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**A special issue devoted to the Issues in Economics**

Guest Editor:
**Saifuzzaman Ibrahim**

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## Editorial Statement

Pertanika is the official journal of Universiti Putra Malaysia. The abbreviation for Pertanika Journal of Social Sciences & Humanities is *Pertanika J. Soc. Sci. Hum.*

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## *Pertanika* Editorial Office

Office of the Deputy Vice Chancellor (R&I), 1st Floor, IDEA Tower II, UPM-MTDC Technology Centre
Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

Tel: +603 8947 1622

E-mail: nayan@upm.my; journal.officer@gmail.com

URL: http://www.pertanika.upm.edu.my/editorial_board.htm

## Publisher

The UPM Press
Universiti Putra Malaysia
43400 UPM, Serdang, Selangor, Malaysia
Tel: +603 8946 8855, 8946 8854 • Fax: +603 8941 6172
penerbit@putra.upm.edu.my

URL : http://penerbit.upm.edu.my

# Preface

Economics is a pillar subject of social science as it is at heart of all decision making. Economics is a dynamic science. With the development of human civilization this science has evolved to include within its ambit a vast range of topics concerned with human life. A society cannot provide all its members everything they want. The society has to make a choice of wants to be satisfied in order of priority. Making such a choice is a highly difficult task. Here the science of economics comes to our rescue. Economics teaches us the ways and means to allocate scarce resources among different competing human wants so as to maximize the total satisfaction of our society.

This Special Issue of the Pertanika Journal of Social Sciences and Humanities (JSSH), entitled *Issues in Economics*, comprises of 14 selected manuscripts contributed by the academic staffs and students of Department of Economics, Universiti Putra Malaysia. All manuscripts have been reviewed by 2 reviewers each. This Special Issue covers various fields of economic studies; financial economics, international trade, development economics, labor economics and environmental economics. This special issue highlights some of the field of studies which may be of interest not only to the experts of the field but also to those new to the field of Economics.

This issue is a concerted effort by staff of the Department of Economics Universiti Putra Malaysia and the Pertanika team. We would like to thank the authors and all parties for their contribution and tremendous support to the realization of this issue. A special thanks to Dr Nayan Kanwal, the Chief Executive Editor, and his dedicated team for their invaluable assistance, and the reviewers for ensuring the quality that would bring about significant contribution to the field of economics.

We hope that this Special Issue of the Pertanika Journal of Social Sciences and Humanities (JSSH), entitled Issues in Economics will provide useful sources for researchers, practitioners and students in their pursuit of knowledge.

Saifuzzaman Ibrahim

**Guest Editor**

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# Consumer Willingness to Pay for Domestic Water Services in Kelantan

**Mahirah Kamaludin[1]*, Alias Radam[2], Khalid Abdul Rahim[1] and Mohd Rusli Yacob[2]**

[1]*Institute of Agricultural and Food Policy Studies, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

[2]*Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

The importance of water to life cannot be denied as it is the most precious substance among all our natural resources. Rapid population growth and urbanization have increased the demand for water which is expected to undergo substantial changes in the future. Kelantan faces many problems in the water sector. The state lacks financial resources to improve its water supply coverage. In fact, there are numerous functions which are supported by the price of water itself such as the costs of water treatment, water storage, and delivery to its customers. Lowwater rates may lead to heavy losses to the water provider who is expected to provide various services to the community, including the delivery of clean and adequate water supply. This study utilizes Contingent Valuation Method (CVM) to derive consumers' willingness to pay (WTP) for improved water services, and based on the WTP value obtained, the aggregate monetary benefits of improving water services for the consumers of Kelantan are estimated. Logit model is used to analyze primary data gathered during the survey. The estimated mean WTP for improved domestic water services is RM0.5979 applicable on the first 35m$^3$ (i.e. 8.7% above the current price). The findings offer policy recommendations to address the numerous, serious water issues faced by the state. The appropriate water tariff may help the water provider to overcome the problems /challenges in providing better services in the state.

*Keywords:* Contingent Valuation Method, willingness to pay, water prices, Logit model, water demand

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*E-mail address*:
mahirahkamaludin@gmail.com (Mahirah Kamaludin)
* Corresponding author

## INTRODUCTION

Water is a replenishable, but also depletable resource. Water is not only a resource of economic value, it is also a basic component of human's natural environment, making

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it a necessity as well. About 70% of the earth's surface is covered by water which includes rivers, lakes, oceans and streams[1]. Consumption of water varies tremendously throughout the year especially for household purposes. There has always been a shortfall in water supply following increases in water demand every year. So new sources and alternatives must be found. The uses of water vary from top to toe such as for bathing, drinking, heating, cooling, cleansing and many more.

Nowadays, the water supply fails to meet demand as water suppliers are facing problems with non-revenue water (NRW), water quality, water services and water scarcity in some places. Furthermore, rapid economic and social developments are placing heavier demands on water resources. Sometimes, it is difficult for water companies to cater for the demand of large populations especially when they lack capital to manage efficiently as maintenance is too costly. Low water tariff puts too much pressure on the water industry as. it tends to create a wrong perception among consumers that water is cheap and this often leads to excessive water usage.

Most environmental goods, such as clean air and water, landscape, diverse flora and fauna, scenic towns and many more are not traded in the markets. These natural resources are precious and have significant functions in the ecosystems. It is difficult to value these environmental goods since they are unpriced, and the consumption of these goods has the characteristics of 'public goods'. Hence, an accurate economic valuation of natural resources, particularly non-marketable goods is needed. Non-market goods may include both direct and indirect values (Kahn, 2005). Their economic value is defined as the aggregate willingness to pay (WTP) or in other words, the amount that people are willing to pay for environmental goods since they are not subject to market prices.

In this study, if consumers are willing to pay a certain amount of money for the consumption of water, it signifies that water service is valued. Thus, it is possible to generate more income to maintain the operation and maintenance (O&M) costs, and even support the improved water services program . This study addresses the following objectives, namely to identify the factors that influence consumers' WTP for improved domestic water services in Kelantan, and determine appropriate water pricing in the state.

We have estimated consumers' willingness to pay (WTP) for improved domestic water services by using the discrete choice of Contingent Valuation Method (CVM). Previous studies have used WTP for water services to decide on the level of water prices. Sarala Devi (2009) points out that income is one of the factors that determines consumers' WTP. Public demand for water quality is needed to determine efficient water pricing. It seems that consumers are willing to pay a higher price if they derive a high social value from the water service. Many previous studies such as Vasquez *et al.* (2009), Farolfi,

[1]Water Science for Schools, 2011.

Mabugu and Ntshingila (2007), and Larson, Lew and Onozaka (2001) have used WTP approach toimprove water supply services in the United States. WTP studies revealed that if something is worth having, then it is worth paying for. If consumers get what they want, they are willing to give up some money for a good value of water supply, and this ultimately, means that they believe it is value for money. CVM has been extensively used in many previous WTP studies in the water sector such as Raje, Dhobe and Deshpande, (2002), (-McPhail, 1993), Shultz and Soliz (2007), and many more. A good CVM is intended to be realistic for respondents to capture the "hypothetical" choice seriously (Whittington, 1998). The CVM obtains values which are contingent on the level of information by the respondents, and the extent of information provided by the survey (Wang *et al.,* 2009). The vital part of CVM is when it creates a realistic contingent valuation scenario which precisely states the options of water supply price that will subsequently reveal the levels of prices the water supplier can charge to provide the service.

## BACKGROUND OF THE STUDY AREA

The investigation on consumer WTP for domestic water services featured in this study focuses on the state of Kelantan, a relatively less developed state which is located on the East Coast of Malaysia. The state has high levels of poverty and a large population that is still living in rural areas. The sole provider of water services in Kelantan is Air Kelantan Sdn. Bhd. (AKSB). Kelantan has most of its population concentrated in one-third of the state area with the availability of water in its alluvial subsurface terrain (Zamri, 2009). It is estimated that about 80% of the population live in the northern region of the low alluvial plain and the remaining 20% live in the southern parts on higher ground. Kelantan's water sources are 60% from surface water and 40% from groundwater[2]. The districts of Kota Bharu, Tumpat and Bachok receive their water source from groundwater while the other districts use surface water. Currently, Kelantan is the largest groundwater operator in Malaysia.

Issues such as interruptions in services and other failures in the water industry are controversial in Kelantan. There are many water industry-related problems in Kelantan according to the 9th Malaysian Plan which indicates low water supply coverage, , production capacity, and quantity of water supply[3]. In fact, it is the state with the highest NRW rate in the country. For example, the state experienced a high rate of NRW (36%) in 2010 (National Economic Planning Unit, 2006). Unfortunately,Kelantan may not have adequate capital and financial resources to enhance water supply coverageIn addition, old and rusty water pipelines need to be replaced due to their worsening conditions. Consumer complaints include dirty water, coloured water, unreliable of water services and frequent unscheduled of water disturbance which disrupt their household

[2]See Water Malaysia Magazine (2009) for further discussions.

[3]Asian Development Bank and International Water Association, 2003.

activities (Association of Water and Energy Research Malaysia, 2011).

In the water industry, NRW is a major problem since it leads to water loss. The Ninth Malaysian Plan (2006) (states that the government has made a plan to reduce the rate of NRW year by year as it recognized the current situation to be very wasteful to the country. In Kelantan, the NRW rate was the highest in the country (36%) in 2010 which is why reducing the NRW has been the main focus for AKSB. However, reducing NRW leads to other problems since changing old and rusty pipes involves huge capital outlays. Through the low tariff and water price paid by consumers, water companies cannot afford to carry out the NRW reduction works, such as pipe replacement, leak repairs, leakage detection, and many more. Still, the reduction of NRW is pivotal in the efforts to improve water supply economically as water losses will be reduced in the distribution system.

Currently, since water tariffs are extremely low, water companies are unable to generate enough revenue to cover the full cost of capital investment, operation and maintenance. The present water rate is RM0.55 which is applied on the first 35m$^3$. Therefore, it is not surprising that the water company is unable to maintain and sustain its operations. In addition, the low price of water sometimes tends to lead to water wastage among consumers. In other words, inexpensive water rates and its ample supply often lead to consumers taking water supply for granted.

## METHODOLOGY

A single bounded CVM was designed to elicit consumer's WTP in this study. The selection of CVM in this study is due to its reliability in valuing non-market goods based in previous studies. This study also includes a hypothetical change in the water services in Kelantan from its current condition to improved conditions in which consumers believe it is at the acceptable standard for their daily use. In a conventional CVM, only a price or bid is offered to respondents. The method involves asking respondents a question such as *"Would you be willing to pay $X for an improvement in water services?"* When a hypothetical price is revealed, the respondents are required to decide whether to "take it" or "leave it".

A pre-test survey was conducted in selected areas in Kelantan with 25 respondents. Information was collected through pre-testing by presenting a realistic situation in order to have more reliable data and information for the valuation questions in the final survey. In the final questionnaire, the first section introduces information on water service conditions in Kelantan in order to give a clear picture to the respondents. The second section includes valuation and WTP for the program with a hypothetical market. The third section explores respondents' perceptions in water uses followed by the final section which covers the demographic profile of respondents.

Based on the results of the pre-test survey, 5 groups of bidding price were designated in the range of RM 0.61 (10%

increase from current price), RM 0.63 (15% increase from current price), RM 0.66 (20% increase from current price), RM0.69 (25% increase from current price), and RM0.72 (30% increase from current price). Stratified random sampling was assigned between urban and rural areas in order to avoid bias in sampling.

*Model Specifications*

Since improvement in water services is considered as an economic good, WTP is expected to be non-negative random variable (Larson *et al.,* 2001; Hanemann, 1989). $WTP_i$ as a dependent (latent) variable is consumers' willingness to pay for a change in water services and it can be expressed in a linear regression model as.

$$WTP_i = x_i \beta + e_i \quad (1)$$

The $x_i$ stands for an independent variable which indicates consumer income, bid price, household size, age, education, etc. which are observable. $\beta$ is a parameter to be estimated with numerical values. Gujarati (1999) points out that $e$ represents the random error term which signifies all the forces which affect WTP but are not clearly introduced in the model. In this study, $i$ represents an individual who responds to any water services improvement.

When a respondent is asked to pay a specific amount of money or price bid due to an improvement in domestic water services, there is a probability to obtain "*yes*" or "*no*" answers. Thus, it can be presented by formulating a model which follows Hanemann *et al.* (1991) as:

$$\begin{aligned} &\text{Prob } \{ \text{Yes} \} \\ &= \text{Prob } \{ \text{WTP} > \text{BID} \} \\ &= 1 - G(\text{BID}; \theta) \end{aligned}$$

$$\begin{aligned} &\text{Prob } \{ \text{No} \} \\ &= \text{Prob } \{ \text{WTP} < \text{BID} \} \\ &= G(\text{BID}; \theta) \end{aligned} \quad (2)$$

Where BID is the proposed price bid, $WTP_{max}$ is the true maximum willingness to pay (WTP), and G (BID, $\theta$) is the cumulative distribution function of WTP. The above equations describe that if the proposed price bid (BID) amount is more than the consumers' true willingness to pay, then they are not willing to pay that amount. However, if the bid is below their true maximum willingness to pay the amount, the probability of obtaining a "Yes" answer to that amount is high, that means they will maximize utility, and pay that specific amount. These equations respond on random utility context based on consumers' decision on the program. This study follows Cameron (1988) with a modified "censored logistic regression". It can also be defined as the following equations (Flachaire and Hollard, 2005):

$$\begin{aligned} c_i &= 1; \text{ if WTP} > \text{BID} \\ c_i &= 0; \text{ if WTP} < \text{BID} \end{aligned} \quad (3)$$

$c_i = 1$ represents the consumer $i$ saying "Yes" to the proposed price bid while a "No" response is indicated by $c_i = 0$. The dichotomous choice logit model is derived from random utility context in consumer decision-making. This signifies a choice

between two mutually exclusive options.

$$\begin{aligned} &P(c = 1) \\ &= P(WTP > BID) \\ &= P(x\beta + e > BID) \\ &= P(e/k > BID/k - x\beta/k) \end{aligned} \quad (4)$$

$k$ is a scaling parameter of the logistic function. The log-likelihood function for single bounded CVM is:

$$\begin{aligned} &\log L^{SCVM} \\ &= \Sigma(1 - c)\{(BID - x\beta)/k\} \\ &- \log\{1 + exp[(BID - x\beta)/k]\} \end{aligned} \quad (5)$$

The estimation of mean WTP can be derived based on Cameron (1988) through the following equation:

$$WTP = \frac{\beta_0 + \sum_{i-2}^{n} \beta_i X}{-\beta_1} \quad (6)$$

Where $\beta_0$ is the estimated constant, $\beta_1$ is the coefficient for the price bid, and $\beta_i$ is the coefficient for socio-economic characteristics of respondents.

## RESULTS AND DISCUSSION

A total of 552 respondents were selected in the survey between August to November 2011. The survey was conducted on randomly selected domestic users who come from urban and rural areas in Kelantan. Respondents come from different districts in Kelantan. They were informed that the study would help the water industry by enabling the water company to understand consumers' expectations of water service improvement.

### *Characteristics of Respondents*

The descriptive analyses for the explanatory variables are presented in Table 1. Majority of respondents are female (50.2%) since they are mostly available at home and they are in charge of house chores related to water consumption. The average age of the respondents is 38 years with educational levels on average at Diploma/Certificate level. Most of them are Malays (92.9%), and thisis not surprising since the majority of the population in Kelantan is Malay. In terms of the occupational aspect, most of the heads of household work in various sectors (31%), followed by government (27.2%), private (25.9%), and corporate (15.9%). The average size of household consists of 5 people with about 2 family members holding jobs. The mean monthly household income is estimated at RM 4077.90 during the time of the survey.

### *Consumer Perception on Domestic Water Services*

Table 2 presents consumers' perception on the quality of water services which was provided by AKSB. Most respondents (80.8%) believe that they should boil the water before drinking it. It shows that they are still pondering about the quality of water for dailyconsumption.

Table 3 indicates consumer awareness on water supply in Kelantan. About half of the respondents (52.9%) responded that they were unsatisfied with the water supply and water quality in the state. The respondents believed that the service

TABLE 1
Characteristics of respondents (n = 552)

| Characteristics | Frequency | Percent |
|---|---|---|
| Gender | | |
| Male | 275 | 49.8 |
| Female | 277 | 50.2 |
| Age of respondents (years) | | |
| Race | | |
| Malay | 513 | 92.9 |
| Chinese | 32 | 5.8 |
| Indian | 3 | 0.5 |
| Others | 4 | 0.7 |
| Size of Household | | |
| 1 – 5 people | 271 | 49.1 |
| 6 – 10 people | 266 | 48.2 |
| More than 10 people | 15 | 2.7 |
| Type of Residence | | |
| Bungalow | 121 | 21.9 |
| Terrace | 212 | 38.4 |
| Apartment/Flat | 21 | 3.8 |
| Others | 198 | 35.9 |
| Occupation of Head of Household | | |
| Government sector | 150 | 27.2 |
| Private sector | 143 | 25.9 |
| Businessman | 88 | 5.9 |
| Others | 171 | 31.0 |
| Education Level | | |
| PhD/Master | 22 | 4.0 |
| Bachelor | 139 | 25.2 |
| Diploma/Certificate | 200 | 36.2 |
| Secondary level | 134 | 24.3 |
| Primary level | 50 | 9.1 |
| No education | 7 | 1.3 |
| Number of working family members | | |
| 0 – 3 members | 481 | 87.1 |
| 4 – 7 members | 65 | 11.8 |
| More than 7 members | 6 | 1.1 |
| Household Income (monthly) | | |
| Less than RM 2,000 | 162 | 29.3 |
| RM2,001 – RM 4,000 | 154 | 27.9 |
| RM4,001 – RM 6,000 | 127 | 23.0 |
| RM6,001 – RM 8,000 | 51 | 9.2 |
| RM8,001– RM 10,000 | 22 | 4.0 |
| More than RM10,000 | 36 | 6.5 |

TABLE 2
Perception on quality of water supply

| | Frequency | Percent (%) |
|---|---|---|
| Drinking from water tap directly | 14 | 2.5 |
| Drinking filtered water | 92 | 16.7 |
| Drinking boiled water | 446 | 80.8 |
| Total | 552 | 100 |

TABLE 3
Awareness on Water Supply

| | Frequency | Percent (%) |
|---|---|---|
| No water problems | 41 | 7.4 |
| Water supply interruptions | 96 | 17.4 |
| Water quality problems | 123 | 22.3 |
| Water supply and water quality problems | 292 | 52.9 |
| Total | 552 | 100 |

problems interrupted their daily affairs since their water consumption was high.

