THE PRODUCTION STRUCTURE OF MANUFACTURING INDUSTRIES WITH FOREIGN DIRECT INVESTMENT: PRODUCTION FUNCTION PERSPECTIVES

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I. Introduction

Since the Plaza Accord in 1985 and the Promotion of Investment Act (PIA) in 1986, the Malaysian economy has been undergoing a rapid change in its industrial structure. In 1985, when the Malaysian economy experienced a negative growth rate for the first time in its history, the manufacturing sector only occupied 20% of GDP, following the agricultural sector's share of 21%. The GDP has grown by more than 8% every year since then allowing the manufacturing sector to surpass the agricultural share in GDP and reach almost 30% of GDP in 1991. During this process manufactured exports have also expanded greatly by between 23% to 36% every year. With this extraordinary expansion the share of the manufactured exports in the total exports has also increased from 33% in 1985 to 63% in 1991.

Obviously the rapid inflow of foreign direct investment (FDI) since 1985–1986 has contributed much to this structural change. The average annual growth rate of the inflow of FDI in approved projects by Malaysian Industrial Development Authority (MIDA) has been almost 70% a year over the period from 1985 through 1991. The inflow on the approved basis more than doubled from 1987 to 1988 and from 1989 to 1990 respectively, while it decreased by 9.5% from 1990 to 1991. This massive inflow can be partly explained, by the highly appreciated currencies of the East Asian countries since the Plaza Accord in 1985 (a pushing effect) and the relaxation of foreign equity ratio regulation and the favourable incentives given by PIA in 1986 (a pulling effect).

The question is how has this inflow influenced the structure of the Malaysian economy? The domestic economy has been clearly stimulated by the inflow to generate demand for private consumption and private investment and there have been changes in the production structure [Yokoyama (1991)]. Much, however, has not been investigated about the effects of this massive inflow of FDI since 1988 on the Malaysian economy. This is partly because only a few years have passed

since this structural change began to happen and partly because there has been very little data to analyze.

Recently MIDA has published data collected at the end of each year, since 1986 on "employment and capital structure of companies in production." Though detailed analysis of this series has not been released yet, it is very informative in the sence that it lessens the gap between applied/approved investments and actually implemented investments.

Using this series this chapter analyzes the production structure of the Malaysian manufacturing sector with FDI. The next section shows the specification of the production function followed by an explanation of data. The results are discussed in section IV on the parameters to be estimated. A summary and some remarks are given in the final section.

II. Model

The production structure of the Malaysian manufacturing sector is described in its production function. Generally any production function is regarded as being stable over time. But the recent inflow of FDI into the sector has been massive enough to assume that its structure is changing over time, even in the short-run. Clearly we are interested in the change of the structure over the period. Also because of the insufficient data available for a long-run we apply a cross-sectional production function over each manufacturing industry in a conventional form for each time as,

$$Y_{i,t} = A_t K_{i,t}^{\alpha} L_{i,t}^{\beta} \varepsilon_{i,t} \qquad (1)$$

where $Y_{i,t}$, $K_{i,t}$ and $L_{i,t}$ represent value added, capital and labour for the i-th industry in the year t respectively.

In the same way, when the $K_{i,t}$ is disaggregated into the capital owned by Malaysian/domestically $(Kd_{i,t})$ and the capital owned by foreigners $(Kf_{i,t})$, the production function is described as,

$$Y_{i,t} = A_t Kd_{i,t}^{\alpha} Kf_{i,t}^{\gamma} L_{i,t}^{\beta} \varepsilon_{i,t}.$$

The Kd and Kf are treated as different production factors though each has been physically installed as the fixed capital in the same manner.

III. Data

Malaysia is not exceptional in the sence that it is difficult to collect data on FDI. But it has published detailed information on FDI mainly on an "application/approved" basis from MIDA, a centre on investment in evaluating applications

for incentives and licences of manufacturing activity. Since 1986, it has begun to release a series of "companies in production," which reports the employment and capital structure of 19 manufacturing industries at the end of each year. Though this series may be confined to investment approved by MIDA, it gives us an important actual information, since it relies on the "in production" not on "application/approved" basis. The investments actually implemented are considered to be covered in this series, where notional/planned investments are reported in most other series as "approved" by MIDA. Another advantage of this series is that it decomposes the total fixed asset of each 19 manufacturing industries into those owned by Malaysian and foreigners.

On the other hand the Department of Statistics (DOS) has been publishing an annual survey of manufacturing industries every year referenced by each census year, 1959, 1963, 1968, 1973, 1981, and 1988 respectively. The latest survey for 1989 was released at the end of 1991. This survey "is estimated to cover 88% of the output, 87% of the value added and 72% of the total employment of the manufacturing sector in reference year 1988" [Department of Statistics (1991:38)]. It reports the Value of Fixed Assets Owned at 31st December 1989 for each 28 (basically 134) industries, the share of which however is not seperated into Malaysian and foreigners.

As can be seen in the Appendix the data above differs in its industrial classification. We aggregate the DOS data to the corresponding industry of the MIDA data following Table 1.

Table 2 shows a comparison between the approved foreign investment (flow) by MIDA and the increase (flow) of fixed assets owned by foreigners in the new series by MIDA. Note that in the years 1986 and 1989 total – Malaysian plus foreigners – fixed assets (stock) of the new series by MIDA and the survey series by DOS are also shown for reference. Note also that in the years both the foreign assets (stock) in production are taken from the new series by MIDA. This table shows that:

(a) There is a great discrepancy between the approved and "in production" investment, which comes mainly from the leads/lags of the implementation of the approved projects or partly from the shelved/abandoned projects.

