by the higher income groups. The problem would appear, however, to be one of low effective demand due to lack of purchasing power, rather than need: despite seasonally low temperatures, particularly in the highlands, the total estimated per capita consumption of cotton and man-made fibres is about 1.3 kg per annum, low even for Africa. Knitwear is also scarce compared to other African countries with seasonal temperature changes such as Kenya.

While tobacco production suffered setbacks towards the end of the last decade, an important new stimulus to the economy in the second part of the 1970s and into the 1980s has come from sugar production and its industrial component, sugar refining. The two major sugar-producing estates, both managed by Lonrho, are SUCOMA in the southern region, responsible for the initial growth of the industry, and more recently the Dwangwa Sugar Estate in the northern region. Each has its own processing plant for refining sugar. Output increased from 49,000 tons in 1974/75 to 93,000 in 1978/79, an 89 per cent increase, 67 per cent of which reflected an increase in growing area. Output thus tripled in the six years between 1974/75 and 1980/81 and in 1981 increased still further to 166,000 tons. Further expansion will depend on the availability of export markets or the establishment of an ethanol plant.

The latter is one of the most interesting resource-based developments in Malawi. At present molasses is exported through Mozambique, and there could be problems of disposal of molasses if existing transportation capacity were to be needed again by Mozambique for its own shipments [9]. Following a proposal by the IFC in 1980, the Ethanol Company Ltd. was promoted by the Oil Company of Malawi (OILCOM), INDEBANK, and the Dwangwa Sugar Estates. It is expected that some 20,000-30,000 tons of molasses will be available for processing into some 5-8 million litres of ethanol equivalent to almost 10 per cent of current petrol consumption in Malawi [10]. It has been established that ethanol can be blended up to 20 per cent with petrol, permitting a very significant reduction in import value. Zimbabwe already has a much bigger plant with an output of 40 million litres a year, producing 15 per cent of its fuel requirements. This is located near the

Mozambique border in the east, not far from Malawi. Zimbabwe is now planning a second plant and is proposing to raise the blend to 25 per cent ethanol. This therefore looks like a sound investment.

In discussing crop-based industrual development, attention should not be confined to the so-called industrial crops. The most important crop in Malawi is not tobacco but maize, the staple food crop of the population. Excluding mixed cropping, this accounts for nearly 80 per cent of the area under crops. Most of this is processed into maize flour. The value added in processing this huge maize crop is, however, underestimated by using local prices for processed and unprocessed maize, rather than import parity. Vast quantities of maize are processed and consumed directly by the producing households, some is processed and marketed locally at the village level, some is sold to ADMARC. The latter stagnated up to 1976, due to the unfavourable pricing policies pursued, but more than doubled between 1976 and 1981, when maize was adopted as a cash crop following improved prices offered. While a substantial amount is still hand-pounded, there are many small village maize mills (diesel-powered, with 8-18 kW engines), and their number is increasing. Custom milling of maize and other products is carried out at village level. This is yet another area where small-scale industry has been effective, particularly in the context of the dispersed nature of raw material availability and of demand. Urban demand still represents a relatively small proportion of the total compared to many other countries. There is therefore no need for additional large-scale processing facilities. Questions remain as to whether existing rural processing capacity is now adequate, expanding satisfactorily on the basis of private initiative, or would benefit from encouragement through additional credit facilities.

Groundnuts constitute an important element in the national diet. About three-quarters of output is consumed on-farm, but substantial quantities are sold to ADMARC. The bulk of the output is of the high quality chalembana variety used in the confectionery trade, and therefore more likely to be exported as nuts than supplied to the processing industry.

Rice is a smallholder crop, with substantial production both in the Shire Valley in the south and in the Karonga lakeside plains in the north. The economies of the crop are uncertain and pricing policy towards the crop needs reviewing.

Despite the unclear economics, it is anticipated that rice production in Malawi will increase substantially, with a corresponding increase in rice processing. This is at present carried out by National Oil Industries Limited (NOIL), owned jointly by ADMARC (50 per cent), MDC (30 per cent) and Press (Holdings) (20 per cent). Average capacity utilization during the 1970s has been quite low, however: the yearly average percentage utilization in 1973-1977 equalled 82, 73, 39, 49 and 49 per cent.

In addition to forward linkages stemming from agricultural production in the form of first-stage agro-processing industry and second-stage industries using processed raw materials, there are important potential backward linkages for industries supplying agricultural inputs, packaging and equipment. In the case of Malawi, the most important items are fertilizers and pesticides among agricultural inputs, cans and woven polypropylene bags under packaging, and various agricultural implements, together with ox-carts as equipment.

A fertilizer plant to produce fertilizer via water electrolysis has been under active discussion for some time. A report submitted by UNIDO in February, 1980 recommended a plant with capacities of 120 tons per day of ammonia and 360 tons per day of calcium nitrate. The potential demand for electric power of 70 MW is very attractive to the Electricity Supply Company of Malawi (ESCOM). A World Bank assessment has been less optimistic, however, and the project currently hangs on the outcome of discussions with a Canadian company that has shown interest. The aim is to use off-peak electric power and the feasibility of the project turns on what is considered to be the economic price of power. The supply of off-peak power depends on the extent of total capacity, which in turn depends on the introduction of other major electricity-using projects. It is this which is uncertain. The potential importance of the project, given the need to raise agricultural productivity, particularly of maize, with the help of fertilizers, is obvious.

A UNIDO programming mission supported a proposal for a pesticide formulation and packaging plant. At present all pesticides are imported as formulated end-products. Prices are high and delivery unreliable. It is thought that a local plant could use domestic resources in the form of mineral diluents, which are locally available. Since these form a substantial proportion, three-quarters or more by weight, of the formulated end-product, there would be savings in transport as well as in purchase costs; in addition, the value added in formulation can equal 40 to 100 per cent of the cost of materials used. Possibilities also exist for linked industries such as the exploitation and processing of mineral fillers. Application of pesticides in agriculture is considered to give high potential returns. It is uncertain however whether the domestic market will be sufficient to sustain a minimum-size plant.

One input-supply industry attempted was production of cans - required potentially for fruit and vegetables by ADMARC at Mulanje and for fish. A major difficulty faced by the fish cannery at Salima has been the shortage of cans, and requirements could increase significantly if fish farming were developed as a commercial enterprise. Local paint producers and a number of other local industrial enterprises also provide some demand. In the absence of local production cans have to be brought from Durban at considerable cost compared to the sheet metal used for manufacture. This substantially increases the cost of exported canned products, reducing their competitiveness abroad and taking away the resource advantage of canning local products. The plant established to make cans at Liwonde unfortunately proved not successful and recently closed

down. Given the dependence of any kind of canned product on a cheap supply of cans, it is important that the most appropriate form of development in this area be investigated.

A far more important form of packaging, in terms of volume of goods packaged, are bags: until recently three to four million jute bags were imported from Bangladesh. Now Whiteheads has established production of woven polypropylene bags, using imported polypropylene granules. Malawi here is following a tread in countries such as Kenya and Nigeria. However, given that bags represent a major input into the agricultural sector, it will be vital to ensure that the cost of delivered bags does not increase as a result of this change. Bangladesh in effect subsidizes its own export production of jute bags; so long as the subsidy is maintained this is a benefit to Malawi, unless Malawi itself is able to supply bags still more cheaply.

The most obvious inputs into agriculture are farm implements of different kinds. It is clearly important that Malawian farms are equipped with the tools required and also that the level of technology is raised over time. This hopefully will be made easier if economic domestic manufacture of implements can be established. Conversely the existence of a large agricultural sector provides the opportunity for backward linkages into agricultural implements supply.

The two substantial producers of farm implements in Malawi are Brown and Clappertons, a private company, and Agrimal Ltd., owned 40 per cent by Press (Holdings) and 20 per cent by Massey Ferguson. The latter produces mostly animal-drawn single-furrow ploughs, with 8-inch (203-mm) shares and hoes. Capacity - 15,000 ploughs, 10,000 ridgers and a million hoes per year - is seriously underutilized, peak sales having been just under 7,000 ploughs of different kinds in 1979 and 790,000 hoes in 1974, the first year of production. Alarmingly, production of ploughs fell to under 900 in 1981. The output of holes has been maintained at a reasonable level of 540,000 (in 1981) but has not expanded.

There are a number of reasons for this, among them loss of export markets. Large numbers of hoes used to be exported to Mozambique and Zambia: Zambia decided to establish its own plant (illustrating the need to achieve a higher degree of economic co-operation among members of the Southern African Development Co-ordination Conference (SADCC); Mozambique has suffered from a shortage of foreign exchange. Whether Malawi itself has a comparative advantage here can be questioned in any case, since it depends on imported steel from Zimbabwe, which has its own production capacity. Similarly, production of ploughs in Blantyre requires protection against deliveries form the Bulawayo factory. More fundamentally, out of a million farmers in Malawi, only a fraction use ox-powered equipment, as is evident from the level of sales. In the Shire Valley and in the Lilongwe District about a half per cent of farmers use oxen and less than one per cent of farm areas are under ox-cultivation. There is negligible use of tractors. The increasing scarcity of land in the southern region

also suggests that it will be quite difficult to promote ox-cultivation there. Here and elsewhere cultivation of hilly terrain makes its adoption difficult. Furthermore, women farmers, who constitute a large proportion of total labour, find it especially difficult to use ox-drawn equipment. This illustrates the general problem of developing backward linkages into industry where agriculture remains largely traditional and/or small-scale. In this light, the decision by Agrimal to move into the production of cutlasses (pangas) is overdue, however unambitious it appears.

One factor limiting sales of hoes, despite a selling price of just over two kwacha, is the low level of purchasing power in the rural areas. Because of this, many farmers prefer to buy inferior hoes produced by village blacksmiths. According to Agrimal, hoes can be produced at village level at a rate of up to one hundred a day in almost every locality. Furthermore the cores of broken Agrimal hoes can be used again: blades are cut from scrap metal and handles made in the informal sector by local carpenters. While these may last half the time of a new Agrimal hoe, i.e. just one season, they can be bought at 50 tambala, a quarter of the price and are therefore an economic purchase. This example of effective informal sector competition is estimated by Agrimal to produce 75,000 to 100,000 hoes a year - one-fifth of the national market.

Livestock resources and livestock-based industry

The number of cattle in Malawi is limited in the south by the pressure of population and requirements for arable versus grazing land, and in the north by the highland nature of much of the terrain - though it is there that the greatest amount of potential new grazing remains. In 1977 there was a national average of only 0.13 cattle per head of population and about the same number of sheep and goats. The number of cattle per head of population in the southern region was half the average, while the ratio in the north was five or six times as great. Nevertheless, cattle numbers have been increasing - very rapidly in the south, at an annual rate of over 8 per cent, and nationally at nearly 5 per cent per annum, i.e. well in excess of the growth of human population. The rapid growth rate in the southern region has increased that region's share of the national cattle herd from 19 per cent in 1969 to 26 per cent in 1979. Nevertheless it is the central region that still holds the largest numbers of cattle, nearly 50 per cent of the total. The number of sheep and goats has not increased rapidly, the annual growth rate of less than one per cent implying a fall over time in the numbers of sheep and goats per head of population.

However, unless stall-feeding of cattle with zero grazing can be developed, land scarcity in the south is likely to limit future expansion. Overgrazing is already noticeable in some areas due to the increase in cattle numbers. At the same time meat is generally in short supply in Malawi and the position is one of excess demand. There is greater availability in the rural areas than in the towns because buoyant rural demand restricts the level of deliveries to urban abattoirs. Consumption per average urban dweller is already

estimated at only 9 kg per annum, and population growth at the current high rates will make it difficult to prevent excess demand increasing over time for both meat and dairy products.

