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**Technological Change as a Determinant of
Economically Sustainable Growth:
A Case Study of the Philippines**

by

Frank M. Little*

***Visiting Research Associate, School of
Economics, University of the Philippines**

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Frank M. Little

Visiting Research Associate

School of Economics, University of the Philippines
Diliman Campus, Quezon City, Philippines 1101

Abstract: This paper outlines a private research program to be carried out under the aegis of the Faculty of Asian and International Studies, Griffith University, Queensland, Australia. The approach embodied in the program perceives economically sustainable growth as dependent upon transformations of production processes at the industry level; i.e. technological change. These transformations then permit the industries to absorb much greater quantities of factor inputs - especially capital embodying technical innovations - without any reduction in productivity, and it is this particular pattern of markedly increased factor employment which characterises sustainable growth. In order to determine whether current growth rates are likely to be sustained the research program aims at establishing a framework to assess the extent to which technological change has occurred in the Philippines. It aims to do this by measuring the changes in the patterns of inputs over the period 1985 - 1994 using changes in the input-output tables over that period. By examining major new industry developments since 1994, assessment of the possible transformations since that date, will be made. Then by using the Philippines-Japanese International I-O table, some attempt will be made to gauge the extent to which the structure of the Philippines economy is moving towards that of Japan. Finally obvious major structural weaknesses highlighted by this comparison, will be outlined, with a view to formulating policies which may help to address those weaknesses.

Keywords: Technological Change, Structural Change, Economically Sustainable Growth Production Processes.

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TECHNOLOGICAL CHANGE AS A DETERMINANT OF ECONOMICALLY SUSTAINABLE GROWTH:

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1. Introduction.

1.1 This paper outlines a research proposal aimed at casting light on the structural changes which have taken place in the Philippines' economy during the late 80s and early 90s to determine whether economically sustainable growth is likely to be achievable in the near future. So far, there is little evidence to suggest that current growth rates are any more sustainable than the upswings of previous cycles which were followed by extended recession years (1984-1986 and 1991-1993). Claims of imminent NIChood, are to say the least, rather premature. Understanding is needed as to whether there have been any radical transformations at the industry level, which might imply that economic development was under way, thereby providing a basis for sustained increases in output and employment. That is, there is a need to assess the extent to which technological change has taken place within the Philippines' industries.

1.2 A major difficulty with making such an assessment is that economic growth is usually seen only in aggregate terms and as a result data resources tend to reflect this focus. Given that technological change occurs at the industry level, no model of aggregate behaviour is going to throw much light on either the basis for the current, or the likely future course of economic growth. Economic relationships established at the macro-economic level are dependent upon processes taking place at the industry level and unless one is aware of those processes, there is no understanding of how the macro-relationships are established and even less of how they might change. Macro level changes need to be tied into the changes occurring at the industry/sectoral level, before their significance can be gauged. Without that industry/sectoral understanding, analysis at the macro-level merely obscures the transformation process on which sustainable growth is dependent. It is therefore the main aim of this research program to provide an analytical framework on which an assessment of those industry changes may be based and determine their adequacy for sustainable growth.

2. Why the Philippines

- 2.1 The reason for studying the relationship between technological change and growth in only one country, is that evolutionary theory (on which this exercise is predicated) argues that history and socio-political institutional environment have a major role to play in determining the nature and extent to which technological change may take place. It is difficult to see how such variables could be included within any cross-country analysis let alone their functional relationship established with the primary variables. For this reason it is felt that a study based on individual countries is the only feasible approach to adopt at this stage.
- 2.2 However the main reason for focusing the study on the Philippines' economy is the somewhat unusual way in which growth and technological change appear to have polarised. During the 50s through the 70s growth of real GDP was in excess of 5%: output expanding in real terms from P16.5b to P92.7b [NEDA, 1985], although there has been some suggestion that the official estimates for the latter part of the 70s may have been overstated. (see para 6.2 below). At least prior to the 1980s Philippines' economic growth was not *dramatically* different from the South East Asian neighbours although by the 1970s it was tending to fall behind [Cabalu, 1993]. What was dramatically different was the Philippines extremely poor rate of productivity increase. During the 60s and 70s it was less than 2% per worker: not only the slowest rate of increase in East Asia and the ASEAN but even slower than India and Nepal [de Dios, 1984, p.13]. This abysmal performance is clearly reflected in the manufacturing sector's productivity change. Although the *decline* in overall productivity over the period 1956-1980 (measured as total factor productivity) was largely due to 'dysfunctional' inter-industry shifts (especially during the 70s), the within-industry productivity growth over the whole period was a minuscule, less than one half of 1% per annum [Hooley, 1985]. Obviously industry was not transforming itself and hence the ability to sustain earlier growth rates was to say the least rather suspect.
- 2.3 In the event, during the 80s the Philippines' growth rate collapsed so that by 1990 per capita real GDP was some 6.4% lower than what it had been 10 years earlier [Lim, 1991]. This is the period which marked the dramatic divergence between the Philippines' economic performance and that of her South East Asian neighbours. Although their rate of growth of real per capita GDP fell significantly in the 80s, it nevertheless remained positive. Now it is not suggested, of course, that the lack of technological change over the previous 30 years period was the immediate cause of this collapse in the Philippines' growth rate. However, it is suggested that the lack of technological change was an underlying reason for the Philippines not being able to extricate itself as readily as its neighbours did, from the double shock of the second oil price hike and the sharp increase in international interest rates. It also raises serious doubts concerning the

sustainability of current growth rates. Has there been sufficient transformation of industry sectors, for increasing output to continue without sharp declines in factor productivity and hence increasing uncompetitiveness? More importantly, are these and proposed industry development projects going to be adequate to enable the Philippines to withstand the increased competition emanating from the Asean free trade agreement (Afta)? This is what the application of the analytical framework to the Philippines' data aims to establish.

3. Objectives of the Study.

3.1 From this Introduction and the brief outline of the economic context within which Philippines' problems have developed, it is now possible to specify the projects' objectives: -

A. The broad objective of the study is to encourage economic growth analysts to place greater emphasis upon the changes in industry based determinants of economic growth and development rather than macro-economic aggregates which tend to obscure what is taking place.

B. Within that broad objective the study would aim to;

- (i) Ascertain the extent to which economic growth in the mid 90s has been associated with technological change rather than increasing factor supply.
- (ii) Assess the significance of proposed industry projects, in accelerating the process of technological change in the Philippines.

C. Determine whether changes in the inter-industry relationships, which reflect technological change, have taken place and where they may need to be encouraged in order to facilitate the spread of technological change to other industry sectors. Highlight possible policy instruments which might be adopted to strengthen that process.

