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The Impact of International Trade on Price Mark-up in Malaysian Manufacturing Industries

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Abstract: This paper investigates the impact of international trade on the strength of the mark-up (price over marginal cost). The estimation is based on the Dynamic Heterogeneous Panel Data Estimation Technique. The major findings are first, that mark-ups are statistically significant greater than one, implying the existence of market power. Second, increased import penetration ratios serve to decrease industry mark-ups. Third, the overall effects of import penetration ratios on the mark-up lead to an increase in price competition, thus decreasing the size of the mark-ups. Finally, increased tariffs seem to have a significant positive impact on the mark-up.

Key words: International trade; price mark-up, manufacturing industry; Malaysia

INTRODUCTION

This paper attempts to investigate the impact of international trade on the strength of the mark-up of price over marginal cost. International trade can have an impact on the mark-up since foreign competition makes domestic product markets more competitive. Higher international trade intensity tends to increase the degree of competition that the domestic firm faces. International trade, therefore, is expected to have an effect on the variations of the mark-up. In this paper the effect of trade on the mark-up, will be measured by the sensitivity of the mark-up to import penetration ratios and tariffs for the Malaysian manufacturing industries from 1978 to 1999.

The Solow residual is commonly used as a measure of the contribution of technical change to economic growth (Solow, 1957). However, Hall (1986, 1988, and 1990) concluded that the Solow residual is a flawed measure, as it does not take into account imperfect competition, and that market power is a major reason for the empirical observation that the Solow residual is pro-cyclical. Hall (1990) used the industry mark-up of price over marginal cost as a parameter in a single equation regression, thus avoiding the need to directly measure marginal cost. His method was further developed by adding intermediate inputs into the production function. Domowitz et al. (1988) find that the estimated mark-ups in the U.S.A. are not as great when intermediate inputs are included. This is the conclusion of most studies of this type when taken over a range of countries, although Norrbin (1993) finds that mark-up is not significantly different from one in nearly all the U.S.A. industries when non-wage compensation is added to labour costs.

In this paper, mark-ups are estimated for nine Malaysian manufacturing industries using a Nominal Solow Residual (NSR) Roeger (1995) type model. This paper will employ the Dynamic Heterogeneous Panel Estimation (DHPE) technique proposed by Pesaran, Shin and Smith (1999), in the form of the Pooled Mean Group (PMG) estimator. The advantage of the PMG estimator is that homogeneity across sectors needs to be tested. This estimator allows for both dynamics across time periods and heterogeneity across cross-sectional units, since it allows researchers to simultaneously investigate both a homogenous long-run relationship and heterogeneous short-run dynamic adjustment towards equilibrium. The net result is the achievement of substantial statistical power from the panel, without denying the importance of sectoral heterogeneity.

Extending the analysis further, this paper will examine the impact of import penetration ratio and tariffs on variations in the mark-up. The explicit control for import penetration ratio and tariffs presents a further development on the existing literature. In examining the effects of import penetration ratios and tariffs, this paper will investigate the effects on the mark-up within individual industries and for the sample as a whole.

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Literature Review and Theoretical Background:
Foreign Competition and Openness:

Productivity gains at the firm level have been a driving force behind recent trade liberalisation efforts in the developing world. Empirical studies have also found that trade liberalisation induces productivity gains at the firm level (Roberts and Tybout, 1995; Krishna and Mitra, 1998).

Olive (2002) derives an industry pricing equation that includes real manufacturing demand as an independent variable. Bloch, Harry and Olive (1999) also used a similar method and find that aggregate demand only affects the mark-up for low import share industries. This suggests that the mark-ups could become less responsive to aggregate demand the more open industries are to the international economy. Other studies have also found that mark-ups are negatively related to openness (Lopez and Lopez, 1996; and Ghosal, 2000). This is interpreted as trade increasing competition in the domestic market and thereby reducing domestic market power. As such, it is often used as an argument to support tariff reduction (Freedman and Stonecash, 1997).

In analyzing the impact of trade on market power previous econometric studies (Domowitz et al., 1988 and Katics and Petersen, 1994) have employed the mark-up of price over average variable cost as a measure of non-competitive behaviour. These studies find that import competition reduces average cost mark-ups, particularly in domestically concentrated industries. However, more recent studies have estimated the price-marginal cost mark-up from an equation derived from profit maximizing conditions (Harrison, 1994; Krishna and Mitra, 1998).