The extent to which this happens will depend on the degree to which production can be intensified, one factor in which is development of the animal feed industry, as discussed later. Unfortunately animal rearing itself is an activity where no great progress has yet been made.

Compared to other economies with substantial livestock sectors, such as Botswana or the Republic of Tanzania, it is apparent that Malawi is not the most obvious country in which to develop animal-based industries. The priority is to increase the supply of meat and dairy products, for both urban and rural consumption, through intensification of beef and dairy cattle rearing and the promotion of goats and poultry. Nevertheless there is a significant national herd, and the corresponding output of hides and skins means other industrial possibilities do exist.

For meat processing, two abattoirs, one operating in Blantyre since 1960 and another in Lilongwe since 1971, have a capacity of 120,000 cattle, over 30,000 pigs and a large number of sheep and goats on a one-shift basis. This capacity is still only slightly used: for instance in 1978 CSC slaughtered 8,500 cattle, just 7 per cent of its capacity. The underlying factor here is the low level of controlled meat prices, which severely restricts supply to the two urban areas, at the same time renders slaughtering operations highly unprofitable. Even if this policy were adjusted there would be no need for additional processing plants in the central and southern regions.

An existing pilot dairy plant in Blantyre buys some 1,200 gallons (5,440 litres) of milk daily, three-quarters coming from smallholders. However, a detailed plan exists for a new processing plant for the Blantyre area with a capacity of 27,000 litres. This factory would also turn out other dairy products. The need for additional production of milk and milk products is pressing: 5 1/2 million pounds (2,500 tons) of dairy produce are imported annually, and demand is unsatisfied in both urban and rural areas. It nevertheless seems doubtful whether this demand can be met from domestic sources for some time to come, during which Malawi will continue to depend on imported milk products.

The need for a tannery is clear. Malawi currently exports raw hides and skins (mostly to Greece) and imports all leather requirements for its limited leather-working activities. A feasibility study for a tannery and related leather-working industry, carried out in 1978 by GOPA, concluded that the project was indeed feasible. Viability will depend primarily on securing an adequate inflow of hides and secondly on finding adequate outlets for the leather. Approximately 80,000 cattle hides or their equivalent are required for a small, economically-viable tannery. This could be satisfied by an intake of 60,000 hides and 75,000 skins (the recommended full capacity for one shift working).

If the first-stage industry is leather production, a further question is the extent to which this can be substituted for imported leather in existing second-stage industries or provide the basis for new second-stage industries using leather as input. Either possibility would produce an increase in manufacturing value added.

Existing leather-based industries are essentially two - the Bata Shoe Company and the Leather and Luggage Manufacturers, Blantyre, making suitcases, briefcases and other items. Per capita consumption of shoes in Malawi is approximately 0.35 pairs per person per annum, i.e. quite low compared to the figure of 1.0 for developing countries as a whole [11]. Bata started shoe production in Malawi in 1974 with 25,000 pairs, reaching 200,000 pairs per annum in 1977. This is about two-thirds of the country's consumption of leather-topped shoes; another 800,000 to a million pairs, mainly with canvas uppers, are also produced.

The demand for leather curios and souvenirs estimated in the GOPA and World Bank studies is based on estimated numbers of tourists coming to Malawi. The only export possibilities considered in these studies are for curios and souvenirs, and these are deemed too uncertain. One real possibility is an export market in labour-intensive small leather goods, including handbags and shoulder bags. While other African countries with large livestock sectors, such as Botswana, would appear a more obvious choice for such an activity, in fact what is required is an adequate rather than abundant supply of leather, the main constraints being labour skills, which can be developed, product design and market promotion. Such products are already successfully produced in neighbouring Tanzania without yet being effectively marketed abroad.

The other potential livestock-related industry is the animal feed industry. At present, mixed animal feed in Malawi is produced largely by the Grain and Milling Company (GRAMIL). The product is based on grain milling, its nutritive content is questionable, and production is relatively small, amounting to some 10,000-12,000 tons of prepared feed per annum.

About two-thirds of this is fed to poultry. At the same time some 400-600 tons of fishmeal and premixes per annum are imported at high prices, while fish residues at Salima Canners and elsewhere are thrown away. Taking GRAMIL and Salima together, there is more than enough manufacturing capacity to meet current demand for feed; milling by-products are also readily available as inputs, together with protein sources such as groundnuts, cottonseed meal, maize germ and rice bran, with additional supply potential in the form of guar beans and soya beans.

The immediate constraint is on the demand side, with poultry feeding (for urban supply) making up the bulk of what is still quite limited demand. With government encouragement, the growth of this industry has been quite rapid. The greatest need here, however, is to develop poultry rearing for households' own and local consumption in the rural areas, as a source of protein and diet enrichment. In

addition to being an effective educational input, this would depend on keeping prices of feed very low, the economics of poultry-rearing being a direct function of feed costs. It may be necessary to develop domestic or village methods of low-cost production of feed mixtures.

Fishery resources and potential industry

Twenty-two per cent of the surface area of Malawi is water, and it is distributed geographically in a way that maximizes the proportion of the population within potential service-distance of the fishing resource. Between 70 and 80 per cent of the animal protein consumed in the country is fish. In 1973, for instance, annual per capita consumption was estimated at 3.9 kg fresh fish and at 10.5 kg dried fish (fresh fish equivalent); the total 14.4 kg, far exceeded 3.3 kg for meat and 0.7 kg for poultry [12]. This is all the more significant in the context of poor prospects for animal production. Signs of overgrazing by cattle are already apparent in the far south and the far north of the country; land availability for grazing is rapidly diminishing, and it is increasingly pre-empted by the demands of intensive subsistence and cash-crop agriculture. At the same time per capita consumption of animal proteins is still well below WHO recommended figures, so that there remains an urgent need to increase output. A further advantage is that, compared to meat, fish represents a relatively cheap form of main dish for low-income rural and urban households.[21]

Fishing also constitutes an important form of employment and can be viewed alongside agriculture as a basic productivity activity. Indeed a large number of rural households are farming/fishing families rather than simply farmers. For this reason it is intrinsically difficult to estimate the number of fishermen. Rough figures issued by the Department of Fisheries are 21,000 in 1979 and nearly 23,000 in 1980, including assistants. Some 70 to 75 per cent of these may be effectively full time.

Certainly a large number of households obtain significant incomes from fishing. Data available from agro-economic surveys show, in fact, that some of the relatively well-off rural households derive their superior position from fishing income. Moreover, considerable income is generated in the processing of fish and in trade. At the same time fishing is valuable as an activity that is carried out very effectively through small enterprises. In Malawi it remains largely artisanal, thus ensuring a wide distribution of the incomes created.

Current output is of the order of 70,000 tons per annum, mostly (about 90 per cent) landed by artisanal fishermen. Malawi has five major fisheries: Lake Malawi; Lake Malombe and the Upper Shire River; Lake Chilwa; Lake Chiuta and the Middle Lower Shire. In addition there is an embryonic fish-farming development. Lake Chilwa with 32 per cent of the catch is now almost as important as Lake Malawi (46 per cent). While output has not been increasing, due to other factors the number of fishermen has probably continued

to increase (excluding losses of boats in recent yeats, due to flooding). The number of traditional boats was estimated at 9,026 in 1978, compared to 7,535 in 1975, an increase of 20 per cent.

As regards development potential, the general view is that, in the southern part of the lake and at other southern fisheries, fishing is close to its maximum sustainable yield. Some scope exists in the central part of Lake Malawi, especially using mid-depth trawling. The stocks of fish in the deep northern section of Lake Malawi are not known, but are probably limited; an assessment programme is underway. Moreover rough water makes fisning difficult, particularly any kind of artisanal fishing. Some research and development is being carried out by the Fisheries Department, with United Nations assistance, on intermediate methods of fishing suitable for the central and northern lake.

Limits to production potential in Malawian fisheries are suggested by production figures over the last decade. The mean volume of output over the three years 1979-1981 was actually 26 per cent down on that for 1971-1973. While this reflects in part the dislocation caused in the recent years by rising lake levels and loss of boats, the figures for the previous three-year period, 1976-1978, were also 7 per cent down, indicating, if not a downward trend, the absence of any upward one. Production of fish had previously expanded quite rapidly from a low base of 5,800 tons in 1960 to the peak of 84,100 in 1972. The fall in supply is even more significant in the context of the rising population.

The Government has sensibly eschewed the possibility of strongly promoting commercial fisheries in established artisanal areas: this would be likely to lead to undesirable substitution and loss of employment. It looks to commercial fishing rather as a means of tapping additional potential, hopefully more in the northern lake where artisanal fishing is difficult or hazardous. The commercial catch however has declined since 1975. Malawi Lake Development Company (MALDECO), a subsidiary of the MDC, accounts for a significant portion of commercial output (over 60 per cent in 1978). Nevertheless, substantial expansion of production through commercial fishing, as a basis for expansion of a fish processing industry, is probably not to be expected.

At present, processing for the artisanal industry is carried out not by the fishermen, for the most part, but by a separate category of full- or part-time beach processors. The latter may dry or smoke the fish and either transport or retail the fish themselves to one or two customary markets, or sell to visiting traders. Present processing facilities are inadequate and unhygienic. Spoilage is estimated at 30 per cent. The condition of the fish is thought to inhibit exports of dried fish, despite the significant quantities that do reach export markets, particulary Zambia. It is possible that effective fish supply might be better achieved by reducing fish losses and improving quality, handling, processing, transportation and marketing - rather than by increasing the gross catch.

The development of fresh-fish marketing through provision of ice and improvement of facilities for drying are direct substitutes; they can therefore both be considered as forms of processing, whose objective is preservation. The CSC, MALDECO and Fisheries Department all manufacture and sell ice to traders who travel long distances to procure it. This indicates ice is a critical element in fish marketing. Investments in additional ice production points could therefore yield high returns.

Most important is the need to improve traditional processors' knowledge of techniques and facilities for drying and preserving. Research focussing on a combination of simple drying and smoking methods has demonstrated the possibility of reducing spoilage by over two-thirds - equivalent to a fifth of the total catch at particular times of the year. Efforts are also needed to develop fish landing and processing areas in the northern part of the lake.

So far the credit needs of the industry have scarcely been touched. The Fisheries Department is active, but it is quite small and short-staffed. Fishermen require assistance in acquisition of boats, boat-builders in gaining priority access to limited supplies of mulanje cedar.

Apart from the informal sector beach processors, two parastatals, MALDECO Fisheries and CSC, and two private companies, Lakes Fisheries and Salima Canners, are involved in commercial processing and handling of fish. The canning company's operations to date have been highly erratic. Some of the factors responsible are non-repetitive teething problems characteristic of any new project involving a number of unknowns. Clearly, though, despite the existence of potential local and export markets for canned products, local demand for fresh and simply processed dried fish (together with exports in this form) is likely to absorb the bulk of available supply and, indeed, deserves this priority. Also, since even the proposal to expand the Salima Cannery must be deemed a high risk, in the absence of new sources of supply such as fish farming, scope for a major fish canning industry in Malawi does not appear to exist.

Canning is only one part of Malawi's fish-processing industry, and even of fish processing for export, it is very much the smallest part. The main processing industry, the one that should have the highest priority for improvement and development, is smoking and drying by traditional processors. The substantial scope for improvement has been indicated. Apart from boats and engines, the other main capital item is nets, a resource-linked industry which already exists in the form of Blantyre Netting Company, a subsidiary of Whitehead's, the textile manufacturer. Sales of fish nets in Malawi already amounted to 2.8 million yards (2.56 million m) of netting in 1978 and Whitehead's is contemplating doubling local capacity. In this respect the position of the Malawian fishing industry is exceptionally healthy, with most single boat owners possessing some 5,000 yards (4,572 m) of gill nets and some larger owners as much as 15,000 yards (13,716 m). This is in sharp contrast to the extreme shortages current in neighbouring Mozambique and Tanzania, and in Zaire. Despite this, supply is well short of

demand, leaving the netting company with large unfilled orders; the proposed expansion of capacity should therefore justify itself in financial as well as development terms. Further demand will depend on the development of the central and northern fisheries.

