Table 5-1

The Regression Equation: RBIs, Non-RBIs and Total Manufacturing Sector, 1981-1997.

| Sectors | RBIs | Non-RBIs | Total Manufacturing |
|---|---|---|---|
| Ln K | 0.6877<br>(16.36)*** | 0.4496<br>(3.72)*** | 0.5762<br>(13.28)*** |
| LnL | 0.3192<br>(5.23)*** | 0.9988<br>(4.33)*** | 0.6808<br>(8.48)*** |
| $\overline{R}^2$ | 0.9958 | 0.9789 | 0.9961 |
| SEE | 0.0561 | 0.1242 | 0.0459 |

Note: $\overline{R}^2$ is the adjusted coefficient of determination and SEE is the standard error of estimation.
Number in brackets is t-statistics value.
***, ** and* Means significant at the 1%, 5% and 10% level

Source: Department of Statistic, Annual Survey of Manufacturing Industry (1981-1997)

Table 5-2
Explanation of Source of Growth, 1981-1997: RBIs, Non-RBIs and Total
Manufacturing Sector

|  | Periods | Output | Capital | Labour | TFP |
|---|---|---|---|---|---|
| RBIs | 1981-1985 | 1.494274 | 1.5739 (*105.3*) | 1.379592 (*92.3*) | -0.01368 (*-97.7*) |
|  | 1985-1989 | 2.026175 | 2.076754 (*102.5*) | 1.797041 (*88.7*) | 0.023831 (*-91.2*) |
|  | 1989-1993 | 1.162344 | 1.205237 (*103.7*) | 1.142914 (*98.3*) | 0.005174 (*-102.0*) |
|  | 1993-1997 | 1.126886 | 1.16795 (*103.6*) | 1.017207 (*90.3*) | -0.14728 (*-93.9*) |
|  | **1981-1997**$^\phi$ | **1.45242** | **1.50596 (*103.7*)** | **1.334188 (*91.8*)** | **-0.00903 (*-95.5*)** |

|  | Periods | Output | Capital | Labour | TFP |
|---|---|---|---|---|---|
| Non-RBIs | 1981-1985 | 1.488474 | 1.936664 (*130.1*) | 1.206162 (*81.0*) | 0.073772 (*-111.1*) |
|  | 1985-1989 | 1.128049 | 0.946967 (*83.9*) | 1.019231 (*90.3*) | -0.82538 (*-74.3*) |
|  | 1989-1993 | 1.238293 | 1.319011 (*106.5*) | 1.131546 (*91.4*) | 0.260978 (*-97.9*) |
|  | 1993-1997 | 1.216615 | 1.181848 (*97.1*) | 1.087671 (*92.0*) | -0.0073 (*-89.2*) |
|  | **1981-1997**$^\phi$ | **1.267858** | **1.346123 (*106.2*)** | **1.111152 (*87.6*)** | **-0.44728 (*-93.8*)** |

|  | Periods | Output | Capital | Labour | TFP |
|---|---|---|---|---|---|
| Total Mfg | 1981-1985 | 1.066502 | 1.199119 (*112.4*) | 0.952763 (*79.5*) | -0.66949 (*-91.9*) |
|  | 1985-1989 | 1.146568 | 1.068795 (*93.2*) | 1.102243 (*96.1*) | -0.31905 (*-89.4*) |
|  | 1989-1993 | 1.195582 | 1.248562 (*104.4*) | 1.134534 (*94.9*) | 0.135031 (*-99.3*) |
|  | 1993-1997 | 1.172936 | 1.174289 (*100.1*) | 1.053874 (*89.8*) | 0.005731 (*-90.0*) |
|  | **1981-1997**$^\phi$ | **1.145397** | **1.17261 (*102.4*)** | **1.060853 (*92.6*)** | **-0.25256 (*-95.0*)** |

Note:
*Percentage points with percentage distribution from output (value added) growth shown in brackets*
*$\phi$ TFP calculation is obtained from regression equation from Table 5-1. While others (TFP) is obtained from regression equation attached in appendix A-1.*

*Source: Department of Statistic, Annual Survey of Manufacturing Industry (1981-1997)*

As stated earlier, to enable observation of changes in the source of growth overtime, an auxiliary regression equation by pooling time series data conducted for four-sub period's time. The regression output is presented in appendix A-1. Source of growth (Table 5-2) for all sector and cyclical periods was dominating by input namely capital, which is percentage of contributions recorded over 100 percent (for all observe periods), except for Non-RBIs (periods 1985-1989 and 1993-1997) and Total manufacturing (periods 1985-1989). The contribution of labour input was around 80 to over 90 percent for the prevailing cyclical periods. Overall manufacturing sector is still dominated by input (or input driven industry) which emphasis on capital input. The findings were similar to Maisom and Arshad (1992).

The total factor productivity (TFP) for all sector for overall time span (1981-97) was both negative in value and percentage distribution. The inconsistent pattern (period-to-period) of TFP for all sectors would tells the story about inefficiency in the sectors itself. Although a positive TFP growth is recorded for some periods for all sector, but the percentage distribution still insignificant (below zero percent). Only periods of 1989-93 shows a consistent positive TFP growth for all sectors.

Based on output (value added) increment, capital accumulation and labour absorption (1981-97), RBIs sector shows a better figure compared to Non-RBIs and total manufacturing. This will therefore reveal that the sector (RBIs) has significantly contributes in terms of output growth, factor efficiency and employment opportunities to the overall manufacturing sector. Which means RBIs at this point of view (although TFP growth recorded is negative) seems to be more capable compared to other sector for the existing period.

