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Leontief Paradox and Comparative Advantage of the Malaysian Manufacturing Industries: 1994-1999

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Abstract: This paper examines the comparative advantage of Malaysian manufacturing industry by elucidating dynamic changes in the production and trade structures in terms of capital and labour contents. The main conclusion of this paper is that Leontief index of comparative advantage changed from greater to less than unity in 1994 and 1999, which implies the case of Leontief paradox in the former year and confirms to the Heckscher-Ohlin theory (H-O) hypothesis for the labour-abundant country. The empirical findings indicate that resources allocation in Malaysia is improving.

1. Introduction

Following the Heckscher-Ohlin theory (H-O), Leontief (1956) examined comparative advantage of the United States of America. He pioneered the work by estimating capital and labour requirements for producing trade flows. His method, replicated elsewhere, subsequently became a standard method of determining comparative advantage of a country. He found that the US, a capital abundant developed country, exported labour intensive products and imported capital intensive products. His results came to be popularly known as the Leontief Paradox. Keesing (1965; 1971) resolved the paradox by extending the Leontief analysis and treating labour not as a homogeneous factor, but disaggregating it into various skills categories.

The structure of production of the Malaysian economy may be examined by looking at its resource endowment, which is reflected in relative prices of input, level of production technology and skills level of its manpower. During the early period of the nation's development, unexploited labour force contributed to the relative abundance of labour for agricultural activities. On the other hand, capital was relatively scarce and level of production technology and skills were considerably low. This created a price relative favouring the production of agricultural commodities and the economy's comparative advantage in the export of these commodities. The economic position of the country now is considerably different in many aspects of resource endowment and levels of production technology and skills. This calls for a change in both its production and export structures.

This paper examines the comparative advantage of Malaysia's manufacturing industry, and attempts to elucidate the dynamic changes in production and trade in terms of its capital and labour contents. The paper is organised as follows: Section 2 deals with the theoretical considerations including efficiency and technical changes in production. Section 3 explains the theoretical framework. Section 4 provides the empirical findings that indicate whether Malaysia's economic resources are efficiently allocated. It also provides some indices of

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comparative advantage of all manufacturing industries and discusses several related issues of changing comparative advantage. Section 5 closes with a summary of the key findings and concluding remarks.

2. Theoretical Considerations

2.1 Efficiency and Technical Change in Production

Generally, all trade theories describe comparative advantage of developing countries by linking characteristics of the economies to characteristics of goods. The hypothesis regarding the comparative advantage and structure of exports, however, differ among them because these theories use different sets of variables and assumptions. In the neo-classical model, a country has a comparative advantage in the production of goods, which use relatively large amounts of inputs that are abundantly available in the country. In the Hecksher-Ohlin approach, only two factors of production, capital and labour, are identified. However, in its revised version, "the neo-factor proportion and neo-technology approaches", capital was disaggregated into human capital and physical capital.

Linder's approach, on the other hand, describes the composition of exports by relating it to a country's level of development and composition of domestic demand. In its simplified version, the approach hypothesises that a country needs a sufficient size of domestic demand in order to back up efficient production in an industry which in a later stage would turn into an export sector. Similarly, a country with a lower per capita income will have its domestic demand concentrated in the low-income products, and its potential exports will consist of products of a similar kind.

There are some exceptions to the development of normal conditions of trade that require no necessity for production of domestic demand for efficient export production. Footloose export production may take place in developing countries for demand in developed countries. Some industrial production in the import substitution phase that caters for high income group requires continuous adjustment in line with changes in world technology without benefiting from the relative labour-intensity and exploitation of economies of scale (Stewart 1978).

Technological-gap exports by developed countries, streaming from scientific and industrial-led industries, may result in a reversal of trade as the product reaches its 'maturity' and production techniques became standardised. A developing country that has a lower level of technological development may thus have a comparative advantage in the export of such products on the basis of low wages.

According to the product-cycle theory "the country with the longest imitation lags must rely almost entirely upon low-wage exports to pay for technological-gap imports" (Hufbauer 1966). The theory thus offered a broader framework to explain reversing trade. Hirsch (1967) argued that "an industrialising country may be competitive in the manufacture of products even when it is capital intensive because the cost of capital may be less important than that of other factors." However, he contended that the capital intensive mature goods would play a more predominant role in exports of developing countries than other capital-intensive goods.