The discrete choice of CVM offered respondents with "YES" and "NO" answers, where "Yes" = 1 and "No" = 0. Based on the previous studies, the most significant determinant in WTP studies is the offered price. This study proves that the bidding price is significant at 5% level. Thus, Fig.1 demonstrates that if the offered price increases, the probability of consumer saying "Yes" decreases and vice-versa in the program. It demonstrates that most respondents are willing to pay when the price bid offered is low. The Fig.1 corresponds with the demand theory in a typical situation: an individual purchases less of a good the higher is its cost (Tietenberg, 2000).

*Results from Logistic Regression*

The data is analysed using IBM SPSS Version 20. A value of 0 is given to respondents who rejected the idea or characteristics of interest in logistic regression. For instance, 0 is used to code the answer 'No' to the question of "Are you willing to pay $*X* for domestic water services improvement?" Then the value of 1 is for a 'Yes' answer. Table 5 demonstrates the determinants of full and reduced models to determine consumer's WTP in the study. Table 5 also shows the importance of each predictor variable in the model. In the full model, the WTP is regressed against all independent variables including the insignificant estimates ($p > 0.05$). There are many explanatory variables that are insignificant towards the WTP variable in the full model. Since there are insignificant variables in the model, the decision is made to drop the variables in the full model. Thus, in the reduced model which is the final model, the WTP is regressed against the remaining significant variables from the full model.

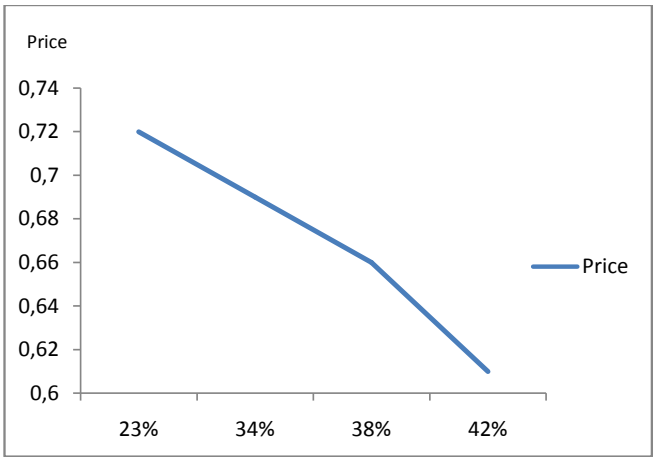


Fig.1: Offered price to consumers

In other words, the reduced model only has statistically significant variables in order to obtain the best estimate.

Direct logistic regression was performed to elicit consumer's WTP towards improvement in domestic water services in this study. The reduced model is restricted to three independent variables (price bid, household income and household size). The model includes all predictors that are statistically significant, $x_2$ (3, N = 552) = 31.03, p<0.001, specifying that the model is able to differentiate between respondents who rejected, and those who were unwilling to pay for improvement in this study. Overall, the model as a whole described correctly classified 62.3% of cases. According to Table 5, the independent variables make a unique statistically significant contribution to the model. The strongest determinant of willingness to pay for domestic water services improvement is 'household income', i.e. reports with an odds ratio of 1. It describes that respondents with high household income are more willing to pay for improvement in domestic water services, controlling for all other factors in the model.

Thus, the mean WTP computed from this study is RM0.5979 applied on the first 35 $m^3$. It is about a 8.7% increase from the current water rate (RM0.55). The β values in Table 5 show the direction of the relationship in the model which is either positive or negative. The BID variable is negative in sign and statistically significant at 5% level as predicted. It indicates that as offered bid price increases, the probability of saying "YES" decreases among consumers under hypothetical market. Respondents reject the offered price as it increases, and this is consistent with the demand theory.

Household income is a significant determinant in this study since it shows a positive sign and it is significant at 5% level too. The determinant is consistent with the economic theory which posits that WTP for goods increases with income, hence

TABLE 4
Consumers responses to offered price

| Price Bid | WTP | | Total |
|---|---|---|---|
| | No (0) | Yes (1) | |
| RM0.61 | 58% | 42% | 105 |
| RM0.63 | 50% | 50% | 121 |
| RM0.66 | 62% | 38% | 116 |
| RM0.69 | 66% | 34% | 119 |
| RM0.72 | 77% | 23% | 91 |
| Total | | | 552 |

TABLE 5
WTP Model Results using Logit Model

| Variables | Full Model (i) | | Reduced Model (ii) | |
|---|---|---|---|---|
| | Coefficient | Standard Error. | Coefficient | Standard Error. |
| Constant | 5.997 | 1.742 | 6.169 | 1.631** |
| Price Bid | -9.874 | 2.467** | -9.721 | 2.439** |
| Household income | 0.000014 | 0.000004** | 0.000015 | 0.000004** |
| Household size | -.083 | .038** | -.082 | .037** |
| Gender (Female = 1, Male=0) | -.143 | .188 | - | - |
| Master/PhD | .530 | .793 | - | - |
| Degree | .577 | .636 | - | - |
| Diploma | .241 | .630 | - | - |
| Secondary school | .348 | .636 | - | - |
| Primary school | .276 | .693 | - | - |
| -2 Log likelihood | 696.768 | | 701.347 | |
| Cox & Snell R Square | 0.062 | | 0.055 | |
| Nagelkerke R Square | 0.085 | | 0.074 | |
| Mean WTP | | | RM0.5979 | |

Significance at 0.05 confidence level (**).

household income should have a positive sign. It denotes that as household income increases, consumers' probability of saying "YES" increases too. People tend to spend more for improvement in water services. Households with high levels of income are willing to pay higher water bills if there is an increase in water prices. In addition, people with higher income canafford to use more water-using appliances to suit their high-end lifestyles such as dishwashers and washing machines.

The household size variable shows a negative relationship with WTP. It demonstrates that as a household size increases, the WTP decreases. The relationship between household size and WTP variables is as expected in this study. The more members there are in a household, the greater the reduction in WTP. They

consume more water but a higher water bill can be burdensome to them. Since most respondents are from rural households which are characterized by larger household size and lower income, they are less willing to pay towards improvement in water services.

## CONCLUSION

Poor domestic water services in Kelantan are a long-standing issue, and consumers have no choice but to go through these problems in daily life. The importance of water cannot be denied since it is a basic need for human life. Thus, consumers demand good quality of water and they are willing to contribute towards the improvement in water services for future benefits. A hypothetical price was established in the Contingent Valuation Methods, and respondents were required to indicate either "Yes" or "No" responses based on their WTP towards improvement in water services. According to the CVM survey on 552 respondents in the state, it is observed that on average the consumers were willing to pay RM0.5979 (8.7% increase from the current price) for the first 35m$^3$ of water to improve domestic water services. The explanatory variables such as BID price, income, and household size are statistically significant at 5% level, and their signs are as expected.

The information obtained from the survey is useful for the water company. The water company can make a better estimation of the amount to charge its customers for a higher quality of water, coupled with a newly upgraded service level that is satisfactory for the future. For that reason, the most significant result of this study is to provide a clear guideline for policy makers to achieve their economic targets without jeopardizing long term economic prospects. The results may influence public policy-making onthe water industry, and offer recommendations for policy makers to consider while they address the numerous water issues faced by the nation. They should be responsive to those particular socioeconomic factors which influenceconsumers' willingness to pay for improvement in services. The government must incorporate the appropriate balance between supply (water resources availability and delivery systems) and demand (adequate, quality and quantity of water) - in order to protect both interests. Water prices should reflect at least the cost of water production in order to promote market efficiency. On the consumers' side, while imposing higher prices will hurt them, t it can also encourage them to save water since there is no substitute for water in life. In addition, educating the young generation about the significance of water in our life is essential in order toensure there is sufficient water supply in the future. . For these reasons, it is important to see whether such policies will be able to improve the water industry in this country.

## REFERENCES

Association of Water and Energy Research Malaysia. (2011). *National Water Services Industry Restructing – Kelantan State Case Study*. Retrieved from http://www.awer.org.my/

publication/national%20water%20services%20industry%20restructuring-kelantan%20case%20study.pdf

Cameron, T. A. (1988). A new paradigm for valuing non-market goods using referendum data: Maximum likelihood estimation by censored logistic regression. *Journal of Environmental Economics and Management, 15,* 355-379.

Farolfi, S., Mabugu, R. E., & Ntshingila, S. N. (2007). Domestic water use and values in Swaziland: A contingent valuation analysis. *Agrekon, 46*(2), 157-169.

Flachaire, E., & Hollard, G. (2005). *Controlling starting-point bias in double-bounded contingent valuation surveys.* Retrieved from: Universite Paris, Program on Maison des Sciences Économiques .

Gujarati, D. (1999). *Essentials of Econometrics* (2nd ed.). New York: Mc GrawHill.

Haneman, M., Loomis, J., & Kanninen, B. (1991). Statistical efficiency of double bounded dichotomous choice valuation. *American Journal of Agricultural Economics, 73*, 1255-1263.

Hanemann, W. M. (1994). Valuing the environmental through contingent valuation. *Journal of Economics Perspectives, 8*(4), 19-43.

Hanemann, W. M. (1989). Welfare evaluations in contingent valuation experiments with discrete response data: reply. *American Journal of Agricultural Economics, 71*(4), 1057-1061.

Kahn, J. R. (2005). *The economic approach to environmental and natural resources* (3rd ed.). United States of America: Thomson South-Western.

Larson, D. M., Lew, D. K., & Onozaka, Y. (2001). *The public's willingness to pay for improving California's water quality*. Paper presented at Annual Meeting of Western Regional project W-133, Miami, Florida.

Larson, D. M., Lew, D. K., & Onozaka, Y. (2001). *The public's willingness to pay for improving California's water quality*. Paper presented at Annual Meeting of Western Regional project W-133, Miami, Florida.

McPhail, A. A. (1993). The "five percent rule" for improved water service: Can households afford more? *World Development, 21*(6), 963-973.

National Economic Planning Unit. (2006). *9th Malaysia Plan*. Kuala Lumpur: NEPU, Malaysia.

Raje, D.V., Dhobe, P. S., & Deshpande, A.W. (2002). Consumer's willingness to pay more for municipal supplied water: A case study. *Ecological Economics, 42*, 391-400.

Sarala Devi, J., Joseph, B., Karunakaran, K., Anurdha, B., & RamaDevi, K. (2009). People's attitudes towards paying for water. *Current Science, 97*(9), 1296-1302.

Shultz, S., & Soliz, B. (2007). Stakeholder willingness to pay for watershed restoration in rural Bolivia. *Journal of the American Water Resources Association, 43*(4), 947-956.

Tietenberg, T. (2000). Environmental and natural resource economics (5th ed.). United States of America: Addison Wesley Longman, Inc.

Vasquez, W. F., Mozumder, P., Hernandez-Arce, J., & Berrens, R. P. (2009). Willingness to pay for safe drinking water: evidence from Parral, Mexico. *Journal of Environment Management, 90*, 3391-3400.

Wang, H., Xie, J., & Li, H. (2009). *Water Pricing With Household Surveys: A Study of Acceptability and Willingness to Pay in Chongqing, China* (Policy Research Working Paper 4690). The World Bank Development Research Group. Retrieved from http://econ.worldbank.org.

Whittington, D. (1998). Administering contingent valuation surveys in developing countries. *World Development, 26*(1), 21-30.

Zamri, W. M. (2009). Groundwater for domestic needs in Kelantan. *Water Malaysia, 20*, 6-10.

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# Impact of Malaysian Industrial Energy Use on Carbon Dioxide Emissions

**Norlaila Abdullah Chik[1]*, Khalid Abdul Rahim[1], Alias Radam[2] and Mad Nasir Shamsudin[3]**

[1]*Institute of Agricultural and Food Policy Studies, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*
[2]*Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*
[3]*Faculty of Agriculture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

Environmental issues such as global warming and climate change have negative effects on Mother Nature resulting in floods, landslides, erosion and extreme heat. Otherwise, the positive effect on the economy subsequent to disaster is through the substitution of capital. Currently the Malaysian energy policy highly promotes energy efficiency and focuses on high value added sectors that produce less $CO_2$ emission. This study attempts to identify the impact of Malaysian industrial energy use on $CO_2$ emission by analyzing energy intensity and $CO_2$ emission intensity. This study found that the transportation sector produced the highest value added but has the highest $CO_2$ emission. The findings of this study will prompt energy policy makers to examine the sector and promote low carbon energy use among its users. At the same time the high value added (productivity) sectors should be encouraged to produce less $CO_2$ emission to protect the environment. In order to reduce $CO_2$ emission, the energy intensive sectors will also have to reduce energy consumption by adopting energy efficient technology that produces less $CO_2$ in the future.

*Keywords*: $CO_2$ emission intensity, energy efficiency, energy intensity, sectors, value-added

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*E-mail addresses*:
laila_duwa@hotmail.com (Norlaila Abdullah Chik),
dr_khalid@upm.edu.my (Khalid Abdul Rahim),
alias@upm.edu.my (Alias Radam),
mns@upm.edu.my (Mad Nasir Shamsudin)
* Corresponding author

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## INTRODUCTION

Rising production of goods and services will consume more energy such as electricity ; gas, petroleum product, coal and crude oil that will affect the environment. Energy is one of the main resources used by a country for economic development as well as social progress (Ayenagbo *et al*., 2011). Energy has

changed the level of value added through production activities as well the lifestyle of households all over the world. Direct and indirect energy consumption has a negative impact on the environment as a result of direct and indirect $CO_2$ emissions (Munskgaard *et al*., 2000).

In Malaysia, $CO_2$ emissions as consequences of energy consumption are not new issues but discussions have intensified in the last two decades. Due to these conditions, the government has promoted strategies to reduce the amount of energy consumption as well as to reduce $CO_2$ emission through energy efficiency in order to protect the environment as stated in the 10$^{th}$ Malaysia Plan. Therefore, Malaysia has declared that it attempts to reduce carbon dioxide by up to 40 percent by the year 2020 in comparison to the 2005 level. Even though Malaysia is a non-annex 1 country in the Kyoto Protocol it has an interest in reducing the $CO_2$ emission (Bari *et al*., 2012).

The trade-offs between economic growth and environmental degradation is of grave concern which has to be addressed before it reaches a point of no return. It is very important to save the environment through efficient energy management and consumption before the quality of environment becomes irreversible (Panayotou, 2003). In order to combat this worsening environment problem particularly with regards to $CO_2$ emission, the strategy is to concentrate on sectors that contributed the highest $CO_2$ emissions. The main objective of this study is to identify the high-impact sectors that contributed to economic growth but are at the same time contributing the highest $CO_2$ emission. This paper begins with a methodology to measure the $CO_2$ emission intensity by sector by applying an input output analysis. Then, the results and findings regarding the $CO_2$ emission by sector are presented. Lastly, a conclusion and policy implications are discussed.

## ECONOMIC GROWTH AND THE ENVIRONMENT

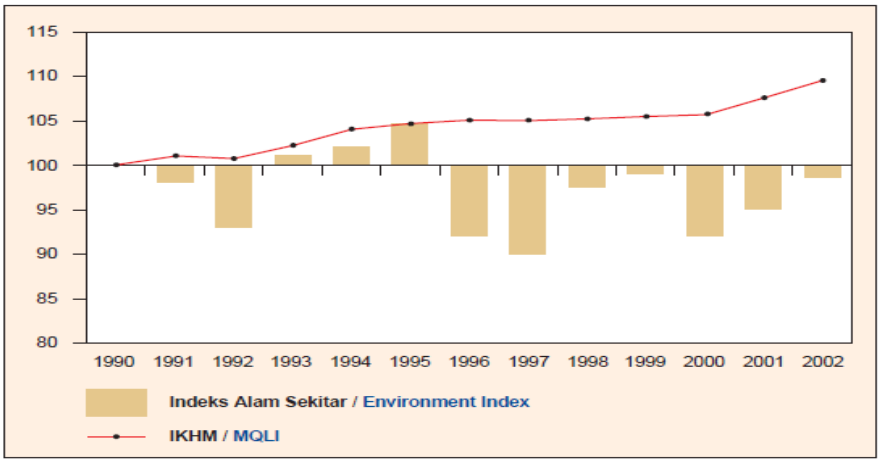
Awareness of environmental problems is one of the challenging issues faced by Malaysians although Malaysia experiences the least environmental problem in Asia. The country has recorded positive economic growth in recent years through structural change in industrialization, agriculture, tourism, and export activities. Economic growth has caused pollution in many sectors, for instance there is increasing air pollution from industrial activities and motor vehicle emissions as well as water pollution from raw sewage. The continuous rise and accumulation of pollution could have many damaging effects. One of the damaging is global warming due to the increase in $CO_2$ emission. Global warming is not only felt by us. Extreme heatdue to global warming might also harm plants and animals living in the sea as well as those on land. It could also change the world climatic patterns, causing floods, drought and an increase in damaging storms.

In terms of well-being and health, human diseases such as malaria and dengue could spread, and crop yields could decline.

Longer-lasting and more intense heat waves could cause more deaths and illnesses as well as increase hunger and malnutrition. All of these disasters are mainly caused by human activities and it will continue to increaseif there is no appropriate control. Disasters such as floods, landslides, erosion and extreme heat often occur in Malaysia and these can destroy many things such as houses, cars, home appliances and infrastructure.

Most floods that occur from October to March are a result cyclical monsoons that are characterized by heavy and regular rainfall during the local tropical wet season. However, floods that occured from December 2006 to January 2007 in Southern Johor was due to global warming and unplanned development, for example inadequate drainage in many urban areas. Meanwhile, landslides that occur in many parts of Malaysia are due to deforestation. Development activities at hill sites and areas abandoned for a long period affect the maintenance of the slopes thus causing landslides.