(b) The total fixed assets data of MIDA's new series and DOS' survey almost correspond with each other, though the former estimates slightly less (Table 3).

The new MIDA data is considered to reflect only a part of the coverage of the DOS data. Assume that the foreigners share of each industry's fixed assets in the MIDA data prevail over the remaining section within each industry. Then, the fixed assets in the DOS data can be decomposed in this chapter into Malaysian Capital and Foreign Capital. The foreigners share of the MIDA data are simply multiplied to the total capital data of DOS, generating $Kf_{i,t}$ and $Kd_{i,t}$ in Table 4.

TABLE 1

MIDA	Department of Statistics
1. Food	1. Food
2. Beverage & Tobacco	2. Beverage
	3. Tobacco
3. Textile & Textile Products	4. Textile
	5. Wearing Apparel
	6. Footwear
4. Leather & Leather Products	7. Leather and Leather Products
5. Wood & Wood Products	8. Wood and Cork Products
6. Furniture & Fixture	9. Furniture and Fixture
7. Paper and Paper Products	10. Paper and Paper Products
	11. Printing and Publishing
8. Chemical & Chemicals Products	12. Industrial Chemical
	13. Other Chemical Products
9. Petroleum & Coal	14. Petroleum Refineries
	15. Miscellaneous of Petroleum and Coal
10. Rubber Products	16. Rubber Products
11. Plastic Products	17. Plastic Products
12. Non-Metallic Products	18. Pottery, China and Earthenware
	19. Glass and Glass Products
	20. Non-Metallic Mineral Products
13. Basic Metal Products	21. Iron and Steel
	22. Non-Ferrous Metal
14. Fabricated Metal Products	23. Manufactured of Fabricated Metal
15. Machinery Manufacturing	24. Machinery
16. Electrical & Electronic Products	25. Electrical Machinery
17. Transport Equipment	26. Transport Equipment
18. Scientific & Measuring & Controlling Equipment	27. Scientific & Measuring & Controlling Equipment
19. Other Manufacturing Industries	28. Other Manufacturing Industries

IV. Results

Comparison with the Former Results

Applying the same data of DOS Yokoyama (1991) estimates the production function of the manufacturing sector for the 1980s to find:

(a) the annual production function is revealed to be mostly homogenous by one degree for each case;

(b) the production elasticity of capital is significantly higher and labour lower when considering capital intensive industries; and

(c) in the late 1980s, the production elasticity of capital is lower and that of labour higher than at the beginning of the decade.

As can be seen in the Table 5A and Table 5B these tendencies have not changed much.

TABLE 2

FOREIGN INVESTMENT APPROVED AND IN PRODUCTION BY INDUSTRY

(M$ Million)

	1986		1987		1988		1989		1990	1991
	Approved	In Prod. (Stock)	Approved	In Prod. (Flow)	Approved	In Prod. (Flow)	Approved	In Prod. (Flow)	Approved	Approved
1. Food	293.8	761.304	202.6	16.843	571.1	93.013	290.7	41.165	325.7	224.9
2. Textile & Textile Products	31.4	376.086	55.4	24.454	238.8	42.383	511.2	186.183	874.2	511.4
3. Paper and Paper Products	12.3	1,000.025	79.7	-895.963	34.2	2.607	294.2	71.654	373.6	162.3
4. Chemical & Chemicals Products	42.0	547.692	325.8	-45.502	763.5	23.176	1,016.4	51.770	1,727.3	1,846.7
5. Petroleum & Coal	876.3	1,160.433	-	87.433	-	-89.971	223.8	72.032	2,703.1	2,564.7
6. Rubber Products	71.1	196.000	191.3	34.340	662.7	292.134	360.7	103.092	54.3	152.5
7. Non-Metallic Products	26.3	717.688	79.7	201.565	73.4	-39.854	339.0	25.910	180.1	1,851.7
8. Basic Metal Products	25.3	417.779	82.3	2.962	612.7	-88.703	440.1	-54.879	4,538.7	3,355.9
9. Fabricated Metal Products	19.6	195.907	8.6	9.753	147.4	19.459	521.4	-23.975	304.9	1671.0
10. Electrical & Electronic Products	97.2	1,331.316	752.3	116.603	1,151.9	478.329	2,720.8	723.557	3,773.2	2,038.8
11. Transport Equipment	53.7	233.868	12.6	-0.603	22.4	20.910	136.8	4.633	279.5	203.9
12. Other Manufacturing Industries	139.0	1,183.369	269.7	63.846	599.9	197.930	1,797.9	380.412	2,494.5	1,372.5
Total	1,688.0	6,845.381	2,060.0	491.277	4,878.0	909.030	8,653.0	1,395.371	17,629.0	15,956.3

TABLE 3
TOTAL FIXED ASSETS IN PRODUCTION BY INDUSTRY (M$ Thousand)