Goh (2000) examines the relationship between trade policies and technological effort, arguing that a firm investing in new technology bears an opportunity cost of not getting their product to the market as quickly. Lopez (2003) introduces a model where domestic firms can choose to respond to foreign tariff liberalisation by investing in the technology of a higher-quality export good.

A domestic firm has to continuously invest in productivity growth, in order to make up for the expansion of its foreign competitors and to avoid exit. Implicitly, the growth of foreign productivity promotes domestic growth, as the decline of the price of imports fosters investment in productivity. Thus, the pro-competitive effect dominates the direct effect, in the steady state of the productivity growth path, if the firm survives import-competition.

Foreign Competition and Market Power Reduction:

For the purpose of this paper, exposure to foreign competition will be analyzed from the perspectives of foreign firms locating in the domestic economy and by looking at the effect of greater competition through the opening of the country to more imports. As quantitative restrictions and tariffs continue to fall, import penetration has increased dramatically in the formerly protected economies.

Market Structure and Barriers to Entry:

As tariff and investment restrictions fall, previously protected firms will face greater competition and loss of market power. With reduced barriers to entry, new innovative firms face fewer hurdles in starting up operations. Studies by Pavcnik, (2000) and Blomstrom and Kokko (1996) have linked greater competition to increased incentives to innovate.

Econometric Analysis of the Mark-ups of Price over Marginal Cost:
The Roeger-approach:

Roeger (1995) proposed an alternative method of computing mark-ups founded on both the primal Solow residuals and the dual Solow residuals. For a firm enjoying technical progress in the use of labour and capital respectively, a reasonable approximation of its marginal cost can be given by the following expression:

$$MC_{it} = \frac{w_{it}\Delta L_{it} + r_{it}\Delta K_{it}}{\Delta Q_{it} - \Psi_{it} Q_{it}} \tag{1.1}$$

where Ψ_{it} corresponds to the rate of technical progress for each time period t and sector i. Under the assumption of constant returns to scale and constant mark-up, Equation (1.1) can be rephrased as follows:

$$TFP = SR = \Delta q_{it} - \alpha\Delta l_{it} - (1-\alpha)\Delta k_{it} = (\mu - 1)\alpha(\Delta l_{it} - \Delta k_{it}) + \Psi_{it} \quad (1.2)$$

where the left hand side of Equation (1.2) has become known as the primal "Solow Residual" (SR, but often termed growth in total factor productivity (TFP)). The mark-up of price over marginal cost is: $\mu = \frac{P}{MC}$, with Δ denoting the first difference, lower case denotes the natural logarithms transform, *q, l,* and *k* denote real value added, labour, and capital inputs respectively, α is the labour share in value added, and $\Psi = \frac{\dot{A}}{A}$ denotes exogeneous Hicks-neutral technological progress. Under perfect competition μ=1, while imperfectly competitive markets allow μ>1.

Roeger (1995) has suggested an alternative approach which involves computing the dual of the Solow Residual (DSR) as given by the expression below:

$$DSR = \alpha\Delta w_{it} + (1-\alpha)\Delta r_{it} - \Delta p_{it} = (\mu - 1)\alpha(\Delta w_{it} - \Delta r_{it}) + \Psi_{it} \quad (1.3)$$

with w, r and p denoting the natural logarithms of the wage rate of labour, rental price of capital and price of output respectively. Roeger also calculated the nominal Solow residual (NSR), given by:

$$NSR = \Delta(p_{it} + q_{it}) - \alpha\Delta(l_{it} + w_{it}) - (1-\alpha)\Delta(k_{it} + r_{it})$$

$$= (\mu - 1)\alpha\left\{\Delta(l_{it} + w_{it}) - \Delta(k_{it} + r_{it})\right\} \quad (1.4)$$

The NSR is a function of the mark-up, the labour share and the growth rate of the ratio of labour to capital costs. Oliveira-Martins et al. (1999) later dropped the assumption of constant returns to scale and Equation (1.4) is actually:

$$NSR = \left(\frac{\mu}{\lambda} - 1\right) \quad \alpha\left\{\Delta(l_{it} + w_{it}) - \Delta(k_{it} + r_{it})\right\} \quad (1.5)$$

where λ>1 denotes increasing returns to scale. From Equation (1.6) it can be seen that with increasing returns to scale, Roeger's method produces a downward bias in the estimation mark-up. For example, if the "true" mark-up coefficient is 1.33 and λ is equal to 1.2, the mark-up ratio estimated by means of Equation (1.4) would be 1.10. Equation (1.4) can be extended to incorporate intermediate inputs and express the mark-up ratio over gross output (GO) instead of value added (VA).
Taking into account intermediate inputs, Equation (1.5) becomes:

$$NSRGO = \Delta(\tilde{p}_{it} + \tilde{q}_{it}) - \tilde{\alpha}\Delta(l_{it} + w_{it}) - \tilde{\beta}\Delta(m_{it} + p^{m}_{it}) - (1 - \tilde{\alpha} - \tilde{\beta})\Delta(k_{it} + r_{it})$$

$$= (\mu - 1)\left\{\tilde{\alpha}\Delta(l_{it} + w_{it}) + \tilde{\beta}\Delta(m_{it} + p^{m}_{it}) - (\tilde{\alpha} + \tilde{\beta})\Delta(k_{it} + r_{it})\right\} \quad (1.6)$$

where $\tilde{p}$ and $\tilde{q}$ correspond to gross output and its respective price, *m* and p^m correspond to intermediate inputs and their prices, *k* and *r* correspond to capital inputs and their price and $\tilde{\alpha}$ and $\tilde{\beta}$ to the share of labour and intermediate inputs in gross output value respectively.

The Open Economy Context:

The discussion thus far has ignored the impact of the open economy context. Yet import and export shares, tariffs, protection rate, subsidy rates and other trade policy clearly carry implications for the degree of international competition to which domestic industry is exposed, and hence the magnitude of the feasible mark-up that domestic industry can maintain. By implication, the suggestion is that trade liberalisation is a means by which inefficiency in production can be remedied.

The growth of foreign competition implies that domestic firms are increasingly exposed to competitive pressure. An increase in the import penetration ratio in an industry means that domestic firms are facing more competition because foreign firms have a bigger presence in the market. Furthermore, changes in foreign competition can permanently reshape the general competitive configuration of an industry; that is, if there are some fixed entry costs, once foreign firms decide to enter the domestic market, they are unlikely to exit. Thus one can think of the increase in foreign competition in the domestic markets, as an increase in competitive pressure for the industry thus will lower the mark-up of price over marginal cost.

Hakura (1998) offers one means of incorporating the open economy context into the estimation of mark-ups of price over marginal cost. The starting point of analysis is the suggestion that tariff and other trade restrictions shield domestic industry from international competition. Hence a reduction in trade barriers should decrease the market power of domestic producers, for example through increased import penetration and decreased tariff, decreasing the mark-ups of price over marginal cost. The suggestion is thus that trade liberalisation such as imports and tariff reductions will reduce the pricing power of industry (see for instance Helpman and Krugman, 1989).

In order to see how changes in import penetration have affected the price marginal cost mark-up, the specification that is interacted with the import penetration ratios (IPR) and the relationship tested by Hakura (1998) is given by,

$$PCM = \beta_0 + \beta_1 \ln\left(IPR_{it} - \overline{IPR_i}\right) + \beta_2 \ln\left(\frac{K}{PQ}\right)_{it} + \beta_3 \ln\left(\frac{\dot{Q}}{PQ}\right)_{it} \tag{1.7}$$

where *PCM* is a price-cost mark-up, ln IPR_{it} denotes the natural logarithm of the import penetration ratio for the *i*'th industry, and ln $\overline{IPR_i}$ denotes the natural logarithm of the mean import penetration ratio for the *i*'th industry. Other variables included in the regression include the capital to output ratio, $\frac{K}{PQ}$, and the percent change in the industry sales, $\frac{\dot{Q}}{PQ}$. Since the gross return to capital is included in the price-cost mark-up, the mark-up is expected to be positively related with the $\frac{K}{PQ}$.

i and *t* denotes industry and time period respectively, while β_1 captures the impact of deviations of import penetration from the sectoral mean value of import penetration on the mark-up. Where $\beta_1<0$, rising import penetration lowers the mark-up, where $\beta_1>0$, rising import penetration raises the mark-up. β_2 captures the sensitivity for *i*'th industry the capital to output ratio on variations of the mark-up, and β_3 captures the sensitivity for *i*'th industry sales on variations of the mark-up.