The present paper analyses changes in the Malaysian input-output structures in terms of the country's primary input requirements which describes the impact of observed structural changes of the efficiency of the economy as whole. Instinctively, efficiency refers to the achievement of maximum output for a given set of inputs–the greater the output in relation to inputs, the higher the level of efficiency; the concept generally referred to as technical efficiency[1]. The above relationship between input and output suggests that we can measure technical efficiency through a production function. In this paper, we assume that the production function is the Leontief-type. Although Leontief's production function is generally considered less realistic than those of the neoclassical function, the former has an L-shaped isoquant with constant returns to scale and zero elasticity of substitution and has the ability to analyse empirical interrelationships among sectors or to obtain a general equilibrium solution to a system of more than a few commodities, making this production function the most practical.

3. The Analytical Framework

3.1 Method

This section describes briefly the techniques used in this study to calculate factor content in production and trade flows. The input-output technique enables us to evaluate the efficiency of the economy in terms of the amount of primary factors required to deliver a ringgit of final demand. An economy capable of producing a ringgit of final demand with less primary input than others, or of delivering a greater final demand of a given composition with a given primary input, will be judged technologically superior or efficient (Carter 1970).

We may define primary input coefficient as a quantity of input per unit of output and calculate it by dividing the amount due to input by its total output. It shows how much should be contributed directly to the input for each unit of output. An increase in output of any industry will increase the demand for capital and labour directly and other industries' demand for the inputs indirectly (Zakariah and Chan 1995). Through the input-output interdependence relation, the direct and indirect capital and labour requirements per unit of output (which show a comprehensive picture of the input productivity) can be ascertained.

The balance equation of an open Leontief input-output system of linear equations can be expressed as:

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

where X is the sectoral output, A is the input coefficient matrix and F is the vector of final demand. Each element in the matrix of Leontief inverse, $(I-A)^{-1}$, represents direct and indirect requirements of intermediate inputs for a unit increase in final demand. Primary input coefficient represents the amount due to primary input for each unit of output. Therefore, pre-multiplying the row vector of primary input coefficients, v by the Leontief inverse matrix yields the direct and indirect primary input requirements per unit of output.

We can now distinguish two concepts of primary input productivity. Firstly, direct input productivity, which measures the amount of input required per unit of output. Then we will present a complete structural description of the economy and derive from it the total (direct and indirect) primary input content of structural deliveries, v^*, to deliver the given final

[1] When prices as an allocative factor for inputs are incorporated, the factor proportions can be described as price efficient. Technical efficiency is not necessarily price efficient and vice-versa; when both price-efficiency and technical efficiency occur jointly, there are sufficient conditions for economic efficiency.

demand, that is:

$$n^* = n\,(I\text{-}A)^{-1} \tag{2}$$

Changes in ν* measure changes in the overall primary input requirements of an economy in delivering final output. Such changes are the net result of changes in direct and indirect primary input coefficients of many sectors. Concurrent analysis of changes in direct and in total primary input requirements for a particular output would give some notion of the importance of shifting industrial specialisation in the changing productivity picture.

From equation (1), we extend the F vector into its components:

$$X = (I\text{-}A)^{-1}\,(eE\text{-}mM+F') \tag{3}$$

where E = total exports, in value
M = total imports, in value
F' = vector of the remaining components of final demand
e = vector of sectoral export shares
m = vector of sectoral import shares

By pre-multiplying the capital coefficient vector, K, to the right side of equation (3), we would obtain

$$K^*X = K(I\text{-}A)^{-1}\,(eE\text{-}mM+F') \tag{4}$$

where K^* is the total capital requirement for a given final demand and total amount of capital embodied respectively in export flow K_e and in import flow K_m, and can be expressed as

$$K_e = K(I\text{-}A)^{-1}\,eE \tag{5}$$

$$K_m = K(I\text{-}A)^{-1}\,mM \tag{6}$$

Similarly, if we pre-multiply the labour coefficient vector, L, to the right side of equation (3), we would obtain

$$L^*X = L(I\text{-}A)^{-1}\,(eE\text{-}mM+F') \tag{7}$$

where L^* is the total labour requirement for a given final demand. Total amount of labour embodied respectively in export flow L_e and in import flow L_m, can be expressed as

$$L_e = L(I\text{-}A)^{-1}\,eE \tag{8}$$

$$L_m = L(I\text{-}A)^{-1}\,mM$$

(9)

Our analysis will involve 32 goods and two primary factors of production, capital and labour. Comparing capital-labour ratio of exports K_e/L_e to that of imports K_m/L_m) and expressing it as

(10)

we can determine to what extant the economy has optimised its resources in producing trade flows. According to Leontief, if Z is less than unity for a capital scarce country, the Heckscher-Ohlin hypothesis is true. Similarly, the hypothesis is also true for a capital-abundant country if Z is greater than unity.