The main conclusion from this brief review is that the fishing industry, both production and processing, is a significant one in Malawi as it stands - both in terms of creating employment and incomes and in terms of supplying a vital item of consumption and creating useful backward linkages; this is despite being organized on informal lines and being directed towards low-income internal consumers rather than export markets.

Forest resources and forest-based industries

Malawi's forest resources constitute something of a paradox. Some 40 per cent of the land surface of Malawi is under forest (20 per cent as natural woodland on normal land, 11 per cent on National Parks and Game Reserves, and 9 per cent under Forest Reserves and Protected Hill Slopes).[12] At the same time there is a serious, indeed critical, problem of wood availability, particularly fuelwood for Malawian rural households. A very high proportion of the population of Malawi depends on wood fuel for cooking and heating; poles are a crucial element in rural housing construction. Even in urban centres wood is still the most commonly used form of domestic fuel. Fuelwood and pole production and consumption is estimated at 10.6 million cu m per annum compared to an annual production of industrial roundwood for other purposes of just 84,500 cu m. Some 99 per cent of all wood consumed in Malawi therefore comprises fuelwood and poles [13].

Recent information issued by the Ministry of Natural Resources puts the total area of man-made forests in Malawi at about 3,950,000 ha, of which 3,100,000 ha is unreserved woodland and 763,000 ha is legally constituted forest on reserved land. Most of the remaining 90,000 ha are made up of central government plantations (75,000 ha). Local authority forests are of minor importance, and there are just 2,000 ha of officially established rural woodlots. There are also some 12,000 ha of private forests established by tobacco and tea estates. The largest portion of the central government plantations comprises the Viphya Pulpwood Project, accounting for 53,100 ha, 71 per cent of the total.

The main divisions are thus between (1) the Viphya plantation, (2) the government plantations in the southern part of the country, developed to yield sawn timber and transmission poles, and (3) fuel plantations developed (a) by agricultural estates for drying tobacco or tea, and (b) for domestic supplies of fuelwood. These are located particularly near urban centres. In addition there is the Fort Lister plantation on Mulanje Mountain, developed to provide splints for the Blantyre match factory.

The bulk of the forest plantations in Malawi (88 to 92 per cent according to different estimates) is conifer, 67 to 73 per cent of this being designated as pulpwood, the rest as sawn timber. Only 5 to 10 per cent are hardwood plantations of direct potential use as fuelwood and poles. A key question is whether this will prove to have been the best form of investment, given the developing shortage of other types of wood suitable as fuel, and the non-feasibility of the original objective for the pinewood, namely production of pulp for export.

Until 1964 forestry in Malawi was associated primarily with the creation of reserves for protection purposes and with the establishment of quite modest areas of softwood plantations for sawn timber production ([13] p. 1). The bulk of investment in softwood afforestation thus appears to have occurred after Independence in 1964. This was mainly the Viphya Project established in the northern part of the country with assistance form the United Kingdom. The area under this project now amounts to over 52,000 ha. Current plans, including those for sawn timber production, call for an area of 78,000 ha by the year 2011.

The project, as originally envisaged, was for a pulp mill of planned annual capacity of 180,000 tons of bleached kraft pulp, to be established at a total cost of some K 320 million. The entire output was to be for export. About 94 per cent of the Viphya Plantation is therefore pinewood. As noted in a recent ODA Viphya Utilization Study, however, the pulpmill has proved unattractive to investors because of high constructional, infrastructural and transport development costs. In addition there would be high transport costs for the exported pulp itself, compounding which is the intention of neighbouring countries to develop their own reserves.[13/] This will affect wood-based industries generally. The ODA study notes that:

> "Studies in other countries in the region, the Republic of South Africa, Mozambique, Zambia and Zimbabwe, indicate that all these have adequate forest resources and are either developing timber and wood-based industries or plan to develop such industries. It is therefore improbable that Malawi will be able to develop a sizeable sustained export trade in timber or wood-based products with other countries in the region"[14].

The scope for utilizating the Viphya forest as a source of sawn timber is limited by the cost of transporting such timber to the main population centres in central and south Malawi, and by the greater proximity of other, existing supplies in those regions. Plantations in the south will generally satisfy the internal demand for timber and wood-based products (except the major requirements of the traditional sector and for fuelwood) until the end of the century and beyond, on a sustainable yield basis. Hence only a small proportion of the Viphya resources will be needed for sawn timber.

Given the scale of this forest resource, minds are being exercised to devise the best use to which it could be put. Some possible industrial uses are reviewed in a later section. Even if the original purpose underlying the investment does not materialize, the existence of a resource on this scale could provide a major opportunity in a new direction sometime in the future. There is some danger, however, that its existence diverts government attention, personnel and finance from the much clearer demands for wood supplies for fuelwood and traditional construction where a huge deficit is apparent and where the basic needs of a substantial part of the population are in jeopardy. This is in addition to the substantial requirements of the tobacco export industry. A Government statement in 1980, referring to the 48,846 ha already established, still talks of the 64,700 ha needed to sustain the proposed pulp mill [15].

While the traditional sector or sectors in Malawi make huge demands on the supply of fuelwood, timber is required for a wide range of purposes. The majority of houses are still of mud and wattle, and require building poles. In 1980, this accounted for an estimated 13 per cent of the combined demand for fuelwood and poles in 1980, over 1 1/2 million cu m per annum [16]. The longer exotic poles grown on plantation have great potential value if they can be made available at a low cost. Housing also requires sawn timber for doors and window frames. The smaller quantity of brick housing would preferably require sawnwood roof timbers, but necessity has often entailed the use of roundwood even here. In addition indigenous wood supplies are used for constructing maize stores, tobacco barns, cattle corrals and fencing. Indigenous fuelwood is used in small-scale brickmaking, for burning lime and for smoking fish. Wood is used in boatmaking, handicrafts, and especially in small-scale furniture-making in rural and urban areas. It is therefore not just a consumption item as fuel, but an input into a wide range of economic activities within the local economy.

Even where sawn wood is employed, this is often hand sawn. An important point to consider, therefore, when natural supplies are being augmented by Government action, is how intervention can be achieved while maintaining the low-cost at which wood is made available to traditional and small-scale users.

Already, on the basis of sustainable supplies, there is an estimated general deficit in the supply of fuelwood and poles amounting to 2.2 million cu m ([15] p. 7). Deficits existed in 1980 in 15 out of the 24 districts, including all districts in the southern region except Mwanza, and all districts of the central region except Salima, Ntcheu and Nkhotakota. In twenty years all but three would be in deficit ([16] p. 7). In 1977, the estimated potential supply of 8.8 million cu m amounted to only 80 per cent of estimated annual consumption of 11 million; this implies a consumption well in excess of sustainable supply levels and thus at the expense of forest reserves and future availability. The imbalance is most acute in certain districts: demand in Lilongwe district, for instance, is estimated at six times as great as potential supply.

Another factor affecting future supplies is agricultural expansion into previously uncultivated, largely wooded, customary land. This rate, estimated 3.5 per cent of such land per annum ([16] p. 3), would account for one-fifth of the total area in six years. Already in some densely populated areas such as the Lilongwe Plain, little natural woody vegetation is left. Projections made by the Department of Forestry forecast fuelwood demand as expanding by 77 per cent, from 10.3 million cu m in 1980 to 18.2 million cu m in the year 2010, with household demand increasing by nearly 90 per cent. Demand for poles is only 14.4 per cent of the combined volume of wood in 1980, but is projected to increase by a 100 per cent by the year 2010. Moreover, the figures projected for fuelwood appear to substantially underestimate real wood requirements since they are based on an assumed drop in domestic wood use per head from 0.85 cu m in 1980 to 0.65 cu m in 2010, partly as a result of increasing scarcity of firewood (which is supply, not demand) and partly because of the expected use of wood-saving stoves, the impact of which should be considered uncertain at the moment.

In addition to the effects of wood shortages on households, and on the tobacco and other industries, these imbalances risk overcutting of forest reserves; they thus constitute a serious threat to the stability of agriculture and the rural environment. A related effect on agriculture arises out of labour time spent in collecting fuelwood. Over 90 per cent of rural households collect all their firewood. Some 20 per cent currently walk a round trip of four miles or more for this purpose; in a few districts in the south this rises to 40 per cent [17]. These percentages and the distances walked are likely to increase rapidly. The time involved added to that spent in fetching water, is time lost for agricultural tasks.

The two policy conclusions arising out of the foregoing are, first, that efforts should be directed towards solving or alleviating this problem above all others. And second that the potential conflicts between the demands of competing users need to be seriously considered. On the first, a number of initiatives have already been taken. A Wood Energy Unit has been established in the Ministry of Agriculture. A Rural Fuelwood and Poles Project, financed mainly by the ODA, was started in 1976 and had established some 700 ha of eucalyptus plantation by the end of 1980. Also the original integrated rural development projects in Malawi each had forestry components, as had the eight smaller rural development project areas operating from 1976. Since a National Tree Planting Day was inaugurated in the same year, as much as 2,000 ha of woodlots may have been established through schools and colleges. Since 1978, there was also a Rural Fuelwood Research Project. Since 1972 over 5,000 ha of eucalyptus plantations have been established by the Kasungu Flue-Cured Tobacco Authority (KFCTA). The Wood Energy Project, which resulted from the 1978 study of fuelwood and pole supply and demand, and which is funded for 1980-1985, is a fairly ambitious programme involving establishment of 88 nurseries (each to produce 100,000 plants per annum from 1980/81). In addition some 12,900 ha of fuelwood and pole plantations will be set up over a four-year period beginning in 1981/82, including 9,000 ha in forest reserves in Blantyre, Zomba and Lilongwe Districts. There will also be charcoal production trials.

Another solution, given the scarcity of land in populated agricultural areas, is agro-forestry carried out by smallholders themselves. This is now being given urgent attention with research into appropriate species being carried out. An earlier woodlot campaign carried out by the Forestry Extension Service also had some impact. The current average annual consumption of 0.85 cu m per head means however that a rural family of five would require as much as 0.4 hectares for a family woodlot [ ]. It seems unrealistic to expect such an area to be planted or brought to maturity by many households.

For a number of reasons any effort on farmers' part is likely to require supplementation. Farmers at low levels of income and exposed to risk are likely to discount the future, especially that of the next generation. For the same reason they are likely to make a sub-optimal choice between putting land under crops and under trees, or applying labour to each. At the same time, where households responsible for planting and maintenance are not assured of keeping the eventual product for themselves, there will be a divergence between private and social benefit in planting decisions. Consequently more direct intervention in planting by the Forestry Department, perhaps through village woodlots or woodlots serving several villages, may need to be considered to make use of whatever land is suitable.

In considering potential forest-based industries a distinction should be made between those that will utilize the Viphya resource and those using other resources. The ODA Viphya Utilization Study considered five separate forms of utilization: pulping, saw milling, plywood veneers, chemical manufacture and (from eucalyptus) transmission pole production. To these charcoal production might have been added.