43

## 5.3    The TFP growth for 3-Digits level

The estimation of each coefficient for 3-digits level will be conducted by using equation (4) as in chapter 4. This will on the one hand, enable observation of coefficient (capital and labour) in terms of its significant contribution and on the other to provide a foundation to estimates TFP growth (using equation (7)-chapter 4). There are 14 industries (in 3-digits level) that are classified as RBIs. All 14 industries (including industry code and classification) of RBIs are presented in appendix A-2. The estimation of 3-digits level of RBIs for the periods of 1981-1997 is depicted as in Table 5-3.

Based on Table 5-3, capital inputs contributes significantly for most of estimated equations where the variables significant at least at 10 percent level while, the contribution of Labour inputs significant (at least at 10 percent level) for some estimated equations. The goodness of fits for each equation is good where value of $R^2$ adjusted estimates around 67 to 99 percent (except for 354 industry).

Capital inputs are empirically significant in 10 industries namely 313, 314, 331, 332, 342, 351, 352, 353, 356 and 369. While, labour inputs only significant in 8 industries viz. 311-312, 331, 332, 341, 354, 355, 356 and 369.

One interesting pattern discovered that although capital input found significant in 10 industries (*at least at 10 percent level*) but the contribution to output (value added) is less than one percent (*except 352*) compared to labour input, with contribution is recorded over one percent especially for 311-312 (1.786202%), 341 (1.7935%) and 355 (1.433197%) as changes (one percent) in labour inputs. Which means some of 3-digits levels is classified as labour-intensive industries.

Table 5-3

The Estimated Regression Equation for all 14, 3-digits RBIs

| Ln Y | Ln K | Ln L | Adj $R^2$ | SEE |
|---|---|---|---|---|
| 311-312 | 0.226298 (1.4398) | 1.786202 (4.4239)*** | 0.9111 | 0.1280 |
| 313 | 0.652568 (4.7382)*** | -0.47306 (-1.4135) | 0.6716 | 0.1527 |
| 314 | 0.750802 (5.282)*** | 0.151394 (1.6226) | 0.6938 | 0.1928 |
| 331 | 0.359984 (2.2879)** | 0.956138 (2.7942)** | 0.96345 | 0.1291 |
| 332 | 0.380998 (3.4656)*** | 0.952489 (5.2287)*** | 0.9861 | 0.1177 |
| 341 | -0.01521 (-0.1937) | 1.7935 (10.2624)*** | 0.9810 | 0.1269 |
| 342 | 0.734804 (9.2149)*** | 0.379931 (1.6256) | 0.9826 | 0.0788 |
| 351 | 0.888566 (13.7538)*** | -0.16891 (-0.9011) | 0.9733 | 0.1618 |
| 352 | 1.002694 (10.878)*** | -0.26127 (-1.2099) | 0.9805 | 0.0811 |
| 353 | 0.656897 (1.9970)* | -0.30684 (-0.3495) | 0.7129 | 0.4067 |
| 354 | 0.91771 (1.3386) | -1.84684 (-1.7853)* | 0.1289 | 0.7340 |
| 355 | 0.060994 (0.5647) | 1.433197 (7.5746)*** | 0.9089 | 0.1753 |
| 356 | 0.652301 (4.8861)*** | 0.587195 (2.7299)** | 0.9949 | 0.0756 |
| 369 | 0.620908 (9.9733)*** | 0.803929 (5.9598)*** | 0.9749 | 0.0985 |

Notes:
*Value in parentheses is t-statistic*
*\*, \*\*, \*\*\* indicates that the coefficient significant at 10%, 5% and 1% level, respectively.*

*Source: Department of Statistic, Annual Survey of Manufacturing Industry (1981-1997)*

Table 5-4
Explanation of Source of Growth, 1981-1997: 3-Digits Industry

| Industry Code | Output Growth | Labour Growth | Capital Growth | TFP |
|---|---|---|---|---|
| 311-312 | 1.090894 | 1.033407 | 1.127402 | -1.0101 |
| 313 | 1.05692 | 0.997122 | 1.077568 | 0.8254 |
| 314 | 1.102806 | 1.260786 | 1.129259 | 0.0640 |
| 331 | 0.821348 | 1.054011 | 1.156702 | -0.6028 |
| 332 | 1.236679 | 1.11069 | 1.201577 | -0.3275 |
| 341 | 1.182698 | 1.094081 | 1.422369 | -0.7580 |
| 342 | 1.128874 | 1.045989 | 1.153063 | -0.1158 |
| 351 | 1.391173 | 1.076257 | 1.469197 | 0.2674 |
| 352 | 1.116299 | 1.042511 | 1.127717 | 0.2579 |
| 353 | 1.196153 | 1.135774 | 1.482696 | 0.5706 |
| 354 | 1.10026 | 1.173655 | 1.335247 | 2.0424 |
| 355 | 1.118884 | 1.056654 | 1.346456 | -0.4776 |
| 356 | 1.203092 | 1.106472 | 1.209149 | -0.2353 |
| 369 | 1.136868 | 1.055112 | 1.152707 | -0.4270 |

Source: Data calculated from Department of Statistics, Malaysia: 1981-1997.