Moreover, a final extension of Equation (1.7) proves necessary due to the use of panel data in this paper. Estimation of the mark-up on an industry-by-industry basis requires a control only for an individual-industry variation of import penetration in order to capture trade effects on the mark-up. In a panel data context this is not sufficient, as it is also important to capture the heterogeneity of the industries in the whole sample. Thus, for this reason the following specification will be adjusted to investigate for the impact of import penetration ratios on variations of the mark-up for an individual industry as well in the whole sample:

$$(\mu-1) \;= \theta_0 + \theta_1 \ln(IPR_{it} - \overline{IPR_i}) \;\; + \theta_2 \ln(IPR_{-it} - \overline{IPR_{-i}})$$

$$+\theta_3 \ln(\frac{K}{PQ})_{it} + \theta_4 \ln(\frac{\dot{Q}}{PQ})_{it} \tag{1.8}$$

where ln IPR_{it} denotes the natural logarithm of the import penetration ratio for *i*'th industry, IPR_{-it} denotes the natural logarithm of the import penetration ratio for the whole sample except industry *i*, ln $\overline{IPR_i}$ denotes the natural logarithm of the mean import penetration ratio for the *i*'th industry, and ln $\overline{IPR_{-i}}$ denotes the natural logarithm of the mean import penetration ratio for the whole sample except industry *i*. Thus θ_1 captures the sensitivity for an individual *i*'th industry import penetration ratio on variations of the mark-up, and θ_2 captures the sensitivity for the whole sample except industry *i* import penetration ratio on variations of the mark-up. Hence Θ_3 captures the sensitivity for an individual *i*'th industry the capital to output ratio on variations of the mark-up, and Θ_4 captures the sensitivity for an individual *i*'th industry sales on variations of the mark-up.

To test for the impact of tariffs on variations of the mark-up, Equation (1.7) can be rewritten with IPR replaced by tariffs as given by:

$$(\mu-1) \;= \Theta_0 + \Theta_1 \ln(Tariff_{it} - \overline{Tariff_i}) \;\; + \Theta_2 \ln(Tariff_{-it} - \overline{Tariff_{-i}})$$

$$+\Theta_3 \ln(\frac{K}{PQ})_{it} + \Theta_4 \ln(\frac{\dot{Q}}{PQ})_{it} \tag{1.9}$$

where $\ln Tariff_{it}$ denotes the natural logarithm of the tariff for an individual *i*'th industry, $\ln Tariff_{-it}$ denotes the natural logarithm of the tariff for the whole sample except industry *i*, ln $\overline{Tariff_i}$ denotes the natural logarithm of the mean tariff for an individual *i*'th industry, and ln $\overline{Tariff_{-i}}$ denotes the natural logarithm of the mean tariff for the whole sample except industry *i*. Equation (1.10) also splits of sources of the sensitivity on variations of the mark-up in manufacturing industry into two components: that due to the impact of deviation of tariffs from the mean value of tariffs on variations of the mark-up for an individual manufacturing industry; and that due to the impact of deviation of tariffs from the mean value of tariffs on variations of the mark-up for the whole sample.

Other variables also included in the regression include the capital to output ratio, $\frac{K}{PQ}$, and the percent change in the industry sales, $\frac{\dot{Q}}{PQ}$. Thus Θ_1 captures the sensitivity for an individual *i*'th industry tariff on variations of the mark-up, and Θ_2 captures the sensitivity for the whole sample except *i* industry tariffs on variations of the mark-up. Hence Θ_3 captures the sensitivity for an individual *i*'th industry the capital to output ratio on variations of the mark-up, and Θ_4 captures the sensitivity for an individual *i*'th industry sales on variations of the mark-up.

The expectation is that the higher the market concentration, the lesser the competition pressure on the domestic markets and as a result mark-up will be higher. By imposing fewer tariffs to the industry with higher market concentration, it will lower the mark-up. Hence, one can expect that the sensitivity for imposing tariff an individual-industry dominance of large firms with market power and concentration on variations of the mark-up is more sensitive than for the whole sample tariffs on variations of the mark-ups in Malaysian manufacturing industry. Liberalised trade such as tariffs can be one of the most effective means of insuring against market power and concentration for individual manufacturing industry dominance of large firms or establishments.

Panel Estimator:

In this study, Equations (1.6), (1.8), and (1.9) will be estimated. The Pooled Mean Group (PMG) estimator provided by Pesaran, Shin and Smith (1999) provides the panel estimator. PMG estimation provides an intermediate case between the dynamic fixed effects (DFE) estimator, which imposes the homogeneity assumption for all parameters except for the fixed effects, and the mean group (MG) estimator proposed by Pesaran and Smith (1995), which allows for heterogeneity of all parameters. PMG exploits the statistical power offered by the panel through long-run homogeneity, while still admitting short-run heterogeneity.