Malawi already possesses seven saw mills. Easily the largest is that run by the Imperial Tobacco Group, mainly in connection with its business as tobacco merchant and packer. Its output of 17,382 cu m in 1979 accounted for about 37 per cent of the country's total. Together with the output from three publicly-owned sawmills run by the Forest Industries Division, this made up about 90 per cent of total production, estimated in 1979 at 46,569 cu m. Imperial Tobacco also owns a veneer and plywood plant, and there is a small, privately-owned match factory near Blantyre. The sawmills at Zomba and Dedza produce structural grade sawn timber for building purposes from softwood and boxwood. At present about half the sawn timber is softwood (pine and cedar), the rest hardwood.

According to World Bank estimates, the demand for sawn timber exceeds supply by a substantial amount; at the same time, prices of domestic timber are well below import parity. It is expected that demand will about double over the next 20 years. Additional capacity could be based on the Viphya resource, to supply timber and poles for the northern region, but the main project is on the Zomba plateau. This would replace the existing mill of 0.6 million cubic feet (17,000 cu m) input capacity with a new one double that size. Softwood supplies available from the Zomba forest would more than

sustain this, and the mill would be well located to fulfill demand from the greater Blantyre/Zomba area. The ODA Viphya Utilization Study recommends a sawmill for Viphya of 28,000 cu m. Both suggested sawmills appear viable, with priority for expansion at Zomba near the main source of demand.

Average annual imports of blockboard, plywood and veneer increased at a rate of just below 8 per cent per annum over the period 1969 to 1979; overall consumption, including local production, rose at over 17 per cent per annum ([14] p. 29). Very little particle board is used in Malawi, unlike other countries, and demand is overwhelmingly for plywood. This demand is buoyant, and expected to increase by two thirds over the ten years to 1990 [14]. Plywood has many uses - in furniture, sub-flooring and sub-roofing, for walls, panelling and partitions, for packaging and outside for decking and construction site fencing - but in Malawi some 40 per cent is used in tea, tobacco and other packaging (particularly tea) and thus represents an export. Local production has lagged behind demand. A new mill would need to be located at Viphya, the only area where there would be sufficient raw material supply. The number of suitable trees still needs to be precisely determined, but the Ministry estimates some 6,000-8,000 cu m are available.

One obvious possibility, given the huge pine reserves, is the production of naval stores, gum, wood and tall oil rosin and turpentine. Trees within five years of felling could be tapped without affecting their subsequent use. Although the domestic market in Malawi would be small - one of the major uses of rosin is as size in the paper industry, which is not yet established in Malawi - export possibilities exist for rosin, which has a fairly high value per unit weight compared to other timber products.

The extent of further processing of gum oleorosin is another matter. While this can be simply distilled into rosin and turpentine, excess distilling capacity already exists in a chemical plant in Zimbabwe (Harare), which could absorb all output in the early stages: domestic capacity could be established subsequently. Further processing of rosin and turpentine into other constituents is not likely to be economic, however, as this is capital-intensive, with substantial scale economies.

Charcoal is not much used in Malawi. This is surprising, in the light of the cold season, since it has advantages in terms of heating and ease of storage. Reduced costs of transportation relative to fuelwood have to be compared with production costs for making charcoal, but estimates suggest a return journey of between 30 to 50 miles as a break-even point. Different potential supply areas have been considered. One possibility is to use areas of indigenous forest land that are in process of being transformed to industrial plantations; another is more remote indigenous forests being taken over as forest reserves, which would not otherwise be exploited. At present some 1,160 ha per annum of indigenous forest are cleared for conversion to industrial plantations but the wood is lost because of distances to markets. The ODA study sees the Viphya forest as a vast potential raw material resource for charcoal production - although acknowledging the doubts expressed over the carbonization qualities of pine.

The problem in both cases may be the distances to the markets. Viphya is at a particular disadvantage because the main market is in the southern and central regions. One possibility is for Viphya to supply charcoal to the cement works at Kasungu. This particular market for energy appears, however, destined for electricity supply through ESCOM and can therefore be excluded. Transport cost to the southern or central region markets would be prohibitive.

In addition to supplying building poles, door-frames and windows, the forest sector provides the basis for a widespread small-scale furniture-making industry. This is another reason for continuing to ensure supplies of wood.

Another eventual possibility is to develop productive capacity for knocked-down pine furniture. Since the late 1970s, both the Republic of South Africa and Zimbabwe have become significant exporters of such furniture for do-it-yourself, chain store and mail order markets. Malawi would be at a substantial transport disadvantage but this may be reduced as transport facilities inprove.

Two more ambitious developments based on wood considered in the ODA Study are production of fuels and chemicals. Items currently being imported, and which might be produced from wood, are gasoline, LPG and methanol, nitrogenous fertilizers, polyethylene, pine oil, solvents, detergent, cellulose, ammonia, lacquers and resins.

The bulk of chemicals in use in Malawi, with its limited industrial base, are nitrogenous fertilizers. Over the period 1977-1979 imports of fertilizers averaged 88,000 tons, some 60 per cent being ammonium sulphate. Fertilizers are in part blended and granulated locally. The ODA Study suggests that an ammonia plant of some 53,000 tons per annum capacity might be feasible, based on Viphya resources. This still needs to be substantiated.

The same study points to the considerable R and D effort that has been devoted over the past ten years to thermal processing of biomass in order to obtain gas or a liquid fuel product. It is now technically feasible to manufacture gasoline from methanol or directly from synthesis gas. Accordingly a gasoline production plant, using wood gasification techniques, with a capacity of 68,000 tons per annum is suggested. Unfortunately the view of other consultants, e.g. Trichem of the Federal Republic of Germany, is that relevant technology has still to be proven industrially and that it will be some years before a wood gasification process for methanol production reaches the stage of development needed to provide all the data required for building a commercial plant. While, therefore, this remains a possibility for the future, immediate progress should not be envisaged.

Another project under discussion is for a transmission pole treatment plant. Given the length of Malawi, such a plant would have a transport cost advantage over alternative sources in supplying northern Malawi. However this advantage would be reversed in relation to the south and centre of the country. It would therefore be necessary to establish the size of this separate sub-market in order to determine feasibility.

The overall outlook for developing the Viphya resource is that while there are many suggestions, the immediate practical options are limited. The original objective of producing pulp for export does not appear feasible; nor, for the moment, does the major alternative of wood gasification for gasoline production. The production of ammoniom sulphate may also be in this category. There will be some usage for fuelwood, but significant production of charcoal is unlikely to be economic; the production of pine furniture, if Malawi were to succeed in entering that market, would probably not use this particular resource. This leaves the establishment of a sawmill to serve the north of the country, a plywood mill, a treatment plant for transmission poles, again serving the north, and the production of naval stores with distillation of oleorosin at a subsequent stage. Together these would use only a small proportion of the total resource. As already noted, while possibilities for fuller utilization continue to be explored, it is important for policy-makers and planners in this area to concern themselves less with justifying ex post this investment but to focus action on the critical needs emerging in the area of fuelwood and rural construction supplies.

Small-scale and informal manufacturing possibilities

Project appraisal in Malawi, as elsewhere, has tended to be biased towards medium- or large-scale projects rather than programmes for small industry development. Large-scale enterprises are more likely to be involved where an effort is being made to attract foreign investment, or where parastatal development corporations are used as the principal vehicle for developing new economic activities. (Large-scale enterprises lend themselves more readily to parastatal participation and control.)

From what has already been said, it is clear that Malawi has a thriving informal enterprise sector and a number of interesting small-scale industries. One should not be misled by official NSO figures of employment in enumerated establishments, which relate only to establishments with 20 or more persons. Official figures for 1975, for instance, suggested firms with less than 50 employees accounted for 3 per cent of manufacturing employment. In fact, this data covered just 28,000 persons employed in formal sector manufacturing: a more comprehensive census of small-scale informal sector enterprises carried out by the Ministry of Trade, Industry and Tourism in 1977/78, estimated the number engaged in this sector at over 100,000, if related sectors such as construction and transport are included [19]. These were well distributed throughout the country: only 18 per cent of small-scale enterprises with paid employees and 15 per cent of self-employed artisans were located in Blantyre or Lilongwe.

In addition to manufacturers, as generally defined, there were some 500 commercial brickmakers, 80 contractors, 1,000 transporters and 1,400 artisans producting handicrafts. Tailoring is the most important activity, as far as employment is concerned. In 1978 this accounted for 606 out of 756 small-scale manufacturing enterprises (80 per cent) in Blantyre/Limbe, Lilongwe and Liqonde, and 92 per

cent of all enterprises involving self-employed persons. Excluding the self-employed, tailoring accounted for only 14 out of 114 units. The other important manufacturing activities are tinsmithing and carpentry, while in the rural areas small-scale commercial maize-milling is of some significance.

Modest as these informal and small-scale activities appear, the competition they provide for actual or potential formal activity is in a number of instances quite severe. The vast number of small tailors, though usually working on a self-employed basis without their own premises - often on khondes, or shop verandahs - provide the major outlet for the cotton fabrics produced by David Whitehead's and the major source of garments for low-income consumers. Reference has been made to the competition provided by informal fish processors for the Salima cannery, for MALDECO industrial fisheries by artisanal fishermen, and by village blacksmiths for the Agricultural Implements Company of Malawi (AGRIMAL) in making agricultural implements.

In discussing industrial development, the construction industry is frequently set apart from the more narrowly defined manufacturing sector and, when considered, often thought of in terms of large-scale, modern sector construction. In reality, construction ought to be considered as an industry alongside others - one that is particularly important to basic needs in the form of both rural and low-income urban construction. Closely associated, and often integrated with it, is an unusually widespread brickmaking industry. As indicated, in 1978 there were some 400 small-scale units producing bricks in Malawi, employing more than 15,000 people. In 1981 these were producing, by the simplest, labour-intensive methods, some 70 million bricks per annum, compared to only about one million machine-made bricks, the latter accounting, therefore, for no more than 1.4 per cent of the combined total. The former were made at only a fraction of the cost: a further example of the competitiveness of small-scale enterprise.

Many of the current and potential resource-based industrial activities identified earlier are, in fact, small scale. The local resource content of small-scale enterprise activity varies but is usually comparatively high, especially in the case of rural enterprises. This general tendency to use local resources may be associated with the fact that they cater especially for low-income consumers, providing basic needs such as rural housing, including doors and window-frames made by carpenters, simple furniture, metal containers (albeit with imported materials), garments, staple food processing, agricultural implements and a variety of repair services, which as already suggested can be regarded as using local resources. For the same reason small-scale enterprise activity is also labour- rather than capital-intensive, labour being another local resource that is available cheaply. In contrast, medium-scale, import-substituting firms often operate with high import content, exhibit a low proportion of value-added, and cater for the higher income groups. Agro-processing, on the other hand, is frequently dominated by medium- or large-scale establishments, often foreign-owned, as in the case of tobacco, tea manufacturing and cotton textiles: thus while small-scale enterprises are often resource-based, resource-based enterprises are not necessarily small.

Small-scale enterprises may thus use local resources and contribute to providing basic needs; for these reasons they are a valuable form of manufacturing. Rural surveys carried out by the Agro-Economic Survey demonstrated the paucity of ordinary household equipment in the average rural household. In Kawinga, for instance, less than half the households owned a bed, almost the same proportion had one chair, and only just over a quarter had a table, indicating the potential benefit from the development of rural carpentry.

Overall prospects for resource-based manufacturing in the 1980s

Having examined the resource base in Malawi, and specific industrial possibilities connected with its separate components, these can be brought together (see figure) to provide an overall picture of the prospects for resource-based manufacturing in the 1980s. The implications are summarized below.