For the given periods 1981-1997 (Table 5-4), average growth of capital for all RBIs sub-industry exceeds most of the contributions of output and labour inputs. There are only 1 industry where average output growth exceeded inputs growth viz. 332. Only one industry (314) where average growth of labour recorded around 1.260786. The contributions of TFP for all 3-digits RBIs, shows that 6 out of 14 industries recorded positive growth but growth of TFP for the given periods and industries are still low (except for 354 industry). Manufacture of miscellaneous products of petroleum and coal (354) has a higher TFP contribution (*2.0424*) followed by 5 others namely 313 (*0.8254*), 353 (*0.5706*), 351 (*0.2674*), 352 (*0.2579*) and 314 (*0.0640*). For 8 other RBIs industries, although TFP recorded negative, but it does not mean that the industry is not competent. None of the industry experience directly positive TFP growth for each of the stated cyclical periods (see *appendix A-3*). For the positive TFP groups, negative TFP growth was observed for the periods 1985-89 (*313, 353, 352*, and *314*), 1989-93 (*354, 313, 351* and *314*) and 1993-97 (*354, 353, 351* and *352*). Meanwhile for the periods 1981-85, all industries in the group, experienced positive in TFP. For the negative TFP groups (consists of 8 industries), for each stated periods and industries shows the positive remark (except for 356 industry). For the periods of 1981-85, *342, 332, 355* and *311* have shown positive in TFP. Only one (*332*) has experiencing positively for the periods 1985-89. Three industries (*342, 341* and *311*) however have been identified in 1989-93 periods and other three industries (332, 369, and 331) in 1993-97 periods. The uneven pattern (especially for negative TFP contributor) of TFP growth in those industries shows that each of the industry still significantly contributes in TFP[1] growth.

---

[1] The evidence of this statement can be further explained by section 5.5 in comparing TFP growth for 3 and 5-digits levels. Where some of 3-digits level still contributes positively in TFP growth in 5-digits levels.

## 5.4 The TFP Growth for 5-Digits Level

For the complete 5-digits industrial classification *see appendix A-4*. Based on estimated equation for all 61 industries, the contribution of capital inputs is much more significant compared to labour inputs. The significant level for capital and labour inputs (which was depicted in appendix A-5) is around 10 to 1 percent level.

Some of industry experienced negative coefficients of labour and capital and some others are positive. A low $R^2$ value is recorded for industry code 31212 (0.078) and 31131 (0.068) and both coefficients are not statistically significant. Capital inputs (coefficients) significant in 41 industries compared to labour inputs (25 industries). Which means capital play a massive role in 5-digits RBIs industry.

For the TFP contributions, comparison is divided into two main groups namely positively TFP groups and negatively contributed groups. For the first groups, 30 industries have been identified and other 31 industries in the second groups.

Based on Table 5-5, for the first 30 groups or 49.2 percent of total industries, 5 industries has identified with high positive TFP growth, 7 industries classified with medium growth and 18 industries classified with low TFP growth. While, for the second group (Table 5-6), from 31 industries or 50.8 percent of total industries identified, 2 industries classified with a low negative TFP, 27 industries classified as medium negative TFP and 2 industries as high negative TFP. The classification is based on the value of TFP growth for the periods 1981-1997.

Table 5-5
Explanation of Source of Growth 1981-1997: Positive TFP 5-digits Industry

| Industry Code | Capital Growth | Labour Growth | Output Growth | TFP | TFP Growth Classification |
|---|---|---|---|---|---|
| 31310 | 1.061946 | 0.982695 | 1.054284 | 2.325065 | |
| 35400* | 1.335247 | 1.173655 | 1.10026 | 2.042443 | High Positive |
| 31131 | 1.032759 | 0.95885 | 1.071124 | 2.021969 | |
| 34190 | 1.192577 | 1.054377 | 1.886401 | 1.324857 | |
| 31180 | 1.051559 | 1.016785 | 1.083474 | 1.122786 | |
| 31340 | 1.12023 | 1.00931 | 1.072274 | 0.983965 | |
| 35591 | 1.039627 | 0.978908 | 1.075313 | 0.938653 | |
| 31212 | 1.394167 | 1.034569 | 1.745691 | 0.680416 | Medium Positive |
| 33190 | 1.960012 | 1.591451 | 1.120676 | 0.625771 | |
| 35300* | 1.482696 | 1.135774 | 1.196153 | 0.570675 | |
| 35220 | 1.189747 | 1.041474 | 1.120787 | 0.558183 | |
| 31164 | 1.071078 | 0.970709 | 1.000452 | 0.556655 | |
| 35119 | 1.22363 | 1.057899 | 1.259515 | 0.447481 | |
| 31153 | 1.087147 | 0.992892 | 1.086981 | 0.427688 | |
| 31110 | 1.259408 | 1.160925 | 1.171608 | 0.425516 | |
| 31214 | 1.102242 | 1.031266 | 1.105632 | 0.423224 | |
| 31169 | 1.398251 | 1.066572 | 1.056072 | 0.379927 | |
| 31140 | 1.149778 | 1.027606 | 1.093089 | 0.333397 | |
| 35290 | 1.12076 | 1.025139 | 1.139926 | 0.283331 | |
| 31121 | 1.085015 | 1.025123 | 1.086578 | 0.282029 | Low Positive |
| 36922 | 1.360486 | 3.289616 | 1.220062 | 0.253164 | |
| 35231 | 1.129855 | 1.064391 | 1.09714 | 0.206597 | |
| 31151 | 1.019467 | 0.929673 | 0.995048 | 0.19277 | |
| 35239 | 1.139086 | 1.081153 | 1.1416 | 0.109488 | |
| 31172 | 1.18411 | 1.085647 | 1.167604 | 0.093041 | |
| 33119 | 1.216696 | 1.142529 | 1.188755 | 0.088838 | |
| 31400* | 1.129259 | 1.260786 | 1.102806 | 0.064081 | |
| 31159 | 1.80396 | 1.012242 | 1.113665 | 0.031219 | |
| 35510 | 1.105505 | 1.017334 | 1.086466 | 0.02753 | |
| 31219 | 1.184901 | 1.089336 | 1.128363 | 0.00494 | |

Note: industry with an asterisk (*) is also classified as 3-digits industry.

