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Trade Liberalization and Manufacturing Growth in Malaysia: A Cointegration Analysis

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ABSTRACT

This study examines the impact of trade liberalization in the manufacturing sector in Malaysia. The theoretical framework for this study employs the Lucas model of "human capital model of endogenous model". This study also uses the cointegration test and error correction techniques to measure the impact of trade liberalization on Malaysian manufacturing sector during the period 1963 - 2003. The empirical results of cointegration test suggest that there exists a long run relationship between manufacturing output and its determinants of trade liberalization, labour, capital and education level. This study uses the error correction model (ECM) to determine the short-run dynamics around the equilibrium relationship and suggest that labour and trade liberalization have emerged as significant determinants for the manufacturing output in Malaysia.

Keywords: *Cointegration test, error correction techniques, economic growth*

Introduction

For the past few decades the relationship between trade liberalization and economic growth in developing countries has been a major issue of debate among the development economists. The impact of trade liberalization on the economic growth provides mixed results. Studies have found evidence that trade liberalization would increase the economic growth (Balassa, 1971 and

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1982; Bhagwati, 1978; Krueger, 1978; Romer, 1989; Edwards, 1992; Harrison, 1995; Savvides, 1995; Liu et al., 1997;). They argued that trade liberalization through export expansion, productivity growth and exposure to foreign competition will enhance the economic growth.

On the other hand, there are studies which found little evidence to support that trade liberalization will enhance the economic growth (Rodriguez & Rodrik 1999; Lewis et al. 2002 and Baldwin, 2003). They argued that trade liberalization through lower tariffs and non-trade restrictions would not guarantee economic growth. According to them the combination of lower trade restrictions with non-discriminatory exchange rate system, efficient monetary and fiscal policies as well as corrupt-free policies are vital to enhance economic growth.

Problem Statement

Trade liberalization is a global phenomenon. The implementation of World Trade Organization (WTO) and ASEAN Free Trade Agreement (AFTA) will promote trade liberalization in order to increase exports and productivity growth through exposure to foreign competition. This will give a significant impact on the manufacturing sector for overall developing countries like Malaysia.

Over the past two decades, the trends of manufacturing sector had gradually changed. To compete among the ASEAN countries in the manufacturing sector, the Malaysian government had implemented various instruments such as tariff policy, tax policy, incentives to firms, government policies, and policies to attract foreign direct investment. However, these policies do not promise Malaysia's capacity to compete compared with other ASEAN countries.

Trade liberalization may increase Malaysia's competitiveness in the manufacturing sector. However, trade liberalization may also reduce the competitiveness. Therefore, the impact of trade liberalization on Malaysian manufacturing sector is not fully explored.

Objective of the Study

The primary objective of this study is to empirically analyze the impact of trade liberalization on the Malaysian manufacturing sector by using the framework of endogenous growth model. The specific objective of this study is to examine the relationship between manufacturing output with trade liberalization, labour, capital and education. Furthermore, it is aimed at determining the short run and long run relationship between manufacturing output and the trade liberalization.

Empirical Framework

An aggregate production function framework developed by Lucas (1988) was used in this study to examine the relationship between trade liberalization and manufacturing growth for Malaysia. The following framework is as follows:

$$Y = f(K, L, EDU, TL) \quad (1)$$

Where Y, K, L, EDU and TL is the manufacturing output, capital, labour, education and index of trade liberalization.

The variable, EDU is used as a proxy for effective workforce in manufacturing sector according to the study by Mankiw, Romer and Weil (1992). The equation (1) is specified in log-linear form with an error term, u and can be written as:

$$LOUT_t = \alpha_0 + \alpha_1 LLAB_t + \alpha_2 LCAP_t + \alpha_3 LTL_t + \alpha_4 LEDU_t + \mu_t \quad (2)$$

The elasticity of each parameter is expected to be positive (α_1, α_2, α_3, α_4, > 0). If the time series variables of LOUT, LLAB, LCAP, LTL and LEDU have unit roots (after tested for ADF and PP test), the equation (2) need to take the first difference of the variables and rewrite as shown below:

$$\Delta LOUT_t = \alpha_0 + \alpha_1 \Delta LLAB_t + \alpha_2 \Delta LCAP_t + \alpha_3 \Delta LTL_t + \alpha_4 \Delta LEDU_t + \mu_t \quad (3)$$

The long run estimation cannot be obtained from the Equation (2). This is due to the procedure of differencing which results in a loss of valuable "long-run information" in the data (Maddala, 1992). Therefore, the error-correction term (ECM) is introduced to overcome the problem of long-run estimation. The specification of a general ECM model is written as:

$$\Delta LOUT = \beta_0 + \sum_{i=0}^{n} \beta_{1i} \Delta LOUT_{t-1} + \sum_{i=0}^{n} \beta_{1i} \Delta LLAB_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta LCAP_{t-1} + \sum_{i=0}^{n} \beta_{3i} \Delta LTL_{t-1} + \sum_{i=0}^{n} \beta_{4} \Delta LEDU_{t-1} + \beta_5 EC_{t-1} + \varepsilon_t$$

where EC_{t-1} is the error-correction term lagged one period.