While Malawi has been pursuing a deliberate strategy of resource-based industrial development with a considerable measure of success since independence, as noted in DEVPOL in 1970-1971 some limits are now apparent. In agro-processing some additional sugar refining may be expected, although the rapid expansion of estate production of sugar may be approaching a limit that has probably already been reached in the case of tobacco and tea. There is scope for some expansion of cotton, which is the crop with by far the most important forward linkages into manufacturing. A limited rubber output also offers industrial possibilities for the production of rubber sheet and crepe. There will be additional processing of two staples, maize and rice, and development of various minor crops - minor, but each capable of making useful contributions - such as fruit and vegetables, guar beans and macadamia nuts. Population pressure on the land in the central and southern regions presents a problem for continued expansion of industrial crops in the medium term and points to the urgent need to expand the agricultural resource base by developing the northern region, where the greatest unused potential exists.

Given the pressure of population on land, the scope for expanding the numbers of cattle (particularly beef cattle) is circumscribed, though this would not prevent the development of some second-stage leather-using industries. Dairy production is poorly developed, and there is scope for much improvement and extension of the industry. The possibilities for expanding fish production are probably fairly limited. The minerals cupboard also appears rather bare, though the sector includes a major existing activity in brick-making and cement production, which together form the basis of the construction industry.

Table 7 divides prospective manufacturing activities into first-stage processing and second-stage manufacture, distinguishing also between activities suitable for small-scale production and those for medium- or larger-scale production.

Table 7. Resource-based industrial possibilities in Malawi[a/]

Input industries	First stage processing	Second stage manufacture
	AGRICULTURE	
Pesticide formulation?	(Tobacco curing)	(Cigarettes)
(Mineral filters)	Sugar refining	Ethanol
Fertilizers?	(Tea processing)	Syrups and glucose
	Cotton ginnery	Cotton fabrics
		(Knitted fabrics)
		(Blankets, towels)
Woven propylene bags	Rubber processing	Tailoring
Cans	Canning of fruits, vegetables	(Fish nets)
	(Lentils)	
Agricultural implements	Groundnut and vegetable oils	Rubber sheet and crepe
(including pangras)	Macadamia nut processing	Soap making
	Tung oil	Solvent extraction of oils
	Guar bean processing	
	Maize milling	
	Rice processing	
	LIVESTOCK	
Animal feeds	Beef butcheries, abattoir	Shoes
	Dairy cattle products	Curios and souvenirs
	Tannery	Travel goods
	FISHERIES	
Cans	(Drying, smoking)	
	(Canning)	
	Fishmeal	

continued

Table 7 continued

FORESTRY

Charcoal production	Ox carts
Cedar for boats	Wood gasification for fertilizer production?
(Fuelwood for domestic consumption and tobacco processing)	Ammonia?
Electric transmission poles	Plywood mill
Sawmills	(Wood wool cement slabs)
Building poles	Pencils
Match splints	Furniture
Honey and beeswax from forests	Matches

MINERALS

Grinding of nepheline syenite	Glass and glass containers
Bricks	Ceramics, ornaments
Marble cutting	Industrial pottery products
Limestone kilns	
Cement?	

NON-WOOD ENERGY

Hydroelectricity

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a/ Activities in parentheses already exist; others are new or expansion of existing activities. Question marks indicate doubtful possibility. Underlining indicates activity providing input to other resource-based activities.

Anticipated first-stage processing includes some additional sugar refining and cotton ginning, some rubber processing, as well as further maize milling and rice processing. Among minor crops, processing of macadamia nuts and of guar beans are possibilities. In the livestock sector, dairy plant and a tannery are the main items; under fisheries further processing may depend on the extent of developments in fish farming. In minerals there is potential for further development of small-scale brickmaking, ceramics and lime production, and of ornamental stones, with the possibility, although not immediate, for expanded cement production. The development of glass sands and grinding of nepheline syenite are possible significant new developments. Some expansion in saw milling is anticipated, together with items such as building poles, naval stores and match splints from the forest sector.

As already noted the major linkages from first-stage processing into second-stage industries have so far been from cotton into the textile industry, particularly the weaving of cotton fabrics but extending into a number of other textile activities. This is despite the limited base of cotton production, and it can be regarded as rather successful development. Other possibilities appear limited: particularly the ethanol plant, based on sugar production, manufacture of glass and glass containers, production of shoes and leather travel goods and curios, and a plywood mill.

Further attention has been paid to assessing and developing the resource-related industries that provide inputs for exploiting the resource base: fertilizers and pesticides remain the most conspicuous gaps; efforts have been made already to produce agricultural implements, cans and, more recently, woven propylene bags, together with fishing nets and boats to develop the fishery industry.

The uncertainty regarding the feasibility of producing fertilizers is associated with the general uncertainly regarding the various related Viphya projects, including the production of pulp. These would clearly have offered a major new stimulus to resource-based manufacturing in Malawi. Unfortunately for some time ahead the scale of forest-based industrial development is likely to be very much more circumscribed than originally anticipated. This reflects economic factors and limitations of present technology.

The uncertain economics of some of the larger projects make it all the more important not to lose sight of the contribution of small-scale and rural industry, particularly tailoring, carpentry, staple food and fish processing, brickmaking and rural construction, all of which are resource-based. They offer scope for considerable expansion if need can be backed by increased purchasing power to convert it to effective demand.

While Malawi does not have a very specific four- or five-year development plan document, the Ministry of Trade and Industry has some limited project appraisal capacity and has prepared a loosely-constructed Industrial Development Programme [20]. Issued in 1982, this follows an even more indicative document, "Guidelines for an Industrial Development Programme", put together in 1980 with UNIDO assistance [21].

The industrial development programme includes a short list of projects for immediate consideration in 1982, and a much longer list divided into group I and group II projects. The main items in the short list are rehabilitation of the Mulanje fruit and vegetable and Salima fish canneries; expansion of existing textile activities; two tanneries (including a small one in the north); the Vipcor (ground-wood) pulp/paper project; a mechanized brickmaking project, lime production, the second cement project, and pottery development; a foundry (using scrap metal - a local resource); and farm implements and tools production. This is consistent with the projects identified in table 7 except for the uncertainly attached to the pulp and fertilizer projects and the timing of the cement project.

The group I projects are those about which sufficient is known to be potentially viable in the next 10-year planning period. The list comprises 65 projects of which 55 are considered potentially implementable in the coming five years, though with a possibility of slippage into the next five. Together they are expected to yield some K 76 million of value-added, of which 27 per cent would come from sugar production and 19 per cent from the fertilizer project. The list does not emphasize the traditional small industries - an omission - but includes some non-resource based small industries such as manufacture of builders' hardware. About 66 per cent of the projects are considered to be agro-related, and only 25 per cent suitable for small-scale production. A quarter of the projects have export potential but only 15 per cent are suitable for foreign investment equity participation, being large enough to warrant the effort required on the part of a substantial foreign investor. This leaves considerable opportunity and need for domestic Malawian entrepreneurship.

Group II comprises potential projects that do not appear feasible within the next ten years or that are not yet sufficiently defined. About half are agro-related and about a third are suitable for foreign investment equity participation.

In general it can be said that a diligent search has been carried out in Malawi to find viable resource-based industrial development possibilities. However, much was anticipated from wood-based development, and the reduced scale of expectations here has produced a much more modest programme. In particular these developments would have produced major forward linkages into chemical production and back into the agricultural resource base. As things stand, second-stage manufacturing, going beyond first-stage agro-processing and the equivalent in other sectors, is rather limited, the forward linkages from cotton growing into the textile industry, and tailoring, being the most striking. What must be considered, therefore, are the constraints inhibiting further development and possible measures to remove them.

IV. Constraints on Further Resource-based Industrial Development

Infrastructure and communications

Given the circumscribed situation facing second-stage industries, an alternative or additional approach is to widen the resource base. In the absence of major mineral descoveries, this means essentially the agricultural resource base. The greatest undeveloped potential here lies in the north, which is still severly handicapped by lack of communications outside and inside the area. This stems from the colonial period when the limited infrastructure was concentrated in the southern region, leaving the central and northern regions virtually unconnected by road or any other means. The building of the road to Lilongwe at the start of the 1970s, together with the establishment of the capital there, has had a major economic impact in the central region, which it would be desirable now to repeat this in the north. While the northern region has the greatest amount of arable land still available for development, migration is particularly from the north to the central region; development in the north would therefore alleviate the growth pressures in the central region, as well as adding directly to production and incomes.

Limits imposed by rural purchasing power

An even more fundamental constraint would seem to be lack of purchasing power in the rural areas. Agro-economic data collected over a period of years for a series of districts are very crude, but the impressions they offer of rural cash income distribution suggest that this lack of purchasing power is critical. (The income data for different districts were combined into one total - not withstanding the fact that they are for different years.[14/] Fortunately the spread is limited to a four-year period over which price increases have not been major. However, the data relate to cash income rather than total income or output, including non-monetary output. There are also a variety of problems of definition and coverage - for instance the difficulty of distingishing off-farm from non-farm income, and household income from trading activities; there are also questions relating to the sample selection of households. Nevertheless, the data are suggestive.)

The dominant feature of cash income distribution is the large proportion of households in the rural areas with very little cash income; over 50 per cent earn less than K 20 per annum, i.e. less than 9 per cent of aggregated income. Although this is based on data aggregated from different years, the data for individual districts and years consistently repeats this pattern. From the point of view of industrial development it is the implied lack of general purchasing power in rural Malawi that appears as a major inhibiting factor.

At the same time, at the upper end of the scale, 11 per cent of households secured nearly half the aggregate cash income, and the top 3 per cent obtained nearly a quarter, implying substantial inequality. This pattern is again repeated for individual districts. It is useful to ask first, how rural income earners as a whole obtain their income, and second, how the richer stratum of 10 per cent obtains it. With respect to rural households as a whole, about 55 per cent of total cash income comes from farming, the rest from non-farm activities. The major source, income from employment, accounts for 22 per cent of the total. Unfortunately, it is not made clear whether this is off-farm employment (including employment on other farms and agricultural estates) or strictly income from non-farming employment. Under 6 per cent of income comes from fish, but this is a country-wide average, and since fishing is concentrated in particular areas, households there may depend (again on average) for as much as one-third of their total income (as in Kawinga South) on fish. Some 7 per cent of income, on average, comes from cattle and small stock other than poultry, reflecting the lack of development in the livestock sector. Moreover, this percentage is much higher in the northern region than in the central and southern regions.

Although tobacco is the most important cash crop, providing 13 per cent of income, it is concentrated in the sample in only four or five districts. Cotton, one of the potential cash crops earmarked for smallholder development (rather than for estate production), is important in only one district - Ntcheu-Mwanza. After tobacco, maize is the most important crop, accounting for 9 per cent of cash income overall, and making a significant contribution in most districts, followed, perhaps surprisingly, by fruit and vegetables, and groundnuts. One indication of the potential importance of rural non-farm activities is that beer-brewing contributes more, overall, than cotton.

Given the localized incidence of many of the cash crops - cotton in Ntcheu-Mwanza, maize in Kawinga-north, rice in Nkhota-kota and tobacco in Dowa-west and Nchisi - the lack of smallholder participation in tea and sugar cane, and the limited development of livestock production, it is clear that lack of access to cash crops is a major problem for a large proportion of smallholders. It is also a major cause of restricted purchasing power in the rural areas.

Given this general lack of access, it is relevant to look at the chief sources of cash income among the ten per cent or so of high cash income earners. Of those depending particularly on one source, about one third are tobacco growers and one fifth are in paid employment of some kind. Livestock and fish are the other main income sources. More than half are apparently crop farmers and about three-quarters depend principally on crops, livestock or fish. There are however, doubts about the sampling frame on which these observations are based and about the coverage of non-farm activities such as crafts, trading and other service activities. Differences in income do not appear to be due to differential access to land among smallholders - estate owners apart - since most farms are very small. Specifically, less than 6 per cent are more than 4

ha and one per cent more than 6 ha. Generally, if employment is excluded, high income is associated with access to a cash crop such as tobacco, cotton or rice, to a livestock activity or to fishing; if the data are reliable, it is this access that appears limited.