	1987 (MIDA)	1987 (DOS)	1988 (MIDA)	1988 (DOS)	1989 (MIDA)	1989 (DOS)
1. Food	2,944,852	3,112,123	3,058,342	3,096,496	3,085,831	3,312,972
2. Beverage & Tobacco	621,154	663,458	607,170	636,185	603,526	640,014
3. Textile & Textile Products	744,077	805,749	831,352	910,440	1,060,618	1,152,565
4. Leather & Leather Products	39,655	10,115	48,566	10,868	85,870	11,229
5. Wood & Wood Products	863,220	955,511	934,142	1,049,092	1,011,073	1,298,980
6. Furniture & Fixture	56,767	134,922	64,427	197,032	82,086	169,801
7. Paper and Paper Products	524,735	1,860,780	521,382	1,841,358	1,755,543	2,011,607
8. Chemical & Chemicals Products	2,621,124	4,620,106	2,497,117	4,501,261	2,462,105	4,410,070
9. Petroleum & Coal	3,102,887	807,203	2,808,753	826,539	2,794,183	896,110
10. Rubber Products	507,028	971,061	929,698	1,344,848	1,123,020	1,760,353
11. Plastic Products	313,330	384,514	341,425	431,362	489,463	626,975
12. Non-Metallic Products	2,774,323	2,521,589	2,668,617	3,552,400	2,644,591	2,974,443
13. Basic Metal Products	1,238,511	1,945,172	982,616	1,720,077	1,184,952	1,974,995
14. Fabricated Metal Products	822,332	535,444	853,221	831,774	724,335	964,841
15. Machinery Manufacturing	303,083	505,869	336,586	547,327	340,705	613,943
16. Electrical & Electronic Products	1,872,916	1,951,267	2,379,523	2,663,666	3,083,410	3,743,283
17. Transport Equipment	1,040,991	1,065,498	1,162,792	906,757	1,045,859	900,885
18. Scientific & Measuring & Controlling Equip.	75,176	79,275	104,660	127,738	152,440	244,796
19. Other Manufacturing Industries	147,473	97,260	172,749	96,299	254,554	101,503
Total	20,613,634	23,032,242	21,303,138	24,751,992	23,984,164	27,809,365

TABLE 4
FIXED ASSETS OWNED BY FOREIGNERS AND MALAYSIANS
(M$ Ten)*

	1987		1988		1989	
	Foreign	Malaysian	Foreign	Malaysian	Foreign	Malaysian
1. Food	82,234,640	2.29D+08	9,101,264	2.29D+08	97,947,888	2.33D+08
2. Beverage & Tobacco	45,489,008	20,856,790	44,784,420	18,834,080	4,401,972	19,981,690
3. Textile & Textile Products	43,373,832	37,201,072	48,505,900	42,538,100	68,364,440	46,892,060
4. Leather & Leather Products	471,608.1	539,891.9	550,113.3	536,686.8	650,267.3	472,632.8
5. Wood & Wood Products	8,725,144	86,825,952	15,325,860	89,583,344	19,038,890	1.11D+08
6. Furniture & Fixture	1,986,740	11,505,460	5,028,326	14,674,870	6,185,864	10,794,240
7. Paper and Paper Products	36,901,760	1.49D+08	37,672,140	1.46D+08	20,433,320	1.81D+08
8. Chemical & Chemicals Products	88,518,144	3.73D+08	94,701,584	3.55D+08	1.03D+08	3.38D+08
9. Petroleum & Coal	32,462,700	48,257,600	34,073,680	48,580,220	39,444,440	50,166,560
10. Rubber Products	44,114,760	52,991,340	75,578,088	58,906,712	98,058,528	77,976,784
11. Plastic Products	590,3497	32,547,900	7,713,663	35,422,540	16,817,780	45,879,720
12. Non-Metallic Products	83,551,112	1.69D+08	1.17D+08	2.38D+08	1.02D+08	1.96D+08
13. Basic Metal Products	66,080,432	1.28D+08	58,123,500	1.14D+08	46,194,920	1.51D+08
14. Fabricated Metal Products	13,391,110	40,153,288	21,946,020	61,231,380	26,793,120	69,690,976
15. Machinery Manufacturing	21,592,850	28,994,050	26,321,080	28,411,620	30,630,560	30,763,740
16. Electrical & Electronic Products	1.51D+08	44,277,620	2.16D+08	50,740,140	3.22D+08	52,640,000
17. Transport Equipment	23,875,650	82,674,152	19,820,820	70,854,880	22,293,270	67,995,216
18. Scientific & Measuring & Controlling Equip.	7,334,224	593,276.6	12,044,550	729,252.3	23,714,250	765,349.8
19. Other Manufacturing Industries	4,490,738	5,235,262	4,220,346	5,409,555	4,170,070	5,980,230

Source: Table 3 and Table A-2 to A-4.

Note: *The unit of the figures with 'D+08' is M$ billion.

TABLE 5A
PRODUCTION ELASTICITY: DOS DATA
(ALL 28 INDUSTRIES)

Year	Capital		Labour		Sum of Elasticity	R^2	S
1984	0.765	(7.9)	0.281	(2.7)	1.046	0.90	0.47
1987	0.608	(7.9)	0.397	(4.6)	1.005	0.91	0.45
1988	0.638	(9.0)	0.338	(4.2)	0.976	0.92	0.42
1989	0.797	(13.3)	0.263	(3.16)	1.060	0.90	0.43

Note: T values are in parenthese. S is the standard error of the regression.

TABLE 5B
PRODUCTION ELASTICITY: DOS DATA
(NON-CAPITAL INTENSIVE 26 INDUSTRIES)

Year	Capital	Labour	Sum of Elasticity	R^2	S
1983	0.659 (6.8)	0.323 (3.0)	0.982	0.95	0.34
1984	0.614 (6.8)	0.438 (4.4)	1.052	0.94	0.36
1987	0.488 (5.2)	0.528 (5.0)	1.016	0.91	0.44
1988	0.543 (6.1)	0.440 (4.4)	0.993	0.92	0.41
1989	0.593 (6.8)	0.366 (3.7)	0.959	0.93	0.39

Note: The same as Table 5A.

(a) The sum of elasticity for 1989 again shows almost one, though it has increased to more than one for the case of all 28 industries, while decreasing to 0.959 for the case of non-capital intensive 26 industries. Still this maintained property of homogeniety is interesting enough considering the goods/factors markets in this developing country. The degree of homogeniety for the all 28 industries case, however, has increased and is bigger than the other case of the non-capital intensive contrary to the findings of Yokoyama (1991).