3.2 Data

The input-output tables used in this paper are for 1987, the most current data available, and which are published by the Department of Statistics (DOS). They are of 60 by 60 dimension. We reclassified and reduced the classification of industries from the Malaysian Industrial Classification at 3-digit level to a classification based on input-output table of 32 industries. Basic data on labour and capital were compiled from the Industrial Manufacturing Survey while trade data were obtained from External Trade Statistics of Malaysia for various years from the same department.

Labour is defined as the number of persons engaged beside alternative measures as salaries and wages, while capital is defined as the value of fixed assets owned at the end of the survey period and classified according to the Malaysian Industrial Classification (MIC). Exports and imports are defined as the values of export and import at the end of calendar periods and classified according to the Standard Industrial Trade Classification (SITC) at the 3-digit level. The three sectoral classifications, MIC, SITC and input-output were matched to ensure that they correspond.

4. Empirical Findings

4.1 Resource Allocation and Trade

An analysis of the relationship between factor intensities, which is crucial to the explanation of comparative advantage, and structure of trade requires a characterisation of products according to factor content. These products will be categorised into labour intensive and capital intensive goods and must show significant differences in their factor content and with a stable order of ranking.

The ratio of labour input in labour intensive sectors to labour input in capital intensive sectors of 2.29 for Malaysia is not only comparable to those of other developing countries such as Hong Kong (2.36), South Korea (3.40), Mexico (2.35) and Singapore (2.73) but also shows that there is twice as much labour in labour intensive goods compared to that in the capital intensive goods. The country's coefficient of variation in labour inputs, in all sectors of 0.50 and coefficient of variation in wage levels of 0.35 clearly indicate that changes in the composition of manufacturing production may have considerable consequences for employment creation (The above parameters are deduced from results presented by Hans *et al.*

1987).

Our study used gross fixed assets in an industry as a measure of capital content, which to an extent can be used to capture human capital content as well. This follows the findings of Hans *et al*. (1987) that "sectors with a relatively high value of physical capital per employee, the relative wage level is high which to a great extent is caused by a relatively high ratio of skilled to unskilled employees." The Spearman rank correlation coefficient between total against human capital intensity for Malaysia is 0.76 while that between physical against human intensity is 0.67 (Zakariah and Chan 1995).

A pre-condition for characterisation of products by their relative factor intensities is that the order of ranking of sectors according to factor inputs in production is stable. When this assumption on strong factor intensities is not fulfilled, that is when products interchange their positions in the order of ranking, being labour intensive in one place and capital intensive in another, generalisations about the optimal international division of labour are not possible (Samuelson 1952; Lary 1968; Herman 1975 and Nyaw 1979).

In addition, Hans *et al*. (1987) ranked 26 manufacturing sectors according to total capital-intensity in seven developing countries and found that there is similarity in the order of ranking of sectors (as measured by Spearman rank correlation coefficients).

By assuming that as a developing country, Malaysia's industrial structure can be represented by the above results on strong factor intensities assumption, we now focus our discussion on the country's capital and labour requirements in production and exports and imports.

Tables 1 and 2 respectively show the direct and indirect requirements of capital and labour in 1994 and 1999 to produce a given bill of final demand, which were RM 20 million of capital and RM3.1 million of salary and wages or 297 thousand workers in 1994 while in 1999, they were RM23 million of capital and RM3.2 million of salary and wages or 209 thousand workers. Some industries such as petroleum products, cement, industrial chemicals, and basic metal were highly capital intensive while others such as wearing apparel, paper and printing, furniture and fixture, tobacco, electrical and non-electrical machinery and plastic and rubber products were extremely labour intensive.