Data Analysis

This study uses annual data for the period from 1963 to 2003. There are five variables used in the analysis such as manufacturing output (OUT), labour (LAB), capital (CAP), openness (TL) and education (EDU). We used the modern econometric program such as "E-views" to estimate the regression.

Findings and Conclusion

Unit Root Test

The unit root tests for stationarity were conducted at the level and first differences of all the five variables (OUT, CAP, LAB, TL and EDU) using Augmented Dickey Fuller (ADF) and Philip-Perron (PP) tests.

The results of the unit root test (for stationary) using the ADF and PP are summarized in Table 1.

Table 1: Unit Root Test Results with ADF and PP Test

Variable	Levels/First Differences	ADF Test		Philip-Perron Test		Conclusion
		Without Trend	With Trend	Without Trend	With Trend	
LOUT	Level	-1.34	-1.93	-0.86	-2.01	I(1)
	First Difference	-7.77***	-7.91***	-7.71***	-7.92***	I(0)
LLAB	Level	-1.45	-2.81	-1.52	1.52	I(1)
	First Difference	-7.69***	-8.40***	-7.47***	-8.37***	I(0)
LCAP	Level	-1.44	-2.71	-0.78	-1.52	I(1)
	First Difference	-3.17**	-3.74**	-3.97***	-3.89***	I(0)
LTL	Level	0.09	-3.55*	0.37	-0.47	I(1)
	First Difference	-8.51***	-8.46***	-10.82***	-11.47***	I(0)
LEDU	Level	-3.99*	-3.08	-4.66***	-2.97	I(1)
	First Difference	-4.50***	-5.33***	-4.45***	-5.33***	I(0)

Note: *, **, *** denotes the rejection of the null hypothesis of unit roots at 10%, 5% and 1% significance levels respectively.

The results from the ADF tests indicate that all the time series data are not significant at all levels since the computed value is less than the critical value. Therefore, the null hypothesis cannot be rejected at 5% of confidence level and concluded that unit root problems exist at level with trends included and also when trends are excluded in the equation.

However, the first differences of all variables are stationary under the ADF with trends included and also when trends are excluded and therefore concluded that each of the data series is stationary after first differencing at the 1% and 5% significance level. Since, these variables are integrated of order 1, the first differenced data are used in the model to run the ordinary least squared method to overcome spurious regression.

The Philips-Perron (PP) unit root tests also confirms of the existence of non- stationarity for all variables at level. The results from the PP tests also indicate that all the time series data are not significant at all levels and concluded that unit root problems exist at level with trends included and also when trends are excluded in the equation.

Cointegration Test Results

We need to specify the order of lags (p) of Vector Autoregression Model (VAR) before carrying out the cointegration test. According to Pesaran and Pesaran (1997), it is optimal to select order of lags for VAR as 1 if the sample size is small. Since the sample size for this study is only 41 observation, it is best to employ $\rho = 1$.

In Table 2, the maximal eigenvalue statistics is 36.26 that is above than the 95% critical value of 33.46. Thus, the results reject the null hypothesis, r = 0, and it suggests of one cointegrating vector of r = 1. Therefore, we conclude that there is only one cointegrating relation among the variables. The maximal eigenvalue test result is consistent with the trace tests.

Table 2: Johansen – Juselius Maximum Likelihood Cointegration Tests

NULL	ALTERNATIVE	STATISTIC	95% CRITICAL VALUE
	MAXIMAL EIGENVALUE TEST		
r = 0	r = 1	36.26962	33.46
r ? 1	r = 2	18.47613	27.07
r ? 2	r = 3	17.40628	20.97
r ? 3	r = 4	7.431368	14.07
r ? 4	r = 5	1.464377	3.76
	TRACE TEST		
r = 0	r ? 1	81.04778	68.52
r ? 1	r ? 2	44.77816	47.21
r ? 2	r ? 3	26.30202	29.68
r ? 3	r ? 4	8.895744	15.41
r ? 4	r ? 5	1.464377	3.76

Notes: The test was performed using E-Views version 4 and r stands for the number of cointegrating vectors.