These conclusions on the distribution of income can be compared with the results of earlier studies. In 1969 it was calculated that the poorest 40 per cent of households received 15 per cent of incomes; the highest 20 per cent received 53 per cent of income, and the richest 5 per cent received 30 per cent [22]. Clearly, with the development of tobacco production since 1969, income distribution has worsened.

The per capita household distribution of income, estimated by Kydd and Christiansen for 1977, indicates that the bottom 58 per cent of individuals receive under 24 per cent of total income, and the top 2 per cent receive over 32 per cent of total income. This, however, referred to total household income, including subsistence output, which increases the share of those at the bottom of the scale compared to data covering only cash income. Comparison of Gini coefficients with other countries suggests, in fact, that the position in Malawi is relatively unequal although (in contradiction perhaps to the data gleaned from agro-economic surveys) the relatively higher inequality appears to be due to concentration in the top 5 per cent rather than any special position over the bottom 40 per cent.

The effect of low rural incomes on the demand for textile products, for instance, is reflected in the low level of per capita consumption of cotton and man-made fibres already mentioned, 1.3 kg per annum. This also reduces the scope for rural industries of all types. The useful contribution made by such industries has already been emphasized, but compared to the size of the population, the numbers of rural craftsmen are extremely small. The Lilongwe Land Development Programme area, for example, had one craftsman per thousand of population in 1978, and even fewer than this in the rural areas.

Where a resource-based industrial development strategy is able to exploit absolute and comparative advantages in specific resources to tap export markets, these problems need not be critical: exports provide the increases in income necessary for cumulative growth. This is more difficult in Malawi's case because of transport disadvantages it faces as a land-locked country, and the limits of its resource base. But, more generally, initiation of cumulative expansion of manufacturing depends in any case on a domestic market as well as overseas markets, even where much of it is resource-based. Thus lack of domestic purchasing power will hamper both the development of forward linkages into second-stage mediumand large-scale enterprises and the development of small-scale urban and rural enterprises. Malawi needs to consider how to convert this vicious circle into a virtuous one[15/] by taking action that will increase rural purchasing power and generate opportunities for continuous expansion of manufacturing enterprise, both small- and large-scale; this would avoid the limitations found with conventional import-substitution industrialization.

The prospective position is worsened if the population increase is taken into account. Arable land per capita in Malawi has already declined from an estimated 0.86 ha in 1966 to 0.63 ha in 1977 [23]. Taking the mean of recent minimum and maximum projections of population trends, the ratio will fall further, to a figure of the order of 0.44 ha by 1985 and 0.26 ha by the year 2005. Population pressure in Malawi is not equally distributed however, so that the corresponding declines in the southern region would be to 0.33 ha by 1985, and to only 0.18 ha by 2005. These are, moreover, averages. More recent data on farm sizes[16/] indicate a mean area cultivated per household as low as 1.20 ha in 1980-1981: this ranged from 74 per cent above average in Kasungu to 33 per cent below in the Blantyre agricultural development region, where the mean area cultivated was just 0.80 ha. Compared to 1968/69, when the mean size of farm holding was 1.54 ha, and 29 per cent of holdings lay below 0.8 ha, the proportion of farms cultivating less than 0.8 ha in 1980/81 might have been as high as 40 per cent. The surplus arable land available was forecast [23] to become clearly negative by 1983 in two out of the three regions, implying problems arising from over-use.

Given the need to find land to produce both food and cash crops, and the need to raise rural purchasing power by widening existing access to cash crops, this diminishing land availability is cause for concern. Accentuating this is the fact that the main food crop, maize, is very land-intensive, and as mentioned, absorbs a very large proportion of total cultivable land. This suggests the need for increasing attention to raising maize yields through promotion of higher-yielding composites and hybrids, in order to release land for other purposes.

Another factor is the probable significantly lower cash incomes accruing to female-headed households in Malawi. These accounted for as many as 42 per cent of households in some localities[17/] and for 28 per cent in rural Malawi as a whole. These are likely to have fewer resources of labour and equipment at their disposal, and to be much more restricted to subsistence production of minimum food requirements. Diminishing availability of land per farm household also raises the possibility of the need to import food, imposing an increased burden on the balance of payments, and reducing foreign exchange availability for supporting the development of manufacturing.

Entrepreneurship and capital constraints

In addition to encouraging private investment and growth of an export-oriented industrial base (i.e., resource-based industrial development), the Government's objectives for the industrial sector, as given in the Statement of Development Policies, include the development of a Malawian entrepreneurial class. The list of Group I and II manufacturing projects identified by the Ministry of Trade and Industry imply a need for such local entrepreneurship since only 15 and 32 per cent of the projects respectively, are considered suitable for foreign equity participation, on grounds of scale. For

this reason it was concluded that domestic manufacturers, both public and private, and new Malawian entrepreneurs generally, will have to be the main implementing force in the next ten years for most projects [21]. This could be problematic.

The key requirements for initiating manufacturing enterprise are capital, entrepreneurship and/or technical skills. Apart from the general lack of managerial and technical skills in Malawi, a World Bank assessment concluded that for local Malawians operating small-scale enterprises, there appears to be little in the way of entrepreneurial efforts applied to manufacturing. Efforts seemed too much directed towards trading and not enough toward manufacturing [24]. It would seem easier, in fact, to indigenize management within large-scale enterprises, despite the major shortage of trained managers and accountants already described. As regards technical skills, large concerns are also in a better position, given time, to provide their own on-the-job training. From the point of view of both entrepreneurship and technical skills, it is more difficult to train for medium- to small-scale enterprises. While these often depend on some technical skill (e.g. in leather goods, soap manufacture or fish canning) or experience accumulated elsewhere, there is no ready mechanism for transfering such skills, especially where the industrial activity is new to Malawi. Even in the case of estate production of tobacco, where some local demonstration effect was available, Malawian entrepreneurs from civil service and similar backgrounds found management more difficult than they anticipated.

In this medium range of industrial activity, it is thus likely that entrepreneurship and technical knowledge are the constraints, as exemplified in the tobacco case, rather than capital, which is more readily available to medium-scale enterprises than to small ones. Much of the indigenous Malawian experience of manufacturing, however, is in very small-scale manufacturing, including that of the self-employed craft entrepreneurs such as tailors, carpenters and brickmakers - where the most important constraint is probably capital. The problem for industrial development in Malawi, therefore, particularly since many of the potential projects identified are in the medium- to small-scale range, is one of an entrepreneurial gap between the large foreign and parastatal concerns and the very small craft-based informal sector enterprises.

It is important to recognize the existence of two distinct categories of manufacturing activity, the small- to medium-scale enterprise - even here ranging from units employing 5 to 10 workers to small factories employing 30 to 50 - and the large number of craft entrepreneurs, many of whom are self-employed or work with just one or two assistants. Each of these has its own contribution to make to the economy and merits support. Such support may take different forms, according to the different constraints and conditions under which each operates.

Many programmes to assist small-scale enterprises included an element of instruction in bookkeeping, since very small enterprises seldom keep books. While the ability to keep accounts and to calculate gross margins is clearly valuable, it is doubtful whether

this kind of assistance is the most appropriate, given the existence of other, overriding constraints on their effectiveness, particularly their shortage of capital and materials. Not surprisingly a survey carried out in Malawi in 1978 by a World Bank consultant [25] in conjunction with the Ministry of Trade, Industry and Tourism, showed that it is very difficult to convince the African Businessmen Association that any programme to develop African businesses should also include an element of non-financial assistance.18/

The consultant's report considered that small-scale enterprises were seriously undercapitalized and suffer chronically from paucity of funds. Generally speaking, they had no access to credit either for start-up or expanding their operations, and are forced to rely on their own savings and profits. The majority of enterprises advanced finance as the biggest problem and only admitted non-financial problems when the team entered into much greater details during the interviews, the consultant reported.

This undercapitalization was reflected in lack of premises and an inadequate supply of raw materials - both problems reflecting lack of capital as well as their physical availability. The lack of materials and supplies often held up the work of small-scale enterprises in Blantyre, and even more in Lilongwe and Mzuzu.

In Blantyre there was a particular need for premises, though this was also the position elsewhere: most entrepreneurs operate from very small and unsuitable premises, or work under trees or outside their homes. This consequence of undercapitalization of small-scale enterprises is common in many African countries [26]. In Malawi, for example, most tailors and many other self-employed artisans work on shop verandahs or khondes, in return for rent. However, this is a mutually beneficial arrangement made possible by the accident of the historical development of shop architecture in Malawi. A Ministry paper estimates that about 95 per cent of self-employed entrepreneurs operate on khondes or in the open air.

The IBRD/Ministry 1978 survey also mentioned marketing problems or problems in finding customers as serious. In line with the constraints on industrial development emphasized in the present study, this referred essentially to lack of purchasing power. Indeed the IBRD report states that the demand for products and services is predominantly dictated by the purchasing power of prospective customers. To a great extent, these belong to the economically weak strata of the population. Related problems are competition from larger, Asian-owned businesses, which enjoy some advantages in terms of scale and capitalization. Less important is access to electricity (despite the rural electrification programme), since apparently few small-scale enterprises can afford to pay the connection fee.

These findings are borne out in preliminary replies by entrepreneurs in a survey of informal sector enterprises in Blantyre and Zomba, carried out by B. M. Kaluwa of Chancellor College. These give the three most important constraints as capital, lack of real purchasing power, and the high cost of electricity. Surveys of the rural informal manufacturing sector reveal similar constraints, with

added disadvantages of a lower concentration of purchasing power than in the towns - leaving entrepreneurs with fewer opportunities to accumulate capital, more severe market limitations, and greater difficulties in securing the necessary raw materials. Clearly, it is important that policies for promoting small-scale enterprises be designed to take account of the nature and composition of such enterprises, and the particular constraints and obstacles they face.

V. Policies for resource-based industrial development

Since independence Malawi has pursued a policy of resource-based industrial development focused on the agricultural sector. Both agriculture and manufacturing value-added have shown impressive rates of growth. However, after 1976, deceleration of manufacturing development is evident, and the high rates were in any case based to a significant extent on the expansion of tobacco and sugar production - both developed largely as estate crops - and on associated agro-processing. If this expansion is to provide a platform for subsequent development of manufacturing activity on a continuous basis, it is therefore necessary to look towards the next stage, namel further linked development. For this reason it is arguable, at least, that the emphasis on estates has been wrong from the point of view of long-term strategy, even if it proved very effective in generating short-term growth.

A conventional import-substituting industrial development strategy was rightly ruled out in Malawi as self-defeating, given its usual orientation towards higher-income consumption goods and the limited size of the domestic market in this regard. Nevertheless the pursuit of the alternative strategy of export-oriented, resource-based strategy, although having had productive results, does not appear capable of indefinite extension, despite the diligent inventory of resources carried out. An apparent weakness has been the failure to generate the internal purchasing power required to stimulate continued growth.

Smallholders versus estates

There are two major ways in which the development of purchasing power might have been retarded: (1) emphasis on estate production, which limited access by smallholders to cash crops and was perhaps augmented in its effect by a low-wages policy; and (2) agricultural pricing policy, which further reduced the share of agricultural proceeds accruing to smallholders. It may be that while Malawi has successfully avoided what Lipton refers to as urban bias [27], it has exhibited at least a degree of formal sector bias.