(b) This property also maintains. The difference has widened. This suggests that the Malaysian capital intensive industries have further strengthened.

(c) This tendency has slightly changed, since the production elasticity of capital has picked up again and that of labour has lowered. Especially for the case of all 28 industries the former has increased to take over the estimate of 1984 (0.765) and the latter decreased to the level below the estimate of 1984 (0.263). But the case for non-capital intensive industries maintains this property still. The estimate of capital elasticity for 1989 is relatively lower and labour higher than that of the beginning of the 1980s. These results indicate that, while capital intensive industries are rapidly changing their

structure, labour intensive industries are steadily increasing their labour elasticity and lowering their capital elasticity.

Different from the data generating these results we disaggregate the 28 industries of DOS data into the 19 in accordance with the new "in production" data by MIDA. Therefore the results above are to be compared with the new set of aggregated data. Table 6A and 6B show the results by the new data.

TABLE 6A
PRODUCTION ELASTICITY: DOS – MIDA DATA
(19 INDUSTRIES)

Year	Capital	Labour	Sum of Elasticity	R^2	S
1987	0.722 (7.4)	0.251 (2.1)	0.973	0.91	0.44
1988	0.631 (8.6)	0.380 (4.4)	1.011	0.95	0.33
1989	0.746 (10.6)	0.199 (2.5)	0.945	0.95	0.30

Note: The same as Table 5A.

TABLE 6B
PRODUCTION ELASTICITY: DOS – MIDA DATA
(NON-CAPITAL INTENSIVE 17 INDUSTRIES)

Year	Capital	Labour	Sum of Elasticity	R^2	S
1987	0.504 (4.7)	0.553 (4.1)	1.057	0.94	0.35
1988	0.580 (5.8)	0.463 (3.8)	1.043	0.95	0.33
1989	0.615 (6.9)	0.379 (3.5)	0.994	0.96	0.28

Note: The same as Table 5A.

These results are generally compatible to the finding above;
(i) almost homogeniety of degree one; and
(ii) higher capital and lower labour elasticity when considering capital intensive industries except the increasing trend of capital elasticity and decreasing labour elasticity for both cases.
Still on average the estimates in Table 6 are compatible enough to those in Table 5, for the averages of capital elasticities in the late 1980s are lower than those in the early 1980s and labour in the late 1980s higher than in the early 1980s.

Production Elasticity with Foreign Direct Investment
Table 7A and 7B show the estimates of the production elasticities of Malaysian capital, foreign capital and labour for all 19 industries and for 17 non-capital

TABLE 7A
PRODUCTION ELASTICITY WITH FDI
(ALL 19 INDUSTRIES)

Year	Foreign Capital	Malaysian Capital	Labour	Sum of Elasticity	R^2	S
1987	0.535 (4.85)	0.181 (1.99)	0.294 (2.71)	1.010	0.92	0.42
1988	0.505 (6.19)	0.151 (2.44)	0.389 (5.15)	1.045	0.96	0.29
1989	0.520 (6.58)	0.248 (4.39)	0.213 (2.76)	0.981	0.96	0.30

Note: The same as Table 5A.

TABLE 7B
PRODUCTION ELASTICITY WITH FDI
(NON-CAPITAL INTENSIVE 17 INDUSTRIES)

Year	Foreign Capital	Malaysian Capital	Labour	Sum of Elasticity	R^2	S
1987	0.418 (5.00)	0.077 (1.08)	0.594 (5.57)	1.089	0.96	0.30
1988	0.465 (5.22)	0.129 (1.90)	0.476 (4.50)	1.070	0.96	0.29
1989	0.437 (5.09)	0.204 (3.48)	0.376 (3.39)	1.017	0.96	0.28

Note: The same as Table 5A.

intensive industries respectively. Main findings are listed as follows. Surprisingly again,

(d) sum of elasticities are almost around one; the production function with foreign capital reveals its property of being homogenous by degree one.

As (b) above,

(e) both higher estimates of capital and lower estimates of labour are observed when considering capital intensive industries.

(f) The production elasticity of labour proves its stability either with or without separation of Malaysian and foreign capital.

(g) The elasticities of foreign capital are estimated far greater than those of Malaysian and have been stable around 0.52 for all 19 and around 0.43 for non-capital intensive 17 industries.

However,

(h) Malaysian capital is estimated to have been gradually elastic since 1987, especially in 1989 when it is more elastic than labour.

The stable and relatively higher estimate of foreign capital elasticity gives one of the main characteristics of the Malaysian manufacturing industries. Though during this period the influx of foreign capital has been substantial, the elasticity of foreign capital has not changed much at around 0.5. In other words foreign capital has been built into the structure of Malaysian manufacturing industries.

One per cent increase of (implemented) foreign capital is supposed to generate one half per cent increase of value added. Note the property of nearly constant returns to scale of this industry shown above. The same one per cent increase of each Malaysian capital and labour also generates in total only half per cent increase of value added. In other words almost a half of the rapid growth of Malaysian manufacturing sector in the late 1980s has been attributed to the implemented foreign owned capital stock.

Although this chapter confines its interests only to the technical production structure not to the distribution aspects, it is quite interesting to remember the Euler Theorem. If a production function is homogeneous by degree one and if each factor is paid by its marginal product (the marginal principle), then the elasticity of each represents the share of each income. Since our production function is in almost every cases homogenous by degree one, if we can additionally suppose the marginal principle, the income share of foreign capital is 50%, while the rest is shared by Malaysian capital and labour. Further the income share of labour is decreasing and the income share of Malaysian capital is increasing from less than 10% to more than 20% in 1989 as can be seen in Table 7. However it is implausible and beyond the scope of this chapter to assume the marginal principle in this developing country. We only limit ourselves to the technical structure of this sector; physical marginal product.