The Hausman test (hereafter *h* test) will be employed on the difference between MG and PMG estimates of long-run coefficients to test for long run heterogeneity. Note that as long as the homogeneity test is passed in the estimations, the report will be only on PMG estimation results.

Finally, it is worth pointing out that a crucial advantage of the estimation approach of this paper is that the dynamics of adjustment in the mark-up are explicitly modelled, while recognising the presence of a long run equilibrium relationship underlying the dynamics. Thus the justification for the use of the PMG estimator is that it is consistent both with the underlying theory of a homogeneous long-run mark-up of price over marginal cost relationship and the possibly heterogeneous dynamic time series nature of the data. As long as sector-homogeneity is assured, the PMG estimator offers efficiency gains over the MG estimator, while granting the possibility of dynamic heterogeneity across sectors unlike the DFE estimator. In the presence of long-run homogeneity, therefore, the use of the PMG estimator is the preference.

The Data, Method of Estimation and Results:

The Data:

The data employed for this paper focus on the five digit manufacturing sectors in Malaysia, over the 1978 through 1999 period. The data employed is a panel data set for purposes of estimation, with observations from 1978 through 1999. The list of sectors included in the panel is as specified in Table 1.1. The nine industries used in this study are defined according to the SIC (Standard Industry Classification). This paper has utilised the data that has been collected and reported to the Department of Statistics (DOS), Malaysia from census of Manufacturing Industries.

Table 1.1: Five digit Manufacturing Industries.

Sectors	Period (T)	Five digit SIC (N)	Total of Panel Observations (NT)	Number of establishments
Food, beverages and Tobacco	22	33	726	38,897
Textiles, Apparel and Leather	22	22	484	33,666
Wood Products	22	70	1540	26,682
Paper Products, Printing and Publishing	22	45	990	11,879
Chemical, and Petroleum, Coal, Rubber and Plastics Products	22	31	682	24,585
Non-Metallic Mineral Products	22	24	528	11,120
Metallic Mineral Products	22	26	572	3,911
Metal Products, Machinery and Equipment	22	74	1628	49,137
Other Manufacturing	22	43	1012	5,222

Note: An Establishment is defined as "An economic unit that engages, under asingle ownership or control, that is, under single legal entity, in one, or predominantly one, kind of economic activity at a single physical location"-Department of Statistics,Malaysia.

Panel Estimation Results for Malaysian Manufacturing Sector:

Roeger's Approach with Intermediate Input:

The results in Table 1.2 and Table 1.3 reports that the Pooled Mean Group Estimation (PMGE) for the manufacturing sectors mark-up given by the specification in Equation (1.10) and Equation (1.11):

$$NSRGO_{it} = \gamma_{0i} + \gamma_{1i}(ROEGER_{it} - \overline{ROEGER_i}) + \varepsilon_{it} \quad (1.10)$$

$$NSRGO_{-it} = \varpi_{0i} + \varpi_{1i}(ROEGER_{-it} - \overline{ROEGER_{-i}}) + \tau_{it} \quad (1.11)$$

where:

$$ROEGER_{it} = \left\{ \tilde{\alpha}_{it}\Delta(l_{it} + w_{it}) + \tilde{\beta}_{it}\,\Delta(m_{it} + p_{it}^{m}) - (\tilde{\alpha}_{it} + \tilde{\beta}_{it})\Delta(k_{it} + r_{it}) \right\}$$

with $\tilde{\alpha}_{it}$ and $\tilde{\beta}_{it}$ denoting the share of labour and intermediate material of sector *i*, $\Delta(l_{it} + w_{it})$ the change in nominal labour cost for sector *i*, $\Delta(k_{it} + r_{it})$ the change in total capital stock for sector *i*, $\Delta(m_{it} + p_{it}^{m})$ the change in total intermediate cost for sector *i*, $ROEGER_{it}$ denotes the natural logarithm of ROEGER for an individual *i*'th industry, $\overline{ROEGER_i}$ denotes the natural logarithm of the mean ROEGER for an individual *i*'th industry, $ROEGER_{-it}$ denotes the natural logarithm of ROEGER for the whole sample except for industry *i*, $\overline{ROEGER_{-i}}$ denotes the natural logarithm of the mean ROEGER for the whole sample except for industry *i*. $NSRGO_{it}$ denotes the Nominal Solow Residual in Gross Output for an individual *i*'th industry. $NSRGO_{-it}$ denotes the Nominal Solow Residual in Gross Output for the whole sample except for industry *i*. γ_{1i} and ϖ_{1i} will measure $(\mu - 1)$ for an individual *i*'th industry and the whole sample except industry *i*, where $\mu = \frac{P}{MC}$ is the mark-up.