Source: Data Calculated from Department of Statistics, Malaysia 1981-1997

Table 5-6

Explanation of Source of Growth 1981-1997: Negative TFP 5-digits Industry

| Industry Code | Capital Growth | Labour Growth | Output Growth | TFP | TFP Growth Classification |
|---|---|---|---|---|---|
| 36991 | 1.17376 | 1.513891 | 1.143141 | -0.02428 | *Low* |
| 35592 | 0.891782 | 0.895769 | 0.91103 | -0.05156 | *Negative* |
| 34200* | 1.153063 | 1.045989 | 1.128874 | -0.1158 | |
| 31215 | 1.216612 | 1.07099 | 1.168801 | -0.15301 | |
| 35599 | 1.229025 | 1.134661 | 1.227483 | -0.1841 | |
| 34120 | 1.261288 | 1.11542 | 1.181634 | -0.18622 | |
| 36910 | 1.203234 | 1.060089 | 1.142909 | -0.19138 | |
| 35130 | 1.421057 | 1.171493 | 1.273808 | -0.20365 | |
| 35111 | 1.151769 | 1.085207 | 1.139413 | -0.20491 | |
| 35600* | 1.209149 | 1.106472 | 1.203092 | -0.23535 | |
| 34110 | 1.893325 | 1.156664 | 1.232133 | -0.24578 | |
| 31161 | 1.023091 | 1.000438 | 1.094227 | -0.24639 | |
| 33113 | 1.158255 | 1.092251 | 1.165563 | -0.26592 | *Medium* |
| 33112 | 1.223426 | 1.094775 | 1.192245 | -0.2989 | *Negative* |
| 33200* | 1.236679 | 1.11069 | 1.201577 | -0.32752 | |
| 31190 | 1.164277 | 1.060555 | 1.098444 | -0.34057 | |
| 31129 | 1.085268 | 1.032208 | 1.06664 | -0.34879 | |
| 33111 | 1.06374 | 1.015828 | 1.065145 | -0.37619 | |
| 33120 | 1.158295 | 1.03065 | 1.151208 | -0.39187 | |
| 31139 | 1.092313 | 1.024886 | 1.088171 | -0.39575 | |
| 36992 | 1.396606 | 1.087223 | 1.20221 | -0.42719 | |
| 36999 | 1.798314 | 1.12737 | 1.222882 | -0.42834 | |
| 35210 | 1.149193 | 1.073726 | 1.140599 | -0.69126 | |
| 31152 | 1.704863 | 1.061754 | 1.115429 | -0.71679 | |
| 31171 | 1.146578 | 1.056904 | 1.131742 | -0.78636 | |
| 36921 | 1.141226 | 1.021318 | 1.143877 | -0.80303 | |
| 31163 | 1.077586 | 51.88718 | 1.109627 | -0.85305 | |
| 31211 | 1.042655 | 1.033985 | 1.083613 | -0.99005 | |
| 35593 | 1.080388 | 1.0172 | 1.10303 | -0.99927 | |
| 35120 | 1.246663 | 1.025216 | 1.218324 | -1.34944 | *High* |
| 31220 | 1.108223 | 1.004737 | 1.095645 | -1.43955 | *Negative* |

*Note: industry with an asterisk (*) also classified as 3-digits industry.*

*Source: Data Calculated from Department of Statistics, Malaysia 1981-1997*

## 5.5    Total Factor Productivity Growth: Empirical Finding

The total factor productivity (TFP) growth, which was depicted in Table 5-4, Table 5-5 and Table 5-6, exposed some interesting finding. For all industries and sub industries (3-digits and 5-digits level), inputs especially capital play a substantial role. Which means the findings is similar to Maisom and Arshad (1992), Chen (1977) and Krueger and Tuncer (1980).

In this section, a comparison of TFP growth to output (value added) growth will be conducted to get a clear-cut view about the contribution of TFP to output (value added) growth for each industry and sub industries.

According to Table 5-7, average TFP contribution to output for 354 (manufacture of miscellaneous products of petroleum and coal) was 1.85. Which means 185 percent of output composition is contributed by third factor inputs viz. technology, and other unobservable factors. Beverage industry (313) becomes a second largest contributor to output (78 percent), followed by 353 (Crude oil refineries – 47 percent), 351 (manufacture of industrial chemical, 19 percent), 352 (manufacture of other chemical products, 23 percent) and 314 (Tobacco manufactures – 5.8 percent). The findings is different to study conducted by Maisom and Arshad (1992), where most of the industries were shown negative in its contributions. Obviously, for the periods of 1981-1997, the development of RBIs has become important and significant to the Malaysian economy.

Table 5-7

TFP Contribution and Industrial Ranking for RBIs: 3-Digits Level

| Industry Code | TFP/Output growth | Industry Rankφ |
|---------------|-------------------|----------------|
| 311-312 | -0.92595 | 14 |
| 313 | 0.780981 | 2 |
| 314 | 0.058107 | 6 |
| 331 | -0.73395 | 12 |
| 332 | -0.27257 | 9 |
| 341 | -0.64091 | 13 |
| 342 | -0.10258 | 7 |
| 351 | 0.192272 | 4 |
| 352 | 0.231048 | 5 |
| 353 | 0.477092 | 3 |
| 354 | 1.856328 | 1 |
| 355 | -0.42689 | 11 |
| 356 | -0.19562 | 8 |
| 369 | -0.37567 | 10 |