Disasters have negative effects on the economy since it results in reconstruction activities such as repairs and replacements increasing the demand for electrical appliances, cement, wood products, medicine, transportation and others. An increase in the demand for these goods will result in the continued growth in production activities in the short and long run thus causing an increase in $CO_2$ emission. An increase in $CO_2$ also causes disasters which have an impact on the supply of resources such as food, shelter, clothing and energy that serve human needs. However, disasters also have positive effects in certain cases but they are insignificant by comparison. Hallegatte and Dumas (2009) suggested that disasters may have positive economic effects through the substitution of capital which refers to productivity effects. They investigated the effects by using a model which embodied technical change.




Source: Malaysia Quality of Life, 2004, Economic Planning Unit (EPU), Malaysia

Fig.1: Malaysia quality of life and environmental index, 1990-2002

Malaysia's environmental index is shown to be moving in the opposite direction to that of the Quality of Life index. The Malaysia Quality of Life Index (MQLI) trend shows that it is increasing rapidly indicating that Malaysia's economy is growing at a positive rate from 1997 to 2002 but during the same period the environment index has decreased. Environmental index dropped by 4.3 percent per annum from 1990 to 2007 and this should not be ignored nor taken lightly. An increase in economic activities has caused degradation in environmental quality.

Empirically, the relationships between economic growth, energy consumption and environmental quality have been widely analyzed over the last two decades. The validity of economic growth and environment can be tested, by applying the environmental Kuznets curve (EKC) hypothesis. The empirical studies differ substantially and are not convincing enough to present policy recommendations that can be applied across countries. An evaluation of the empirical studies suggests that most studies focus either on the economic growth–energy consumption nexus or economic growth–environmental pollutants where little attempt has been made to test these two links under the same framework.

## FRAMEWORK OF THE STUDY

Literature on the relationships between economic growth, energy consumption and environmental degradation has been reviewed by Zhang and Chen, (2009) on three strands. The first strand focuses on the relationship between economic growth and environmental pollutants by applying the environmental Kuznets curve (EKC) hypothesis of Grossman and Krueger (1991). The second strand of the study is the relationship between economic output and energy consumption. This means that economic growth and output may be determined together, because economic growth is directly related to energy consumption as higher economic development needs more energy consumption (Haliciogl, 2009). The third strand is a combination of these two strands which examines the relationships between three variables: economic growth, energy consumption and environmental degradation.

The EKC approach is useful in examining the dynamic relationships between economic growth, consumption of energy and environmental degradation. For example, Ang (2007) applied the vector error-correction and co-integration modeling technique to examine the dynamic causal relationship between growth, energy consumption and emission for France and used exactly the same technique for Malaysia (Ang, 2008). Ang (2007) concluded that France is an economy independent in energy corresponding to its policy to achieve energy independence in the long term. However, Malaysia is an energy dependent economy due to its rapid industrialization that requires high and more efficient energy consumption and he concluded that output growth of Granger causality test causes energy consumption

in Malaysia. But, there is weak evidence of causality running from carbon emissions to income in the long run, but no feedback link is observed.

The rapid economic development through urbanization, industrialization and other land-use activities since the 1980s later caused water, air and land pollution, which has continued to become serious environmental problems in Malaysia (Khalid, 2007). A number of authors maintain that fundamental solutions to many environmental problems should be considered in combination with current energy consumption patterns (e.g. Duchin & Lange, 1994; Duchin, 1996, 1997, 1998).

This study uses an input-output model (IO) as it helps to reduce the effect of price distortion and makes interpretation of the results easier. Most importantly, this model can determine to what extent each sector consumes energy and generates $CO_2$ emission. For example, Cruz (2002) suggested that such an approach provides a consistent and systematic tool to appraise the impact of measures regarding the achievement of both pollution control and sustainable development for Portugal. Regarding reports that energy intensities and $CO_2$ emissions are derived from fossil fuel use, Alcantara and Padilla (2006) presented an approach that allows the identification of the "key" productive sectors responsible for $CO_2$ emission.

Tunc *et al*. (2006) estimated $CO_2$ emission for the Turkish economy using an extended I-O model with 1996 data in order to identify the sources of $CO_2$ emission. Lise (2006) stated that the emission growth in Turkey, over a period of 23 years between 1980 and 2003, was almost 80% as a result of the growing economy, 13% as a result of structural change towards more energy-intensive sectors and 13% as a result of an increase in the carbon intensity of energy, while decreasing energy intensity offset these increases by 7%.

Mongelli *et al*. (2006) suggested that developing countries may become a shelter for the production of non-environmental-friendly commodities using an extended I-O model. In this case, the comparative advantage from the so-called Pollution Haven Hypothesis due to freer international trade may change the economic structure and consequently the trade patterns of the countries linked by trade relationships.

Chung *et al.* (2009) estimated the energy and GHG emission intensity in Korea using an extended I-O model and concluded that energy consumption and environmental counter measures to reduce GHG did not slow down economic activities.

Using an I-O table constructed by the Malaysian Department of Statistics (DOS), this study depicts the Malaysian economy into energy sector that consists of 3 energy and 37 non-energy types. Unfortunately, there have been limited studies done on the impact of production sectors on the environment in Malaysia, particularly by applying the input-output analysis . Therefore, the significance of this study is that it covers in detail the production sectors which have contributed the highest value-added in GDP with the highest $CO_2$

emission generation. Jaafar *et al*. (2008) applied an input-output analysis in their study and found that electricity generation has a negative impact on the environment in Malaysia.

## METHODOLOGY

This study focuses on $CO_2$ emission because it is the most listed factor in the Intergovernmental Panel on Climate Change (IPCC) (revised in 1996) that affects climate change. This study uses the emission factor as recommended in IPCC guidelines (Module 1) for the assessment of the amount of $CO_2$ emission caused by energy consumption. $CO_2$ emission factor is calculated based on the following models:

$$f_i = C_i / e_i \qquad (1)$$

where $f_i$ is the $CO_2$ emission factor of energy consumption by sector i.e. petroleum product. $C_i$ is the $CO_2$ emission from energy consumption by sector and $e_i$ is the energy consumption by sector.

In order to estimate the $CO_2$ emission intensity, the following equation is used:

$$M = (m_i \# r_i)\, f\, (I\text{-}A)^{-1} \qquad (2)$$

Equation (2) estimates the $CO_2$ emission intensity (multiplier) in the Malaysian economic sectors by using the extended input-output model introduced by Leontief and Ford (1972). *M* denotes $CO_2$ emission intensity (multiplier), m is a 11x40 matrix of fuel mix in the production sectors, i.e. demand for 11 energy types per unit of total demand for energy for all production sectors; r is a 1x40 vector of energy intensities, i.e. total energy consumption per unit of production in all 40 sectors; *f* is a 11x1 vector of $CO_2$ emission per unit of consumption for each of the 11 energy type; $(I\text{-}A)^{-1}$ is the 40 x 40 Leontief inverse matrix. Whereas $f$, $m_i$, $r_i$, $(I\text{-}A\text{-})^{-1}$ are factors of behavior of the sector in the economy, i.e. demand for inputs in the energy supply sector and other production sectors.

In order to estimate generation of $CO_2$ emission in Malaysia, the following model is used:

$$E_i = M.V \qquad (3)$$

Where $E_i$ denotes a vector of total $CO_2$ emission in the production sectors as a consequence of production of goods and services; V denotes the value added in as described in Equation (3).

This study uses the 40-sector classification input-output table for Malaysia for 2005 published by the Department of Statistics (DOS), in current prices. The 40 sectors consist of 37 non-energy sectors and 3 energy sectors which are petroleum products (motor petrol, gasoline, diesel, kerosene, LPG, refinery gas, non energy, aviation fuel and fuel oil), coal and natural gas and electricity. Energy consumption data for 2005 are obtained from the National Energy Balance of Malaysia Energy Centre (PTM, 2006) and the Ministry of Energy, Water and Communications Malaysia while the data concerning $CO_2$ emission factor is derived by calculating the energy consumption and $CO_2$ emission in Malaysia as recommended by IPCC, Module 1 (revised in 1996).

## RESULTS AND FINDINGS

### *Comparative $CO_2$ emission intensity of Malaysia*

Malaysia's $CO_2$ emission intensity is higher than world average as shown in Fig.2. $CO_2$ emission intensity is measured in tonnes of $CO_2$ emitted from the use of energy to produce a unit of GDP (US$1,000). The $CO_2$ emission intensity of developed countries such as the United States, Singapore, Japan and United Kingdom are lower because the main sector of these nations mostly come from the service sector, which uses less energy to produce per unit of GDP compared to the developing countries such as Malaysia, which is based on manufacturing goods. Thus, the emission intensity is higher than those countries which import manufactured goods.

In order to measure whether Malaysia has employed clean or polluted technology in its production sectors it is pertinent to do it by comparing the $CO_2$ emission intensity of Malaysia and the developed countries because most of developed countries like the U.S., UK, Japan and Singapore are already using clean technology in their production activities. Developed countries have dominated the boundaries of technology that have innovated and adopted new technologies the earliest (World Bank, 2008). Therefore, $CO_2$ emission intensity of developed countries can be used as a benchmark in order to measure the level of $CO_2$ emission intensity of Malaysia. In this case, Malaysia should reduce $CO_2$ emission intensity so that its level is at par with $CO_2$ emission intensity of developed countries.

In order to reduce energy intensity and $CO_2$ emission intensity, most developed countries have adopted strategies such as improving energy efficiency in the

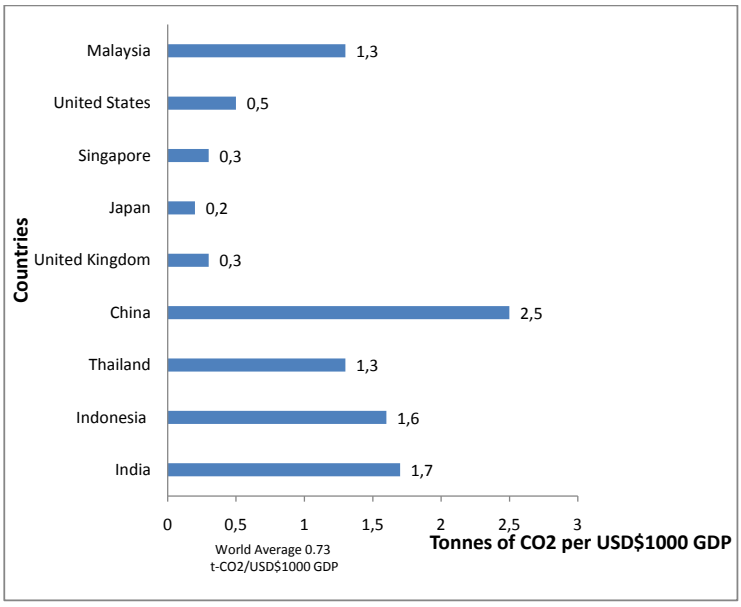



Fig.2: $CO_2$ emission intensity for selected countries, 2010 (in T-$CO_2$/US$1000GDP)

manufacturing sector and production. Some developed countries have moved from manufacturing sector towards services sector and import products that are energy intensive to produce and increased their GDP at a rate higher than $CO_2$ emission. Countries such as the United States and United Kingdom are outsourcing their production to other developing countries such as China as a solution to reducing global energy use and global GHG emission but this may not be to the best interest of developing countries as they will bear the highest $CO_2$ emission intensity. Therefore, Malaysia requires technology transfer, skills and knowledge in order to improve energy efficiency in the country. Consequently, producers and consumers should share the benefits and costs of this initiative.

*$CO_2$ emission intensity (multiplier) in Malaysia*

In this study $CO_2$ emission intensity is estimated first in order to quantify $CO_2$ emission by production sectors. $CO_2$ emission intensity is the ratio of $CO_2$ emission produced to GDP or value-added (units of $CO_2$ per Malaysian Ringgit, MYR). This intensity is used to estimate $CO_2$ emission based on the amount of energy used by each sector and it may also be used to compare the environmental impact of different sectors. In this study the production sector has been divided into energy and non-energy groups. The energy group consists of primary energy (crude oil, coal and natural gas), petroleum product and electricity, while the non-energy group consists of agriculture, manufacturing, transportation and services sectors.

In the total production sector the average value of the total energy intensity and $CO_2$ emission intensity caused by energy consumption in Malaysia in 2005 was found to be 64.5 (toe/M-MYR) and 0.272 (T-$CO_2$/M-MYR ), respectively. The sectors that are below both average values are considered to be those that have improved energy efficiency and produced environmental friendly products because they use less energy and less $CO_2$-intensive technology in the production activities. However, sectors that have above both average values are considered as those sectors that used more energy and $CO_2$-intensive technology. Therefore, those polluted sectors are encouraged to take appropriate action to reduce their $CO_2$ emission production voluntarily so that their $CO_2$ emission intensity is reduced to the below average value.

From this analysis, we have traced energy consumption for every Ringgit Malaysia as the main source that caused the increase in $CO_2$ emission intensity. Estimating the energy intensity and $CO_2$ emission intensity becomes the crucial step in appropriately understanding the energy consumption structure and generation of $CO_2$ emission. Table 1 presents the four categories of energy intensity and $CO_2$ emission: High-High, High-Low, Low-High and Low-Low. The sectors in the category of High-High are Electricity, Manufacture of yarn and cloth, Manufacture of other textiles, Other chemical industries, Other

TABLE 1
Energy intensity and $CO_2$ emission intensity by category

| Category | High-High | | High-Low | | Low-High | | Low-Low | |
|---|---|---|---|---|---|---|---|---|
| Sector | Energy intensity (toe/M-RM) | CO2 emission intensity (tCO2/M-RM) | Energy intensity (toe/M-RM) | CO2 emission intensity (tCO2/M-RM) | Energy intensity (toe/M-RM) | CO2 emission intensity (tCO2/M-RM) | Energy intensity (toe/M-RM) | CO2 emission intensity (tCO2/M-RM) |
| Crude petrol, natural gas and coal | | | | | | | 27 | 0.063 |
| Petroleum products | | | 79 | 0.197 | | | | |
| Electricity | 328 | 0.367 | | | | | | |
| Agriculture | | | | | | | 25 | 0.101 |
| Mining | | | | | 64 | 0.316 | | |
| Manufacture of oils and fats | | | | | | | 40 | 0.264 |
| Manufacture of other foods | | | | | | | 46 | 0.236 |
| Manufacture of yarns and cloth | 91 | 0.403 | | | | | | |
| Manufacture of other textiles | 77 | 0.392 | | | | | | |
| Manufacture of wearing apparels | | | | | | | 33 | 0.203 |
| Manufacture of wood product | | | | | | | 50 | 0.266 |
| Manufacture of industrial chemical | | | 124 | 0.216 | | | | |
| Manufacture of paints and lacquers | | | | | | | 43 | 0.174 |
| Manufacture of drugs and medicines | | | | | 61 | 0.33 | | |
| Manufacture of soap etc. | | | | | | | 45 | 0.193 |
| Other chemical industries | 91 | 0.439 | | | | | | |
| Manufacture of others products | | | | | 56 | 0.304 | | |
| Other non-metallic manufacture | 86 | 0.515 | | | | | | |
| Manufacture of cement etc. | 208 | 0.93 | | | | | | |
| Iron and steel industries | 86 | 0.403 | | | | | | |
| Manufacture of non-ferrous metals | | | | | | | 34 | 0.19 |
| Structural metal industries | | | | | 55 | 0.301 | | |
| Other metal industries | | | | | 59 | 0.38 | | |

TABLE 1 (*continue*)

| Category | High-High | | High-Low | | Low-High | | Low-Low | |
|---|---|---|---|---|---|---|---|---|
| Sector | Energy intensity (toe/M-RM) | CO2 emission intensity (tCO2/M-RM) | Energy intensity (toe/M-RM) | CO2 emission intensity (tCO2/M-RM) | Energy intensity (toe/M-RM) | CO2 emission intensity (tCO2/M-RM) | Energy intensity (toe/M-RM) | CO2 emission intensity (tCO2/M-RM) |
| Manufacture of industries machinery | | | | | | | 41 | 0.222 |
| Man. of household machinery | | | | | | | 17 | 0.125 |
| Manufacture of radio, television etc. | | | | | | | 18 | 0.14 |
| Man. of electric appliances etc. | | | | | | | 16 | 0.114 |
| Man. of other electric machinery | | | | | | | 26 | 0.158 |
| Manufacture of motor vehicle | | | | | | | 47 | 0.269 |
| Construction | | | 49 | 0.309 | | | | |
| Wholesale and retail trade | | | | | | | 46 | 0.154 |
| Transportation | 101 | 1.162 | | | | | | |
| Communication | | | | | | | 38 | 0.145 |
| Real estate | | | | | | | 39 | 0.166 |
| Business services | | | | | | | 38 | 0.225 |
| Education | | | | | | | 32 | 0.108 |
| Private non-profit institution | | | | | | | 23 | 0.078 |
| Recreation | | | | | | | 48 | 0.122 |
| Recycling | | | | | | | 6 | 0.033 |
| Others services | | | | | | | 42 | 0.168 |

Source: Calculation from equation 2.

non-metallic manufacture, Manufacture of cement, Iron and steelindustries and Transportation sector.

The Electricity sector has the highest energy intensity at about 328toe/M-MYR and generates about 0.367 T-$CO_2$/M-MYR. For example, in order to produce 1 million Ringgit of electricity about 328 toe of energy was used and will generate 0.367 T-$CO_2$ of $CO_2$ emission. On the other hand, the transportation sector uses about 101 toe of energy in order to produce one million Ringgit, but it has produced the highest $CO_2$ emission of about 1.162 T-$CO_2$/M-MYR This comparison shows that the sector with the highest energy intensity does not necessarily generate the highest $CO_2$ emission. However sectors such as the transportation sector are typically characterized by industries that do not employ environmental-friendly processes or those that have carried out combustion processes on a big scale. Consequently, sectors in this category have to take the necessary actions in order to reduce their energy intensity and $CO_2$ emission intensity.