4. Conceptual Framework.

4.1 In this program technological change is seen as changes in the way productive activities are carried out, so that organisational components of those activity changes are inseparable from the changes in input patterns: both must be seen together. That is why I prefer to call such changes transformations. Seen in this way technological change differs from economic development and industrialisation as these focus upon the changes in output and employment generated by the technological change. Nevertheless both are frequently assumed to be simply the result of economic growth. There is also some ambiguity in the

way structural change is perceived. Chenery, [1988] and Kubo, Robinson and Syrquin [1988] appear to see structural change as the;

“.... set of changes in the composition of demand, trade, production and factor use, as per capita incomes increases.” [Chenery, 1988 pp.31-32]

i.e. as associated with economic growth. Others on the other hand [Leontieff, 1953; Manne & Markowitz, 1963; Anne Carter, 1970] see structural change in terms of changing I-O relationships and is therefore much more clearly linked to changing input patterns. The a failure on the part of Chenery et al to distinguish between transformation in the pattern outputs and transformation in the pattern of inputs leads to a failure to clearly specify the underlying causes of change. If structural change is seen as the outcome of changes in ‘domestic demand’, ‘external trade’ and ‘technology and substitution’ [Chenery and Syrquin, 1988], then following Dixon and McDonald [1993], this may be written as;

$$X = B(C + I + G + E - M)$$

where

X is the vector of industry outputs

B is the Leontieff inverse matrix

C + I + G + E - M the vectors of GNP by expenditure.

From the initial equation we may obtain

$$\Delta X = (\Delta B)(C + I + G + E - M) + B(\Delta C) + B(\Delta I) + B(\Delta G) + (\Delta E) - B(\Delta M)$$

[ibid p.9].

The problem with such an explanation of structural change is that the terms on the right hand side are highly interrelated. Changes in B are normally associated with even more marked changes in the primary input section of the table and it is these changes which can give rise to changes in C, I, G and E-M! The intermediate and primary sections of each industry's inputs cannot be examined independently of one another, because the column vector of an industry represents a structure which needs to be examined as a whole. Therefore if technological and structural change are to have a causal role in growth and development then the transformation must be seen in input not output terms and certainly not a mixture of the two. Structural change as a transformation of inputs seem to me more consistent with Boulding's concept of ‘structural growth’ [quoted in Little, 1995 p.5].

in which the aggregate which “grows” consists of a complex structure of interrelated parts and in which the growth process involves change in relation of the parts.

and going on to say: -

"Problems of structural growth seem to merge almost imperceptibly into the problems of structural *change* or development, so frequently "what grows" is not the overall size of the structure but the complexity or systematic nature of its parts."

Incidentally, this perception of structure is also consistent with Bronowski's [1976] view of science in the late 20th Century - that structure has become the organising concept.

- 4.2 The implication of the view of economic growth, outlined in para 1.2 above, is that to be sustainable growth must emanate from technological change i.e. from the transformation of the economy. This view does not see growth, as an increase in an aggregate entity occurring in response to a parametric change in an otherwise unchanging system - like output responding to an increase in investment, *ceteris paribus*. Rather sustainable growth comes from a transformation of the system itself, embodying re-organisations of productive processes, which then permit the absorption of dramatically increased factors, without associated declines in productivity. But without that transformation, productivity is likely to fall sharply - as witness Cabalu's [1993] comments on the sharply declining capital productivity (increasing ICORs) without any appreciable increase in labour productivity. Anne Carter [1970] found a similar pattern of relatively low labour productivity increase associated with increasing capital:labour ratios (i.e. substitution). However, when technological/structural change occurred, capital as well as labour productivity tended to increase together (although the latter increases much more rapidly) with a consequent marked increase in the industry overall productivity. Anne Carter [1970 Ch.8] found that;

"... there seems to be a positive association, that is improvements in labour and capital productivities go hand in hand. in most sectors labor and capital intensities both decline". [ibid, p.143]

Substitution should therefore be quite clearly distinguished from technological change within the results of the analysis. Thus the central tenet of this research program is transformation of the production processes themselves underpin the changing patterns of output and employment, both through their productivity and their income effects: i.e. technological change becomes the basis for sustainable growth. The initial research program had proposed to test this argument by examining the extent to which sustained structural change had been associated with the steady growth (at least up until the 1980s) despite the absence of any apparent technological change. In the event that approach had to be abandoned because of the lack of a consistent set of past I-O data at a sufficiently disaggregated level to enable a reasonable measure of industry transformation to be made.

- 4.3 This raises a question: to what extent do changes in I-O tables actually reflect technological change? Obviously, I-O table structure is a very incomplete description of the production processes and hence the technology which underlies them. However, the higher the degree of disaggregation, the closer the I-O sectors come to being a reflection of a single production process so that changes in the table may be seen as changes in a production process and hence at least a first approximation to technological change. Nevertheless even at the 230 sector level (a possible level of disaggregation for this study) there is some difficulty in distinguishing arc furnace from rolling mill processes so that inevitably there will be some element of change due to changes in product mix as well as technology. However, at the 60 sector level, where tables are relatively consistent over time, any concept of an industrial process is completely submerged. A second point is that an I-O table is at best an incomplete *description* of the production processes it contains so that the changes in the table would not *explain* that technological change. They would only describe the degree of change taking place. It is in the discussion with industry groups about their proposed developments that it is hoped to elicit some understanding as to why technological change may or may not be taking place.
- 4.4 When looking at this type of analysis the question is whether the direct or total factor requirements should be used. Measures of total factor requirements obviously take systematic account of shifting industrial specialisation within industry sectors. However, the extent to which such specialisation may be associated with technological change within the sector is more likely to require an analysis of the direct co-efficients. Thus the appropriateness of a particular input measure to be employed is determined by the research objectives being pursued rather than on *a priori* theoretical considerations. Actually, a comparison of the direct and indirect input changes may help to highlight a possible problem with sectoral specialisation. Where there is little difference between each measure of factor input this would imply little sectional activity outside the basis process i.e. an 'enclave' activity. Total factor requirement increases could then be compared within sectors in the standard framework. (para 5.4)
- 4.5 The particular way of perceiving the process of technological change outlined above has a number of very important implications which impinge directly on development policy formulation.

(a) It is not simply increasing output but patterns of input change which lies at the heart of technological change. Industry projects need to be seen in terms of their potential for transforming other industries not simply in terms of their direct addition to output. This ability to transform activity can occur in a number of ways:

- (i) The re-organisation of production in existing industries following the transformation in the initial industry.
- (ii) Industries which may evolve to carry out downstream processing of the output from the new industry (the development of forward linkages).
- (iii) The generation of new industries to service the new activities arising from both (i) and (ii) (what Anne Carter [1970] calls the 'increasing roundaboutness of activity')

(b) The second implication is that increases in output do not come solely from the additions of more inputs, but also from the re-organisation of productive activity associated with technological change. The re-organisation of production is possibly the most important but undoubtedly the most underrated aspect of technological change. It is this aspect which enables an industry to sharply increase its absorptive capacity for inputs - especially those capital inputs which embody innovations - while at the same time increasing their productivity. The increased absorption of inputs is then reflected in the sharply increased growth rates usually associated with economic development or industrialisation. This inability to recognise the role of productive re-organisation in permitting large-scale increases in factor absorption lies at the basis of the argument that the NICs' success was simply their ability to generate more factor inputs through greater saving. The suggestion that increased household savings will automatically generate those new industries which underpinned the NICs' development (such as a steel industry in the case of Korea which already by 1980 reflected a productivity measured in man hours/metric ton considerably better than the European and only a little less productive than the U.S. [Chong, 1985]) is so naive, as to border on the ludicrous. The significance of industry re-organisation in the U.S. adjustment to Japanese automobile competition in the 80s, has been outlined in Little [1996].