Marginal Productivity with Foreign Direct Investment

Let us first compare again the latest estimates of marginal productivities with those of Yokoyama. Table 8 summarizes the estimates of both, while Table 9A shows the latest estimates for both all industries and non-capital intensive. Here from the equation (1) the marginal productivities of each, MP_K and MP_L, are calculated by

$$MP_K = \alpha \, Y/K$$
$$MP_L = \beta \, Y/L.$$

Each column in Table 8 is evaluated at the average of the factor productivity (Y/K and Y/L) for all 28 industries and non-capital intensive 26 industries. The figures in parentheses are evaluated at the average income (Y) divided by the average factor (K or L). Both figures do not differ very much from each other except that the latter is slightly lower.

Contrary to the expectation of Yokoyama (1991) in 1989 marginal product of capital increased substantially and that of labour decreased slightly. This is because of the higher estimate of production elasticity of capital and lower estimate of labour in 1989 discussed above. Considering that the increase of capital and the decrease of labour in their marginal productivities in 1989 are not

TABLE 8
MARGINAL PRODUCTIVITY OF CAPITAL
AND LABOUR* – 28 (26 INDUSTRIES): DOS DATA

	Capital (M$/M$1 Capital)		Labour (M$1,000/Person)	
	All-28 Industries	Non-Capital Intensive 26 Industries	All 28 Industries	Non-Capital Intensive 26 Industries
1983	–	0.612 (0.528)	–	7.35 (6.32)
1984	0.631 (0.607)	0.484 (0.451)	10.3 (6.59)	10.1 (8.75)
1987	0.475 (0.352)	0.398 (0.313)	16.7 (10.2)	14.9 (12.0)
1988	0.522 (0.409)	0.462 (0.374)	15.4 (9.18)	13.5 (10.6)
1989	0.755 (0.590)	0.578 (0.467)	15.4 (7.76)	12.6 (9.62)

Source: For 1983–1988 [Yokoyama (1991)] and for 1989 calculated by Table 5A and 5B

Note: *Calculated from the production functions for each year and evaluated at the average productivity. The figures in parentheses are evaluated at the average income divided by the average capital/labour.

enough to overweigh those in the early 1980s, it is still too early to foresee the direction of the increase or decrease especially for the case of capital. But it can be said that the marginal productivity of labour is more than that in the early 1980s, even after adjusting for inflation during the period. Almost the same results can be seen in Table 9A when we apply the newly aggregated data for the 19/17 industries, though these estimates are slightly lower than those for the 28/26 industries.

In a similar way we can evaluate the marginal productivity of foreign capital, Malaysian capital and labour respectively using the production elasticities at the average of each. Table 9B is the estimates of them.

TABLE 9A
MARGINAL PRODUCTIVITY OF CAPITAL AND
LABOUR* – 19(17) INDUSTRIES: DOS – MIDA DATA

	Capital (M$/M$1 Capital)		Labour (M$1000/Person)	
	All 19 Industries	Non-Capital Intensive 17 Industries	All 19 Industries	Non-Capital Intensive 17 Industries
1987	0.547 (0.430)	0.389 (0.318)	11.5 (6.65)	13.5 (12.3)
1988	0.474 (0.379)	0.463 (0.394)	13.6 (9.69)	12.4 (10.9)
1989	0.664 (0.552)	0.564 (0.477)	10.2 (5.87)	11.3 (9.78)

Source: Calculated by Table 6A and 6B

Note: *The same as Table 8.

TABLE 9B
MARGINAL PRODUCTIVITY OF FOREIGN CAPITAL, MALAYSIAN
CAPITAL AND LABOUR – 19(17) INDUSTRIES*: DOS – MIDA DATA

	Foreign Capital (M$/M$1)		Malaysian Capital (M$/M$1)		Labour (M$1000/Person)	
	All 19 Industries	Non-Capital Intensive 17 Industries	All 19 Industries	Non-Capital Intensive 17 Industries	All 19 Industries	Non-Capital Intensive 17 Industries
1987	1.348 (0.965)	1.071 (0.724)	0.416 (0.161)	0.189 (0.076)	13.5 (7.80)	14.6 (13.20)
1988	1.096 (0.828)	1.064 (0.790)	0.369 (0.143)	0.344 (0.146)	13.9 (9.92)	12.7 (11.21)
1989	1.350 (0.981)	1.161 (0.804)	0.840 (0.302)	0.747 (0.274)	11.0 (6.28)	11.2 (9.71)

Source: Calculated from Table 7A and 7B

Note: *The same as Table 8.

Though almost equal productivity is estimated for labour in Table 9B as in Table 9A, those of capital are quite different. Heterogeneity between foreign and Malaysian capital is the main reason for this difference. As can be seen in Table 9B marginal productivity of foreign capital is much higher than that of Malaysian capital, though the latter has been increasing rapidly. Further it is quite interesting to note that at average productivity marginal productivity of foreign capital is around M$1.00 for M$1.00 of the capital. M$1.00 of foreign capital can marginally produce almost an equivalent amount of value added in the Malaysian manufacturing sector, while Malaysian capital can produce less than M$1.00. This tendency is more obvious when considering capital intensive indutries. This may explain the massive inflow of foreign capital since 1986 and the change of the capital intensity of the flow towards the more capital intensive industries. The Malaysian capital stimulated by the inflow may have been trying to participate in seeking for higher productiviy.