The sectors in the High-Low category include Petroleum products, Manufacture of industrial chemicals and Construction. These sectors with higher energy intensity but with lower $CO_2$ emission intensity than the average are employing low $CO_2$ emitting energy use technology or employing combustion technology while consuming much more energy than the other sectors. These sectors managed to reduce $CO_2$ emission for every million Ringgit of output with high energy use i.e. above average value of both energy intensity but produce below than the average value of $CO_2$ emission intensity. Although those sectors have higher energy intensity they can reduce the $CO_2$ emission intensity below than average value of $CO_2$ emission intensity.

In the Low-High category, the sectors include Manufacture of oils and fats, Manufacture of drugs and medicine, Manufacture of other products, Structural metal industries, other metal industries and Manufacture of motor vehicles. These sectors used low energy intensity but produced high $CO_2$ emission intensity. These sectors should be given attention because despite their low energy consumption, they were generating high $CO_2$. This means that these sectors have been employing extremely intensive $CO_2$ emission technology typically characterized by industries that used processes that were not eco-friendly in terms of energy use or they carried out combustion process on a large scale. These sectors succeeded in reducing their energy use but they produced high $CO_2$ emission for every million Ringgit of output.

On a positive note, most production sectors in Malaysia are in the Low-Low category because most of them use processes that are environmental friendly in terms of energy use. They carry out combustion process on a small scale due to their lower energy intensity and their $CO_2$ emission intensity is lower than average value as shown in Table 1. The sectors in this category are Primary energy products, Motor vehicles, Wood products, Mining, Foods, Chemical industries, Soap products,

Non-Ferrous metal, Electric and electronic products and Machinery and Services. These sectors can reduce their energy use and produce low $CO_2$ emission for every million Ringgit of output. These sectors consumed below than average value of energy intensity and produced below than average $CO_2$ emission intensity.

*Value-added and $CO_2$ emission*

By employing $CO_2$ emission intensity, we can quantify the $CO_2$ emission generated by value-added of each sector in the economy. The relationship between value-added and $CO_2$ emission for each sector is shown in Fig.3. The sector classification is shown in the Appendix. The regression line is plotted and the slope indicates $CO_2$ elasticity of value-added which is smaller than unity. If the sector is above the regression line, its actual $CO_2$ emission factor will be larger than the one predicted by the regression line and measures to reduce $CO_2$ emission are imperative. Further, the average value of value-added and $CO_2$ emission for all sectors in 2005 are used as the origins of the coordinate system as shown in the figure. The value-added of a sector that lies to the right of the ordinate axes is higher than the average value. On the other hand, the value-added of a sector that lies to the left of the ordinate axes is lower than the average value.

Fig.3 also shows the relationship between GDP by sector (value-added) and $CO_2$ emission intensity in 2005. Firstly, this scatter plot is divided into 4 quadrants: quadrants I, II, III and IV. The sectors that lie in quadrant I indicate that they produce lower GDP with higher $CO_2$ emission such as sectors (16), (3) and (11), while the sectors that lie in quadrant II indicate that they produce higher value-added with higher $CO_2$ emission. These sectors include Transportation (32), Business services (35), Wholesale and retail trade (31), Other products (17), Construction (30), Other electric machinery (28), Real estate (34), Primary energy (1), Other services (40) and Agriculture (4). The sectors that lie in quadrant III produce lower value-added with higher $CO_2$ emission are Mining (5), Manufacture of oils and fats (6), Manufacture of other foods(7), Manufacture of yarn and cloth (8), Manufacture of other textiles (9), Manufacture of wearing apparels (10), Manufacture of industrial chemicals (12), Manufacture of paints and lacquers (13), Manufacture of drugs and medicines (14), Manufacture of soap (15), other non-metallic manufacture (18), Manufacture of cement (19), Iron and steel industries (20), Manufacture of non-ferrous metal (21), Structural metal industries (22), Other metal industries (23), Manufacture of industrial machinery(24), Manufacture of household machinery (25), manufacture of radio, television (26), Manufacture of motor vehicles(29), Recreation (38) and Recycling (39), while quadrant IV indicates that the sector produces higher value added with lower $CO_2$ emission. They are Communication (33), Education (36) and Manufacture of electrical appliances (27).

Most of the sectors are in quadrants II and III rather than quadrants I and IV. The

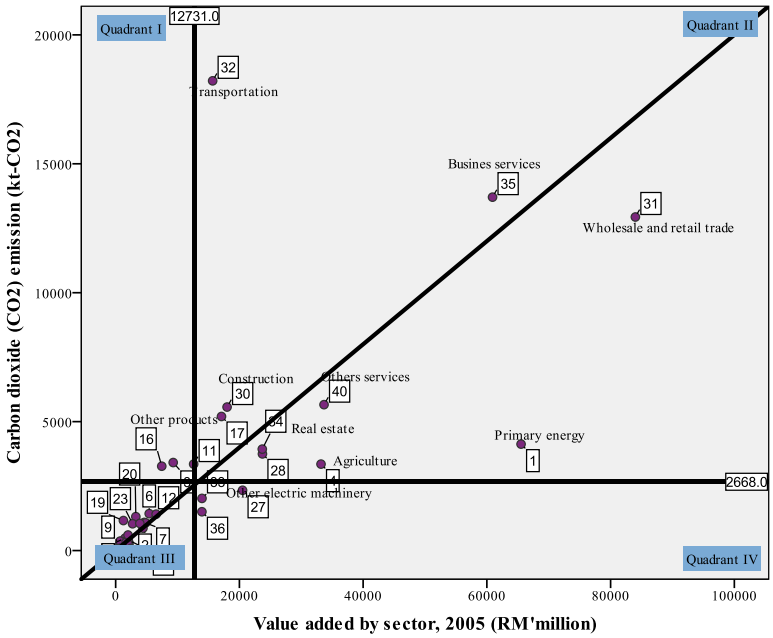



Fig.3: Distribution of $CO_2$ emission for 40 sectors in 2005

sectors that lie in quadrants I and II should be given most attention since they contributed high $CO_2$ emission more than the average values of $CO_2$ emission (2,668 kt-$CO_2$) but below than average values of value-added (RM12,731 million) for the sectors that lie in quadrant I. However, the sectors that lie in quadrant II should be examined closely due to their high contribution of value-added as well as $CO_2$ emission. These sectors include Transportation (32), Construction (30) and Manufacture of other products (17). They contribute highly to $CO_2$ emission intensity and produce high output compared to Wholesale and retail trade (31) and Business services (35) which produce the highest value-added but generate lower $CO_2$ emission. However, Business services (35) and Wholesale and retail trade (31) should reduce their $CO_2$ emission generation so that they can move down to quadrant IV which is better.

The sectors that lie in quadrant III should not be a big problem because their value-added and $CO_2$ emission are relatively lower than average values. Therefore, those sectors should find alternative ways to increase their value-added and at the same time maintain or reduce their $CO_2$ emission so that they can move to the right to quadrant IV. The sectors that lie in quadrant IV are considered as clean sectors because they succeeded in reducing $CO_2$ emission to below than average value and producing environmental-friendly products with less $CO_2$ intensive technology compared to the sectors that lie in quadrants I and II. The sectors that lie in quadrant IV are Manufacture of electrical appliances (27), Communication (33) and Education (36).

## CONCLUSION AND POLICY IMPLICATIONS

This study examined the structure of $CO_2$ emission intensity in each sector in the Malaysian economy. In the energy sector, Electricity produced the highest $CO_2$ emission, while in the non-energy sector Transportation produced the highest $CO_2$ emission in 2005. Malaysia's effort in protecting the environment based on energy use is by not encouraging new energy intensive sector but to promote energy efficient and high production industries . Based on an estimation of 40 sectors, the sector with high $CO_2$ emission intensity must be considered seriously, particularly the sectors that are located in quadrant II as plotted in Figure 3. For example, the sectors that lie above the average value of value-added and $CO_2$ emission have to reduce their $CO_2$ emission intensity and these sectors should focus primarily on energy conservation and efficiency improvement rather than environment-friendly energy use. In contrast, the sectors that have less than average value of GDP and $CO_2$ emission should be supported as strategic industries since they have a comparative advantage from the perspective of Malaysian energy and environment.

Analyzing energy intensities and $CO_2$ emission intensities is becoming an essential step in correctly understanding the structure of energy use. Moreover, in recent years global warming has become an issue of concern particularly for those countries such as Malaysia which experience high growth rate in energy consumption and $CO_2$ emission.. Hence energy use and $CO_2$ emission structure should be taken into account in policy-making. Intensity of each sector should be closely studied and analyzed for a better understanding x so that an Environmental Policy can be formulated. In the future, energy consumption for the sectors located in QI and QII will be increasing. Therefore, the generation of $CO_2$ emission will riseThus these sectors may not have achieved their voluntary target in reducing their $CO_2$ emission even though demand in the sectors continue to grow.

Based on the results and findings, our study uncovered some problems that have to be solved for future benefits. However, the government is struggling to find the best strategy to address environmental issues particularly in $CO_2$ emission produced by the Transportation sector. For example, a policy should be enacted to forbid old vehicles especially lorries and buses from using the roads because old engines may cause incomplete combustion that generate more $CO_2$ compared to new vehicles. The polluting sectors which are located in QI and QII should be charged with higher carbon tax due to their higher $CO_2$ emission (above average value). By imposing a carbon tax, producers will strive to reduce $CO_2$ emission by improving energy efficiency.

## REFERENCES

Alcantara, V., & Emilio, P. (2006). *An input-output analysis of the "Key" sectors in $CO_2$ emissions from a production perspective: an application to the Spanish economy*. Department of Applied Economics, Autonomous University of Barcelona.

Ang, J. (2007). CO2 emissions, energy consumption, and output in France. *Energy Policy, 35*(10), 4772–4778.

Ang, J. (2008). The long-run relationship between economic development, pollutant emissions, and energy consumption: evidence from Malaysia. *Journal of Policy Modelling*, 30, 271–278.

Ayenagbo, K., Kimatu, J.N., & Rongcheng, W. (2011). A model for a sustainable energy supply strategy for the social-economic development of Togo. *Journal of Economics and International Finance*, *3*(6), 387-398.

Bari,M. A., Joy, J. P., Rawshan , A.B., Zaharaton, R. Z.A., & Hamid, A. J. (2012). The Role of CO2 Emission in Energy Demand and Supply. *American Journal of Applied Sciences*, *9*(5), 641-646.

Chung, W.S, Tohno S., & Shim S.Y. (2009). An estimation of energy and GHG emission intensity caused by energy consumption in Korea: An energy IO Approach. *Applied Energy,* 86, 1902-1914.

Cruz, L. M. G. (2002). *Energy-environment-economy interactions: An input output approach applied to the Portuguese case*. Paper presented for the 7th Biennial Conference of the International Society for Ecological Economics on Environment and Development: Globalization & the Challenges for Local & International Governance", Sousse, Tunisia.

Department of Road Transport, Malaysia 2004. Data of New Transportation Registered.

Malaysia Environmental Quality Report. (2004). Department of Environment, Malaysia.

Department of Environment, Malaysia (2004). *Malaysia Environmental Quality Report.*

Duchin, F. (1996). Population change, lifestyle, and technology: how much difference can they make? *Population and Development Review*, 1, 321–330.

Duchin, F. (1997). Technology and lifestyle as central concepts for global scenarios. In: Boorsma, P.B., Aarts, K., Steenge, A.E. (Eds.), *Public Priority Setting: Rules and Costs* (pp. 103–119). Kluwer Academic, New York .

Duchin, F. (1998). *Structural economics: measuring change in technology, lifestyles, and the environment*. Washington, DC, Covelo, CA: The United Nations University, Island Press.

Duchin, F. & Lange, G.M. (1994). *The future of the environment: ecological economics and technological change*. New York : Oxford University Press.

Global economic prospects—technology diffusion in the developing world. (2008). World Bank. /http://siteresources.worldbank.org/INTECAREGTOPKNO CO/Resources/Session BURNS. pptS

World Bank. (2008). Global economic prospects—technology diffusion in the developing world. Retrieved from http://siteresources.worldbank.org/INTECAREGTOPKNOCO/Resources/Session BURNS. pptS

Hallegatte, S., & Dumas, P. (2009). Can natural disasters have positive consequences? Investigating the role of embodied technical change. *Ecological Economics*, *68*(3), 777–786

Horwich, G. (2000). Economic lessons of the Kobe earthquake. *Economic Development and Cultural Change*, *48*(3), 521-542.

Huang, J.P. (1993). Electricity consumption and economic growth: A case study of China. *Energy Policy*, *21*(6), 717-720.

Input-Output Tables. (2005). Department of Statistics, Malaysia. Department of Statistics, Malaysia. (2005). *Input-Output Tables*.

Jaafar, A. H., Al-Amin, A. Q., & Siwar, C. (2008). Environmental impact of alternative fuel mix in electricity generation in Malaysia. *Renewable Energy*, *33*(10), 2229-2235.

Khalid, A. R. (2007). Agriculture and the environment. In Fatimah *et al.* (Eds.), *50 years of Malaysian agriculture: Transformational issues, challenges and direction* (pp 56-77). Serdang, Malaysia: UPM Press.

Leontief, W., & Ford, D., (1972). Air pollution and the economic structure: Empirical results of input-output computations. In A. Brody & A. Carter, (Eds.), *Input- Output Techniques*. Location: North-Holland Publ. Company.

Lise, W. (2006). Decomposition of $CO_2$ emissions and foreign trade over 1980-2003 in Turkey. *Energy Policy*, 34, 1841-1852.

Malaysia Energy Centre. (2006). *National Energy Balance Malaysia*. Malaysia Energy Centre

Mongelli, I., Tassielli, G., & Notarnicola, B. (2006). Global warming agreements, international trade and energy/carbon embodiments: An input-output approach to the Italian case. *Energy Policy, 34*(1), 88-100.

Montalvo, G. J, & Marta, R. Q. (2005). Ethnic diversity and economic development. *Journal of Development Economics*, *76*(2), 293-323.

Munksgaard, J., Wier, M., & Dey. C..(2006). Using input-output analysis to measure the environmental pressure of consumption at different spatial levels. *Journal of Industrial Ecology*, *9*(1-2), 169-185.

Munksgaard, J., Pedersen K. A. & Wier. M. (2000). Impact of household consumption on CO2 emissions. *Energy Economics, 22*,423-440

Panayotou, T. (2003). Economic growth and environment. *Economic Survey of Europe*, 2, 45-72.

Paul, S., & Bhattacharya, R. N. (2004). Causality between energy consumption and economic growth in India: A note on conflicting results. *Energy Economics*, *26*(6), 977-983.

Ramcharran, H. (1990). Electricity consumption and economic growth in Jamaica. *Energy Economics*, *12*(1), 65-70.

Shiu, A., & Lam, P.L. (2004). Electricity consumption and economic growth in China. *Energy Policy*, *32*(1), 45-54.

Tunc, G. I., Serap, T. A., & Akbostanci, E. (2006). $CO_2$ emissions vs. $CO_2$ responsibility: An input-output approach for the Turkish economy. ERC Working papers in economics 06/04, ERC.

Wu, Y. (1997). Wealth and spending patterns in China: Empirical evidence from household surveys. *International Journal of Social Economics*, *24*(7/8/9), 1007-1022.

Yoo, S.H. (2005). Electricity consumption and economic growth: Evidence from Korea. *Energy Policy*, *32*(1), 1627-1632.

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# Monetary Policy and Exchange Market Pressure in Malaysia

**Tey Sheik Kyin, Lee Chin* and Muzafar Shah Habibullah**

*Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

Exchange market pressure (EMP), which provides a measure of the volume of intervention necessary to achieve any desired exchange rate target, is the latest model used in the measurement of exchange rate conditions. In order to obtain a more complete picture of Malaysia's condition and to examine how Bank Negara handles different exchange market pressures, this study considers the Malaysian exchange rate in relation to that of its two major trading partners– namely, Japan (RM/YEN exchange rate) and the United States (RM/USD exchange rate)– to construct EMP models. Monthly data from 1990:1 to 2008:9 were used in this study, and the sample period was further divided based on crisis periods and Malaysia's experience employing different exchange rate regimes. Vector autoregression (VAR) modeling was used. The study's findings suggest that the prescription of traditional theory was not followed by Malaysia and that Bank Negara should implement a different monetary policy with a different EMP model only under crisis and fixed exchange rate regimes.

*JEL Classification Codes:* F31, E52

*Keywords:* Exchange market pressure, monetary policy

## INTRODUCTION

Since the management of the exchange rate is crucial to a country's wellbeing, there has been a growing number of theories and empirical exchange rate models aiming to analyze exchange rate movements. Exchange market pressure (EMP), which refers to the magnitude of money market disequilibrium arising from international excess demand or supply of domestic currency, is one of the latest models used in the measurement of exchange rate conditions. Girton and Roper (1977), who are the best- known authors in the field, state that EMP can be measured quantitatively by

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*E-mail addresses*:
leechin@upm.edu.my (Lee Chin),
muzafar@upm.edu.my (Muzafar Shah Habibullah)
* Corresponding author

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forming a summary statistic from observed changes in exchange rate and foreign exchange reserves of the domestic central bank; furthermore, it provides a measure of the volume of intervention necessary to achieve any desired exchange rate target (p.537). One of the advantages of EMP indices is that they can be calculated without having to obtain closed-form solutions for expectations and without having to specify the nature of stochastic disturbances to the economy. If the exchange rate is free-floating, EMP could be observed directly; if the exchange rate is fixed, the changes in foreign exchange reserve reflect the magnitude of the imbalance; if under managed float, EMP is observed by changes in the exchange rate and foreign exchange reserves. Therefore, EMP measurement can be used in various exchange rate regimes.

In the literature, numerous studies have tried to find the implications of policy responses by monetary authorities. The IMF and several studies (e.g., Basurto & Glosh, 2000; Dekle *et al.*, 2002 ) have supported the traditional theory that higher interest rates help to strengthen the currencies; however, some argue that the suggestion made by traditional theory and the IMF is ineffective and exacerbates the already great depreciation of domestic currency (e.g., Furman & Stiglitz, 1998; Ohno *et al.*, 1999; Pakko, 2000; Radelet & Sachs, 1998; Wong *et al.*, 2005). On the other hand, Caporale *et al.* (2005) found mixed results– that tightening monetary policy helped to defend the exchange rate during tranquil periods but had the opposite effect during the Asian financial crisis. In the case of Malaysia in the mid 1980s, there was rapid economic growth, during which fiscal surpluses were maintained, monetary expansion was not excessive and inflation was generally under control. Such rapid economic growth, however, exposed several signs of macroeconomic fundamentals being seriously at risk and led to an unexpectedly vulnerable economy and to subsequent crisis. The Asian financial crisis, which erupted in mid 1997, caused Malaysia to lose most of its currency reserves, and the national currency experienced rapid devaluation as a result. Bank Negara's initial response to the crisis was to hike up the interest rate and tighten fiscal policy, which was advocated by the IMF and traditional views as a way to protect weakened currency. Nevertheless, the results found that with a hike in interest rates, exchange rates kept depreciating. It seems that the interest rate policy did not bring the expected outcome.