5. Methodology

- 5.1 The first step is to compare changes in cost structures given by the I-O tables for 1985, 1988 and 1994, when the latter becomes available (about the middle of 1998 from discussions with the National Statistical Office).

The reason for using the 1985 rather than the 1979 table as the starting point is that 1985 saw the introduction of the distinction between commodities and industries (see para 6.3 below), enabling the secondary output of industries to be allocated to those sectors with which it was more consistent. As a consequence, the 1985 and subsequent tables are not directly comparable with any of the earlier tables. The lack of general comparability between the 1979 and 1988 tables is particularly unfortunate because both years represented similar points in the cycle

of business activity. 1985 on the other hand represented the mid-point of a sharp recession so that any apparent increase in labour productivity to 1988 may merely reflect the tendency for output to vary much more than employment over a cycle, so that during the recovery stage output would expand more rapidly than employment. However, where secondary output does not significantly affect the distribution of output between sectors, comparisons may be able to be made between 1979 and 1988. Another unfortunate consequence of the change in the format of the I-O tables is that it is no longer consistent with Census of Establishment data. As Table 2 demonstrates, there can be major differences in the distribution output between sub-sectors, when the Census of Establishment data is compared with that of the I-O tables, making the Census information on employment and capital inapplicable in these particular cases.

5.2 The comparison of the technological structures will be mainly based on a comparison of the domestic technical co-efficient matrix for each year. The domestic matrix will be used to enable domestically produced intermediate inputs to be separated from imports as this distinction is obviously extremely important in assessing the consequences of change. Also the technical rather than the inverse co-efficients will be used because the former set of co-efficients is much more likely to reflect any changes in the actual production process, taking place. Inverse co-efficients may be advantageous where classifications of firms may be sensitive to the particular mix of products characterising their output. However, given that the present format of the tables re-allocates secondary output to the sector with which it is consistent, the problem of sensitive classifications should no longer be a serious problem. Given that the indirect effects associated with comparing changes in the inverse co-efficients may well mask what is happening in any particular production process, the main emphasis of the study will be upon the changes in the technical co-efficients. Nevertheless, where it is felt further insights may be gained (as outlined in para 4.4) comparison will be able to be made across the inverse co-efficient tables.

5.3 In comparing I-O tables over time a number of steps required to ensure their comparability.

1. The tables obviously need to be aligned so that the industries/commodities can be readily compared over the different time periods. There is some uncertainty at this stage as to the number of industry sectors involved in the 1994 table, but it is understood it will be in the range 230-270 sectors. At 230, industry sectors would be the same as the 'commodity' sectors in the 1988 tables, but either way some aggregation is likely to be required to make those years compatible with 1985. The respective sectoral tables are shown in Table 1. At this stage it is not known whether it might be feasible to disaggregate some of the 1985 sectors especially in the services divisions rather than simply combining those sectors in the 230 sector tables, to obtain the necessary consistency with 1985.

Table 1
Comparison of the 186 and the 230 Table
I-O Tables

1 Palay	1 Palay
2 Corn	2 Corn
9 Beans & Peas	3 Vegetables, beans and peas
10 Other vegetables, n.e.c.	
11 Cassava	4 Tubers and root crops
12 Other tubers and root crops	
5 Banana	5 Banana
6 Pineapple	6 Pineapple
7 Mango	7 Mango
8 Fruits and nuts, n.e.c.	8 Citrus fruits
	9 Fruits & nuts, n.e.c. exc. coconut
3 Coconut/Copra in farms	10 Coconut/Copra in farms
4 Sugarcane	11 Sugarcane
13 Tobacco (native and virginia)	12 Tobacco
14 abaca	13 Abaca
15 Other fiber crops	14 Other fiber crops
16 Coffee and cacao	15 Coffee
	16 Cacao
17 Rubber	17 Rubber
18 Other crops, n.e.c.	18 Other agricultural production, n.e.c.
19 Hogs (swine)	19 Hogs
20 Cattle	20 Cattle & Other livestock & products
21 Other livestock & products	
22 Chicken for meat	21 Chicken for meat
23 Hen's egg production	22 Hen's egg
24 Other poultry & products	23 Other poultry & poultry products
25 Agricultural services	24 Agricultural services
26 Ocean, coastal & inland fishing	25 Ocean, coastal & inland fishing
27 Fish farms & other fishery activities	26 Aquaculture & other fishery
28 Logging operation	27 Forestry
29 Other forestry activities	
30 Gold and other precious metal	28 Gold and silver
31 Copper	29 Copper
32 Nickel	30 Nickel
33 Chromium	31 Chromite
34 Other metallics	32 Other metallic ores
35 Coal	33 Coal
38 Other non-mettalic mining & quarrying	34 Crude Petroleum & Natural gas
	35 Stone, clay and sand

- 36 Sand, stone & gravel
- 37 Salt mining
- 47 Slaughtering & meat packing plants
- 48 Meat processing
- 41 Milk processing
- 43 Butter, cheese & other dairy products
- 42 Ice cream, other flavored ice
- 51 Fruit/vegetable preserving
- 52 Fish canning
- 53 Other fish preparations
- 44 Crude coconut oil, copra cake & meal
- 45 Other crude vegetable & animal oil
- 46 Refined coconut & vegetable oil & margarine
- 39 Rice & corn milling
- 49 flour & other grain milling
- 54 Bakery Products
- 55 Noodles Manufacturing
- 40 Sugarcane milling/refining
- 56 Cocoa, chocolate & confectionary
- 57 Dessicated coconut
- 59 Coffee processing
- 50 Feeds manufacturing
- 58 Ice, exc. dry ice
- 60 Starch & Starch products
- 61 Food flavoring & coloring extracts
- 62 Miscellaneous food manufacturing
- 63 Wine & liquor
- 64 Brewery & malt product
- 65 Soft drinks & carbonated water
- 66 Cigarettes
- 67 Cigars, chewing & smoking tobacco
- 68 Tobacco leaf flue curing
- 69 Textile mills
- 70 Knitting mills
- 72 Other made-up textile goods
- 36 Salt
- 37 Other non-metallic mining and quarrying
- 38 Slaughtered livestock & poultry
- 39 Meat & meat products, processed
- 40 Milk, processed
- 41 Butter & cheese
- 43 Other dairy products
- 42 Ice cream, other flavore ices
- 44 Canned/preserved fruits & vegetables & juices
- 45 Canned fish
- 46 Dried, smoked fish & other fish products
- 47 Crude coconut oil, cake & meal
- 48 Crude vegetable, fish & animal oil
- 49 Refined coconut & vegetable oil
- 50 Rice & corn milled
- 51 Wheat & cassava flour & other milled grains
- 52 Bakery products exc. noodles
- 53 Noodles
- 54 Sugar, milled & refined
- 55 Manufactured cocoa, chocolate & sugar confect
- 56 Dessicated coconut
- 58 Coffee, roasted & processed
- 59 Animal feeds
- 57 Ice, exc. dry ice
- 60 Starch & starch products
- 61 Flavoring extracts, mayonnaise, coloring produ
- 62 Miscellaneous food products
- 63 Liquors & wines
- 64 Beer
- 65 Softdrinks & carbonated water
- 66 Cigarettes
- 67 Cigars, chewing & smoking tobacco
- 68 Flue-cured & redried tobacco leaf
- 69 Textile yarns & fabrics, woven
- 70 Hosiery, underwear
- 71 Knitted fabrics
- 72 Other made-up textile goods, n.e.c.
- 73 Carpets & rugs
- 75 Articles made of native materials
- 76 Artificial leather & Impregnated & coated fabrics
- 77 Fiber batting, padding upholstery fillings