The results in Table 1.2 indicate that a statistically significant variation in the mark-up is present for an individual *i*'th industry when estimated an industry-by-industry basis over the sample period.

The estimation using Roeger's approach found that the manufacturing sector's mark-up is in line with or close to the average manufacturing sector mark-up obtained in the original Roeger (1995) estimation for the U.S.A, Oliviera-Martins et al. (1996) for Australia, by Oliviera-Martins et al. (1999) for France, Germany, Japan, and the United Kingdom. However, the average manufacturing sector mark-up in Malaysia is extremely below the average manufacturing sector mark-up obtained by Fedderke, (2003) for South Africa (47 % in Malaysia as opposed to a 45% for the U.S.A., 24% for Australia, 52% for France, 52% for Germany, 43% for Japan, 31% for the United Kingdom, and 79% for South Africa). Whilst the results tend to vary widely for different countries, the estimate by Oliviera-Martins et al. (1999) provides support for the results obtained in this paper.

Thus the mark-up in the Malaysian manufacturing sector appear to be higher compared to the mark-up in the U.S.A., Australia, Japan, and the United Kingdom manufacturing sectors, despite the fact that manufacturing sectors, in producing tradable goods, might be expected to be subject to foreign competitive pressure. Some manufacturing sectors such as those for Metallic Mineral Products have achieved higher mark-up due to the government's policy for protecting or promoting specific classes of industry.

Consequently, the results presented in this paper are more in line and intuitively plausible with estimates of profit rates typically reported in the manufacturing sector such as the results reported by Hall (1990) for the U.S.A. manufacturing sector in which many of Hall's significant mark-up ratio are close to, or over, 100 per cent. Roeger (1995) finds that estimates of mark-up ratio for the U.S.A. manufacturing sectors range from 15 to 175 per cent. However, the mark-up in Malaysian manufacturing sectors in this paper are still considered plausible and in line with other countries such as the U.S.A. and Japan.

Table 1.2 also shows that the speed of adjustment towards the long-run equilibrium as indicated by *φ-parameter* is rapid and the *φ-parameter* confirms the presence of a long run equilibrium relationship. The Hausman test accepts the inference of a long run homogeneity mark-up for the *i*'th manufacturing sector.

Table 1.2: PMG estimator results for an individual *i*'th industry mark-up

Industry	$\gamma_1 = \mu - 1$	$\phi(ECM)$	h-test
Food, Beverages and Tobacco	0.45^{**} (0.03)	-1.21^{*}(0.07)	0.04(0.92)
Textiles, Apparel and Leather	0.46^{**}(0.02)	-1.17^{*}(0.06)	1.14(0.84)
Wood Products	0.47^{**} (0.03)	-1.23^{*}(0.07)	0.12(0.73)
Paper Product, Printing and Publishing	0.49^{**}(0.02)	-1.19^{**}(0.04)	0.07(0.79)
Chemical, and Petroleum, Coal, Rubber and Plastics Products	0.47^{**}(0.03)	-1.21^{*}(0.07)	0.05(0.95)
Non-Metallic Mineral Products	0.49^{**} (0.02)	-1.19^{**}(0.05)	0.08(0.78)
Metallic Mineral Product	0.50^{**} (0.02)	-1.18^{**}(0.04)	0.48(0.49)
Metal Product, Machinery and Equipment	0.44^{**}(0.03)	-1.16^{*}(0.06)	0.02(0.89)
Other Manufacturing	0.49^{**}(0.02)	-1.20^{**}(0.05)	0.30(0.58)

(** denotes Significance at 5% level, * denotes Significance at 10% level, ECM= Error Correction Measurement)

The results in Table 1.3 show that a statistically significant variation in the mark-up is present for the whole sample except for industry *i*. The table also reveals that the speed of adjustment towards the long-run equilibrium as indicated by *φ -parameter* is rapid and the *φ -parameter* confirms the presence of a long run equilibrium relationship. The Hausman test accepts the inference of a long run homogeneity mark-up for the whole sample except for industry *i*.