*Note: φ Industry rank is based on TFP growth value for each industry.*

*Source: Data calculated from Department of Statistics, Malaysia, 1981-1997.*

The importance of those industries can be observed by its exports performance (gross exports) as presented in Table 5-8. Although 79.43 percents of total gross exports Malaysia mainly contributed by Non-RBIs (especially electronic and electrical appliances) but RBIs exports (20.57 % of gross exports) still contributes significantly. For the periods of 1981 to 2000, percentage contribution of RBIs exports shows a downward pattern compared to its counterparts (Non-RBIs). The duality pattern between RBIs and Non-RBIs (see appendix A-6) explicitly shows that the RBIs sector seems to be classified as a 'sunset' industry. Empirically some of this 'sunset' industry however still contributes significantly to total gross exports of manufacturing. For the periods of 1981 to 2000, most of exports income in RBIs mostly contributed by food manufacturing (4.30%), chemicals and chemicals products (4.14 %), wood products (3.7 %), petroleum products (3.28), and rubber products (2.1 %). While some other industry only constitutes below one percent of total manufacturing exports.

Table 5-8
Gross Exports of Resource Based Industries (RBIs), 1981-2000.
(RM million)

| Year | Food | Beverage & Tobacco | Wood products | Rubber products[1] | Paper & pulp products | Petroleum products | Chemicals & chemical products | Non-Metallic mineral products | Furniture & parts | Total RBI exports |
|---|---|---|---|---|---|---|---|---|---|---|
| 81 | 648.2 | 29.8 | 475.3 | 82.7 | 48.4 | 225.4 | 199.3 | 50.9 | - | 1760.0 |
|  | *10.15* | *0.47* | *7.45* | *1.30* | *0.76* | *3.53* | *3.12* | *0.80* | *0.00* |  |
| 82 | 592.3 | 22.2 | 426.3 | 88.7 | 50.9 | 286.6 | 283.6 | 72.2 | - | 1822.8 |
|  | *7.89* | *0.30* | *5.68* | *1.18* | *0.68* | *3.82* | *3.78* | *0.96* | *0.00* |  |
| 83 | 667.7 | 28.2 | 491.8 | 97.5 | 56.7 | 598.2 | 453.0 | 103.5 | - | 2496.6 |
|  | *6.85* | *0.29* | *5.04* | *1.00* | *0.58* | *6.14* | *4.65* | *1.06* | *0.00* |  |
| 84 | 811.4 | 28.2 | 426.1 | 106.5 | 70.3 | 923.2 | 660.2 | 137.1 | - | 3163.0 |
|  | *6.51* | *0.23* | *3.42* | *0.85* | *0.56* | *7.41* | *5.30* | *1.10* | *0.00* |  |
| 85 | 755.5 | 25.5 | 365.1 | 113.1 | 71.4 | 1041.4 | 610.2 | 150.3 | - | 3132.5 |
|  | *6.06* | *0.20* | *2.93* | *0.91* | *0.57* | *8.35* | *4.89* | *1.21* | *0.00* |  |
| 86 | 923.2 | 37.4 | 536.5 | 239.3 | 97.7 | 720.1 | 760.7 | 190.8 | - | 3505.7 |
|  | *6.01* | *0.24* | *3.49* | *1.56* | *0.64* | *4.69* | *4.96* | *1.24* | *0.00* |  |
| 87 | 1170.3 | 56.9 | 851.5 | 484.9 | 129.0 | 836.0 | 927.4 | 301.3 | - | 4757.3 |
|  | *5.75* | *0.28* | *4.19* | *2.38* | *0.63* | *4.11* | *4.56* | *1.48* | *0.00* |  |
| 88 | 1307.4 | 80.5 | 911.3 | 914.4 | 250.6 | 765.0 | 1375.8 | 450.2 | 165.3 | 6220.5 |
|  | *4.87* | *0.30* | *3.39* | *3.41* | *0.93* | *2.85* | *5.12* | *1.68* | *0.62* |  |
| 89 | 1714.2 | 80.1 | 1075.2 | 1142.9 | 360.5 | 1004.3 | 1407.0 | 657.8 | 306.1 | 7748.1 |
|  | *4.69* | *0.22* | *2.94* | *3.13* | *0.99* | *2.75* | *3.85* | *1.80* | *0.84* |  |
| 90 | 1966.1 | 95.3 | 1347.2 | 1353.8 | 422.0 | 1285.1 | 1468.1 | 771.1 | 461.6 | 9170.3 |
|  | *4.20* | *0.20* | *2.88* | *2.89* | *0.90* | *2.74* | *3.13* | *1.65* | *0.99* |  |
| 91 | 2094.6 | 169.1 | 1722.1 | 1756.7 | 446.4 | 1149.2 | 1800.6 | 888.1 | 739.0 | 10765.8 |
|  | *3.42* | *0.28* | *2.81* | *2.86* | *0.73* | *1.87* | *2.94* | *1.45* | *1.21* |  |