- 71 Cordage, rope and twine
- 73 Custom made tailoring
- 74 Ready made clothing
- 75 Embroidery
- 76 Other wearing apparel
- 87 Tanneries and leather finishing
- 88 Leather products exc. footwear
- 77 Footwear, exc. rubber, plastic or wooden
- 78 Rough and worked lumber
- 79 Veneer and plywood
- 80 Other wood, cork and cane products
- 134 Furniture & fixture, primarily of wood, cane/products
- 81 Pulp, paper and paperboard
- 82 Paper and paperboard containers
- 83 Other converted paper & paperboard products
- 84 Newspaper and periodicals
- 85 Books and pamphlets
- 86 Commercial & job printing & allied industries
- 94 Basic industrial chemicals
- 95 Fertilizer
- 96 Plastic materials
- 97 Pesticides
- 98 Paints, varnish and related compounds
- 93 Drugs and medicines
- 99 Soap and synthetic detergents
- 100 Perfumes, cosmetics & other toilet preparation
- 101 Other chemical products
- 102 Petroleum refinery
- 89 Tires & tubes incl. retreading
- 90 Rubber footwear
- 91 Other rubber products n.e.c.
- 92 Fabricated plastic products
- 104 Pottery, china and earthenware

- 74 Cordage, rope and twine
- 78 Custom tailoring and dressmaking
- 79 Ready made clothing
- 80 Embroidery
- 81 Other wearing apparel
- 82 Tanneries and leather finishing
- 83 Leather products and substitutes
- 84 Leather footwear and footwear parts
- 85 Lumber, rough or surfaced
- 86 Veneer and plywood
- 87 Hardboard and particleboard
- 88 Wood drying and preserving plants
- 89 Millwork plants
- 90 wooden and cane container
- 91 Wood carvings
- 92 Miscellaneous wood, cork & cane products
- 93 Wooden furniture and fixtures
- 94 Rattan furniture and fixtures
- 95 Other furniture and fixtures
- 96 Pulp, paper and paperboard
- 97 Paper and paperboard containers
- 98 Articles of paper and paperboard
- 99 Newspaper and periodicals
- 100 Printing & publishing of books & pamphlets
- 101 Commercial & job printing & other allied services
- 102 Basic industrial chemicals
- 103 Fertilizer
- 104 synthetic resins, plastic materials
- 105 Pesticides and insecticides
- 106 Paints, varnish and lacquer
- 107 Drugs and medicines
- 108 Soaps and detergents
- 109 Perfumes, cosmetics & other toilet preparation
- 110 Miscellaneous chemical products n.e.c.
- 111 Petroleum refinery
- 112 Miscellaneous petroleum and coal products
- 113 Rubber tires and tubes
- 114 Rubber footwear
- 115 Other rubber products
- 116 Plastic furniture, footwear & other plastic products
- 117 Pottery, china and earthenware

- 105 Glass and glass products
- 103 Cement manufacture
- 106 Structural clay products
- 107 Structural concrete products
- 108 Other non-metallic mineral products
- 109 Primary iron and steel products
- 110 Non-ferrous basic metals
- 111 Cutlery, handtools and general hardware
- 112 Structural metal products
- 113 Metal container
- 114 Stamped, coated & engraved metal products
- 115 Fabricated wire products
- 116 Miscellaneous fabricated metal products
- 117 Agricultural machinery & equipment
- 118 Wood & metal working machinery
- 119 Other special industry machinery
- 120 Other non-electrical machinery
- 121 electrical industrial mach. & equip. & parts
- 122 Radio, TV, communication equip. & parts
- 123 Semi conductor devices
- 124 Electrical appliances & housewares
- 125 Batteries
- 126 Insulated wires & wiring devices
- 127 Miscellaneous electrical apparatus & supplies
- 128 Shipbuilding and major repair
- 129 Motor vehicle assembly
- 130 Rebuilding of motor vehicle
- 131 Motor vehicle parts and accessories
- 132 Motorcycle and bicycles and parts
- 133 Railroad equipment, aircraft & other transport equip.
- 136 Professional, scientific instruments
- 118 Flat glass
- 119 Glass container
- 120 Other glass and glass products
- 121 Cement
- 122 Structural clay products
- 123 Structural concrete products
- 124 Other non-metallic mineral products
- 125 Blast furnace, steel works
- 126 Iron and steel foundries
- 127 Non-ferrous smelting & refining
- 128 Non-ferrous metal foundries
- 129 Cutlery, handtools and general hardware
- 130 Structural metal products
- 131 Metal containers
- 132 Stamped, coated & engraved metal products
- 133 Wire nails
- 134 Other fabricated wire & cable products
- 135 non-electrical lighting & fixtures
- 136 Other fabricated metal products
- 137 Agricultural machinery and equipment
- 138 Metal & woodworking machinery & equipment
- 139 Engines, turbines & other industrial mach. & eq
- 140 Office machines
- 141 Pumps, compressors, blowers & airconditioners
- 142 Machine shops
- 143 Electrical industrial machinery & apparatus
- 144 Radio & TV receiving set & recorder
- 145 Communication equipment n.e.c.
- 146 Parts & supplies for radio equipment
- 147 Other electrical appliances & housewares
- 148 Primary cells, batteries and accumulator
- 149 Insulated wires & cables
- 150 Current carrying wiring devices
- 151 Electrical lighting fixtures & supplies exc. wiring d
- 152 Ships & boats incl. major repair services
- 153 Motor vehicles
- 154 Rebuilding & major repair services of motor veh
- 155 Motor vehicle parts and accessories
- 156 Motorcycles and bicycles
- 157 Other transport equipment n.e.c.
- 158 Scientific, measuring & controlling