A scrutiny of the table reveals that factor intensity in production does not always go hand-in-hand with trade as high capital content export industries do not rank as high as those in production, implying that these industries are not meant for export as is evident by their low export ratio. High capital content in imports and exports in the industries shown in the table is correlated more to their import and export ratios rather than to their capital intensity in production (see Table A1). For example, high capital content in import of non-electrical machinery is dictated more by the industry's high import ratio, representing about 26.5 per cent of total import. Similarly, high capital content in export of petroleum products is a result of a high export ratio of the industry, i.e. about 15.0 per cent of total export.

It is interesting to note that although electrical machinery has a high volume of inputs, it is not found to have a high capital content in its import. This is particularly due to the low capital content in its production. Having a high labour content in its production and boasting a high export volume, the garment industry appears to be labour intensive in export. The high labour in exports and imports of electrical machinery is a consequence of the industry's export and import volume rather than its labour content in production.

Table 1: Capital and labour requirements (1994)

Industry	Direct and indirect requirements per million RM of final output			Direct and indirect requirements per million RM of exports			Direct and indirect requirements per million RM of imports		
	Capital	Labour (L)	Labour (W)	Capital	Labour (L)	Labour (W)	Capital	Labour (L)	Labour (W)
Dairy Prod.	0.4669	0.0068	0.0928	0.0019	0.0000	0.0004	0.0046	0.0001	0.0009
Veg.Fruit	0.6167	0.0134	0.1110	0.0113	0.0002	0.0020	0.0094	0.0002	0.0017
Oil & Fats	0.3713	0.0032	0.0423	0.0519	0.0005	0.0059	0.0019	0.0000	0.0002
Grain Mill	0.4693	0.0056	0.0628	0.0019	0.0000	0.0003	0.0071	0.0001	0.0010
Baker Conf.	0.6258	0.0158	0.1395	0.0020	0.0001	0.0005	0.0042	0.0001	0.0009
Other Foods	0.4226	0.0071	0.0743	0.0078	0.0001	0.0014	0.0032	0.0001	0.0006
Animal Feed	0.2879	0.0036	0.0493	0.0012	0.0000	0.0002	0.0014	0.0000	0.0002
Beverages	0.6774	0.0067	0.0999	0.0012	0.0000	0.0002	0.0016	0.0000	0.0002
Tobacco	0.2340	0.0056	0.0686	0.0002	0.0000	0.0001	0.0004	0.0000	0.0001
Textiles	1.0375	0.0127	0.1332	0.0301	0.0004	0.0039	0.0349	0.0004	0.0045
Wearing Apparel	0.3498	0.0236	0.2139	0.0269	0.0018	0.0164	0.0022	0.0002	0.0014
Sawmills	0.7000	0.0160	0.1310	0.0444	0.0010	0.0083	0.0009	0.0000	0.0002
Furniture Fixture	0.6675	0.0245	0.2025	0.0179	0.0007	0.0054	0.0011	0.0000	0.0003
Paper Printing	0.6586	0.0138	0.2115	0.0069	0.0001	0.0022	0.0165	0.0003	0.0053
Indus. Chemicals	1.1517	0.0023	0.0494	0.0328	0.0001	0.0014	0.0683	0.0001	0.0029
Paints etc.	0.5106	0.0043	0.0879	0.0022	0.0000	0.0004	0.0027	0.0000	0.0005
Other Chemicals Prod.	0.5655	0.0071	0.1094	0.0109	0.0001	0.0021	0.0143	0.0002	0.0028
Petroleum Prod.	1.4111	0.0010	0.0299	0.2134	0.0002	0.0045	0.0488	0.0000	0.0010
Rubber Processing	0.1494	0.0032	0.0307	0.0059	0.0001	0.0012	0.0008	0.0000	0.0002
Rubber Prod.	0.5490	0.0114	0.1105	0.0066	0.0001	0.0013	0.0022	0.0000	0.0005
Plastic Prod.	0.6533	0.0137	0.1362	0.0093	0.0002	0.0019	0.0119	0.0002	0.0025
Glass Prod.	1.3331	0.0143	0.1552	0.0117	0.0001	0.0014	0.0120	0.0001	0.0014
Cement	1.4746	0.0065	0.0603	0.0017	0.0000	0.0001	0.0036	0.0000	0.0001
Non-Metallic	0.8869	0.0138	0.1258	0.0081	0.0001	0.0012	0.0043	0.0001	0.0006
Basic Metal	0.9587	0.0054	0.0784	0.0322	0.0002	0.0026	0.0838	0.0005	0.0069
Other Metal	0.7197	0.0091	0.1150	0.0143	0.0002	0.0023	0.0215	0.0003	0.0034
Non-Electrical Machinery	0.3982	0.0070	0.0874	0.0372	0.0007	0.0082	0.1055	0.0018	0.0232
Electrical Machinery	0.2565	0.0059	0.0661	0.0197	0.0005	0.0051	0.0302	0.0007	0.0078
Motor Vehicles	0.4871	0.0051	0.0681	0.0066	0.0001	0.0009	0.0208	0.0002	0.0029
Other Transport	0.5776	0.0171	0.1112	0.0371	0.0011	0.0071	0.0479	0.0014	0.0092
Other Manufactures Prod.	0.3663	0.0119	0.1201	0.0032	0.0001	0.0011	0.0253	0.0008	0.0083
Total	20.0348	0.2972	3.1743	0.6587	0.0088	0.0899	0.5935	0.0082	0.0916