V. Concluding Remarks

This chapter analyzes the production structure of the manufacturing industries with the enormous inflow of foreign direct investments since 1986. The annual production function is cross-sectionally estimates applying the newly released series of the capital "in production" owned by either Malaysians or foreigners. Major findings are:

(a) the production function reveals almost homogeneous by degree one; constants returns to scale every year with the factors of foreign capital, Malaysian capital and labour;

(b) the foreign capital is much more elastic than Malaysian capital, though the Malaysian capital is becoming elastic rapidly;

(c) the marginal productivity of foreign capital is high enough to be around one (M$1.00 per equivalent amount of foreign capital), while that of Malaysian capital is rapidly growing and that of labour is steady at around M$10,000.00 per person; and

(d) when considering capital intensive industries the findings (b) and (c) above are more apparent but the elasticity and the marginal productivity of labour are estimated at less.

Much remains to be done. Since the Malaysian economy, especially the manufacturing sector, is now undergoing a most rapid change in its economic structure, the parameters estimated in this chapter cannot be stable for long. This is one of the reasons why we estimate the annual production function so that we can trace the change of parameters. New methods should be saught to describe this kind of rapid structural change. Detailed industry specific studies are needed of course, because some of the Malaysian manufacturing industries are totally export-oriented or resource based, while others are domestic oriented. The inflow of foreign direct investment is important in stimulating the host economy of demand and supply sides both for the short-run as we study here, but for longer run its technology transfer to the manufacturing industries in the host country is much more important. These studies are left for the future with the expectation of the release of detailed data on the topic.

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Appendix

TABLE A-1
EMPLOYMENT AND CAPITAL STRUCTURE AS AT 31ST DECEMBER, 1986

	Number (Establishment)	Employment (Person)	Malaysian F. Assets (M$'000)	Foreign F. Assets (M$'000)	Total Fixed F. Assets (M$'000)	Share of Foreign Assets (%)	Capital Labour Ratio (M$1000/ Person)
1. Food	464	43,579	2,201,666	761,304	2,962,970	25.69	67.99
2. Beverage & Tobacco	60	9,589	181,656	429,575	611,231	70.28	63.74
3. Textile & Textile Products	296	61,603	340,168	376,086	716,254	2.51	11.63
4. Leather and Leather Products	22	3,030	21,522	18,595	40,117	46.35	13.23
5. Wood and Wood Products	422	38,303	821,098	75,739	896,873	8.45	23.42
6. Furniture and Fixtures	47	3,228	45,903	8,808	54,711	16.10	16.95
7. Paper and Paper Products	179	15,605	424,138	100,025	524,163	19.08	33.59
8. Chemical & Chemicals Products	238	16,289	2,034,098	547,692	2,581,790	21.21	158.50
9. Petroleum & Coal	30	2,711	1,973,727	1,160,433	3,134,160	37.03	1,156.09
10. Rubber Products	132	18,011	277,681	196,000	473,681	41.38	26.30
11. Plastic Products	196	12,470	267,452	45,686	313,138	14.59	25.11
12. Non-Metallic Products	242	20,984	1,623,663	717,688	2,341,351	30.65	111.58
13. Basic Metal Products	82	9,462	864,705	417,779	1,282,484	32.58	135.54
14. Fabricated Metal Products	285	18,335	661,272	195,907	857,179	22.85	46.75
15. Machinery Manufacturing	136	8,733	182,543	115,542	298,085	38.76	34.13
16. Electrical & Electronic Products	236	84,002	406,409	1,331,316	1,737,725	76.61	20.69
17. Transport Equipment	136	15,908	858,417	233,868	1,092,285	21.41	68.66
18. Scientific & Measuring & Controlling Equipment	18	4,893	5,243	48,643	53,886	90.27	11.01
19. Other Manufacturing Industries	81	11,418	76,505	64,695	141,200	45.82	12.37
Total	3,302	398,153	13,267,866	6,845,381	20,113,247	34.03	50.52

Source: MIDA, 1986

TABLE A-2
EMPLOYMENT AND CAPITAL STRUCTURE AS AT 31ST DECEMBER, 1987

	Number (Establish-ment)	Employment (Person)	Malaysian F. Assets (M$ '000)	Foreign F. Assets (M$ '000)	Total Fixed F. Assets (M$ '000)	Share of Foreign Assets (%)	Capital Labour Ratio (M$1000/ Person)
1. Food	465	47,420	2,166,705	778,147	2,944,852	26.42	62.10
2. Beverage & Tobacco	63	9,303	195,269	425,885	621,154	68.56	66.77
3. Textile & Textile Products	303	63,206	343,537	400,540	744,077	53.83	11.77
4. Leather and Leather Products	23	2,996	21,166	18,489	39,655	46.62	13.24
5. Wood and Wood Products	421	40,146	784,396	78,824	863,220	9.13	21.50
6. Furniture and Fixtures	49	3,317	48,408	8,359	56,767	14.73	17.11
7. Paper and Paper Products	183	15,858	420,673	104,062	524,735	19.83	33.09
8. Chemical & Chemicals Products	240	15,891	2,118,934	502,190	2,621,124	19.16	164.94
9. Petroleum & Coal	30	2,688	1,855,021	1,247,866	3,102,887	40.22	1,154.34
10. Rubber Products	138	19,717	276,688	230,340	507,028	45.43	25.72
11. Plastic Products	195	13,340	265,224	48,106	313,330	15.35	23.49
12. Non-Metallic Products	245	20,986	1,855,070	919,253	2,774,323	33.13	132.20
13. Basic Metal Products	83	9,386	817,770	420,741	1,238,511	33.97	131.95
14. Fabricated Metal Products	290	18,816	616,672	205,660	822,332	25.01	43.70
15. Machinery Manufacturing	140	8,934	173,713	129,370	303,083	42.69	33.92
16. Electrical & Electronic Products	212	87,016	424,997	1,447,919	1,872,916	77.31	21.52
17. Transport Equipment	136	15,458	807,726	233,265	1,040,991	22.41	67.34
18 Scientific & Measuring & Controlling Equipment	19	5,642	5,626	69,550	75,176	92.52	13.32
19. Other Manufacturing Industries	82	12,267	79,381	68,092	147,473	46.18	12.02
Total	3,317	412,387	13,276,976	7,336,658	20,613,634	35.60	49.99