135 Furniture and fixtures primarily of metal
 137 Jewelry, silverware & related products
 138 Musical Instruments
 139 Sporting and athletic goods
 140 Medical & dental goods and supplies
 141 Toys, dolls, exc. rubber, plastic
 142 Stationers' artist and office supplies
 143 Miscellaneous manufacture n.e.c.
 144 General building construction
 145 General engineering construction
 146 Special trade construction
 147 Electrical generator & distributor
 148 Gas & steam exc. LPG
 149 Waterworks and supply
 164 Wholesale trade
 165 Retail trade
 151 Railway transport
 150 Busline operator
 152 Public utility cars & taxi cabs
 153 Jeepney & autocalesas
 154 Other road passenger transport
 155 Road freight
 156 Ocean (overseas) shipping
 157 Interisland shipping
 159 Arrastre, stevedoring
 158 Air transport services
 160 Tour and travel agencies
 161 Other supporting & allied transport services
 163 Storage and warehousing
 162 Communication
 166 Banking institutions
 167 Non-banks
 168 Life insurance
 169 Non-life & other insurance activities
 170 Real estate

instruments

159 Photographic & optical instruments
 166 Ophthalmic goods and supplies
 160 Watches and clocks
 161 Metal furniture and fixtures
 162 Jewelry and related products
 163 Musical instruments
 164 Athletic and sporting goods
 165 Surgical, dental, medical & orthopedic equip. &
 167 Toys, dolls, exc. rubber, plastic
 168 Stationers' artist & office supplies
 169 Miscellaneous manufactures n.e.c.
 170 Construction
 171 Electricity
 172 Gas and steam exc. LPG
 173 Waterworks & supply
 174 Wholesale and retail trade
 175 Railway transport services
 176 Bus transport
 177 Public utility cars
 178 Jeepney, autocalesas & tricycles
 179 Tourist bus and car and rent-a-car
 180 Road freight transport
 181 Ocean passenger & freight transport
 182 Interisland shipping
 183 Stevedoring and supporting services
 184 Air transport services
 185 Tour and travel agencies
 186 Custom brokerage & other services allied to tra
 187 Storage and warehousing
 188 Telephone services
 189 Telegraph services
 190 Postal, messengerial & Other communication s
 191 Banking services
 192 Non banking financial svcs. exc. pawnshops
 193 Pawnshops
 194 Life insurance
 195 Non-life insurance
 196 Real estate development
 197 Real estate letting/renting

171 Ownership and dwelling
 180 Advertising services
 181 Machinery & equipment renting & leasing
 179 Professional business services
 182 Other business services n.e.c.
 175 Private education services
 176 Private health services
 186 Other social & related community services
 183 Motion picture & other entertainment services
 184 Other amusement & recreational services
 185 Personal & household services
 178 Restaurants cafes & other eating & drinking places
 177 Hotels, inns & other lodging places
 172 Public education services
 173 Public health services
 174 Public administration and defense

198 Ownership and dwelling
 202 Advertising services
 203 Machinery & equipment renting & leasing
 199 Legal services
 200 Bookkeeping, accounting services
 201 Engineering, architectural services
 204 employment and recruitment services
 205 Business management and consultancy service
 206 Detective and protective services
 207 Other business services
 209 Private education services
 210 Private hospitals
 211 Private medical/dental clinics
 208 Sanitary & similar services
 212 Other social and community services
 213 Motion picture production
 214 Motion picture distribution & projection
 215 Radio & TV programming
 216 theatrical production
 217 Other recreational & cultural services
 218 Repair shops for motor vehicles
 219 Other repair shops, n.e.c.
 220 Laundry, dry cleaning and dye
 221 Barber & beauty shops
 222 photographic studios
 223 Other personal services, n.e.c.
 224 Restaurant cafes & other eating & drinking places
 225 Hotels & motels
 226 Other lodging places
 227 Public education services
 228 Public health services
 229 Public administration and defense
 230 Unclassified

2. Tables will also need to be adjusted for price changes over the period. Although it may be suggested that because the price of both inputs and outputs will change over time there may be no need to adjust the tables to a constant price basis [Titanus, 1966; Sevaldson, 1963]. However, the weight of opinion appears to be in favour of a constant price basis for comparison. As Anne Carter [1970] argues; -

"To discuss whether less steel or more aluminum was used per unit of automobile output in two different years requires that the units in which steel, aluminum and automobiles are measured be fixed over the period of comparison" [ibid p.22].

It is therefore necessary to deflate all of the basic information to a common price basis. To accomplish this, price indices based upon producer prices or the wholesale (and in the case of some services, the retail) price index will be derived for each sector's output. This would then give control totals for each sector's deflated total output and inputs. These control totals enable a total Final Demand and Primary Inputs to be derived as residuals: the adjustment of the individual items within each of those vectors then being modified by the change in the relevant GNP by expenditure or National Income IPINs.

- 5.4 The second step in the program requires obtaining lists and descriptions of the major industry projects from the Department of Trade and Industry's Board of Investments, as well as industry groups, in order to determine the potential for further changes in production processes beyond 1994. Although this aspect is at an extremely rudimentary stage, there appear to be 2 clearly distinct patterns emerging:

- (a) Developments that simply reflect increases in output with very little prospect of generating any technological impact. These projects appear to be closely related to construction activity and include cement and certain iron and steel projects.
- (b) The second group includes projects which may have the potential to change existing production processes in other sectors and include a number of petro-chemical projects as well as iron and steel projects.

However, as even the details of these projects are by no means certain at this juncture, the study is clearly a very long way from being able to draw any clear distinctions at this stage.

- 5.5 The third step is to compare the process of technological change in the Philippines against some standard in order to assess its performance. This comparison has 2 aspects;

- (i) Assessing the adequacy of technological change and its present rate of implementation in the light of that shown in the standard.
- (ii) Using that standard as a basis for estimating the potential impact that

new industry projects might have on the structure of the Philippines' economy.

The standard which it is intended to use in the structure of the Japanese economy as reflected in the I-O tables which the Institute of Developing Economics has compiled on a comparable basis to the Philippines' tables - the Philippines-Japan International I-O table. These tables are available for 1985 and 1990 [NSO-IDE, 1992, 1996]

- 5.6 The final step is, in the light of increasing competition arising from Afta to formulate policy guide lines for a national strategy on technological change. These guidelines would not be aimed at proposing selected key sectors to be encouraged, but rather would focus on the smaller scale incremental changes in inter-industry relationships (what Pack & Westphal [1986 pp.118-9] refer to as 'intensive' technological change). The guidelines would therefore emanate from the first 3 steps of the research program: i.e. from technological change that has already occurred and those industries in which it needs to be encouraged in order to facilitate its spread throughout the economy.