This is not to say that smallholder agriculture has been ignored; indeed, official policy towards agriculture has been two-pronged. But rather that agricultural policy has had a differential impact on the two sectors. Four integrated agricultural development projects were started after independence: the Lilongwe

Land Development Project in the central region, started in 1968/69; the Lakeshore Rural Development Project, started in 1968/69; the Shire Valley Agricultural Development Project, in the southern region, started in 1969/70; and the Karonga Rural Development Project, in the north, started in 1972/73. In 1978 these were merged into a National Rural Development Programme, based on eight agricultural development divisions. Also, associated with these, there has been a relatively effective system of agricultural extension based on a group approach. This contributed, for instance, to an increase in sales of fertilizers to smallholders through ADMARC - from 23,000 tons in 1971 to 60,000 tons in 1980. The repayment rates have been particularly impressive: 90 to 99 per cent for short-term credit (for seasonal inputs) and of 70 to 85 per cent for medium-term credit.

However, the original four agricultural development project areas covered only some 20 to 25 per cent of the rural population, and it could be argued that launching a national programme in 1978 was too long delayed. Moreover there was a heavy infrastructural component which, however necessary, is not the same thing as improved access to high-value cash crops, access here referring to positive encouragement and direct technical assistance in production in the case of difficult crops such as tobacco.[19/]

In practice, therefore, the main emphasis in cash crops has been on the estate sector. However the superior performance of the estate sector used by some observers to justify this, as measured by its contribution to GDP, to exports or to manufacturing development through agro-processing, is not in itself proof of the validity of this strategy. Firstly, it may simply reflect additional effort and resources put into its development on one hand, and the more restricted access to cash crops offered to smallholders, including government regulation limiting this access, on the other; secondly, other disadvantages such as those emanating from price policies may have hindered smallholder development; thirdly, estate development may have been in part at the direct expense of the smallholder sector through encroachment on land and demands for labour; fourthly, estates may not, in fact, have been as efficient in the use of the resources at their disposal as claimed or implied by some assessments; and fifthly, the strategy may have some long-term disadvantage through its effect on the generation of purchasing power, as already indicated.

One possibility would be to substitute smallholder for estate production of some of the main crops. The quantity of tobacco grown by estates in Malawi, including burley tobacco, increased six and a half times between 1969 and 1979. During this time, the share of total area accounted for by smallholders fell from 80 per cent to 59 per cent; the percentage increase in tobacco area under estates was more than five times that for smallholders. Between 1970 and 1979, the number of tobacco estates increased by 437 per cent while the number of smallholders growing fire-cured tobacco, the main smallholder variety, rose by just 15 per cent.

While tobacco production by smallholders requires careful supervision and extension, it has proved successful in a number of East African countries, particularly as promoted by the B.A.T. company. Also, because groundnuts, a major smallholder crop in Malawi, are very efficient users of residual fertilizers [28], tobacco can be integrated into a useful smallholder crop rotation. It would certainly have been possible to develop burley tobacco using smallholders, the tenant system practised by estates being not very different from this. It has been suggested [28] that the scope for new development in burley production is limited, however, because the world market for burley is very much smaller than flue-cured. It could equally be argued that Malawi should make an effort now to establish itself as substantially as possible in this market.

Sugar had been produced almost entirely by estates, though there is some smallholder production at Dwangwa. In other countries, such as Kenya, outgrowers' schemes have proved effective and might still be considered in Malawi for the future. Tea has also been developed almost entirely as an estate crop in Malawi although again smallholder production, delivering to a central factory, has been effective, for example, in Kenya. The limited availability of new tea land precludes much development now.

Cotton, although already grown by smallholders, is only recommended for estate production in the Estate Diversification Study if more realistic official prices were to be fixed - low prices being cited as the reason for the estates' lack of interest in the crop ([28] annex F, p. 5). Rather than using estates as a vehicle for increased cotton production, even under the guise of diversification, it may be better to allocate this to smallholder production.

The Diversification Study considered the prospects for winter-irrigated wheat on estates to be good, due to the high import parity price. Smallholder production of wheat is, of course, quite possible, and given the high costs of irrigation, intensive production by smallholders may be quite advantageous.

Certainly the conventional view of estates as a uniformly efficient mode of production needs substantial qualification. The evaluators responsible for the Estates Diversification Study ([28] annexes, p. 13) found that:

(1) A large proportion of estate owners are absentee owners using hired managers (about 75 to 80 per cent of estates financed by the National Bank of Malawi in 1980/81, for instance, were under absentee ownership) - a situation contrasting with that in Zimbabwe;

(2) Development of many estates has been financed entirely through bank loans, few owners having invested their own capital;

(3) The majority of owners have only a limited knowledge of tobacco growing;

(4) Standards of management are relatively low, as demonstrated by lack of proper soil conservation and land husbandry practices, and by generally mediocre tobacco yields and quality;

(5) There has been an almost complete absence of fuelwood planting to safeguard future fuel supplies, as a result of preoccupation with short-term profit maximization.

Three different categories of estate are, however, distinguishable: some 200 company estates are run by substantial farming companies; about 75 large individual estates are mostly expatriate-owned; the remainder are smaller individual estates, Malawian-owned, which can be further divided into direct production estates based on flue-cured tobacco and the burley estates operated on the tenant system. It is the latter that are the least efficient, although there is substantial variation within all categories.

Lack of effective use of resources by the estates is reflected particularly in the low degree of land utilization. Out of an estimated gross tobacco estate area of some 350,000 ha in 1979/80 only 9 per cent was under tobacco and perhaps another 5 per cent under maize, giving a total cropped area of only 50,000 ha ([28] annexes, p. 13). Even allowing for fallow, it is clear that no more than 40 per cent of the available land was in productive use at all: this, in areas of critical land shortage in the smallholder sector.

Out of 639 burley tobacco estates in 1979/80, 367 were tenant estates, embracing 18,722 tenants, each with one or two acres of tobacco and, usually, some maize land. The estates supply and charge for supervision and inputs, while requiring the tenant to sell his tobacco through the estate at ceiling prices usually well short of auction prices. Since the supervision offered, particularly with absentee owners, is usually minimal, the advantage of this system over straightforward smallhoder organization is questionable.

There is direct competition for land and labour between the estate and smallholder sectors. The estates are mostly on leased customary land, covering some 470,000 ha in 1981 or nearly 15 per cent of the best cultivable land [29] - including as much as 17.4 per cent in the central region. This expansion of the area under estates is comparatively recent: in 1970 they numbered 220 and then occupied about 2 per cent of the cultivable land; by 1978 there were over 1,100 (predominantly tobacco estates) occupying an estimated 13 per cent of the cultivable land then available [30].[20/] The effect on smallholder farming of the transfer of some 140,000 people into wage employment is not easy to assess, but could also have been significant. The near total lack of fuelwood planting by the estates until recently also implies a major divergence between private and social benefit, as already noted.

Wages policy

As noted at the outset, Malawi's low wage policy has been viewed as an important positive factor in creating employment opportunities and in restricting the rural-urban migration so problematic in other developing countries.

Certainly IBRD calculations for a range of estate crops in Malawi show that the rate of return on shareholders' equity [31] has a high degree of sensitivity to wage changes. The main estate crops, tobacco, sugar and tea are all highly labour-intensive so that wages account for a significant proportion of direct cost. However, with respect to the choice of technique in manufacturing and in the economy as a whole, the author's analysis of employment elasticites produced less than conclusive results. Furthermore, independently of any effect on choice of technique, a large proportion of the increase in employment has been in estate agriculture. Thus 77 per cent of the increase in formal sector employment over the period 1968-1977 was in agriculture, forestry and fishing - mostly estate agriculture. About 64 per cent of the increase in private sector employment over the period 1971-1979 was in the same sector [32].[21] This expansion in estate employment is not necessarily a genuine net increase in employment, since it could be considered in part a diversion from the alternative of smallholder production, which is equally more labour-intensive.

Finally, there is the question of the impact of the policy on rural purchasing power, given this alternative and the severity of the wages policy applied. The Basic Economic Report [33] states that average real earnings of labour fell by about a third over the period 1969-1979 and Malawi's Malawi's Country Presentation in 1981 gives the fall in average real wages since 1970 as 34 per cent [34]. This came about through imposed rigidity in money wages, the minimum wage for urban unskilled workers remaining unchanged from 1973 to 1980, then rising by 12.5 per cent in 1980, and a further 56 per cent in January 1981. Since the real wage minimum was then only 75 per cent of the 1973 level [35], the real rate just before the two increases would have been just 60 per cent of the 1973 level, implying a 40 per cent fall in real wages over seven years up to the time of increase.

These considerations suggest that, still within the context of a realistic wages policy, a more flexible approach would have been possible and desirable, and would have avoided sudden spurts in the wage rate

Agricultural price policy

Perhaps even greater in its impact on rural purchasing power has been agricultural price policy. Kydd and Christiansen have argued that the financial resources used in the development of the estate sector were obtained by in effect imposing a heavy tax on smallholders via ADMARC deductions; this onerous tax burden had the effect of reducing the real rate of return to peasant labour so that it induced a substantial transfer of labour between the sectors, despite the continuous decline observed in the real wage paid to estate labour [36].

The tax is imposed through excessive margins between ADMARC selling prices and prices paid to producers, and is thus reflected in ADMARC profits on the various crops. These averaged (on all crops measured in 1980 prices) over K 17 million annually in the

period 1971/72 to 1979/80, 80 per cent coming from tobacco. Over the years 1972-1978, ADMARC profits varied between 22 and 39 per cent of sales.[22] Comparing moving averages of prices paid and received for dark-fired tobacco, for example, the proportion paid to growers fell from as high as 60 per cent in 1957 to just over 21 per cent in 1975, and was below one-third for most of the 1970s. A major advantage of the estates, in contrast, has been that they have been free to sell direct at auctions.

Smallholder cotton is another crop that appears to have been adversely affected. The area under cotton is said to have been diminishing in recent years as a direct effect of pricing policy, with yields also falling. The decline in yields of over fifty per cent, in the southern region particularly, is associated with a lack of incentives, This in turn diminished interest in crop spraying.

Given the high degree of substitutability between, for instance, cotton, maize and groundnuts, the composition of agricultural output is affected both by the relative prices fixed for different crops, and by large irregular jumps in individual prices. For example, a 50 per cent increase in the price of groundnuts in 1979/80 had the effect of more than doubling output, with a further increase in 1980/81. Similar increases in maize prices have met an equally strong response. While this sign of greater flexibility in pricing is to be welcomed, it raises the question of why previous prices were kept so low and whether the drastically changed ratio of prices is now appropriate.

Prices of major crops have frequently been out of line with export parity, and the relation of producer prices to export parity, has differed greatly between crops. For instance, in 1977 the ADMARC purchase price for groundnuts in Lilongwe was 10 tambula/lb (100 tambulas = 1 kwacha), compared to an export parity price at local markets of 24.4 t/lb, an implicit tax of 144 per cent. The corresponding prices for maize in Lilongwe were 2.3 and 1.4 t/lb, representing an implicit subsidy in this case of 39 per cent ([33] p. 92). In addition, substantial geographic variations in the extent of these implicit taxes and subsidies have arisen out of the policy of nationally uniform buying prices. Prices of minor crops such as lentils and guar beans also show this sort of divergence and require scrutiny.

Price control

The government operates a system of price control combining maximum retail prices for a limited range of essential products, either low-income consumer items such as meat, milk, sugar, beer, matches, bread, maize meal and vegetable oils or basic inputs such as petrol, hoes and fertilizers, and recommended retail prices covering most other locally manufactured products which, though generally observed, are not legally binding. For these products there is also a requirement that the Ministry of Trade and Industry be notified in advance of proposed price increases, which must be justified in terms of increased costs of some kind before a letter of no objection is issued.