Source: MIDA, 1987

TABLE A-3

EMPLOYMENT AND CAPITAL STRUCTURE AS AT 31ST DECEMBER, 1988

	Number (Establishment)	Employment (Person)	Malaysian F. Assets (M$ '000)	Foreign F. Assets (M$ '000)	Total Fixed F. Assets (M$ '000)	Share of Foreign Assets (%)	Capital Labour Ratio (M$1000/Person)
1. Food	474	50,946	2,187,182	871,160	3,058,342	28.48	60.03
2. Beverage & Tobacco	62	8,462	179,751	427,419	607,170	70.40	71.75
3. Textile & Textile Products	315	72,085	388,429	442,923	831,352	53.28	11.53
4. Leather and Leather Products	23	3,244	23,983	24,583	48,566	50.62	14.97
5. Wood and Wood Products	423	47,191	797,676	136,466	934,142	14.61	19.80
6. Furniture and Fixtures	51	4,042	47,985	16,442	64,427	25.52	15.94
7. Paper and Paper Products	181	17,059	414,713	106,669	521,382	20.46	30.56
8. Chemical & Chemicals Products	237	16,478	1,971,751	525,366	2,497,117	21.04	151.54
9. Petroleum & Coal	30	2,701	1,650,858	1,157,895	2,808,753	41.22	1,039.89
10. Rubber Products	170	29,196	407,224	522,474	929,698	56.20	31.84
11. Plastic Products	199	14,504	280,371	61,054	341,425	17.88	23.54
12. Non-Metallic Products	243	21,564	1,789,218	879,399	2,668,617	32.95	123.75
13. Basic Metal Products	86	9,972	650,578	332,038	982,616	33.79	98.54
14. Fabricated Metal Products	292	19,302	628,102	225,119	853,221	26.38	44.20
15. Machinery Manufacturing	146	10,016	174,721	161,865	336,586	48.09	33.60
16. Electrical & Electronic Products	244	107,578	453,275	1,926,248	2,379,523	80.95	22.12
17. Transport Equipment	140	16,498	908,617	254,175	1,162,792	21.86	70.48
18. Scientific & Measuring & Controlling Equipment	20	8,016	5,975	98,685	104,660	94.29	13.06
19. Other Manufacturing Industries	85	13,970	97,041	75,708	172,749	43.83	12.37
Total	3,421	472,824	13,057,450	8,245,688	21,303,138	38.71	45.06

Source: MIDA, 1988

TABLE A-4
EMPLOYMENT AND CAPITAL STRUCTURE AS AT 31ST DECEMBER, 1989

	Number (Establishment)	Employment (Person)	Malaysian F. Assets (M$ '000)	Foreign F. Assets (M$ '000)	Total Fixed F. Assets (M$ '000)	Share of Foreign Assets (%)	Capital Labour Ratio (M$1000/Person)
1. Food	480	50,823	2,173,506	912,325	3,085,831	29.57	60.72
2. Beverage & Tobacco	62	7,855	188,425	415,101	603,526	68.78	76.83
3. Textile & Textile Products	332	87,834	431,512	629,106	1,060,618	59.32	12.08
4. Leather and Leather Products	25	3,722	36,143	49,727	85,870	57.91	23.07
5. Wood and Wood Products	422	49,967	862,882	148,191	1,011,073	14.66	20.23
6. Furniture and Fixtures	52	5,345	52,182	29,904	82,086	36.43	15.36
7. Paper and Paper Products	181	19,432	1,577,220	178,323	1,755,543	10.16	90.34
8. Chemical & Chemicals Products	238	17,352	1,884,969	577,136	2,462,105	23.44	141.89
9. Petroleum & Coal	31	3,103	1,564,256	1,229,927	2,794,183	44.02	900.48
10. Rubber Products	194	33,483	497,454	625,566	1,123,020	55.70	33.54
11. Plastic Products	202	17,513	358,171	131,292	489,463	26.82	27.95
12. Non-Metallic Products	249	22,646	1,739,282	905,309	2,644,591	34.23	116.78
13. Basic Metal Products	89	11,223	907,793	277,159	1,184,952	23.39	105.58
14. Fabricated Metal Products	293	20,219	523,191	201,144	724,335	27.77	35.82
15. Machinery Manufacturing	151	10,721	170,722	169,983	340,705	49.89	31.78
16. Electrical & Electronic Products	265	129,293	433,605	2,649,805	3,083,410	85.94	23.85
17. Transport Equipment	145	20,105	787,051	258,808	1,045,859	24.75	52.02
18. Scientific & Measuring & Controlling Equipment	22	10,868	4,766	147,674	152,440	96.87	14.03
19. Other Manufacturing Industries	87	17,965	149,975	104,579	254,554	41.08	14.17
Total	3,520	539,469	14,343,105	9,641,059	23,984,164	40.20	44.46