Table 5-8 (cont.)
Gross Exports of Resource Based Industries (RBIs), 1981-2000.
(RM million)

| Year | Food | Beverage & Tobacco | Wood products | Rubber products[1] | Paper & pulp products | Petroleum products | Chemicals & chemical products | Non-Metallic mineral products | Furniture & parts | Total RBI exports |
|---|---|---|---|---|---|---|---|---|---|---|
| 92 | 2247.5 | 192.2 | 2352.5 | 2156.6 | 514.9 | 1447.8 | 2289.2 | 892.2 | 997.1 | 13090.0 |
| | *3.15* | *0.27* | *3.29* | *3.02* | *0.72* | *2.03* | *3.20* | *1.25* | *1.40* | |
| 93 | 2366.5 | 184.7 | 4036.1 | 2465.7 | 531.0 | 1668.4 | 2827.8 | 1057.1 | 1450.9 | 16588.2 |
| | *2.64* | *0.21* | *4.50* | *2.75* | *0.59* | *1.86* | *3.15* | *1.18* | *1.62* | |
| 94 | 2918.1 | 210.9 | 4773.8 | 2750.8 | 624.5 | 2138.6 | 4547.9 | 1431.2 | 2006.7 | 21402.5 |
| | *2.43* | *0.18* | *3.97* | *2.29* | *0.52* | *1.78* | *3.78* | *1.19* | *1.67* | |
| 95 | 3218.1 | 397.0 | 4953.7 | 3267.8 | 775.2 | 3126.6 | 6256.5 | 1676.7 | 2291.7 | 25963.3 |
| | *2.19* | *0.27* | *3.36* | *2.22* | *0.53* | *2.12* | *4.25* | *1.14* | *1.56* | |
| 96 | 3296.8 | 576.1 | 6086.1 | 3584.9 | 698.4 | 3281.2 | 6710.4 | 1641.0 | 2812.3 | 28687.2 |
| | *2.08* | *0.36* | *3.84* | *2.26* | *0.44* | *2.07* | *4.23* | *1.04* | *1.77* | |
| 97 | 3723.0 | 746.5 | 6489.7 | 3959.0 | 747.0 | 3372.2 | 8137.3 | 1709.0 | 3384.2 | 32267.9 |
| | *2.08* | *0.42* | *3.63* | *2.21* | *0.42* | *1.88* | *4.55* | *0.96* | *1.89* | |
| 98 | 4581.6 | 913.1 | 5981.7 | 5736.0 | 964.0 | 3128.6 | 10627.0 | 2095.8 | 4362.4 | 38390.2 |
| | *1.93* | *0.38* | *2.52* | *2.41* | *0.41* | *1.32* | *4.47* | *0.88* | *1.84* | |
| 99 | 4510.2 | 1043.9 | 6984.3 | 5060.5 | 1136.0 | 4512.9 | 11105.1 | 2242.5 | 5317.8 | 41913.2 |
| | *1.66* | *0.38* | *2.57* | *1.86* | *0.42* | *1.66* | *4.09* | *0.83* | *1.96* | |
| 2000 | 4514.4 | 1214.6 | 6801.1 | 4739.7 | 1398.0 | 8132.1 | 15033.3 | 2570.5 | 6076.8 | 50480.5 |
| | *1.42* | *0.38* | *2.14* | *1.49* | *0.44* | *2.56* | *4.73* | *0.81* | *1.91* | |
| Avg | *4.30* | *0.29* | *3.70* | *2.10* | *0.62* | *3.28* | *4.14* | *1.18* | *0.96* | |

Note: [1] exclude rubber footwear
Value in italic is percentage contribution of total manufacturing

*Source: Monthly Bulletin, January 2001: Bank Negara Malaysia (Table VIII.5, P-117)*

55

The comparison for 3 and 5-digits levels between TFP growth and output (value added) growth is presented as in Table 5-9. Based on Table 5-9, comparison between 3-digits and 5-digits levels of industry show an interesting figure with ranking of each industry is listed in the fourth column. As noted in Table 5-5, 30 industries in 5-digits levels experienced a positive TFP and other 31 industries experienced a negative TFP. For 311-312, there are 24 industries has been classified in 5-digits levels. Although 311-312 industries has classified with negative in TFP but in broad categories, the industries still contributes a positively in TFP. 14 or 58.3 percent out of 24 industries in 311-312 experienced positive TFP contribution. The highest ranking is 3 (31131- pineapple canning) with contribution of TFP to average output growth is *1.8872* and the lowest ranking is 61 (31220 – manufacture of prepared animal feeds) with contribution of TFP to average output growth is *–1.3139.*

The most consistent ranking is 313 (Beverage industry) and 354 (manufacture of miscellaneous products of petroleum and coal). In 3-digits levels, 313 industries is ranked 2, while in 5-digits levels the industry is ranked 1 (31310-31330 – distilling, rectifying, blending spirits and malt liquors and malt) with contribution to output growth is 2.205349 and 6 (soft drinks and carbonated water industries) with contribution to output is around 0.917644 respectively. For 354 industries, the industry is rank 1 and 2 respectively in 3-digits and 5-digits level with contribution to output growth is 1.856328.

56

Table 5-9

TFP per Output Contribution and Ranking for RBIs: 3 & 5-Digits Level

1981-1997

| Industry Code | | TFP/Output | Rank |
|---|---|---|---|
| 311-312 (-14) | 31110 | 0.36319 | 15 |
| | 31121 | 0.259557 | 20 |
| | 31129 | -0.327 | 47 |
| | 31131 | 1.887708 | 3 |
| | 31139 | -0.36368 | 50 |
| | 31140 | 0.305004 | 18 |
| | 31151 | 0.19373 | 23 |
| | 31152 | -0.64261 | 54 |
| | 31153 | 0.393464 | 14 |
| | 31159 | 0.028033 | 28 |
| | 31161 | -0.22517 | 42 |
| | 31163 | -0.76878 | 57 |
| | 31164 | 0.556404 | 12 |
| | 31169 | 0.359755 | 17 |
| | 31171 | -0.69483 | 55 |
| | 31172 | 0.079686 | 25 |
| | 31180 | 1.036284 | 5 |
| | 31190 | -0.31004 | 46 |
| | 31211 | -0.91366 | 58 |
| | 31212 | 0.389769 | 8 |
| | 31214 | 0.382789 | 16 |
| | 31215 | -0.13091 | 34 |
| | 31219 | 0.004378 | 30 |
| | 31220 | -1.31388 | 61 |
| 313 (2) | 31310 | 2.205349 | 1 |
| | 31340 | 0.917644 | 6 |
| 314 (6) | 31400 | 0.058107 | 27 |
| 331 (-12) | 33111 | -0.35318 | 48 |
| | 33112 | -0.2507 | 44 |
| | 33113 | -0.22815 | 43 |
| | 33119 | 0.074732 | 26 |
| | 33120 | -0.3404 | 49 |
| | 33190 | 0.558387 | 9 |
| 332 (-9) | 33200 | -0.27257 | 45 |

57

Table 5-9 (cont.)