Table 1.3: PMG estimator results for the whole sample except for industry *i* mark-up

Industry	$\varpi_1 = \mu - 1$	$\phi(ECM)$	h-test
Food, Beverages and Tobacco	0.40^{**}(0.03)	-1.10^{*}(0.08)	0.48(0.49)
Textiles, Apparel and Leather	0.37^{**}(0.03)	-1.43^{**}(0.02)	4.85(0.08)
Wood Products	0.41^{**}(0.02)	-1.14^{**}(0.04)	1.19(0.25)
Paper Product, Printing and Publishing	0.45^{**}(0.02)	-1.15^{*}(0.06)	0.87(0.35)
Chemical, and Petroleum, Coal, Rubber and Plastics Products	0.36^{**}(0.03)	-1.09^{*}(0.08)	0.49(0.48)
Non-Metallic Mineral Products	0.41^{**}(0.03)	-1.18^{*}(0.07)	0.44(0.51)
Metallic Mineral Product	0.38^{**}(0.03)	-1.45^{**}(0.02)	7.06(0.15)
Metal Product, Machinery and Equipment	0.31^{**}(0.02)	-1.13^{**}(0.04)	1.73(0.19)
Other Manufacturing	0.45^{**}(0.02)	-1.16^{*}(0.06)	0.89(0.35)

(** denotes Significance at 5% level, * denotes Significance at 10% level, ECM= Error Correction Measurement)

Hakura's Approach with Intermediate Inputs:

Table 1.4 reports the PMGE estimation for the specification using Equation 1.8. In this table, the column showing the Hausman tests (h-test) consistently allow for the inference of homogeneity for the manufacturing sector. Furthermore, the *φ -parameter* in the *φ(ECM)* column confirm the presence of rapid adjustment towards long-run equilibrium for all variables. The θ_1 and θ_2 columns show that increased import penetration ratio seems to have a significant negative impact on the variations of the mark-ups (since θ_1 and $\theta_1 < 0$).

Intuitively, an increase in import penetration ratio means that domestic firms are facing more competition because foreign firms have a bigger presence in the domestic market. Thus one can think of the increase in foreign competition in the domestic market as an increase in competitive pressure for the industry which will lower the mark-up of price over marginal cost. Furthermore, the implication of imports means that domestic firms will integrate into world market so has the effect of increasing price competition and hence lowering the size of the domestic mark-up of price over marginal cost.

Table 1.5 reports the PMGE estimation for the specification using Equation 1.9. In this table the Θ_1 and Θ_2 columns indicates that increasing tariffs seem to have a significant positive impact on the variations of the mark-up (since Θ_1 and $\Theta_2 > 0$). A 1% fall in tariffs for an individual *i*'th industry will lower mark-ups by 0.37% for Metallic Mineral Products, 0.46% for Chemical, Petroleum, Coal, Rubber and Plastics Products, 0.54% for Non-Metallic Mineral Products, 0.55% for Textiles, Apparel and Leather, 0.65% for Wood Products, 0.68% for Food, Beverages and Tobacco, 0.69% for Metal Product, Machinery and Equipment, 0.82% for Paper Products, Printing and Publishing, and 0.84% for Other Manufacturing.

The Hausman test again allow for the inference of homogeneity for the manufacturing industries, and the *φ-parameter* confirms the presence of a long run equilibrium relationship between all variables.

Table 1.4: PMG estimator results for the import penetration ratios, and Growth of Industry sales

Industry	θ_1	θ_2	θ_3	θ_4	$\phi(ECM)$	h-test
Food, beverages and Tobacco	-0.54**(0.02)	-0.10**(0.04)	0.08**(0.04)	0.53**(0.02)	-1.27*(0.06)	13.93(2.43)
Textiles, Apparel and Leather	-0.52**(0.02)	-0.05**(0.04)	0.37**(0.05)	0.51**(0.02)	-1.33*(0.08)	6.00(0.20)
Wood Products	-0.58**(0.01)	-0.16**(0.03)	0.15**(0.03)	0.57**(0.01)	-1.18**(0.04)	8.83(0.07)
Paper Product, Printing and Publishing	-0.57**(0.02)	-0.15**(0.03)	0.13**(0.03)	0.56**(0.02)	-1.20**(0.05)	4.15(1.79)
Chemical, and Petroleum, Coal, Rubber and Plastics Products	-0.53**(0.02)	-0.07**(0.04)	0.05**(0.04)	0.52**(0.02)	-1.30*(0.07)	10.95(2.65)
Non-Metallic Mineral Products	-0.52**(0.04)	-0.05**(0.04)	0.03**(0.04)	0.51**(0.02)	-1.34*(0.08)	5.50(0.24)
Metallic Mineral Product	-0.52*(0.02)	-0.04**(0.04)	0.03**(0.04)	0.51**(0.02)	-1.35*(0.08)	7.80(0.10)
Metal Product, Machinery and Equipment	0.61**(0.01)	-0.23**(0.02)	0.22**(0.03)	0.60**(0.01)	-1.15**(0.03)	9.55(0.05)
Other Manufacturing	-0.57**(0.02)	-0.14**(0.03)	0.13**(0.03)	0.56**(0.02)	-1.20**(0.05)	15.64(1.61)