Surce: MIDA, 1989

TABLE B-1
SURVEY DATA, MANUFACTURING, 1987

	Value Added (M$ '000)	Labour (Person)	Capital (M$ '000)
1. Food	1,797,844	68,620	3,112,123
2. Beverage	312,806	5,127	385,384
3. Tobacco	535,435	4,263	278,074
4. Textile	545,333	28,145	578,611
5. Wearing Apparel	366,630	39,448	216,889
6. Leather and Leather Products	5,853	542	10,115
7. Footwear	10,110	873	10,249
8. Wood and Cock Products	867,399	56,262	955,511
9. Furniture and Fixtures	89,952	9,322	134,922
10. Paper and Paper Products	194,242	8,989	1,453,572
11. Printing and Publishing	440,203	19,333	407,208
12. Industrial Chemicals	1,537,720	7,137	4,264,319
13. Other Chemical Products	416,801	9,179	355,787
14. Petroleum Refineries	260,502	1,125	763,591
15. Miscellaneous of Petroleum and Coal	33,183	881	43,612
16. Rubber Products	899,101	37,503	971,061
17. Plastic Products	277,155	18,138	384,514
18. Pottery, China and Earthenware	52,244	4,547	69,037
19. Glass and Glass Products	87,320	2,072	313,128
20. Non-Metallic Mineral Products	650,791	17,489	2,139,424
21. Iron & Steel	433,075	10,653	1,697,971
22. Non-Ferrous Metal	71,141	2,705	247,201
23. Manufacture of Fabricated Metal	369,760	19,209	535,444
24. Machinery	330,057	14,474	505,869
25. Electrical Machinery	2,147,285	100,294	1,951,267
26. Transport Equipment	379,932	14,531	1,065,498
27. Scientific & Measuring & Controlling Equipment	106,632	6,283	79,275
28. Other Manufacturing Industries	124,231	10,513	97,260

Source: Department of Statistics, *Industrial Survey: Construction, Manufacturing, Mining, Stone Quarrying 1987*, Kuala Lumpur

TABLE B-2
SURVEY DATA, MANUFACTURING, 1988

	Value Added (M$ '000)	Labour (Person)	Capital (M$ '000)
1. Food	2,276,,131	71,216	3,196,496
2. Beverage	321,344	4,873	388,795
3. Tobacco	378,299	3,267	247,390
4. Textile	588,856	32,422	620,289
5. Wearing Apparel	470,869	46,218	283,438
6. Leather and Leather Products	7,397	675	10,868
7. Footwear	9,255	829	6,713
8. Wood and Cork Products	999,730	64,154	1,049,092
9. Furniture and Fixtures	116,662	12,305	197,032
10. Paper and Paper Products	250,129	10,141	1,430,810
11. Printing and Publishing	436,132	19,991	410,548
12. Industrial Chemicals	1,840,053	7,857	4,084,917
13. Other Chemical Products	468,957	10,034	416,344
14. Petroleum Refineries	273,232	1,133	778,315
15. Miscellaneous of Petroleum and Coal	57,484	1,019	48,224
16. Rubber Products	1,336,171	46,962	1,344,848
17. Plastic Products	340,072	20,325	431,362
18. Pottery, China and Earthenware	68,462	4,703	124,522
19. Glass and Glass Products	104,367	2,847	339,538
20. Non-Metallic Mineral Products	819,964	18,550	3,088,340
21. Iron & Steel	430,232	10,171	1,468,179
22. Non-Ferrous Metal	115,180	3,003	251,898
23. Manufacture of Fabricated Metal	507,161	23,958	831,774
24. Machinery	461,202	16,148	547,327
25. Electrical Machinery	2,714,144	131,549	2,663,666
26. Transport Equipment	591,267	14,885	906,757
27. Scientific & Measuring & Controlling Equipment	139,691	7,992	127,738
28. Other Manufacturing Industries	134,465	11,106	96,,299

Source: Department of Statistics, *Industrial Survey: Construction, Manufacturing, Mining, Stone Quarrying 1988*, Kuala Lumpur

TABLE B-3
SURVEY DATA, MANUFACTURING, 1989

	Value Added (M$ '000)	Labour (Person)	Capital (M$ '000)
1. Food	2,447,470	74,143	27,809,365
2. Beverage	369,974	4,307	413,003
3. Tobacco	390,026	5,906	227,011
4. Textile	665,976	34,571	768,084
5. Wearing Apparel	600,910	55,998	373,336
6. Leather & Leather Products	10,110	726	11,229
7. Footwear	13,049	1,612	11,145
8. Wood and Wood Products	1,265,364	74,975	1,298,980
9. Furniture and Fixture	145,415	13,784	169,801
10. Paper and Paper Products	387,327	11,276	1,555,746
11. Printing and Publishing	573,363	20,375	455,861
12. Industrial Chemical	1,879,879	8,655	3,954,328
13. Other Chemical Products	569,168	11,242	455,742
14. Petroleum Refineries	614,577	1,161	859,004
15. Miscellaneous of Petroleum and Coal	75,016	820	37,106
16. Rubber Products	1,322,062	52,748	1,760,353
17. Plastic Products	489,865	26,972	626,975
18. Pottery, China and Earthenware	100,266	6,113	159,481
19. Glass and Glass Products	144,419	3,053	376,433
20. Non-Metallic Mineral Products	1,060,900	21,414	2,438,529
21. Iron & Steel	680,065	11,282	1,715,476
22. Non-Ferrous Metal	124,609	3,456	259,519
23. Manufactured of Fabricated Products	754,312	27,953	964,841
24. Machinery	658,378	18,147	613,943
25. Electrical Machinery	3,837,458	162,606	3,743,283
26. Transport Equipment	970,795	20,364	900,885
27. Scientific & Measuring & Controlling Equipment	230,047	9,842	244,796
28. Other Manufacturing Industries	210,931	14,559	101,503

Source: Department of Statistics, *Industrial Survey: Construction, Manufacturing, Mining, Stone Quarrying 1989*, Kuala Lumpur