6. Data Sources.

- 6.1 One of the reasons for proposing that the initial research program be conducted in the Philippines, was the apparent availability of the sort of detailed data that that program would require. The usual problems with national accounts data cited by Heston [1994] did not seem to apply to the Philippines. There is no lack of baseline surveys of production expenditure and prices, also, Gross Value Added at the 60 sectors level in constant prices is available from 1967. Finally, benchmark I-O surveys are available for 1961, 1965, 1969, 1974, 1979, 1985 and 1988. There therefore appears to be ample data to enable a research program to focus on the changes in economic structure and thereby determine the extent to which economic development and hence sustainable growth are actually taking place.
- 6.2 However, despite this commendable effort this apparent abundance of data is not quite the reality. In the case of national accounting, Levy [1966] suggests the minimum information they should provide are;
 - (a) the absolute size of the aggregate
 - (b) secular trend
 - (c) short-term changes and fluctuations." [ibid p. 136]

Estanislao [1983] suggests that although (a) and even (b) may have been reasonably accurately estimated over the period 1956-1975¹, it is unlikely that (c) has been. He suggests that the official estimates of short term changes and fluctuations have been too narrow in the light of other indices of economic performance. Since 1975 (i.e. up until 1980) it is suggested that official estimates of the real growth rate have been overly optimistic [ibid p.2]. In the case of the I-O tables, as Anne Carter suggests, there is no basis for estimating the accuracy of the co-efficients. If the focus of the study is the changes in those co-efficients, as a reflection (amongst other things) of technological change, then comparability of the tables cannot be based upon the relative constancy of the co-efficients as Estanislao suggests [ibid p.215]. Indeed, the apparent consistency - especially of the manufacturing co-efficients - over the 1965, 1969 and 1974 tables [ibid pp.218-220], may well simply indicate the lack of technological change over that period, referred to in para 2.2. above. Rather than the lack of constancy in the co-efficients, it was the lack of uniformity in the degree of their disaggregation and formatting which has led to difficulties in their comparison. In the initial formulation of the research program it was hoped to compare the 1969, 1979 and 1988 tables, to assess the degree of technological change, structural change and growth of output within each sector. In the event, changes in the PSIC code in 1977 (which although limiting the number of useful comparisons which could be made with the 1969 table, was not a major hurdle) and the fact that the 1979 table in its disaggregated form (195 sectors) was no longer available, were obvious impediments to meaningful comparisons. However, it was the change in 1985 format, which introduced the re-allocation of secondary output to its appropriate primary sectors, that meant earlier tables were now no longer directly comparable. Nor would they be comparable any longer to the census of establishment data. (Despite the differences in coverage it was found that the measure of output given by the I-O tables in 1979, were reasonably comparable in most sectors, with the 1978 census of establishment figures). The lack of comparability with earlier tables has left us with no option other than to focus on present trends and therefore to compare the 1985, 1988 and 1994 tables.

6.3 However, even with this considerably reduced coverage a number of data problems remain.

(a) At the present time, not only is the 1994 table not yet available, neither is the 1985, 186 by 186 industry and the 426 by 426 commodity matrices. However, copies of both the make and absorption matrices are now available so that it is only a matter of multiplying them to derive the industry matrix. We have been advised to use the technical co-efficient tables in the multiplication and that the matrix inversion would probably best be carried out on a main frame computer to avoid any need to partition the matrix. It is understood that the 1994 table will be available about mid-1998.

¹ There is some ambivalence in his statements on the period covered by the accurate estimates.

(b) Although the 1994 table will comprise 230-270 industry sectors and 457 commodity sectors and will therefore be reasonably comparable with the 1985 tables, the 1988 table comprises only a 230 by 230 commodity matrix, where the 230 'commodity' are identical to the 230 industry sectors in the 1994 table. The commodities in the 1988 table are therefore defined as co-terminous with the industries in 1988 and are not separately available.

(c) The difficulties involved in defining a separately identifiable commodities classification, led us to compare the output generated by the I-O table with the Census of Establishment survey and the results of that comparison are shown in Table 2. As can be seen from Table 2 the distribution of output between sectors is clearly reversed in a number of manufacturing categories; viz -

Textile Manufacturing:	Textile mills; Knitting mills
Basic Metals:	Furnaces, steel works, foundries
Metal Industries:	Metal containers, cutlery, handtools, etc.

Table 2

**A Comparison of the Distribution of Output Between Sectors Within
Manufacturing Categories by the 1988 I-O Tables and the
Census of Establishments**

I-O Sector Nos.	I-O Gross Output	Percent	C.E. Industry Number/s	C.E. Value/Output	Percent	C.E. Product Output	Percent
Food Manufacturing							
30-39	57,450,240	22.42	311	5,178,939	6.21	4,640,033	5.81
40	3,616,910	1.41	3112	2,509,370	3.01	2,461,618	3.08
41-43	5,188,484	2.03	3113	4,658,690	5.59	4,765,573	5.97
50	78,038,824	30.46	3118	3,164,446	3.8	208,2005	3.36
51	6,097,315	2.38	3119 + 3121	5,864,940	7.04	5,858,685	7.34
54	14,315,759	5.59	3123	13,721,238	16.46	12,878,772	16.13
44	8,135,453	3.18	3114	5,695,947	6.83	5,188,353	6.5
45-48	22,233,988	8.68	3115	7,254,450	8.7	6,972,647	8.74
52-53	19,998,288	7.81	3122	3,483,439	4.18	3,191,871	4
55	2,026,122	1.14	3124	1,680,042	2.02	1,655,876	2.08
56	2,514,154	0.98	3125	2,041,199	2.45	2,030,867	2.55
47	18,000,491	6.25	3116	10,441,875	12.53	10,141,878	12.71
48-49	3,015,556	1.18	3117	2,443,483	2.93	2,480,614	3.11
58	1,839,394	0.72	3127	3,884,711	4.66	3,785,174	4.76
57	721,950	0.28	3128	406,631	0.49	397,725	0.5
59	8,379,063	3.27	3128	5,781,955	6.94	5,650,036	7.08
60-62	5,729,961	2.24	3129	5,156,091	6.18	5,028,375	6.3
	258,201,958	100.02%		83,367,424	100.02%	79,821,502	100.02%
Beverages							
63	2,458,185	11.73	3131 + 3132	2,384,322	9.47	2,303,141	9.17
64	10,480,787	50	3133	14,092,096	55.95	14,086,153	56.07
65	8,022,821	38.27	3134	8,712,494	34.59	8,731,598	34.76
	20,961,793	100%		25,188,912	100.01%	25,120,892	100%
Tobacco							
66-67	15,690,196	86	3141 + 3142 + 3143	15,567,923	98.14	15,416,641	96.86
68	2,554,646	14	3144 + 3149	625,843	3.87	500,036	3.14
	18,244,842	100%		16,193,766	100.01%	15,916,677	100%
Textile Manufacturing							
69	7,603,423	31.46	3211	14,152,624	72.37	12,949,408	72.23
70-71	13,461,907	55.68	3212	2,958,272	15.12	2,854,114	15.92
72-77	3,114,197	12.88	3213 ----> 3219	2,447,091	12.51	2,125,486	11.86
	24,179,527	100.02%		19,555,987	100%	17,929,008	100.01%
Footwear & Wearing Apparel							
79	20,649,728	79.79	3222	13,886,375	84.75	10,268,266	86.92
78,80-81	2,648,583	10.23	3221, 3223, 3229	1,323,858	8.08	443,096	3.75
84	1,948,380	7.53	324	643,489	3.93	623,910	5.28
82-83	634,433	2.45	323	531,052	3.24	478,202	4.05
	25,881,124	100%		16,384,774	100%	11,813,474	100%
Wood & Cork Products							
85	7,830,438	42.22	3311	3,479,451	31.82	3,285,628	31.76
86	5,868,057	31.64	3312	4,334,327	39.63	3,961,436	38.29
87-92	4,847,746	26.14	3313 ----> 3319	3,122,410	28.55	3,097,792	29.95
	18,546,241	100%		10,936,188	100%	10,344,856	100%
Furniture & Fixtures							
93-95	7,549,389	98.22	332	3,866,613	97.26	3,647,682	97.58
101	137,187	1.78	3860	108,881	2.74	90,373	2.42
	7,686,576	100%		3,975,494	100%	3,738,155	100%