Note: L denotes number of employment and W denotes salaries and wages.
Source: Computed from equation (2).

Table 2: Capital and labour requirements (1999)

Industry	Direct and indirect requirements per million RM of final output			Direct and indirect requirements per million RM of exports			Direct and indirect requirements per million RM of imports		
	Capital	Labour (L)	Labour (W)	Capital	Labour (L)	Labour (W)	Capital	Labour (L)	Labour (W)
Dairy Prod.	0.4989	0.0057	0.0973	0.0743	0.0008	0.0145	0.3567	0.0041	0.0695
Veg.Fruit	0.4809	0.0090	0.1051	0.2904	0.0054	0.0635	0.5208	0.0097	0.1138
Oil & Fats	0.3633	0.0026	0.0385	2.1233	0.0153	0.2253	0.1624	0.0012	0.0172
Grain Mill	0.4156	0.0036	0.0592	0.0731	0.0006	0.0104	0.5066	0.0044	0.0721
Baker Conf.	0.6287	0.0105	0.1265	0.0578	0.0010	0.0116	0.2923	0.0049	0.0588
Other Foods	0.5003	0.0058	0.0878	0.3517	0.0041	0.0617	0.3427	0.0040	0.0602
Animal Feed	0.2709	0.0024	0.0452	0.0339	0.0003	0.0056	0.1000	0.0009	0.0167
Beverages	0.8932	0.0052	0.1175	0.1108	0.0006	0.0146	0.0884	0.0005	0.0116
Tobacco	0.4603	0.0066	0.0786	0.0962	0.0014	0.0164	0.0212	0.0003	0.0036
Textiles	1.1841	0.0085	0.1270	1.6092	0.0115	0.1726	1.9337	0.0138	0.2073
Wearing Apparel	0.3772	0.0164	0.1913	1.0845	0.0472	0.5498	0.1392	0.0061	0.0706
Sawmills	0.8407	0.0125	0.1262	1.8672	0.0279	0.2802	0.1177	0.0018	0.0177
Furniture Fixture	0.7212	0.0155	0.1740	1.2253	0.0263	0.2956	0.0923	0.0020	0.0223
Paper Printing	0.9045	0.0109	0.2036	0.4206	0.0051	0.0947	1.5593	0.0188	0.3510
Indus. Chemicals	0.9574	0.0012	0.0345	1.6496	0.0022	0.0594	4.6597	0.0061	0.1677
Paints etc.	0.4983	0.0039	0.0964	0.1051	0.0008	0.0203	0.1714	0.0014	0.0331
Other Chemicals Prod.	0.6964	0.0054	0.1094	0.7382	0.0057	0.1160	1.4241	0.0111	0.2238
Petroleum Prod.	1.4964	0.0006	0.0216	10.7544	0.0043	0.1556	4.4667	0.0018	0.0646
Rubber Processing	0.1784	0.0030	0.0384	0.1361	0.0023	0.0293	0.1001	0.0017	0.0216
Rubber Prod.	0.6546	0.0109	0.1545	0.2926	0.0049	0.0690	0.1774	0.0029	0.0419
Plastic Prod.	0.6991	0.0107	0.1466	0.6600	0.0101	0.1384	0.8278	0.0127	0.1736
Glass Prod.	1.3422	0.0074	0.1258	0.5879	0.0032	0.0551	0.6993	0.0039	0.0655
Cement	3.3971	0.0034	0.0872	0.3057	0.0003	0.0078	0.1868	0.0002	0.0048
Non-Metallic	0.8139	0.0077	0.1377	0.1522	0.0014	0.0258	0.2295	0.0022	0.0388
Basic Metal	1.0384	0.0043	0.0857	1.7341	0.0072	0.1431	6.1401	0.0255	0.5067
Other Metal	0.7489	0.0070	0.1199	0.7115	0.0067	0.1139	1.2746	0.0120	0.2041
Non-Electrical Machinery	0.2974	0.0037	0.0708	7.1110	0.0877	1.6939	4.8237	0.0595	1.1491
Electrical Machinery	0.2547	0.0034	0.0574	9.7769	0.1323	2.2030	11.2266	0.1519	2.5297
Motor Vehicles	0.4855	0.0036	0.0699	0.2733	0.0020	0.0394	1.0443	0.0077	0.1504
Other Transport	0.7265	0.0089	0.1597	0.8049	0.0098	0.1769	2.0254	0.0248	0.4452
Other Manufactures Prod.	0.3688	0.0085	0.1338	1.3722	0.0315	0.4980	1.8132	0.0417	0.6580
Total	*23.1936*	*0.2089*	*3.2270*	*46.5842*	*0.4601*	*7.3616*	*47.5240*	*0.4393*	*7.5711*