Therefore, this study aims to investigate whether the monetary shocks that drove the EMP to increase resulted in the crash and ultimate collapse of the Malaysian *ringgit*. Since Malaysia adopted a different exchange rate regime after the crisis, this study aims to compare how Bank Negara handles different EMPs under different exchange rate regimes by constructing two separate EMP models-namely, an RM/YEN EMP model and an RM/USD EMP model. It is important to understand the responses of EMP to monetary shocks under various regimes. Under a fixed exchange rate, what are the responses of EMP to monetary shocks and

what are the responses of monetary shocks to the EMP? Under a managed float, will the responses differ? This study answers these questions clearly. In addition, this study assesses which instrument is more influential in managing EMP and helps determine whether output growth plays a role and should be omitted as an explanatory variable or not.

The remainder of this study is organized as follows: Section 2 provides a review of the literature; Section 3 presents a theoretical framework to measure EMP and VAR approach; Section 4 briefly discusses the empirical results of the analysis; and Section 5 presents a summary and policy implications.

## LITERATURE REVIEW

The term 'exchange market pressure' (EMP) was coined by Girton and Roper (1977) to explain both exchange rate and the central bank's intervention in the foreign exchange market. By using a monetary model, Girton and Roper derived EMP as the sum of exchange rate depreciation and reserve outflows (scaled by base money), which means that currency market imbalance can be removed through reserve or exchange rate changes. It is calculated as:

$$emp_t = \Delta e_t + \Delta f_t \qquad (1)$$

where $emp_t$ stands for the exchange market pressure at time $t$, $\Delta e_t$ for the changes in the exchange rate at time $t$, and $\Delta f_t$ for the foreign reserves at time $t$.

Weymark (1995), however, argued that Girton and Roper's definitions of EMP are too narrow and model-specific. According to Weymark, the specification and assumptions of Girton and Roper's model do not employ domestic credit changes to influence the exchange rate levels that rise from international excess demand or supply of domestic currency. Weymark stated that the exchange-rate- equivalent measure of EMP is the best way to measure the size of external imbalance and is a useful measure of the magnitude of speculation since EMP values measure the size of the exchange rate change that would occur if the policy authority unexpectedly refrained from intervening in the exchange market (p.280-281).

In the early stages of empirical testing on EMP, numerous studies focused on the determinants of EMP and generally used the Ordinary Least Square (OLS) method. The empirical test of the EMP was first done by Girton and Roper (1977) and was tested on the postwar economy (1952-1974). Their results showed that all variables' coefficients were significant at the 5%t confidence level and carried the correct signs– i.e., negative signs for coefficients of Canadian domestic growth and US output growth and positive signs for coefficients of US money growth and Canadian output growth. Thus, Girton and Roper's EMP model became one of the crucial models in measuring EMP and has been applied extensively with certain modifications (Bahmani-Oskooee & Shiva, 1998; Burdekin & Burkett, 1990; Connolly & Silveira, 1979; Kim, 1985; Klaassen & Jager, 2006; Mah, 1998; Pentecost, 2001; Tatomir, 2009).

Some studies tried to link EMP indices to the currency crisis by constructing EMP as single-crisis indices that are expected to systematically behave differently prior to crisis and hence provide reliable warnings of potential crises (Eichengreen *et al.*, 1995; Kaminsky *et al.*, 1998, 1999; Sachs *et al.*, 1996). These studies predicted that currency crises would occur when the measure of EMP indices exceeds a certain threshold. Since there is no consensus in favor of these EMP indices, a few studies have tried to examine and compare different versions of EMP indices and reached similar conclusions– namely, that there are three variations in three sets of EMP indices and the speculative pressure can provide a better measure by employing extreme value theory (Liu & Zhang, 2009; Mcfarlane, 2010; Pontines & Siregar, 2004). Gunsel *et al.* (2010) and Hgerty (2010) both used the EMP index as a crisis indicator and tried to examine the linkage between economic fundamentals and currency crisis for different groups of countries. Gunsel *et al.* (2010) concluded that a decrease in the budget balance deficit, the real exchange rate and the ratio of M2 to foreign reserve all increase the probability of currency crises, while Hgerty (2010) found that higher inflation, government borrowing and oil prices all appear to precipitate crises. Aizenman and Hutchison (2010) who focused on the transmission of global crisis into emerging markets found that emerging markets with higher total foreign liabilities had greater exposure and were much more vulnerable to crisis. They found that emerging markets respond to global shock by allowing greater exchange rate depreciation and comparatively less reserve loss.

In the literature, several studies examined the degree of intervention and interrelation between monetary policy and EMP through different econometric tests, such as Structural VAR, vector error correction model (VECM), dynamic OLS, and two stage least square (2SLS) (e.g., Bautista & Gochoco-Bautista, 2005; Bielecki, 2005; Kamaly & Erbil, 2003; Khawaja, 2007; Kurihara *et al.*, 2011; Liu, 2009; Tanner, 2001, 2002; Younus, 2005). In general, most of the empirical work used VAR to examine the interrelation between monetary policy and EMP, and most of the results were similar: domestic credit was positively correlated with EMP, confirming the prediction of the traditional monetary theory (Bautista & Gochoco-Bautista, 2005; Kamaly & Erbil, 2003; Kurihara *et al.* 2011; Tanner, 2001, 2002). There were, however, several studies (Garcia & Mallet, 2007; Khawaja, 2007) which found that an increase in the interest rate was associated with increased EMP. This positive correlation between interest rate and EMP is contrary to the traditional theory that higher interest rates should, in principle, help strengthen a currency. Kurihara *et al.* (2011), who examined how monetary authorities handle EMP under different exchange rate systems, found that use changes in interest rate to combat EMP will result in a stable foreign exchange market during a managed float but will be

less effective in a floating exchange rate. They also found that a sterilization policy was present under a floating exchange rate system.

## METHODOLOGY

This study closely followed Girton and Roper's EMP model, which was derived from a model of equilibrium in the money market. The EMP model, which is defined as a summation of exchange rate depreciation and reserves outflow, is shown below:

$$emp = e - r_m$$
$$= dc_m - h_f - \beta y_m + \beta y_f$$
$$- \vartheta + \alpha i_m - \alpha i_f \qquad (2)$$

This model (Equation 2) predicts that an increase in EMP means exchange rate depreciation, a decline in international reserves (reserve outflow), or both. From the EMP theoretical model, there are six variables relevant to exchange market behavior: domestic credit growth ($dc_m$), domestic output growth ($y_m$), world money supply ($h_f$), domestic interest rate ($i_m$), world output growth ($y_f$) and the world interest rate ($i_f$). Furthermore, $r_m$ is domestic reserves, $e$ is exchange rate, $\theta$ is the deviation from PPP, $\beta$ is income elasticity (where $\beta > 0$); and $\alpha$ is interest rate semi-elasticity (where $\alpha > 0$). Since this study's interest is to test the interaction among EMP, monetary policy and output growth, the EMP model in this study is expressed as follows:

$$emp = (e - r_m) = dc - \beta y_m + \alpha i_m \qquad (3)$$

where all foreign variables are considered constant terms. Equation (3) predicts that the exchange rate and/or the growth rate of foreign reserve are reactions to domestic credit growth, interest rate change and domestic output shocks.

The VAR approach is commonly used as a system of forecasting interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. Simply put, VAR is a system of linear equations and each variable is a function of its own lags and the lags of the other variables in the system (Mansor, 2005). VAR in level or unrestricted VAR, which allows data to decide on whether the effects of shocks are permanent or not (Ramaswamy and Slok, 1998) is used in this study. The VAR system is as follows:

$$X_t = a_0 + a_1 X_{t-1} + a_2 X_{t-2} + \ldots\ldots\ldots + \nu_t \qquad (4)$$

where $X_t$ = *(dc, i, y, emp)* is a vector of variables, $a_i$ is a vector of coefficient, and $\nu_t = (\nu_d, \nu_i, \nu_y, \nu_{emp})$ is a vector of error term.

The impulse response function (IRF) and variance decomposition (VD) are the main types of structural analysis of the VAR model and illustrate the dynamic characteristics of empirical analysis. The impulse response function permits inferences on the direction of response of a variable interest to one standard deviation

shock in another variable. Meanwhile, variance decomposition indicates the percentage of a variable's forecast error variance attributable to innovation in all variables considered in the system. The standard method of constructing IRFs and VDs is to use the Choleski decomposition.

The critical elements in the specification of the VAR model are the ordering of variables and the determination of lag length. Misspecification of the ordering and lag length will generate inconsistent coefficient estimates, resulting in the distortion of impulse responses and variance decomposition. The ordering of variables in this study considers domestic credit, which is fully determined by monetary authorities as the most exogenous variable, followed by the policy variable, which is partly determined by monetary authorities and partly determined by market i.e., interest rate; output growth, which is influenced by monetary variables; and EMP, which is considered to be the most endogenous variable. To determine lag length, this study follows Johansen's (1992) suggestion that the chosen lag length that residuals of the regression do not exhibit serial correlation.

The monthly data[1] utilized in this study cover the period 1990:1 to 2008:9. The data are divided into periods in order to provide a better overview of the interrelation between EMP and monetary policy shocks under various exchange regimes. The division into sub-periods is based on Malaysia's experience of crisis and adoption of different exchange rate regimes. The crisis period began when the Thai baht was hit by a massive speculative attack on May 14-15, 1997; it ended in August 1998 when Malaysia implemented selective capital control and a fixed exchange rate regime was adopted. Therefore, in the case of the RM/YEN exchange rate in the EMP model, the data are divided into three periods: pre-crisis from 1980:1 to 1997:4; within-crisis period from 1997:5 to 1998:8; and post-crisis from 1998:9 to 2007:9. Since the exchange rate of the *ringgit* was pegged against the US dollar at RM3.80/$1 USD in September 1998 and Malaysia changed its exchange rate regime from fixed to managed float in July 2005, the post-crisis period for the RM/USD EMP model has been further subdivided as follows: post-crisis I, the period when Malaysia implemented a fixed exchange rate; and post-crisis II, when Malaysia implemented a managed float system. Therefore, in the case of the RM/USD exchange rate in the EMP model, the data are divided into four sub-periods: pre-crisis from 1980:1 to 1997:4; within-crisis period from 1997:5 to 1998:8; post-crisis I from 1998:9 to 2005:6; and finally, post-crisis II from 2005:7 to 2008:9.

All variables are in growth form, and the variables included in the empirical model are: growth in exchange rate ($\Delta e$[2]), changes in reserve scaled by lagged monetary base, ($\Delta r / M_{t-1}$), changes in domestic credit scaled by lagged monetary

[1]The variables used in this study have dynamic properties and can be best captured with high frequency data.

[2]The exchange rate, RM/YEN is a cross rate, which is calculated from the RM/USD and YEN/USD nominal exchange rates.

base ($\Delta dc$ / $M_{t\text{-}1}$[3]), changes in domestic interest rate or money market rate ($\Delta i$ [4]), and output growth ($\Delta y$ [5]). The data were obtained from International Financial Statistical (IFS).

## EMPIRICAL RESULTS AND DISCUSSION

The integration orders of all variables used in analysis were verified through the unit root tests of Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski, Phillips, Schmidt, and Shin (KPSS). The results (as shown in Appendix A) for the RM/YEN EMP model and RM/USD EMP model showed that all three unit root tests reported the same result: all variables were stationary at level form in all three sample periods tested. Since the model employs all variables in growth form, it was not surprising that almost all variables were stationary in level. For the RM/YEN EMP model, the lag length chosen for which the residuals of the regression do not exhibit serial correlation for pre-crisis, within-crisis and post-crisis periods were 5, 1, and 11, respectively. Meanwhile, for the RM/USD EMP model, the lag length chosen for pre-crisis, within-crisis, post-crisis I and post-crisis II periods were 4, 1, 5 and 1, respectively.

Fig.1, Fig.2 and Fig.3 are impulse responses function (IRFs) of the RM/YEN EMP model for pre-crisis, within-crisis, post-crisis periods, respectively. Meanwhile, Fig.4, Fig.5, Fig.6 and Fig.7 are IRFs of the RM/USD EMP model for pre-crisis, within-crisis, post-crisis I and post-crisis II periods.

One of the main questions investigated in this study is how the interest rate affects exchange market pressure. The results suggest that the EMP responds positively to interest rate shock ($i$) in pre-crisis and post-crisis periods for both EMP models of RM/YEN and RM/USD nominal exchange rates. From the IRFs of both EMP models, the initial responses of EMP to $i$ were nearly zero; nevertheless, they were positive during the crisis period and the period when Malaysia implemented a managed float exchange rate regime. These findings suggest that the case of Malaysia did not follow traditional theory's prescription that currency pressure can be reduced by raising the interest rate. The findings are opposite to that of Tanner (2001, 2002) and Bautista and Gochoco-Bautista (2005). There is a possibility that a preserve effect is caused by raising the domestic interest rate, which is argued by Furman and Stiglitz (1998), Radelet and Sachs (1998) and Wong *et al.* (2005).

The results suggest that the response of EMP to the shocks in domestic credit ($dc$) is ambiguous. From the results of the RM/YEN EMP model, the responses are negative in the pre-crisis period but become positive after the crisis. RM/USD EMP models show

[3]Domestic credit is defined as the difference between the monetary base and foreign assets. Thus, domestic credit growth is $(\Delta(M_t - FA_t)) / M_{t-1})$.

[4]The central bank of Malaysia directly influences the interbank rate through its intervention in the money market; therefore the overnight interbank rate is used as a monetary policy indicator. (Domac, 1999; Mansor, 2005)

[5] Monthly data on real income is not available. The use of industrial production as proxy for real income is well established (Khawaja, 2007).

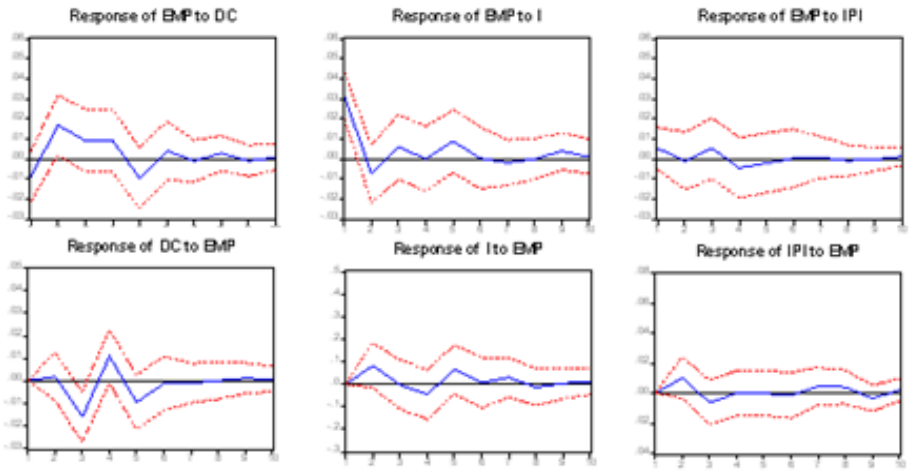


Fig.1: The Impulse Response Functions of RM/YEN EMP Model for Pre-crisis Period.

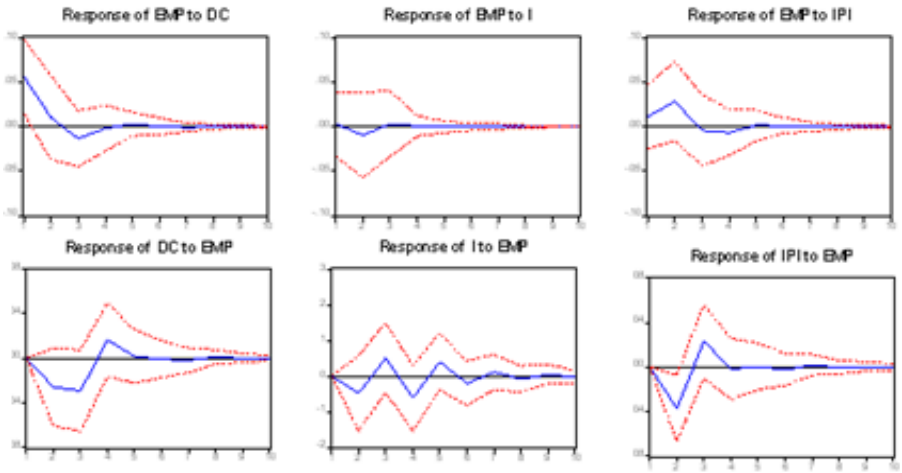


Fig.2: The Impulse Response Functions of RM/YEN EMP Model for Within-crisis Period.

the same results as RM/YEN EMP models–namely, that *dc* has positive effects on EMP during crisis and after crisis except in post-crisis I, which is the period when Malaysia adopted a fixed exchange rate regime. The responses of EMP to domestic credit shocks in post-crisis I under the RM/USD EMP model were negative. The responses in both EMP models were mixed; however, what we can be sure of here is that currency pressure can be reduced by decreasing the domestic credit during a crisis regardless of whether Malaysia is facing high or low EMP.