Paper & Paper Products							
96	5,176,504	48.82	3411	6,286,667	61.35	6,160,785	61.63
97-98	5,470,591	51.38	3412 + 3413	3,960,763	38.65	3,836,003	38.37
	10,647,095	100%		10,247,430	100%	9,996,788	100%
Printing & Publishing							
99-100	2,716,361	39.74	3421 + 3422	2,394,874	57.48	1,588,766	49.04
101	4,118,332	60.26	3423 + 3429	1,771,496	42.52	1,651,068	50.96
	6,834,693	100%		4,166,370	100%	3,239,834	100%
Chemicals							
102	5,714,987	15.66	3511	5,237,434	11.64	4,693,438	11.92
104	2,982,782	8.17	3513	2,832,894	6.3	2,732,364	6.94
103	3,990,987	10.94	3512	4,676,538	10.4	4,043,121	10.27
106	1,802,914	4.94	3521	2,497,848	5.55	2,346,858	5.96
107	9,211,667	25.24	3522	13,184,810	29.31	10,771,019	27.35
108	4,726,907	12.95	35231 + 35232	8,792,263	19.54	8,070,228	20.49
109	3,444,062	9.44	35233	2,186,533	4.86	886,621	4.79
105	1,183,688	3.24	3514	1,685,470	3.75	1,471,725	3.74
110	3,439,105	9.42	3529	3,898,376	8.87	3,371,037	8.58
	36,497,099	100%		44,991,966	100.02%	39,385,211	100.02%
Petroleum & Petroleum Products							
111	47,070,770	92.57	353	44,481,575	98.88	44,177,116	98.92
112	3,780,998	7.43	354	512,413	1.14	480,746	1.08
	50,851,768	100.00%		44,993,988	100%	44,657,862	100%
Rubber Products							
113	4,993,916	64.49	3551	5,438,407	64.53	5,229,267	64.06
114	2,063,134	26.65	3552	2,129,031	25.26	2,129,854	26.1
115	686,279	8.86	3559	860,091	10.21	803,606	9.84
	7,743,329	100%		8,427,529	100%	8,162,827	100%
Non-Metallic Mineral Products							
121	5,827,568	47.19	363	5,582,197	49.09	5,552,143	50.67
118-120	3,167,915	25.65	362	3,012,531	26.40	2,937,478	26.81
122-123	1,446,896	11.72	3691 + 3692	1,031,254	9.07	842,241	7.69
117, 124	1,906,714	15.44	361 + 3699	1,744,948	15.35	1,625,759	14.83
	12,349,093	100%		11,370,930	100%	10,957,621	100%
Basic Metal Industries							
125	9,267,855	37.34	3711	587,580	1.85	569,137	1.95
			3712	16,967,946	53.53	16,114,916	55.15
126	9,300,863	37.47	3713	272,019	0.86	260,425	0.89
			3719	1,934,022	6.1	1,929,328	6.6
127-128	6,254,527	25.2	372	11,937,419	37.88	10,348,613	35.41
	24,823,245	100.01%		31,698,986	100%	29,222,417	100.00%
Metal Industries							
129	3,158,919	25.89	3811	229,602	3.85	224,031	4.23
130	1,398,562	11.46	3812	671,084	14.61	624,304	11.78
131	2,425,277	19.88	3813	2,141,147	35.9	1,992,075	37.58
132	3,981,905	32.64	3814	1,912,574	32.07	1,712,178	32.3
133-136	1,236,010	10.13	3815 + 3816 + 3819	810,343	13.59	748,756	14.12
	12,290,673	100%		5,964,750	100.02%	5,301,344	100.01%

Table 1

Non-Electrical Machinery							
137	179,036	7.27	3822	127,081	3.83	104,471	3.83
140	652,760	26.49	3825	452,783	13.65	425,374	15.6
138, 139, 141, 142	1,632,069	66.24	3821 + 3823 + 3824 + 3829	2,737,901	82.52	2,197,728	80.58
	2,483,865	100%		3,317,745	100%	2,727,573	100.01%
Electrical Machinery							
143	567,799	1.93	3831	677,797	3.43	784,104	3.23
148	1,662,383	5.06	3834 + 3835	1,645,292	6.42	1,489,329	6.10
147	2,989,146	10.17	3833	1,149,309	4.49	1,040,899	4.29
144	3,278,886	11.16	38321 + 38329	3,616,559	14.11	3,547,144	14.6
145	570,978	1.94	38323 + 38324	704,254	2.75	528,600	2.18
6	16,417,118	55.87	38325	14,225,196	55.51	13,618,788	58.05
149-150	3,338,019	11.36	3836	2,619,317	10.22	2,510,191	10.33
151	562,647	1.92	3839	790,714	3.09	779,341	3.21
	29,386,976	100%		25,628,438	100.02%	24,293,394	100.03%
Transport Equipment							
152	822,544	11.88	3841	807,684	9.08		
153, 154, 155	5,470,453	78.86	3843 + 3844 + 3845	7,336,782	82.48	Not Applicable	
156-157	644,300	9.29	3846 + 3847 + 3849	750,545	8.44		
	6,937,297	100.01%		8,895,011	100%		
Miscellaneous Manufacturing							
116	5,359,592	38.06		6,698,335	68.05		
183	115,700	0.82	This sector to be	68,447	0.71		
168	393,318	2.79		166,360	1.72		
158-160 (incl. 116)	594,604	4.22	finalised	375,373	3.87	Not applicable	
				108,881 (i-161)			
162, 164-167, 169	7,621,312	54.11		81,268	0.84		
	14,084,526	100%		324,113	3.34		
				110,953	1.14		
				142,939	1.47		
				340,354	3.51		
				1,393,194	14.36		
				9,791,336	100.01%		

Table 3

Output of knitted Products by Textile Mills, Knitting Mills and Other Industries,
1985 and 1988
(Current Prices)

	1985		1988	
	Output	% Total	Output	% Total
Textile Mills	15,872	1.41	6,490,467	48.21
Knitting Mills	1,120,364	98.59	5,177,328	38.46
Other	2,327	0.20	1,794,112	13.33
	<u>1,138,663</u>	<u>99.99</u>	<u>13,461,907</u>	<u>100.00</u>

The distribution of the output of knitted products between textile mills, knitting mills and other industries is contained in Table 3. This shows that the 1985 textile mills produced an insignificant 1.41% of total output in 1985 whereas by 1988 it is claimed they produced almost a half. This represents a more than 400 fold increase in the output knitted products from textile mills while the increase in the output of the knitting mills themselves was just over 3 1/2 times. At the same time the output of knitted products from the ready-made clothing industry rose from zero to 1,624,744 in 1988. The dramatic change in the distribution of output, is very difficult to accept - especially the growth in the output from textile mills.