Note: L denotes number of employment and W denotes salaries and wages.
Source: Computed from equation (2).

4.2 Leontief Index of Comparative Advantage

In this section, we will discuss the results of measuring comparative advantage by using Leontief's method for the case of two-factor (capital and labour) - multiple goods (31 industry groups). Columns 5 and 6 of Table 3 show capital-labour ratios of Malaysian exports and imports in 1994 and 1999 while the last column shows the Leontief's statistics, *Z,* which is the capital-labour ratio of exports (column 5) to capital-labour ratio of imports (column 6). The table sets out that in 1994, Malaysia's exports contained more capital and less labour while its imports showed the reverse. For a labour abundant developing country, Malaysia's Leontief statistics are greater than unity *(Z = 1.13)* for 1994 inplying a case for Leontief Paradox (H-O hypothesis is true for a capital abundant country if *Z* is greater than unity). But in 1999, the index was estimated as 0.93 in line with the H-O hypothesis for a capital-scarce country which confirmed the results of other studies for Malaysia but for different years. Zakariah and Chan (1995) found the index to be 0.85 in 1971 and Yokohama *et al.* (1989) calculated it to be 0.78 and 0.94 for 1970 and 1975, respectively. The paradox in 1994 can be attributed to the high rate of capital accumulation as the economy moved rapidly towards industrialisation, reflected in both its production and trade flows.

Table 3: Leontief Index (1994-1999)

	Production	Exports	Imports	K_e/L_e	K_m/L_m	Z
Year 1994						
Capital	20.035	65.874	59.346			
Labour:						
Employment (L)	0.297	0.879	0.819	74.937	72.411	1.035
Wages & salaries (W)	3.174	8.990	9.164	7.327	6.475	1.131
Year 1999						
Capital	23.194	46.584	47.524			
Labour:						
Employment (L)	0.209	0.460	0.439	101.241	108.176	0.936
Wages & salaries (W)	3.227	7.362	7.571	6.328	7.510	0.843

Note: All values in RM million,

Source: Calculated from production and trade data (DOS, 1994-1999).

Elsewhere, the paradox has been resolved by differentiating labour into its various categories of skills in the calculation of the index. A major export of Malaysia is electrical machinery whereas its labour content in both exports and imports is considerable. Without further analysis, we have noted that Malaysia's exports involve assembling works of products carried out by unskilled workers while its imports consist of products that are designed by skilled workers.

Looking at the economy as a whole, total capital and labour requirements are presented in Table 1. The economy requires larger amounts of capital and labour for each million ringgit of imports than that of exports. It should be noted that the factor requirements computed are not the actual requirements but only reflect the relative factor intensity of the two categories of manufactured goods.