TFP per Output Contribution and Ranking for RBIs: 3 & 5-Digits Level,

1981-1997

| Industry Code | | TFP/Output | Rank |
|---|---|---|---|
| 341 (-13) | 34110 | -0.19947 | 41 |
| | 34120 | -0.1576 | 36 |
| | 34190 | 0.70232 | 4 |
| 342 (-7) | 34200 | -0.10258 | 33 |
| 351 (4) | 35111 | -0.17983 | 39 |
| | 35119 | 0.35528 | 13 |
| | 35120 | -1.10762 | 60 |
| | 35130 | -0.15987 | 38 |
| 352 (5) | 35210 | -0.60605 | 53 |
| | 35220 | 0.498028 | 11 |
| | 35231 | 0.188305 | 22 |
| | 35239 | 0.095908 | 24 |
| | 35290 | 0.248552 | 19 |
| 353 (3) | 35300 | 0.477092 | 10 |
| 354 (1) | 35400 | 1.856328 | 2 |
| 355 (-11) | 35510 | 0.025339 | 29 |
| | 35591 | 0.872911 | 7 |
| | 35592 | -0.05659 | 32 |
| | 35593 | -0.90593 | 59 |
| | 35599 | -0.14998 | 35 |
| 356 (-8) | 35600 | -0.19562 | 40 |
| 369 (-10) | 36910 | -0.16745 | 37 |
| | 36921 | -0.70203 | 56 |
| | 36922 | 0.207501 | 21 |
| | 36991 | -0.02124 | 31 |
| | 36992 | -0.35534 | 51 |
| | 36999 | -0.35027 | 52 |

Note: *number in brackets is ranking in 3-digits levels and – sign shows that the industry experienced negative TFP.*

Source: *Data calculated from Department of Statistics, Malaysia 1981-1997.*

## 5.6    Factors That Contribute to TFP Growth: Empirical Finding

In this section, the strength of coefficient that would contributes and enhances TFP growth will be discussed. A model proposed in section 4.7 (in chapter 4) will be regressed and all coefficients of each of explanatory variables will be tested and certified. The selection of the explanatory variables is based on the argument of availability and validity of the data and on the other hand to prove the hypothesis made by earlier researchers by using Malaysian industrial micro-data (especially in the selected area of RBIs sector).

The concern of testing will be variously covered several area namely manufacturing output (value added) growth, competitive force or exports growth, incentives to factor of production which is proxy by wage per unit labour and capital-to-value added ratio as a proxy to capital multiplier effect or capital utilization to output growth.

Tables 5-10 show the trends of TFP growth compare to average exports and output growth for the periods 1982-1997 for selected industry. Average export growth is listed in fourth column. Average export growth for all industries is around RM 1.24 million. Although the selected industries experienced positive and negative of TFP growth, but annual exports for all industries shows a better figure. To empirically show the correlation between TFP growth and selected variables, some multiple regression conducted for the selected industries namely food manufacturing industry (311-312), wood and wood products industry (331), furniture and fixture (332), rubber products industry (355) and non-metallic mineral products (369). The choice of the selected industries is dictated by the availability of data for the periods of 1981-1997 except for furniture and fixture industry since data cover only the years 1988-1997.

Table 5-10

TFP, Export, and Output Growth Rates, 1982-1997 Annual Averages (Selected Industry)

| Code | Industry descriptions | Average TFP growth | Average output growth | Average export growth |
|---|---|---|---|---|
| 311-312 | Food manufacturing | -1.02 | 1.0909 | 1.1208 |
| 313 314 | Beverage and tobacco | 0.83 0.07 | 1.0569 1.1028 | } 1.2594 |
| 331 | Wood and woods products | -0.61 | 0.8213 | 1.2006 |
| 332* | Furniture and fixtures | -0.32 | 1.2016 | 1.4134 |
| 341 342 | Paper and pulp products | -0.75 -0.11 | 1.1827 1.1289 | } 1.2058 |
| 351 352 | Chemicals and chemical products | 0.27 0.25 | 1.3912 1.1163 | } 1.2762 |
| 353 354 | Petroleum products | 0.56 2.04 | 1.1962 1.1003 | } 1.2198 |
| 355 | Rubber products | -0.47 | 1.1189 | 1.3101 |
| 369 | Non-metallic mineral products | -0.42 | 1.1369 | 1.2585 |

*Note: * data for exports cover only the years 1988-1997, because the observation before 1988 is not available.*

*Source: Department of Statistics, 1981-1997*
*Monthly Bulletin, Bank Negara Malaysia, January 2001.*

The hypothesis of that rapid growth of exports accelerates economic growth and thus total factor productivity (TFP) has been widely discussed and tested. As exports expand, both the resource allocation effect and externality effect lead to an economy-wide productivity increase. Nishimizu and Robinson (1984) significantly proved the existence of a significant correlation between productivity growth and export expansion. The correlation between exports performance and productivity was also statistically had proven by Chen and Tang (1990) on their study on exports performance and productivity growth in Taiwan manufacturing sector.