Another main question in this study is "How did monetary authorities respond to EMP?" Surprisingly, the results suggest that monetary authorities responded identically to different EMPs (i.e., RM/YEN EMP and RM/USD EMP). The results of both RM/YEN and RM/USD EMP models showed

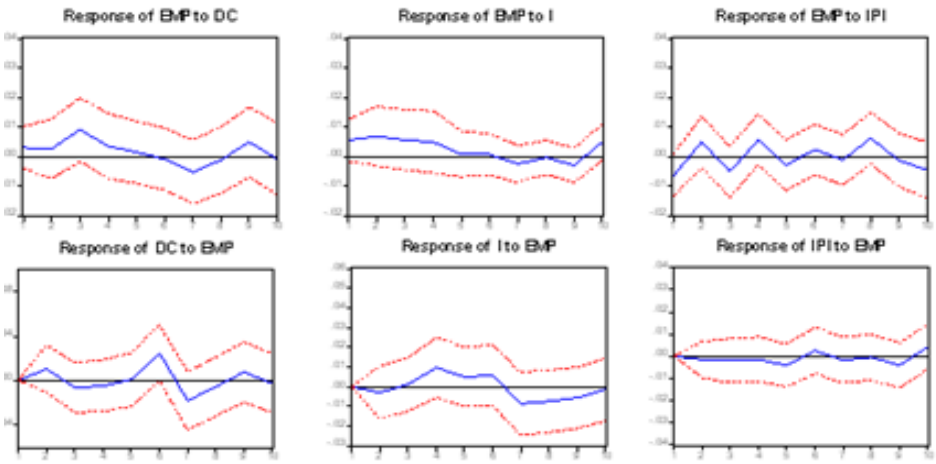


Fig.3: The Impulse Response Functions of RM/YEN EMP Model for Post-crisis Period.

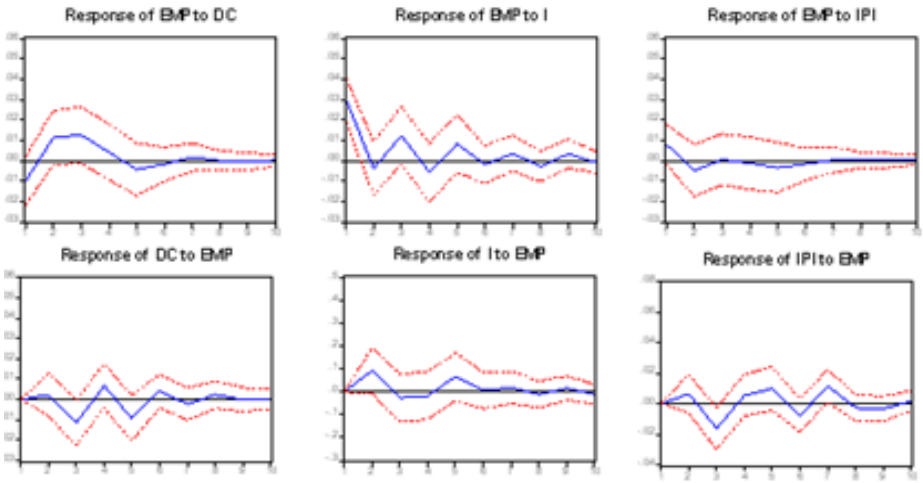


Fig.4: The Impulse Response Function of RM/USD EMP Model for Pre-crisis period.

that there was a lagged positive response of EMP on *dc* in pre-crisis period and post-crisis periods, and that there was a negative response during the crisis period. These findings suggest that Malaysia tends to intervene through sterilized reserve outflows by expanding rather than contracting domestic credit in non-crisis periods. Tanner (2001) has stated that such a policy reaction reflects a weak financial system that preceded the crises. Some have argued that sterilization may increase speculation against currency and that the central bank will not defend the currency, thereby exacerbating the already high EMP (Bautista & Gochoco-Bautista, 2005). Since then, Malaysia has tended not to sterilize and has instead tried to contract domestic credit growth when a crisis occurs (negative response of domestic credit to exchange

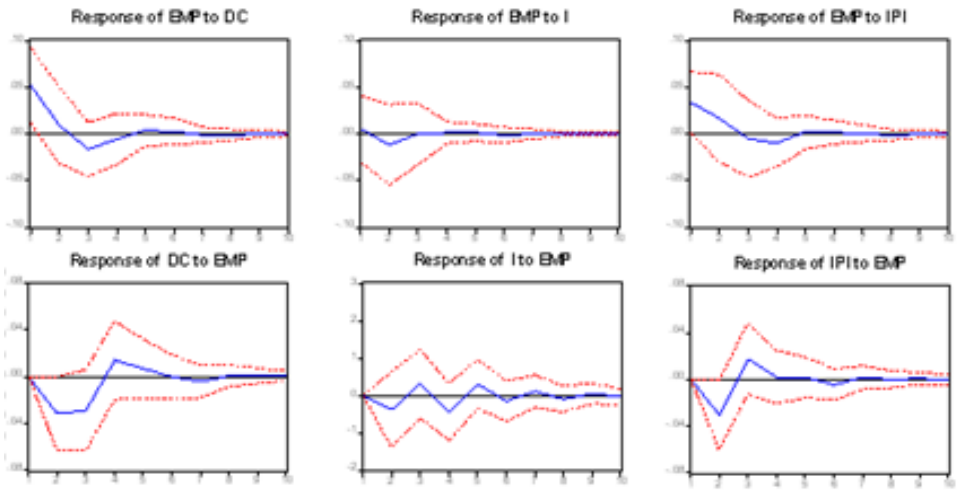


Fig.5: The Impulse Response Function of RM/USD EMP Model for Within-crisis.

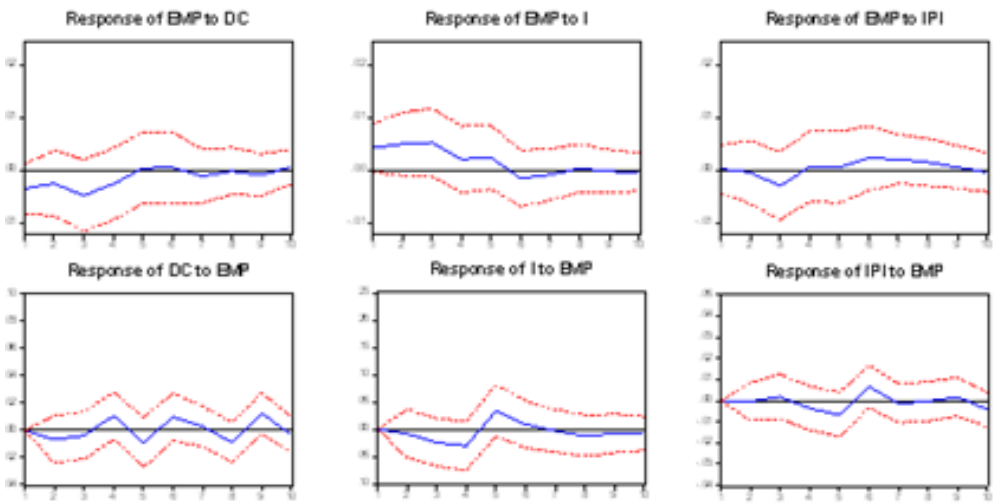


Fig.6: The Impulse Response Function of RM/USD EMP Model for Post-crisis I Period.

market pressure); however, expanding monetary policy was reapplied after the crisis. Perhaps, this might help to stimulate the weak economy.

Finally, one last question that was investigated in this study is "Does output growth (y) affect exchange market pressure?" From the IRFs of the RM/YEN EMP model, it was found that a shock in *y* does affect the EMP negatively at least in period 1 during crisis and post-crisis periods. However, there was only an inverse relationship during post-crisis II, the period when Malaysia adopted a managed float exchange regime in the RM/USD EMP model. As Garcia and Malet (2007) explained, the inverse relationship between output growth and EMP can be intuitively

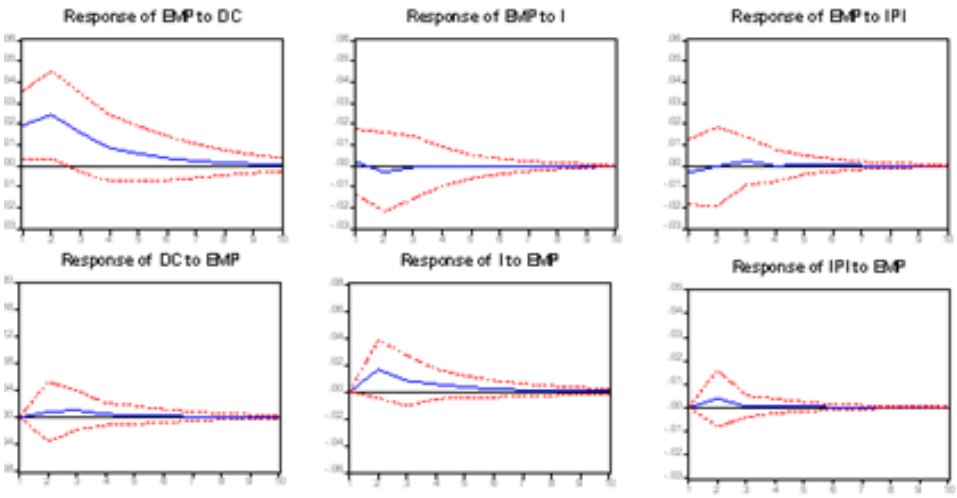


Fig.7: The Impulse Response Function of RM/USD EMP Model for Post-crisis II Period.

justified by the virtue of the model itself, where lower output growth implies a smaller increase of money demand that requires an adjustment via either a loss of reserves or a drop in the nominal exchange rate (high EMP).

The results also show that monetary authorities implement different monetary policies with different exchange rate regimes. When facing exchange market pressure or high pressure in currency, monetary authorities tend to decrease domestic credit and interest rates to defend the exchange rate when a crisis occurrs or during a fixed exchange rate regime; however, during a managed float exchange rate regime (i.e., pre-crisis and post-crisis II periods), Malaysia will likely choose to increase domestic credit and interest rate in the face of high EMP.

In conclusion, the case of Malaysia rejects the assumption that a tight monetary policy should, in principle, help strengthen the local currency. The responses of exchange market pressure to shocks in domestic credit are mixed, while an increase in interest rate does not help to reduce the EMP. On the other hand, monetary authorities implement different monetary policies with different exchange rate regimes.

Tables 1 and 2 present the results of variance decompositions for the RM/YEN EMP and RM/USD EMP models. Variance decompositions show that domestic credit is an important source of shocks in exchange market pressure, followed by interest rates. These suggest that domestic credit and interest rate are important instruments for managing exchange market pressure. Moreover, VDs also show that output growth plays a role in the shocks of EMP during the crisis period. In addition, EMP is an important source of shocks in output growth in pre-crisis and within-crisis periods. Therefore, output growth should not be omitted from the EMP study.

TABLE 1
Variance Decompositions of RM/YEN EMP Model

| | Pre-crisis | | Within-crisis | | Post-crisis | |
|---|---|---|---|---|---|---|
| Period | 1 | | 1 | | 1 | 50 |
| VDs of dc | | | | | | |
| *dc* | 100 | 74.753 (37) | 100.00 | 50.986 (14) | 100.00 | 57.014 |
| *i* | 0.000 | 5.261 (41) | 0.000 | 0.530 (14) | 0.000 | 5.701 |
| *y* | 0.000 | 2.185 (39) | 0.000 | 20.154 (12) | 0.000 | 24.182 |
| *emp* | 0.000 | 17.802 (34) | 0.000 | 28.329 (14) | 0.000 | 13.102 |
| VDs of i | | | | | | |
| *dc* | 13.243 | 15.612 (44) | 5.629 | 6.600 (18) | 7.608 | 15.502 |
| *i* | 86.757 | 71.512 (42) | 94.371 | 61.415 (17) | 92.392 | 57.661 |
| *y* | 0.000 | 6.759 (43) | 0.000 | 12.001 (15) | 0.000 | 17.225 |
| *emp* | 0.000 | 6.117 (39) | 0.000 | 19.985 (18) | 0.000 | 9.612 |
| VDs of ipi | | | | | | |
| *dc* | 0.532 | 10.252 (33) | 0.111 | 4.003 (14) | 7.706 | 14.454 |
| *i* | 0.012 | 4.647 (43) | 1.776 | 1.110 (16) | 0.007 | 8.807 |
| *y* | 99.456 | 80.297 (38) | 98.113 | 49.851 (15) | 92.291 | 71.665 |
| *emp* | 0.000 | 4.805 (36) | 0.000 | 45.036 (15) | 0.000 | 5.075 |
| VDs of emp | | | | | | |
| *dc* | 2.196 | 14.052 (36) | 38.974 | 29.052 (12) | 0.712 | 13.060 |
| *i* | 29.912 | 26.169 (39) | 0.103 | 0.868 (11) | 2.448 | 9.016 |
| *y* | 0.832 | 1.840 (36) | 1.568 | 8.566 (12) | 3.220 | 14.468 |
| *emp* | 67.061 | 57.939 (39) | 59.355 | 61.514 (11) | 93.621 | 63.456 |

Notes: *dc* is domestic credit growth, *emp* is exchange market pressure, *i* is interest rate and *y* is output growth. () is the period when the shocks are stable.

## CONCLUSION AND POLICY IMPLICATIONS

This study adopted two EMP models and attempted to examine how the monetary authorities in Malaysia handle different EMPs. The results of the study offer several suggestions: first, the prescription of the traditional theory that currency pressure can be reduced by raising the interest rate was rejected in the case of Malaysia; second, currency pressure can be reduced by decreasing domestic credit when a crisis has occurred no matter which currency pressure Malaysia is facing; third, monetary authorities responded equally to different exchange market pressures; and finally, monetary authorities implement different monetary policies with different exchange rate regimes.

Several policy implications emerged. First, a hike in interest rate will drive EMP to increase, resulting in the crash and collapse of the Malaysian *ringgit*. Monetary authorities should choose to decrease interest rate in the face of high EMP; however, contracting monetary

TABLE 2
Variance Decompositions of RM/USD EMP model

| | Pre-crisis | | Within-crisis | | Post-crisis I | | Post-crisis II | |
|---|---|---|---|---|---|---|---|---|
| Period | 1 | | 1 | | 1 | | 1 | |
| VD of dc | | | | | | | | |
| *dc* | 100 | 78.2964(26) | 100 | 46.1176(18) | 100 | 64.8448(63) | 100 | 94.9285(16) |
| *i* | 0 | 8.5492(31) | 0 | 1.2379(21) | 0 | 7.8034(61) | 0 | 1.3246(14) |
| *ipi* | 0 | 1.4682(22) | 0 | 19.5072(20) | 0 | 18.9715(67) | 0 | 2.5167(16) |
| *emp* | 0 | 11.6863(27) | 0 | 33.1374(20) | 0 | 8.3801(66) | 0 | 1.2302(18) |
| VD of i | | | | | | | | |
| *dc* | 12.422 | 14.4837(20) | 6.9078 | 6.9145(23) | 0.3514 | 9.1581(65) | 1.1224 | 10.3498(18) |
| *i* | 87.578 | 74.2105(21) | 93.0922 | 61.8531(24) | 99.6486 | 76.2312(59) | 98.8776 | 69.4728(17) |
| *ipi* | 0 | 4.5359(21) | 0 | 21.7252(21) | 0 | 8.5085(76) | 0 | 12.7040(14) |
| *emp* | 0 | 6.7699(29) | 0 | 9.5071(24) | 0 | 6.1022(67) | 0 | 7.4733(19) |
| VD of ipi | | | | | | | | |
| *dc* | 0.4516 | 6.0414(25) | 0.007 | 4.2540(18) | 0.337 | 5.6550(68) | 7.2773 | 18.2443(12) |
| *i* | 0.0193 | 5.1586(26) | 0.3253 | 2.5095(22) | 3.459 | 9.3405(64) | 1.3809 | 1.1245(11) |
| *ipi* | 99.5291 | 73.2661(25) | 99.6677 | 66.0734(18) | 96.204 | 80.6247(62) | 91.3418 | 79.6829(16) |
| *emp* | 0 | 15.5339(23) | 0 | 27.1631(18) | 0 | 4.9804(64) | 0 | 0.9483(16) |
| VD of emp | | | | | | | | |
| *dc* | 3.2342 | 11.0004(22) | 35.9845 | 29.3249(16) | 2.8924 | 6.4704(74) | 13.9733 | 26.3056(17) |
| *i* | 30.1741 | 31.2359(24) | 0.4047 | 1.6188(17) | 4.1844 | 10.2062(61) | 0.1311 | 0.2577(13) |
| *ipi* | 2.1577 | 2.6601(22) | 15.2723 | 14.7237(15) | 0.0078 | 2.7422(67) | 0.3327 | 0.2901(14) |
| *emp* | 64.4339 | 55.1036(25) | 48.3386 | 54.3326(14) | 92.9154 | 80.5812(64) | 85.5629 | 3.1466(16) |

Notes: *dc* is domestic credit growth, *emp* is exchange market pressure, *i* is interest rate and *y* is output growth. () is the period when the shocks are stable.

policy works to strengthen the currency during crisis. Second, domestic credit is a useful instrument for managing exchange market pressure, followed by interest rates. Therefore, policy makers should emphasize domestic credit rather than interest rates as a monetary policy tool. Third, the response of EMP to the shocks of domestic credit and interest rates in both EMP models are the same; this means that monetary authorities can use the same policy when facing different currency pressures. Lastly, monetary authorities should increase domestic credit when facing high EMP in non-crisis or fixed exchange rate regimes. However, when a crisis is occurring or during a period of managed float, monetary authorities should decrease domestic credit when facing high EMP. A decrease in domestic credit therefore will help to reduce the currency pressure.

## REFERENCES

Aizenman, J., & Hutchison, M. M. (2010). *International financial market and transmission of crisis: Determinant of EMP and absorption by reserves*. Paper presented in Conference on Global Economic Crisis: Impact, Transmission and Recovery, Number 3 .

Bahmani-Oskooee, M., & Shiva, R. (1998). A method of detecting whether a central bank engages in a black market for foreign exchange: Evidence from Iran. *Economics Letter*, 60, 97-103.

Basurto, G., & Ghosh, A. (2000). The interest rate-exchange rate nexus in the Asian crisis countries. *IMF Working Paper, No. 00/19*. Washington: International Monetary Fund.

Bautista, Carlos C., & Gochoco-Bautista M. S. (2005). Monetary policy and exchange market pressure: The case of the Philippines. *Journal of Macroeconomics,* 27, 153-168.

Bielecki, S. (2005). Exchange market pressure and domestic credit evidence from Poland. *The Poznan University of Economics*, *5*(1), 20-36.