There is some divergence of opinion as to the effectiveness and impact of this system. A UNDP/UNIDO Programming Mission describes it as a "rather flexible policy ... complementary to the Government's policy limiting wage increases to productivity increases" which "does not ... appear to have represented an undue burden on industrialists" [37]. On the other hand, the World Bank's Basic Economic Report saw the long delays in granting price increase requests as having a negative impact on the profitability of business firms, "constituting a significant desincentive to investment in the sector".

Certainly the system is not popular with manufacturers, as is to be expected of any price control; but it must also be seen in the context of a wages policy. On the other hand, there are a number of products, particularly in the agricultural sector, such as meat and milk, where serious divergences have occurred or are occuring, with various repercussions. These cases appear to be those in which the relevant ministries (in the case of agricultural products, the Ministry of Agriculture advises the Ministry of Trade and Industry) lack relevant researched data on which to base sensible decisions. Here it is clearly better to minimize intervention. To deal with the problem of delays in expressing a lack of objection, it would be desirable to introduce a maximum period of, say, one month, for a decision to be reached.

Other measures and incentives

Other aspects of government policy having a direct or indirect impact on industrial development strategy include a well-established policy of strict limits on levels of tariff protection to domestic industry. This appears to have had healthy results. At present, information is not available on effective rates of protection, something that ought ot be investigated. Resource-based industries catering for the domestic market enjoy a degree of natural protection, so that strong measures to encourage the use of domestic resources are not necessary, except indirectly in promoting local small industries, many of which are local resource-using. However the present system of customs rebates and drawbacks on imported inputs used in manufacturing involve some bias in favour of production using certain imported inputs; these might be examined. Scrutiny of the import list suggests that there are a number of consumer goods that could be substituted by locally-made products, which may be of rougher quality than the imported equivalent but in many ways are more appropriate at the present time.

The constraints on an export-oriented industrial strategy, even in respect of exports to neighbouring countries, suggests that Malawi ought to look to its other potential advantage, cheap labour, and combine this where possible with a resource advantage. To exploit a labour advantage and offset other disadvantages such as transport costs for inputs and outputs arising out of a land-locked situation will require the development of labour skills. Malawi is at a disadvantage here compared to, for instance, Zimbabwe, because of the much more limited size of its industrial training ground. The best way in which incentives could be offered to persuade firms to expand their training programmes should therefore be considered.

Malawi was wise to introduce a 10 per cent duty on imported raw materials and capital goods in the mid-1970s, together with a three per cent levy. This reduces the incentive to purchase capital-intensive production techniques, at the expense of employment. One weakness in the system, however, is that these duties can be waived on the basis of individual application if a special case is made: this opens up the possibility of large foreign or domestic investors applying pressure to secure preferential treatment, and, more generally, opens the door to possible corruption. This flexibility should be removed. Moreover, the impact of the limited duty on capital goods imports on the choice of technique is likely to be cancelled out by the standard set of allowances that exist in relation to capital investment. These include initial allowanaces (20 per cent on plant and equipment), annual allowances (variable, but going up to 33 per cent on plant and equipment), investment allowances (10 per cent on new plant and equipment other than motor vehicles) and initial expenditures (incurred prior to start-up). Since it impinges on the choice between capital and labour, and particularly on the evelopment and use of labour skills, it would appear desirable to review the whole system of fiscal incentives.

Much of Malawi's exports of manufactured goods have been in the form of value added by agro-processing of commodities such as tobacco or tea, which need only limited promotion on the world market. Development and exploitation of less well-known agricultural commodities or minerals, such as guar beans, macadamia nuts, Malawian honey, or ornamental stones may need more deliberate export promotion or export incentives, as would new second-stage industries exporting consumer goods. The IBRD reported that the Import and Export Company of Malawi (IMEXCO), the MDC subsidiary involved in trading domestic and imported products, had only one person working on exports in 1979; the Export Promotion Council, established in 1971, also had only limited budget and staff ([33] p. 127). This should be expanded.

As regards fiscal incentives, the IBRD raised the possibility of a direct subsidy related to the domestic value-added in export production. This would have the advantage over some of the capital allowances described of not favouring capital-intensive activity.

Policies towards local small industry

The actual and potential contribution of small industry to industrial development in Malawi has already been emphasized. Finance for this sector is largely unavailable from the commercial banking system, whose two banks follow conventional conservative policies requiring a high degree of collateral or good standing. The normal minimum loan extended by INDEBANK is K 100,000. In 1981, however, INDEBANK did establish a Special Development Fund to cater for smaller enterprises, for which a lower limit of K 25,000 applies. In addition, a small Government Loans Board has made loans mostly to the agricultural sector.

Although the Government made basic commitment to assist small enterprise development when it established SEDOM, the Small Enterprise Development Organization of Malawi, in 1980/81, this remains largely externally financed and expatriate-run. The Government has therefore not itself so far made a significant gesture in terms of finance or manpower to small enterprise promotion either within SEDOM or within a ministry. The best approach for SEDOM to pursue within a general programme for the development of small industry has still to be determined.

In deciding appropriate forms of assistance it is also necessary to make an essential distinction between small factory industry (or other enterprises of equivalent size) and very small informal sector enterprise comprising mostly self-employed craft entrepreneurs or enterprises employing three or four people. The best way to assist very small craft enterprises such as carpenters or tinsmiths follows from an examination of the constraints facing them. As already indicated, the vast majority of self-employed entrepeneurs lack premises and are short of tools and materials with which to ply their trade. This reflects their undercapitalization. Since cash loans to this type of entrepreneur are both risky and difficult to administer, the easiest way of injecting capital into such enterprises would be through establishing simple workshop clusters. These can serve as focal points for the delivery of materials and technical assistance if required, and attract buyers. Recommendations along these lines have been made in the Arbell Report on Malawi and for a number of other African countries by the present author [26].

Malawi's very limited experience in this direction has not been so far very good. This is because of the manner of its application rather than the validity of the approach itself. The Biwi Triangle in Lilongwe, which was opened in 1977, has made the common mistake of offering much grander workshops than appropriate for most of the very simple informal enterprises needing assistance. As a result, the economic rents, ranging from K 60 to K 110 per month are far in excess of what most small-scale enterprises can afford to pay. Consequently a large number of sheds stand empty. This is also the result of the poor choice of location, inconveniently far from shoppers -- in contrast to the intensive artisan activity going on in Lilongwe in the vicinity of the major market. A false analogy appears to be drawn here with the concept of an industrial area which supplies only wholesalers and can afford to be away from the market centre. The planning of workshop clusters should clearly take account of the need of many artisans to sell direct to consumers. Exemplifying another problem, the motor repair section at Biwi, comprising ten units (of which only three are occupied) and a limited common facility, is not very appropriately designed. No additional equipment is provided, welding equipment, for instance, that might allow an undercapitalized mechanic to compete for business with the larger garages. The entrepreneurs are thus provided with overelaborate buildings, but with little useful content. Again prior discussion with the entrepreneurs themselves could have identified their most critical needs. The other two sections are an irrational mixture of activities, including a butcher's shop, un-

hygienically located opposite a craft worker's, a laundry (far from consumers), tailoring, battery reconditioning, knitwear, motor bicycle repair, and radio repair. The high rents clearly keep out the majority of independent artisan/entrepreneurs in Lilongwe, who remain without premises, while catering for a small, heterogeneous and randomly selected group.

The Liwonde estate, dating from 1975, was even more inappropriately designed - with a luxurious steel-made structure, costing altogether K 675,000 - and built before it was known what activites it might house. The estate was again remote from the major urban centres like Blantyre and Lilongwe, and even from Liwonde itself. It totally misread the locational pull of isolated premises in Liwonde compared to that of an urban/industrial complex such as Blantyre. It would be unfortunate if this example were to prejudice thinking against an industrial estate approach of a quite different type, that of very simple workshop clusters. The rental of K 5 per month suggested in the Arbell report indicates what is required.

An immediate issue is how SEDOM should divide its attention between rural and urban activity, and between promoting craft entrepreneurs and much more varied industrial small-scale enterprises producing a variety of small industrial products. Its own inclination is to concentrate on the latter, focussing for the first three years in Blantyre before turning to a second major urban centre like Lilongwe. In fact both types of activity are in equal need of assistance, and it would be desirable to make progress in both directions at the same time.

It should be noted that much the same assortment of self-employed craft entrepreneurs exists in urban as in rural areas. Within this category the rural-based entrepreneurs are more difficult to assist, being more dispersed and frequently under-employed, seasonally at least, as a result of limited village demand. Supply of materials to these dispersed artisans, as tried by the Salima Trade School, for instance, in assisting its village-based graduates, is unlikely to be economic.[23] How best to assist village artisan activites therefore needs more investigation.

The rural/urban issue arises again in considering the appropriate form of assistance to larger small-scale enterprises. Many of these are located in rural areas and are resource-based - for instance sawmills, small agro-processing units and rural construction companies. It would be unfortunate if these were ignored as a result of adopting a narrower focus. The main need here is likely to be finance. Once SEDOM has established a presence through small industrial estates in the main regional centres, administration of these estates can usefully be combined with the management of credit assistance to larger rural-based enterprises in the locality.

Notes

1/ Author's italics.

2/ Detailed data sources are given in the original report [1].

3/ The emphasis on the private sector is probably responsible for the fact that the quasi-public organization Press (Holdings) was founded in 1960, well before the orthodox Malawi Development Corporation was launched in 1964.

4/ Tobacco, tea and sugar processing together account for about 40 per cent of sales and employment.

5/ A useful review of mineral resources available in Malawi is given in Mamu and Crow [4].

6/ Mamu and Crow [4].

7/ Further investigations are being made; Shell has carried out airborne reconnaissance over Lake Malawi.

8/ Carried out as part of UNIDO 515 Project MLW/77/802 and summarized by Buchanan [6].

9/ About 12 per cent on equity after taxes in 1976, according to IBRD [7].

10/ GOPA (Gesellschaft für Organisation, Planung and Ausbildung) estimates.

11/ Protein requirements can be fulfilled from non-animal sources, but meat, poultry and fish are consumed independently of protein content as main dish complements to starchy staples.

12/ Many forest reserves have primarily a protective function in areas of steep topography; national parks are also not available as sources of fuelwood. However this still leaves a very large forest area.

13/ Recent studies of a wood-based complex at Chinteche considered a pulp, paper, sawn wood and panel mill; the pulp mill, consisting of a reconditioned groundwood unit of 12,000 tons capacity, avoids chemical processing and would cater only for part of the domestic market.

14/ The data are not reproduced here, but are summarized in the original report [1].

15/ ILO Mission reports to Colombia and Kenya in the early 1970s identified a virtuous circle where improved income distribution increased demand for low-income products produced by labour-intensive technology, creating more demand for labour and improving income distribution still further. Since such products are also likely to have a high local resource content, this may be associated also with a resource-based development strategy.

16/ Recent data issued by the NSO from the 1980/81 census.

17/ Recent data issued by the NSO from the 1980/81 census.

18/ Commenting on the report [25], the ministry nevertheless felt that the emphasis should be on developing entrepreneurship and skills rather than credit. The report does identify an entrepreneurial gap at medium-scale level but does not consider it a main constraint among small-scale enterprises.

19/ Various small holder crop authorities have been established at different times, but these are generally localized and limited in scope.

20/ The IBRD method of calculating cultivatable land [30] may not be the same as used by the present author.

21/ The NSO estimate [32] takes account of the break in employment series in 1977.

22/ Derived from ADMARC annual reports.

23/ Attempts at this kind of service, together with the supply of extension advice, proved extremely expensive in Kenya in the mid-1970s, largely because of transport costs, and were quickly abandoned.

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