On the theoretical side, there has or at least two main argument of the correlation between productivity growth and export expansion, one stresses scale economies and the other stresses competitive forces. The latter argument will be discussed and tested (empirically) in this section.

While for other variables, especially wage per unit labour or a proxy of incentive to factor of production is hypothesized with direct relationship with TFP growth. In addition capital-to-value added ratio or proxy for capital utilization is hypothesized with inverse relationship with TFP growth. National Economic Action Council-NEAC (1998), statistically prove that the inverse relationship between TFP and capital utilization exist when discussing the loss of efficiency in the Malaysian economy during the 1997-98 crisis.

Table 5-11

Estimated Regression Equation for Selected 3-digits RBIs

| Industry code | 311-312 | 331 | 332$^\phi$ | 355 | 369 |
|---|---|---|---|---|---|
| Constant | -2.829974 | -0.380387 | 0.202653 | -1.722438 | -0.500871 |
| | *-5.9513\*\*\** | *-0.9042* | *0.3459* | *-3.4627\*\*\** | *-0.6339* |
| Gy | 0.4194 | -0.0047 | -0.1922 | 0.5326 | -0.4188 |
| | *2.2236\*\** | *-0.04* | *-1.0617* | *2.7133\*\** | *-0.6512* |
| Gexp | 0.2344 | -0.06 | 0.0453 | -0.0338 | 0.1742 |
| | *1.0971* | *-0.8214* | *0.3028* | *-0.4367* | *1.5863* |
| Gw/l | 1.2949 | 0.4467 | 0.1599 | 0.7271 | 1.2422 |
| | *4.6895\*\*\** | *1.2071* | *0.5185* | *2.1341\*\** | *1.8861\*\** |
| Gcvar | -0.2681 | -0.4116 | -0.4867 | -0.0667 | -0.9742 |
| | *-3.2404\*\*\** | *-5.8283\*\*\** | *-2.4918\** | *-3.1946\*\*\** | *-1.8003\*\** |
| R$^2$ adjusted | 0.7068 | 0.8645 | 0.4378 | 0.5092 | 0.7205 |
| SEE | 0.0904 | 0.056 | 0.0756 | 0.0851 | 0.0745 |
| Observation | 16 | 16 | 9$^\phi$ | 16 | 16 |

Note:
*Value in italic is t-statistics*
*\*, \*\*, \*\*\* Denotes the coefficient significant at 10%, 5% and 1% respectively.*
*$\phi$ Data cover only for the years 1988 to 1997, because data for exports before 1988 is not available.*

*Industry code: classification*
*311-312: food manufacturing*
*331: wood and wood products*
*332: furniture and fixture*
*355: Rubber product*
*369: non-metallic mineral product*

*Source: Department of Statistic, Annual Survey of Manufacturing: 1981-1997.*

Based on estimated regression in Table 5-11, some surprisingly outcome explicitly discovered. For all estimated regression equation, the $R^2$ adjusted value is ranges between 0.44 (332) to 0.86 (331). This implies that only 44 percent to 86 percent of the model could explain the variation of TFP. Which means 56 percent to 14 percent of variation of TFP explained by other factors that is not include in the model.

The hypothesis of *no correlation* between TFP growth and capital-to-value added ratio (*Gcvar*) is consistently rejected (for all selected RBIs) at least at 10% significant level. Which means that, it is true evidence that obviously capital utilization would give impact to rising TFP growth (*by neglecting the minus sign for the coefficient*).

The incentive effect to workers (*Gw/l*) has a positive impact to TFP growth and the coefficient sign is parallel to the early hypotheses. Three (*311-312, 355 and 369*) industries had shown the significant effect at least at 5% level. Therefore it is clear to say that as wage per unit labour increase, TFP would also increase because wage increase seen as an incentive for workers to work harder or even more productive.

Since early work (Nishimizu and Robinson, 1984; Chen and Tang, 1990) had proved the relationship between exports growth and TFP with strong positive evidence, but in this model exports growth has two different sign. Positive relationship only observed for the 311-312, 322 and 369 industries, while other with negative sign. There is no coefficient has found statistically significant. One concrete conclusion could be made, that is the competitiveness of the selected RBIs is very low (insignificant) in the world market and thus accidental affect the TFP growth. Although some of the coefficient is positive but it cannot be proved significant. This findings shows that the exports growth of RBIs is still very low compared to its counterpart (Non-RBIs). Because off this low competitive in

exports, lead to a slower growth of TFP. Thus an effective policy (containing price and marketing) should be effectively implemented especially for wood and wood products and rubber industry since it was classified as export-orientation industry in the Second Industrial Master Plan (IMP2).

The coefficient for output growth only significant (at 5% level) for only two industries (*311-312* and *355*) and other industries not. Thus far the technology effect has improved (increased) value added over time, especially for food manufacturing and rubber industry. For other industry, the technology effect did not give any improved sign or the technology was hardly to observe.


## 5.7 Conclusion

Pattern of average TFP growth of the RBIs especially in broad categories (5-digits levels) has shown that the industries vary in terms of sign and composition. Explicitly, in comparing 3 and 5-digits levels, there are some remarkable findings. Industries with negative TFP growth (in 3-digits levels) still contribute positively in broad categories.

*See appendix A-7 and A-8 for ranking classification.* For the variation of TFP growth, since export growth statistically proves unfavourable to this industry (since it was less competitive in world market), therefore efforts towards increasing the TFP growth should be supported by other factors especially incentives (wage increment per labour) and concentration to elevate efficiency in capital utilization to the industry.