Burdekin, R., & Burkett, P. (1990). Re-examination of the monetary model of exchange market pressure: Canada 1963-1988. *The Review of Economics and Statistics,* 72, 677-681.

Connolly, M., & Da Silveira, J. D. (1979). Exchange market pressure in post-war Brazil: An application of the Girton-Roper monetary model. *American Economic Review,* 69, 448-454.

Caporale, G. M., Cipollini, A., & Demetriades, P. O. (2005). Monetary policy and the exchange rate during the Asian crisis: Identidication through heteroscedasticity. *Journal of International Money and Finance,* 24, 39-53.

Dekle, R., Hsiao, C., & Wang, S. (2002). High interest rates and exchange rate stabilization in Korea, Malaysia, and Thailand: An empirical investigation of the traditional and revisionist views. *Review of International Economics*, 10, 64-78.

Domac, I. (1999). The distributional consequence of monetary policy: Evidence from Malaysia. *World Bank Policy Research Working Paper No.2170*, World Bank.

Eichengreen, B., Rose, A., & Wyplosz, C. (1994). Speculative attacks on pegged exchange rates: An empirical exploration with special reference to the European monetary system. *Working Papers 4898*, National Bureau of Economics Research.

Eichengreen, B., Rose, A., & Wyplosz, C. (1995). Exchange market mayhem: The antecedents and aftermath of speculative attacks. *Economics Policy,* 10, 249-312.

Furman, J., & Stiglitz, J. E. (1998). Economic crises: Evidence and insights from East Asia. *Brookings papers on Economics Activity*, 1-135.

Garcia, C., & Malet, N. (2007). Exchange market pressure, monetary policy, and economic growth: Argentina, 1993-2004. *The Development Economies, XLV*(3), 253-82.

Girton, L., & Roper, D. (1977). A monetary model of exchange market pressure applied to the postwar Canadian experience. *American Economic Review,* 67, 537-548.

Goldfajn, I., & Gupta, P. (1999). Does monetary policy stabilize the exchange rate following a currency crises. *IMF Working Paper 99/42*. Washington: International Monetary Fund.

Gunsel, N. R., Tursoy, T., & Rjoub, H. (2010). An empirical analysis of currency crises, fundamentals and speculative pressure. *African Journal of Business Management*, *4*(6), 972-978.

Hgerty, S. W. (2010). Exchange market pressure and currency crises in Latin America: Empirical test of their macroeconomics determinants. *Economic Bulletin*, *30*(3), 2210-2219.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economics Dynamics and Control,* 12, 231-254.

Johansen, S. (1992). Testing weak exogeneity and the order of cointegration in UK money demand data. *Journal of Policy Modeling,* 14, 313-334.

Kamaly, A., & Erbil, N. (2003). A VAR analysis of exchange market pressure: A case study for the MENA region. *Working Paper 2025*. Retrieved from http://www.erf.org.eg/CMS/getFile.php?id=43

Kaminsky, G. L., Lizondo, S., & Reinhart, C.M. (1998). Leading indicators of currency crises. *International Monetary Fund Staff Paper 45*.

Kaminsky, G. L., & Reinhart, C. M. (1999). The twin crises: The causes of banking and balance-of-payments problems. *American Economic Review*, 89, 473-500

Kim, I. (1985). Exchange market pressure in Korea: An application of Girton- Roper Monetary model. *Journal of Money, Credit and Banking*, 17, 258-263.

Khawaja, M. I. (2007). Exchange market pressure and monetary policy: Evidence from Pakistan. *PIDE Working Paper,* 31. Islambad: Pakistan Institute of Development Economics.

Klaassen, F., & Jager, H. (2006). Model-free measurement of exchange market pressure. *Tinbergen Institute Discussion Paper*, TI2006-112/2.

Kurihara, Y., Yukushima, A., & Minegishi, S. (2011). Exchange market pressure on floating exchange rate system in Asia: Revisited. *International Review of Business and Social Sciences*, *1*(2), 22-38.

Liu, X., & Zhang, J. (2009). RMB exchange market pressure and central bank exchange market intervention. *China and World Economy*, *17*(3), 75-92.

Mcfarlane, L. (2010). Exchange market pressure, currency crises and monetary policy: Evidence from Jamaica. *Working Paper Bank of Jamaica*.

Mah, Jai Sheen (1998) Exchange Market Pressure in Korea: Dynamic Specification, *Applied Economics Letter,* 5, 765-768.

Mansor, H. I. (2005). Sectoral effect of monetary policy: Evidence from Malaysia. *Asian Economics Journal,* 19, 83-102.

Mansor, H. I. (2006). Stock prices and bank loan dynamics in a developing country: The case of Malaysia. *Journal of Applied Economics, IX*, 71-89.

Ohno, K., Shirono, K., & Sisli, E. (1999). Can high interest rates stop regional currency falls? *ADB Working Paper Series, no., 6*. Asian Development Bank Institute.

Pakko, M. K. (2000). Do high interest rates stem capital outflows? *Economics,* 67, 187-192.

Pentecost, J. E., Hooydonk, V. C., & Poeck, V. A. (2001). Measuring and estimating exchange market pressure in the EU. *Journal of International Money and Finance,* 20, 401-418.

Pontines, V., & Siregar, R. (2004). Exchange market pressure and extreme value theory: Incidence of currency crises in East Asia and Latin America. Retrieved from http://repec.org/esausm04/up.18986.1077770584.pdf

Radelet, S., & Sachs, J. (1998). The East Asian financial crisis: Diagnosis, remedies, prospects. *Brookings Papers on Economic Activity,* 1, 1-74.

Ramaswamy, R., & Slok, T. (1998). The real effects of monetary policy in the European Union: What are the differences? *IMF Staff Papers, 45*, 374-396.

Sachs, J., Tornell, A., & Velasco, A. (1996). Financial crises in emerging markets: The lessons from 1995. *National Bureau of Economic Research Working Paper No. 5576*. Cambridge, MA: National Bureau of Economic Research.

Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica,* 48, 1-49.

Tanner, E. (2001). Exchange market pressure and monetary policy: Asia and Latin America in the 1990s. *IMF Staff papers,* 47, 311-33.

Tanner, E. (2002). Exchange market pressure, currency crises, and monetary policy: Additional evidence from emerging markets. *IMF Working Paper,* wp/02/14.

Tatomir, S. (2009). Exchange market pressure on the Croation Kuna. *Financial Theory and Practice*, *33*(2), 187-199

Thornton, J. (1995). Exchange market pressure in Costa Rica, 1986-92: An application of the Girton-Roper Model. *International Economics Journal,* 9, 67-72.

Weymark, D. N. (1995). Estimating exchange market pressure and the degree of exchange market intervention for Canada. *Journal of International Economics,* 39, 273-295.

Weymark, D. N. (1998). A general approach to measuring exchange market pressure. *Oxford Economics Papers,* 50, 106-121.

Wong, S. C., Jomo, K. S., & Chin, K. F. (2005). Malaysian 'Bail outs'?: Capital controls, restructuring and recovery. In K.S. Jomo (Ed.), *The 1997-98 East Asian Crises and Crisis and Crisis Management in Malaysia 1997-1998*, (pp. 1-46). Singapore: Singapore University Press.

Younus, S. (2005). Exchange market pressure and monetary policy. *Policy Analysis Unit (PAU) Working Paper*, wp0603.

## APPENDIX A

TABLE A
The Unit Root Tests for RM/YEN EMP Model

| | ADF | | PP | | KPSS | | I |
|---|---|---|---|---|---|---|---|
| | Constant | Constant with trend | Constant | Constant with trend | Constant | Constant with trend | |
| | | | *Pre- Crisis : 1980M1 - 1997M4* | | | | |
| *dc* | -13.20 (0)[a] | -13.17 (0)[a] | -14.03 (8)[a] | -14.27 (9)[a] | 0.116 (18) | 0.102 (18) | I(0) |
| *i* | -10.92 (0)[a] | -10.88 (0)[a] | -10.87 (2)[a] | -10.83 (2)[a] | 0.178 (0) | 0.163 (0) | I(0) |
| *ipi* | -13.37 (0)[a] | -13.40 (0)[a] | -13.45 (4)[a] | -13.50 (3)[a] | 0.109 (3) | 0.027 (3) | I(0) |
| *emp* | - 8.49 (0)[a] | - 8.45 (0)[a] | - 8.49 (0)[a] | - 8.45 (0)[a] | 0.049 (2) | 0.048 (2) | I(0) |
| | | | *Within- Crisis: 1997M5 - 1998M8* | | | | |
| *dc* | - 3.47 (0)[b] | - 4.44 (0)[b] | - 3.48 (1)[b] | - 7.12 (10)[a] | 0.317 (1) | 0.060 (1) | I(0) |
| *i* | - 7.96 (0)[a] | - 7.66 (0)[a] | - 7.72 (1)[a] | - 7.67 (2)[a] | 0.090 (1) | 0.089 (1) | I(0) |
| *ipi* | - 5.55 (0)[a] | - 5.36 (0)[a] | -10.74 (14)[a] | -11.17 (14)[a] | 0.356 (10) | 0.111 (3) | I(0) |
| *emp* | - 4.19 (0)[a] | - 4.44 (0)[b] | - 4.26 (4)[a] | - 8.31 (14)[a] | 0.290 (6) | 0.109 (3) | I(0) |
| | | | *Post- Crisis : 1998M9 - 2007M9* | | | | |
| *dc* | -12.00 (0)[a] | -12.03 (0)[a] | -11.98 (2)[a] | -12.03 (0)[a] | 0.135 (2) | 0.100 (3) | I(0) |
| *i* | -13.88 (0)[a] | -14.38 (0)[a] | -12.41 (7)[a] | -13.07 (7)[a] | 0.453 (12) | 0.145 (15) | I(0) |
| *ipi* | -11.40 (1)[a] | -11.41 (1)[a] | -21.36 (9)[a] | -22.24 (10)[a] | 0.300 (43) | 0.110 (30) | I(0) |
| *emp* | - 8.58 (0)[a] | - 9.00 (0)[a] | - 8.64 (3)[a] | - 8.95 (9)[a] | 0.455 (2) | 0.051 (5) | I(0) |

Notes: a and b denotes significance at 1% and 5% levels. Figures for ADF are the t-statistics for testing the null hypothesis that the series is nonstationary. Figures for KPSS are LM-statistics for testing the null hypothesis that the series is stationary. Figures in parenthesis are lag length for ADF and bandwidth for PP and KPSS.

TABLE B
The Unit Root Tests for RM/USD EMP Model

| | ADF | | PP | | KPSS | | I |
|---|---|---|---|---|---|---|---|
| | Constant | Constant with trend | Constant | Constant with trend | Constant | Constant with trend | |
| | | | *Pre- Crisis: 1980M1 – 1997M4* | | | | |
| *dc* | -13.20(0)[a] | -13.17(0)[a] | -14.03(8)[a] | -14.27(9)[a] | 0.117(18) | 0.102(18) | I(0) |
| *i* | -10.92(0)[a] | -10.88(0)[a] | -10.87(2)[a] | -10.83(2)[a] | 0.178(0) | 0.163(0) | I(0) |
| *ipi* | -13.37(0)[a] | -13.39(0)[a] | -13.45(4)[a] | -13.49(3)[a] | 0.109(3) | 0.027(3) | I(0) |
| *emp* | - 8.76(0)[a] | - 8.76(0)[a] | - 8.76(1)[a] | - 8.76(1)[a] | 0.169(0) | 0.098(0) | I(0) |
| | | | *Within- Crisis: 1997M5 – 1998M8* | | | | |
| *dc* | - 3.47(0)[b] | - 4.44(1)[b] | - 3.48(1)[b] | - 7.12(10)[a] | 0.317(1) | 0.138(5) | I(0) |
| *i* | - 7.96(0)[a] | - 7.66(0)[a] | - 7.72(1)[a] | - 7.67(2)[a] | 0.090(1) | 0.089(1) | I(0) |
| *ipi* | - 5.55(0)[a] | - 5.36(0)[a] | -10.74(14)[a] | -11.17(14)[a] | 0.449(13) | 0.141(4) | I(0) |
| *emp* | - 3.80(0)[b] | - 3.94(0)[b] | - 3.82(3)[b] | - 6.49(7)[a] | 0.221(4) | 0.138(4) | I(0) |
| | | | *Post- Crisis I: 1998M9 – 2005M6* | | | | |
| *dc* | -10.92(0)[a] | -10.85(0)[a] | -11.03(2)[a] | -10.95(2)[a] | 0.101(1) | 0.073(1) | I(0) |
| *i* | -12.28(0)[a] | -12.64(0)[a] | -11.76(3)[a] | -12.33(2)[a] | 0.441(10) | 0.146(16) | I(0) |
| *ipi* | - 9.81(1)[a] | - 9.79(1)[a] | -17.21(1)[a] | -17.96(2)[a] | 0.056(1)[c] | 0.046(1) | I(0) |
| *emp* | - 5.45(0)[a] | - 5.87(0)[a] | - 5.47(1)[a] | - 5.87(1)[a] | 0.352(5) | 0.144(16) | I(0) |
| | | | *Post- Crisis II: 2005M7 – 2008M9* | | | | |
| *dc* | - 6.03(0)[a] | - 6.06(0)[a] | - 6.03(0)[a] | - 6.06(0)[a] | 0.251(1) | 0.202(1) | I(0) |
| *i* | - 3.87(8)[a] | - 4.07(1)[b] | - 6.11(4)[a] | - 6.65(3)[a] | 0.349(4) | 0.079(4) | I(0) |
| *ipi* | - 9.74(0)[a] | - 9.62(0)[a] | -21.32(14)[a] | -21.89(14)[a] | 0.239(14) | 0.133(10) | I(0) |
| *emp* | - 1.85(0)* | - 1.71(0)* | - 1.94(1)* | - 1.79(2)* | 0.109(3) | 0.113(3) | I(0) |

Note: a and b denotes significance at 1% and 5% levels and * denote the series is nonstationary at level. Figures for ADF and PP are the t-statistics for testing the null hypothesis that the series is nonstationary. Figures for KPSS are LM-statistics for testing the null hypothesis that the series is stationary. Figures in parenthesis are lag length for ADF and bandwidth for KPSS. All series are logarithm transformed.

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# Exchange Rate Misalignment and Economic Growth: Recent Evidence in Malaysia

**N. A. M. Naseem[1,2]* and M. S. Hamizah[2,3]**

[1]*Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*
[2]*School of Economics, Faculty of Economics and Management, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia*
[3]*Faculty of Economics and Administration, Universiti Malaya, 50603 Kuala Lumpur, Malaysia*

## ABSTRACT

The present study aims at investigating the growth effects of real exchange rate misalignments in Malaysia over the period 1991:1-2009:4. The RER misalignment is built through the estimation of the NATREX equilibrium model. Using the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration framework, the results indicate the presence of positive and significant relationship between the RER misalignment and economic growth. This finding obtained is consistent with the notion that the RER misalignment through the distortion in relative price has systematic influence on the pattern of economic development.

*JEL Classification:* C13, C32, F43, O41

*Keywords*: Real Exchange Rate, Misalignment, NATREX Model, Output Growth, ARDL

## INTRODUCTION

In recent years, there has been ongoing concern on the link between real exchange rate (RER) and economic growth. Although RER is not a formally feature in economic growth model, its important role appears to be the core constituent in the affiliation of the development strategy (Eichengreen, 2008). A large numbers of literature on the growth studies employ RER proxies directly. Typically, the finding of RER instability used to be hindered or slower growth (Gavin *et al.,* 1995). Indeed, the evidence provided through the time series movement of the real effective exchange rate (REER) per se is misleading, as it does not distinguish between equilibrium and

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*E-mail address*:
naseemniaz@upm.edu.my (N. A. M. Naseem)
* Corresponding author

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disequilibrium episodes of the movement (Clark *et al.,* 1994; Mongardini, 1998). Since then, the subject of significance of the exchange rate movement on output growth has increasingly received profound interest in economic circles, due to the proposal of the deviation level of the actual RER relative to its equilibrium value or so-called "RER misalignment". The motivation towards increased effort to date with the RER misalignment stems from the fact that its stability and proper alignment tend to lead correct RER pricing in the market, which is essential for the achievements of growth in the tradable sector (Naseem *et al*., 2009, 2010), as well as, the economy at large (Mbaye, 2013). Agarwala (1983), for instance, argues that although there are many forms of distortions that can affect macroeconomic performance, RER misalignment is by far the single most important price distortion affecting economic performance.

The symptom of RER misalignment can be interpreted as exchange rate disequilibrium, characterizing the distortion in relative prices of non-tradable goods to tradable goods, which has been regarded as an important indicator for international competitiveness of a country vis-à-vis the rest of the world (Edwards 1988, Guergill and Kaufman, 1998, Rogoff, 2005 and Candelon *et al.,* 2007). In other words, the RER misalignment is a persistence and significance departure of the actual RER from its long-run equilibrium path. The equilibrium RER usually refers to the value of the RER that is associated with reasonable growth and simultaneous attainment of internal and external balance for specified values of the "structural fundamentals" that may influence these objectives (Nurkse, 1945 and Edwards, 1988)[1]. The magnitude of the RER misalignment through the difference between the actual (observed) RER and its "equilibrium value" can be empirically labeled as overvalued when the actual RER is below the equilibrium RER, with an "undervalued" RER indicating the opposite (Richaud *et al.,* 2000; Zhang, 2001).

Based on Goldstein (1995) and Leape *et al.,* (1997), both exchange rate regimes, in fixed and floating originate misalignment. In particular, the degrees of fixity in exchange rate in terms of fixed or managed exchange rates or in the situation where floating markets are not efficient appear to be a crucial source of RER misalignment. In a floating exchange rate regime, bubble factors, such as speculative attacks, are the primary cause of misalignments that move the exchange rate too much in relation to economic fundamentals. While in fixed regimes, misalignments attribute to poor policy fundamentals that preclude the exchange rate to regulate to changes in economic fundamentals. In addition, the absence of institutional or other types of rigidities (i.e. price stickiness), frictions, and

[1]The internal balance refers to a situation in which the market for nontraded goods is in a sustainable equilibrium, operating at full employment and full capacity output, while the external balance refers to a situation in which the value of the current account deficit is financed through a sustainable level of capital inflows.

other short-run factors preventing the RER from adjusting rapidly towards its medium to long run equilibrium level, which would be the focal caused of an implicit "ideal" underlying RER misalignment to the extent may have great implications on the balance of the economy (Razin & Collins, 1997; Edwards & Savastano, 1999).