The principle finding sets out that the capital-labour ratio in exports and imports has increased, primarily due to the general increase in labour productivity. The capital-labour ratio in exports is lower than that in imports because capital accumulation and labour productivity grew slower in the export sector compared to that in the import sector.

5. Summary and Conclusions

In this section, we can conclude that Leontief index of comparative advantage changes from greater to less than unity in 1994 and 1999, which implies the case of Leontief paradox in the former year and confirms to H-O hypothesis for the labour-abundant country. The paradox has been resolved by Keesing (1965; 1971) who identified labour to be the main source of the paradox, and pointed out that the factor of production should be differentiated between skilled and unskilled labour.

In our example, labour comprises a pool of varying skill levels without differentiating them according to their productivity levels. The particular case in place would be in the electronic industries where its labour content in exports and imports varied; for the export sector, labour is seen to be unskilled, involved in assembling integrated circuits whereas in the imports sector, skilled labour was noted in relation to the design of such products (Mohammed Sharif 2001).

Malaysian export competitiveness can be improved by adopting two measures: first, increasing labour productivity through capital augmentation in the economy's capital stock, particularly in the export oriented sector. Special attention needs to be given to enlarging the pool of skilled, professional and technical workers so that the country's exports contain more human capital, and can at least match that of imports. Second, there is a need to diversify the export composition by reducing the concentration of the garment and electronic industries that encompass relatively low amounts of skilled labour and capital. Diversification in export composition requires the country's production to explore new product lines that have the competitiveness advantage. Evolution in the domestic production structure creates dynamic comparative advantage in the economy, which is reflected in the country's international trade.

The current analysis of classifying industries can still be considered too aggregated. Perhaps if electrical machinery industry can be further classified into various sub-industries, its resource allocation in international trade would become clearer. The economy's factor intensity, exports and imports are highly concentrated in a few sectors, creating an anomaly, which is sensitive to the present methodology. Nyaw (1979) and Mohammed Sharif (2001) excluded "petroleum products" from their calculation to avoid the effect of the highly capital-intensive industry.

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Appendix 1

Table A1: Export and import ratios, 1994-1999

Industry	*1994*		*1999*	
	Export ratio (Export per million of total imports)	Import ratio (Import per million of total imports)	Export ratio (Export per million of total imports)	Import ratio (Import per million of
total imports)				
Dairy Prod.	0.004	0.010	0.001	0.007
Veg.Fruit	0.018	0.015	0.006	0.011
Oil & Fats	0.140	0.005	0.058	0.004
Grain Mill	0.004	0.015	0.002	0.012
Baker Conf.	0.003	0.007	0.001	0.005
Other Foods	0.018	0.008	0.007	0.007
Animal Feed	0.004	0.005	0.001	0.004
Beverages	0.002	0.002	0.001	0.001
Tobacco	0.001	0.002	0.002	0.000
Textiles	0.029	0.034	0.014	0.016
Wearing Apparel	0.077	0.006	0.029	0.004
Sawmills	0.063	0.001	0.022	0.001
Furniture Fixture	0.027	0.002	0.017	0.001
Paper Printing	0.010	0.025	0.005	0.017
Indus. Chemicals	0.028	0.059	0.017	0.049
Paints etc.	0.004	0.005	0.002	0.003
Other Chemicals Prod.	0.019	0.025	0.011	0.020
Petroleum Prod.	0.151	0.035	0.072	0.030
Rubber Processing	0.039	0.005	0.008	0.006
Rubber Prod.	0.012	0.004	0.004	0.003
Plastic Prod.	0.014	0.018	0.009	0.012
Glass Prod.	0.009	0.009	0.004	0.005
Cement	0.001	0.002	0.001	0.001
Non-Metallic	0.009	0.005	0.002	0.003
Basic Metal	0.034	0.087	0.017	0.059
Other Metal	0.020	0.030	0.010	0.017
Non-Electrical Machinery	0.093	0.265	0.239	0.162
Electrical Machinery	0.077	0.118	0.384	0.441
Motor Vehicles	0.014	0.043	0.006	0.022
Other Transport	0.064	0.083	0.011	0.028
Other Manufactures Prod.	0.009	0.069	0.037	0.049
Total	**1.000**	**1.000**	**1.000**	**1.000**

Source: External Trade Statistics, DOS, 1995/1999.