(** denotes Significance at 5% level, * denotes Significance at 10% level, ECM=Error Correction Measurement)

Table 1.5: PMG estimator results for the tariffs, , and Growth of Industry Sales

Industry	Θ_1	Θ_2	Θ_3	Θ_3	$\phi(ECM)$	h-test
Food, Beverages and Tobacco	0.68*(0.09)	0.34*(0.09)	0.45*(0.09)	0.85*(0.09)	0.12*(0.09)	3.22(0.52)
Textiles, Apparel and Leather	0.55*(0.08)	0.28*(0.09)	0.45*(0.09)	0.15*(0.09)	0.03*(0.09)	1.66(0.80)
Wood Products	0.65*(0.07)	0.42*(0.09)	0.46*(0.08)	0.93*(0.07)	-1.63**(0.04)	6.63(0.16)
Paper Product, Printing and Publishing	0.82*(0.09)	0.39*(0.09)	0.48*(0.09)	0.85*(0.09)	-1.58**(0.05)	6.21(0.18)
Chemical, and Petroleum, Coal, Rubber and Plastics Products	0.46*(0.09)	0.42*(0.09)	0.44*(0.09)	0.99*(0.09)	-1.57**(0.03)	2.97(0.56)
Non-Metallic Mineral Products	0.54*(0.08)	0.26*(0.09)	0.48*(0.09)	0.12*(0.09)	-1.53**(0.03)	1.88(0.76)
Metallic Mineral Product	0.37*(0.09)	0.34*(0.09)	0.49*(0.09)	0.03*(0.09)	-1.62**(0.04)	2.42(0.66)
Metal Product, Machinery and Equipment	0.69*(0.08)	0.59*(0.09)	0.49*(0.08)	0.04*(0.08)	-1.59**(0.04)	6.18(0.19)
Other Manufacturing	0.84*(0.09)	0.37*(0.09)	0.50*(0.09)	0.84*(0.09)	-1.66**(0.05)	6.70(0.15)

(**denotes Significance at 5% level, * denotes Significance at 10% level, ECM= Error Correction Measurement).

Conclusion:

This paper investigates the impact of international trade and tariffs on the strength of the mark-up of price over marginal cost in the Malaysian manufacturing industries over the sample period of 1978 to 1999. This period is particularly interesting because it captures the effects of many actions in favour of international trade liberalisation on competition.

To estimate the mark-ups, this paper uses an extension of the approach put forward by Roeger (1995) where price margins are defined over gross output instead of value added. The main conclusions are summarised below.

The results are statistically robust, and the variations of the mark-ups estimated for Malaysian manufacturing industries in the 1978 to 1999 period are in the range of 44 per cent to 50 per cent for an individual *i*'th manufacturing industry and in the range of 31 per cent to 45 per cent for the whole sample except manufacturing industry *i*. This indicates mark-ups are statistically significant and greater than one, implying the existence of market power in Malaysian manufacturing industries. These results are also plausible and more in line with other developed countries such as the U.S.A. and Japan.

This paper also finds that increased import penetration ratios serve to decrease industry mark-ups in the Malaysian manufacturing sector. This implication is that integrating the Malaysian manufacturing sector into the world markets has the effect of increasing price competition, and hence lowering the size of the domestic mark-up. Furthermore, the overall effect of import penetration ratios on the mark-ups will lead to an increase price competition, thus decreasing the size of the mark-ups in the Malaysian manufacturing sector.

Finally, the findings also suggest that an increase in tariffs for the manufacturing industries in Malaysia seems to have a significant positive impact on the mark-up. Increasing or decreasing tariffs increases or decreases the mark-ups for domestic manufacturing industries.

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