Table 3 below provides the estimates of long-run cointegration vectors.

Table 3: Estimates of Long-Run Cointegrating Vectors

LOUT	LCAP	LEDU	LTL	LLAB
1.000000	0.136656	-0.970635	-0.644038	-0.928683
	(0.09982)	(0.17827)	(0.09538)	(0.09613)

Note: Figures in parentheses indicate standard errors.

The long-run equilibrium relations for Malaysian manufacturing sector can be written as below:

$$LOUT = -0.64LTL - 0.97LEDU + 0.13LCAP - 0.92LLAB$$

This may be due to the negative relationship between education and manufacturing output where the proxy used for education is the number of enrolment for secondary school.

Estimation of an Error-Correction Model (ECM)

This section will explain the results estimated from an error-correction model (ECM). According to Hendry's (1995) general to specific modeling approach, the initial step is to set the value of lags of the explanatory variables, and then delete the most insignificant differenced variables. We start the estimates by using with the 4 lags and tried various values of lags. After a few estimations, the model that fits the data best is presented in the Table 4.

The final results of the ECM as presented in Table 4 had passed the diagnostic tests. The Jarque-Bera statistics is used to test the normality test, which confirms the normality of residual where it fails to reject null hypothesis at 5% of significant level. Furthermore, test on first-order serial correlation was conducted with the Durbin-Watson statistics. The Durbin-Watson statistic is 1.85 as in Table 4, therefore there is no serial correlation at the 95% confidence level. The non-existence of serial correlation confirms with the Breusch-Godfrey's Lagrange Multiplier (LM) test results where it rejects the existence of serial correlation and therefore accepts the null hypothesis (no correlation exists between variables) when the p-value (0.51) is more than 0.05.

From Table 4, the ECM is estimated at -0.158, which is between 0 and –1 and is statistically significant at the 10% significance level. This implies that, the ECM has the correct sign and suggests a moderate speed of convergence to equilibrium. The statistical significance of the ECM confirms the presence of long- run equilibrium between the manufacturing output and the regressors (capital, labour and trade liberalization).

Table 4: Estimated Error Correction Model

Variable	Coefficient	t- statistics
Constant	0.194614	3.96500**
ΔLMANU(-1)	-0.460871	-1.72060
ΔLMANU(-2)	-0.656872	-2.20638
ΔLEDU(-1)	-0.596020	-1.19748
ΔLEDU(-2)	0.412542	0.90413
ΔLTL(-1)	0.131651	5.05068**
ΔLTL(-2)	0.410916	3.8192
ΔLCAP(-1)	-0.130897	-0.46158
ΔLCAP(-2)	0.151184	0.50640
ΔLLAB(-1)	0.427984	1.83824***
ΔLLAB(-2)	0.579962	2.70171
ECM_{t-1}	-0.158764	-2.29127***
R-squared = 0.735		
Adj R-squared = 0.623		
Normality Test = 2.73 (0.25)		
Durbin-Watson = 1.85		
Serial Correlation LM = 2.41(0.51)		
RESET = 4.02 (0.26)		

*, **, *** significant at the 1%, 5% and 10% significance level.

Conclusion

The empirical results of cointegration test (Johansen-Juselieus test) found one cointegrating vector and thus, exists a long run relationship between manufacturing output and regressors. The Johansen-Juselius procedures for cointegration based on the VAR model have been used to find long and short run estimates of the relationship.

This study uses the error correction model (ECM) to determine the short-run dynamics around the equilibrium relationship. The study shows that labour and trade liberalization have emerged as significant determinants for the manufacturing output in Malaysia. However, education and capital does not provide significant results. Diagnostic test statistics showed no evidence of serial correlation, specification error and heteroscedasticity during the study period from 1963 to 2003. The stability test, CUSUM and CUSUM of Square test, also confirms of the stability of data over the sample period.

Contributions and Future Direction of the Study

The results of this research provide direction and insights to those who see potential advantages and future gains on the level of Malaysian manufacturing sectors. The results of this study suggest the importance for developing countries to embark on trade liberalization policies to enhance economic growth as well as standard of living.

Future research should also extend the study to trade liberalization and manufacturing sector using more data for variable or better proxies. The time period for future study should also extend to more than 40 observations consisting of annual series or quarterly data in order to obtain more precise result. Better proxy for variable such as LAB (labour) should use the cost of labour instead of the number of people employed in manufacturing sector. This study also can be extended by using the capital/labour ratio variable replacing both the variable capital and labour.

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