In the case of Basic Metals, Table 2 shows that output of the rolling mills is far and away the main iron and steel activity in the Philippines comprising more than 85% of its output according to C.E. data. The I-O table implies, that approximately half of the output of the rolling mills was in fact secondary foundry products and as in the case of the secondary output of the textile mills this is very difficult to accept. Rolling mills and foundry activities are quite distinct, the former employing considerable capital equipment in the form of the mills which could not be used for manufacturing foundry products. To imply that nearly half of the output of the rolling mills sector would be unrelated to the mill use, does not make any sense. However, where there is a possible tie up in the ferro alloy processing stage which feeds into both rolling mill activity (through the electric arc furnace) and into foundry casting (through induction furnaces). However, both of these industries would be included in the steel making furnaces industry (3711) which according to the CE data constituted a mere 3% of total iron and steel output.² Unfortunately, without the separate commodity

² I am grateful to Mrs. Amy Caballero, Basic Industries Department, BOI, for providing this explanation.

classification it is not possible to determine which particular foundary products have been produced in the rolling mills and there is no way of comparing this particular distribution of output with that generated in 1985, as steel works and foundaries were aggregated into the one industry in that year.

In the case of Metal industries, the distribution of output between cutlery handtools and general hardware on the one hand and metal containers on the other showed a reasonably similar pattern in the 1985 I-O table to the 1988 table. It was therefore felt that the differences in the distribution of output between the I-O and C.E. sources was probably the result of the differences in the coverage of each survey. The C.E. data covers only those firms with 10 or more employees and makes no allowance for the informal sector.

From this somewhat cursory inspection, it appears that there may be a number of problems associated with the 1988 I-O table, as well as the lack of a commodity matrix separate from the industry matrix. Considerable care will therefore need to be taken in drawing any conclusions from the results of the analysis.

7. Reprise.

- 7.1 One of the central aims of this project is to try to focus policy attention on the process of technological and structural change, which must take place if economically sustainable growth is to be achieved. However, from this brief inspection of the I-O tables it appears there will be a number of serious problems involved in comparing one year's table with another, which suggests that at present there is no reliable data base from which an assessment of those changes can be made. The lack of resources reflected not only in the back of a data base but also the incomplete structure of the last benchmark table, is viewed with some alarm. It is only from the assessment of such a data base that policies could be formulated to accelerate the transformation in *existing* industries. This apparent unwillingness to provide the necessary resources for a more reliable data base is difficult to understand in the light of government's professed aspirations to achieve NICHood status.

References

- Bronowski, j. (1976) *The Ascent of Man*; London: BBC.
- Cabalu, Helen (1993) *Philippine Development Experience: A Case of What Not to do*; Paper delivered at International Conference on International Development 13-15 Dec. 1993. Perth, Western Australia.
- Carter, Anne, P. (1970) *Structural Change in the American Economy*; Cambridge Mass: Harvard University Press.
- Chenery, H.B. (1988) "Growth and Transformation" in H.B. Chenery, S. Robinson and M. Syrquin (eds.), *Industrialisation and Growth*; World Bank: Oxford University Press pp. 13-36.
- Chong Hyun Nam (1985) *The Changing Comparative Advantage, Trade and Adjustment Policies in the Steel Industry*; A paper presented at the 15th Pacific Trade and Development Conference on Industrial Policies for Pacific Economic Growth; Tokyo, 26-29, 1985.
- de Dios, E.S. (ed.) (1984) *An Analysis of the Philippine Economic Crisis*; Quezon City: University of the Philippines Press.
- Estanislao, J.P. (1983) *Economic Growth and Structural Change in the Philippines, 1956-1978*; Manila: Center for Research and Communication.
- Heston, A. (1994) "A Brief Review of Some Problems in Using National Accounts Data in Level of Output Comparisons and Growth Studies"; *Journal of Development Economics*; vol 44 pp.29-52.
- Hooley, R.(1985) *Productivity Growth in the Philippine Manufacturing: Retrospect and Prospect*; Manila: PIDS.
- Kubo, Y., Robinson, S. & Syrquin, M. (1988) "The Methodology of Multisector Comparative Analysis" in Chenery, H.B., Robinson, S. and Syrquin, M. (eds.) *Industrialisation and Growth*; World Bank: Oxford University Press pp.121-147.
- Leontieff, W. et.al. (1953) *Studies in the Structure of the American Economy*; New York: Oxford University Press.

- Levy, E. (1966) "The Usefulness of Existing National Accounts for the Analysis of the Philippine Economy"; *Philippine Economic Journal*; vol. 5 (First semester); pp.134-45.
- Lim, J.Y. (1991) "The Macro Aspects and the Political Economy of Liberalization and Deregulation" in Joseph, Y. Lim and katsumi Nozawa (eds.) *Deregulation and Economic Development in the Philippines*; Institute of Developing Economies: Tokyo.
- Little, F.M. (1996) *Technological Change: The Missing Element for Achieving Sustainable Growth in the Philippines*; paper delivered at the First National Conference on Management of Technology; Manila, October 1996, Forthcoming.
- Manne, A.S. & Markowitz, H.M. (eds.) (1963) *Studies in Process Analysis*; New York: W.W. Norton.
- NEDA (1985) *Philippine Yearbook*; Manila: National Economic and Development Authority.
- NSO-IDE (1992) *International Input-Output Table: Philippines-Japan 1985*; Input-Output Joint Research Project, Tokyo: Institute of Developing Economies, Statistical Data Series No. 63.
- _____ (1996) *International Input-Output Table: Philippines-Japan 1990*; Input-Output Joint Research Project, Tokyo: Institute of Developing Economies, Statistical Data Series No. 72.
- Pack, H. & Westphal, L.E. (1986) "Industrial Strategy and Technological Change": Theory vs. Reality"; *Journal of Development Economics*; vol. 22 pp.87-128.
- Sevaldson, P. (1963) "Changes in Input-Output Coefficients" in T. Barna (ed.) *Structural Interdependence and Economic Development*; New York: St. Martin's Press, pp. 303-328.
- Titanus, C.B. (1966) *Input-Output Experiments: The Netherlands 1948-1961*; Rotterdam: Rotterdam University Press.