In spite the fact that the research of mechanisms involving relationships between exchange rate misalignment and growth is not extensive, but has grown recently with two dominant explanations has been established. One of the main arguments in favor of growing interest, especially in emerging and developing countries, is that the persistent of exchange rate misalignment results in a severe reduction in welfare and efficiency cost hurts economic growth. Among others, Edwards (1988) and Toulaboe (2006) investigates the effect of RER misalignment (i.e. the relative price distortions in the tradable and non-tradable goods sectors) on growth, and discover that a non-optimum allocation of resources through different sectors of the economy leads to a negative impact on growth. In fact, Krugman (1979) and Kaminsky *et al.,* (1998) underlines that misalignment in terms of exchange rate overvaluation, is often the sign of the inconsistency of the decisions of macroeconomic policies, leads to an unsustainable current account deficit and increasing external debt. The empirical literatures have also provided evidence that the presence of protracted overvaluation of currencies is also viewed as a precursor to the most recent currency crisis such as the Asian crisis of 1997 (Frankel & Rose, 1996; Sachs *et al.,* 1996; Kaminsky & Reinhart, 1999; Edwards & Savastano, 1999; Chinn, 2000; Edwards, 2000; Stein & Lim, 2004; Ahmad *et al.,* 2010a). Similarly, the situations of prolonged overvalued RER are associated with poor economic performance (Dollar, 1992; Easterly, 1993, 2001; Clark et al 1994; Easterly *et al.,* 1997; Ong, 1997; Razin and Collins, 1997; Benaroya and Janci, 1999; Domac and Shabsigh, 1999; Acemoglu *et al.,* 2003; Hausman *et al.,* 2005; Gala, 2008). Most notably, a chronic misalignment or overvaluation in RER is the major source of low growth in Africa and Latin America (World Bank, 1984; Gulhati *et al.,* 1985; Cottani *et al.,* 1990; Ghura & Grennes, 1993; Elbadawi & Soto, 1997; Klau, 1998; Fosu, 2000, Fajnzylber *et al.,* 2005; Toulaboe, 2006).

Although the impact of overvaluation is more accentuate, one suggests that small to moderate undervaluation of a currency provides favorable atmosphere to spur output growth. That is, undervaluation is said to enhance international competitiveness while promote exports (Ahmad *et al.*, 2010b) and investment (Dooley *et al.*, 2005), leading to boost economic growth as the adoption of technologies, based on economies of scale (Razin & Collins, 1997; Dooley *et al.,* 2005). China and East Asian countries, for example, have experienced additional growth effect through the lower rate of exchange adjusted for productivity and inflation (Bhalla, 2007). Polterovich and Popov (2004), Rodrik (2008), Eichengreen (2008) and Macdonal and Vieira (2010)

further corroborate the existence of a positive relationship between economic growth and undervalued currencies, which helps fostering long-run economic growth. In return, large undervaluation of a currency also suppresses economic performance through a higher inflation (Adams & Gros, 1986). It reduces consumption and investment (Kahn, 1994; Aguirre & Calderón, 2006). Meanwhile, further substantial exchange rate undervaluation through the policy of sterilization may also result in loss of country's accumulated reserves.

Given the fact that the evolution of the RER misalignment through time can result in misleading conclusions in affecting economic performance, exploring some ideas on the relationship between these two "hot issues" for Malaysia becomes necessarily important. Hence this study exclusively focuses on exchange rate misalignment as an indicator of Malaysian economic growth for the period 1991-2009 that span over three main economics events: (1) 1991 – 2009 the development years of the foreign exchange market and financial opening of the country; (2) 1997 – 1998 the financial crisis; (3) 2008 – 2009 the recent global economic crisis. According to the authors' best knowledge, this study is going to be the first authentic study in Malaysia in examining the linkages between real exchange rate misalignments and output growth. One of the benefits of undertaking single country study is the ability to incorporate the special character of particular country. Such study evades the assumption of similarities among countries in terms of social, geography, economic level and politically (Sun *et al.,* 2002). Malaysia provides an interesting country case study as the competitiveness of real exchange rate plays the key role in its development strategy through its heavily depends on external sector, which acts as its main engine of economic growth. In particular, Malaysia has switched from a flexible regime to a pegged regime under the risk management during the 1997 – 1998 Asian financial crises. Also, the restoration to operate in a managed float by scraping the ringgit's pegged to the U.S. dollar in mid-2005 is an effort to further stimulate its economic performance.

An interesting feature of the finding is that it corroborates the important role of RER misalignment in enhancing the output growth throughout the post-1990 era. The omission of such variables can lead to serious misspecification and instability of the economic development. The findings obtained from this study will bring a new dimension to the understanding of RER misalignment and economic growth. The rest of this paper is organized as follows:

a. Equilibrium Exchange Rate and Misalignment; briefly explains the measurement of Malaysian exchange rate misalignment through the NATREX equilibrium model.

b. Growth Model; describes the growth model used to estimate the effect of real exchange rate misalignment on economic growth.

c. Econometric Methodology and Data; outlines the econometric methodology and presents the data set.

d. Empirical Results; reports the empirical results and respective interpretations.

e. Robustness Check; ascertains the sensitivity of the findings.

f. Summary and Conclusion; concludes the findings and policy implications.

## EQUILIBRIUM EXCHANGE RATE AND MISALIGNMENT

The measurement of the real exchange rate misalignment has long been argued as it engages with an unobserved variable. It is the equilibrium RER or modeling the determinants of the long-run equilibrium RER. Based on the economic literature, there are voluminous competing theories and concepts of equilibrium RER such as purchasing power parity (PPP), monetary model, black market premium (BMP), desirable equilibrium exchange rate (DEER), behavioral equilibrium exchange rate (BEER), natural equilibrium real exchange rate (NATREX) and fundamental equilibrium exchange rate (FEER) (see Williamson, 1994 and Hinkle & Montiel, 1999 for a survey).

In line with the development, this study follows the estimation in Ahmad *et al.,* (2010a). The estimation employs the NATREX model to estimate Malaysian real equilibrium exchange rate. The NATREX model developed by Stein (1994, 1996) is a moving equilibrium exchange rate, which varies over time in response to the changes in the prevailing current real macroeconomic fundamental variables. Edwards (2000) has noticed that the NATREX model is an appropriate measurement to acquire a good fit for exchange rate misalignment as it takes into account real economic activities comprise all adjustments made by the underlying real macroeconomic fundamentals of their respective economies[2]. The equilibrium RER is defined as the ratio of the foreign producer price index (PPI) to the domestic consumer price index (CPI) based (i.e. PPI-CPI based) which is a function of a set of macroeconomic fundamental variables, namely government expenditure (GOVTEXP), interest rate differential (RIRD), terms of trade (TOT) and productivity (PROD) (see for example Rajan *et al.,* 2004)[3]. The NATREX equilibrium model is derived via vector error correction technique (VECM) and can be expressed as an Equation (1)[4]:

[2]For detailed discussion on the NATREX equilibrium model, please consult Stein (1994 and 1996), Stein and Paladino (1998) and Stein and Lin (2002).

[3]The choice of the PPI has been widely applied in analyses of developing countries due to the influenced by it being weighted with traded goods, signifying a greater proportion of traded goods (Dornbusch, 1984; Edwards, 1989). In addition, the wide used of CPI in most of previous studies is justified by the matter of expediency and the data unavailability.

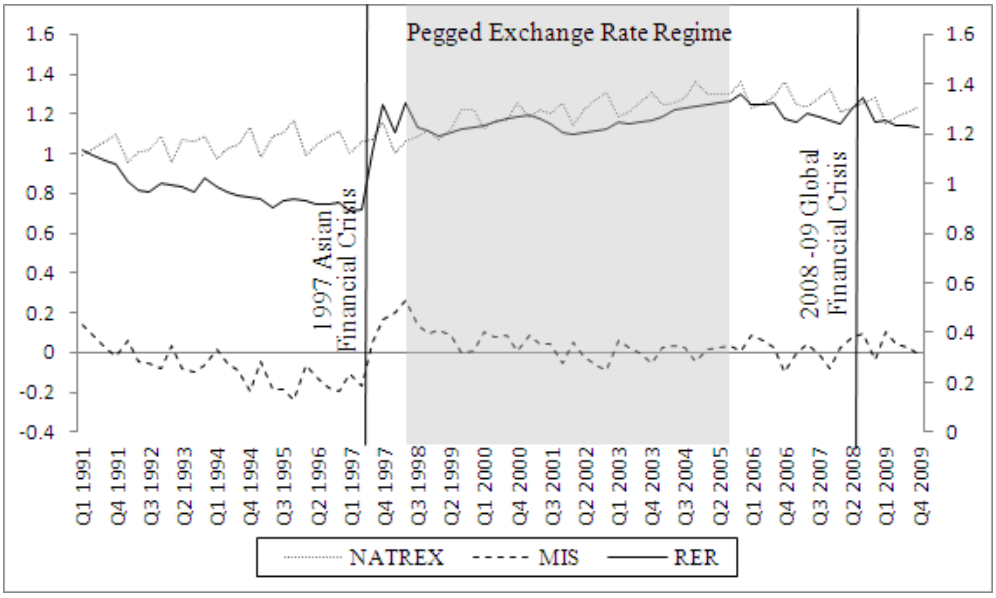
[4]For the theoretically predicted signs of independent variables, among other, see Elbadawi and Soto (1994), Baffes *et al*. (1999), Clark and MacDonald (1998), Edwards and Savastano (1999) and Edwards (2000).

$$RER = 0.367GOVTEXP - 0.038RIRD + 0.878\ TOT + 0.307PROD - 4.398 \quad (1)$$

From the above equation, the rate of misalignment can be calculated through the difference between the actual (RER) and the natural real equilibrium exchange rate (NATREX), implying the deviation of a currency from its equilibrium path. The series of misalignment rate (MIS) is demonstrated in Fig.1. The RER is said to be misaligned in terms of overvaluation when NATREX is higher than RER, (RER < NATREX) and vice versa.

## GROWTH MODEL

The econometric framework adopted in this study relies on the standard growth equation augmented by including the term 'misalignment effect' to the right-hand side variables that are usually considered in growth equations. The specification of the output growth equation is consistent with the nature of the Malaysian economy. The equation has been commonly used in the literature on the determination of growth model (see for example Kormendi & Meguire, 1985; Barro, 1991; Levine & Renelt, 1992; Mankiw *et al.,* 1992). Based on the neoclassical model of Solow (1956), the rate of economic growth is




Notes: RER is the Malaysian real exchange rate, ringgit against the US dollar. An increase in RER implies a real depreciation of exchange rate. NATREX is the Malaysian natural real equilibrium exchange rate. MIS is the Malaysian Real Exchange Rate Misalignment. The level of misalignment = [(RER – NATREX)/ NATREX] * 100, where a negative (positive) number implies an overvaluation (undervaluation).

Fig.1: The Malaysian Real Exchange Rate Misalignment

the function of capital stock and rate of population. It is also widely hypothesized to measure human capital as the key factor of growth (Barro, 1991) and Easterly (2001). Following the developments of the endogenous growth theory, a number of determinants are included to reflect the macroeconomic stabilization policies (inf) and the institutions development (FD). In addition, the currency misalignment is integrated in order to measure the impact of RER misalignment (mis) on economic growth. Among those that measure the impact of exchange rate misalignment to long-run growth model are Fajnzylber *et al.,* (2005), Aguirre and Calderón (2006) and Zakaria (2010). To be more specific , the following form of dynamic growth model summarizes the basic thrust of the output growth model:

$$GROWTH_t = f(KS_t, HC_t, POP_t, FD_t, inf_t, mis_t) \quad (2)$$

$$GROWTH_t = \gamma_0 + \gamma_1 KS_t + \gamma_2 HC_t + \gamma_3 POP_t + \gamma_4 FD_t + \gamma_5 inf_t + \gamma_6 mis + u_t \quad (3)$$

where, $GROWTH_t$ is the growth rate in real GDP per capita, $KS_t$ is the capital stock per worker (calculated as a ratio of total capital stock to labor force), $HC_t$ is the life expectancy (as a proxy for human capital), $POP_t$ is the level of population, $FD_t$ is the financial depth (defined as the ratio of broad money supply (M2) to GDP), $inf_t$ is the rate of inflation (as a proxy of lack of price stability), $mis_t$ is the degree of exchange rate misalignment, $u_t$ is the disturbance term and $t$ refers to time period. The uppercase letters designate that the underlying variables are in natural log form.

The sensitivity of the variables in the output growth model is measured through their parameters. Usually, the output growth equation will have $\gamma_1$ (capital stock elasticity of output growth) > 0, $\gamma_2$ (human capital elasticity of output growth) > 0, $\gamma_3$ (population elasticity of output growth) < 0, $\gamma_4$ (financial depth elasticity of output growth) > 0. $\gamma_5$ (rate of inflation semi-elasticity of output growth) < 0. As mentioned earlier, $\gamma_6$ can either be positive or negative depending on the significance of over or under-valuation of a currency. Thus, $\gamma_6$ (misalignment in terms of undervaluation semi-elasticity of output growth) > 0.

The capital stock is constructed through the perpetual inventory method (PIM). It estimates capital stock from time series of gross fixed capital formation. Basically, it allows the estimation on how many of the fixed assets installed as a result of gross fixed capital formation carried out in previous years have continued to the current periods. It can be defined as follows:

$$K_t = (1-\delta)K_{t-1} + I_t \quad (4)$$

where $K$ denotes the capital stock, $\delta$ is the rate of physical depreciation and $I$ is investment described as the gross fixed capital formation. The initial capital stock is computed based on the assumption that both capital and output grow at the same

level. Explicitly, the initial capital stock for data commencing in 1991, for example can be derived as $K_{1990} = I_{1991}/(g+\delta)$, where $g$ is the 3 year growth rate of output (e.g. 1991, 1992 and 1993) and $\delta(0.06)$ is the assumed rate of depreciation (See Hall & Jones, 1999; Bernanke & Gurkaynak, 2001). However, due to the unavailability of quarterly base data, these variables (capital stock, life expectancy and level of population) have been interpolated from yearly to quarterly base using Gandolfo (1981) to facilitate the utility of the system.

## ECONOMETRIC METHODOLOGY AND DATA

In this study, the autoregressive distributed lag (ARDL) bound test proposed by Pesaran *et al.,* (2001) is utilized to estimate the growth model. It is well-known that one of the major advantages of ARDL bounds test is that it is applicable regardless of the stationary properties. It is irrespective of whether the regressor in the output growth equation is purely $I(0)$ or $I(1)$, or mutually cointegrated. This proposes a useful approach that bypasses the need for pre-testing the integration order of variables. The potential biased associated in the unit root test can be avoided. Besides, the issue of endogeneity is less of a problem. The ARDL model takes sufficient number of lags to capture the data generating process in general to specific modeling framework (Laurenceson & Chai 2003). According to the bounds test procedure, it is essential to model equation (3) as a conditional ARDL as follows:

$$\begin{aligned}
&\Delta GROWTH_t \\
&= \theta_0 + \delta_1 GROWTH_{t-1} + \delta_2 KS_{t-1} \\
&\quad + \delta_3 HC_{t-1} + \delta_4 POP_{t-1} + \delta_5 FD_{t-1} \\
&\quad + \delta_6 Inf_{t-1} + \delta_7 mis_{t-1} \\
&\quad + \sum_{i=1}^{n} \lambda_1 \Delta GROWTH_{t-i} + \sum_{i=0}^{n} \lambda_2 \Delta KS_{t-i} \\
&\quad + \sum_{i=0}^{n} \lambda_3 \Delta HC_{t-i} + \sum_{i=0}^{n} \lambda_4 \Delta POP_{t-i} \\
&\quad + \sum_{i=0}^{n} \lambda_5 \Delta FD_{t-i} + \sum_{i=0}^{n} \lambda_6 \Delta \inf_{t-i} \\
&\quad + \sum_{i=0}^{v} \gamma_7 mis_{t-i} + u_t \qquad (5)
\end{aligned}$$

where $\Delta$ is first difference operator and $u_t$ is a white-noise disturbance error term. The long-run relationship between the concerned variables can be conducted based on the Wald test ($F$-statistic) by imposing restrictions on the estimated long-run coefficients of one period lagged level of the variables equal to zero, $Ho: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = 0$. Then, the computed $F$-statistic is compared to the critical value tabulated in Pesaran *et al.,* (2001) and Narayan (2005). The lower bound values assume that all explanatory variables are integrated of order zero, or $I(0)$, while, the upper bound values assume that all explanatory variables are integrated of order one, or $I(1)$. Therefore, if computed $F$-statistic falls below the lower bound value, $I(0)$, the null hypothesis of no cointegration cannot be rejected. Conversely, if the computed $F$-statistic exceeds the upper bound value, $I(1)$ then, it is concluded that growth and its determinants are moving together to a long-run equilibrium. A conclusive inference cannot be reached if the computed $F$-statistic falls within the bound values.

Once a cointegration relationship has been ascertained, the long-run and short-run parameters of the cointegration equation are then estimated. The long-run cointegration relationship is estimated using the following specification:

$$GROWTH_t = \gamma_0 + \sum_{i=1}^{p} \gamma_1 GROWTH_{t-i} + \sum_{i=0}^{q} \gamma_2 KS_{t-i} + \sum_{i=0}^{r} \gamma_3 HC_{t-i} + \sum_{i=0}^{s} \gamma_4 POP_{t-i} + \sum_{i=0}^{t} \gamma_5 FD_{t-i} + \sum_{i=0}^{u} \gamma_6 \inf_{t-i} + \sum_{i=0}^{v} \gamma_7 mis_{t-i} + u_t \quad (6)$$

However, the speed of adjustment back to equilibrium might not able to adjust immediately. Thus, the output for growth is most likely to be varied from its actual level of growth. It may have been caused by the adjustment process and lags in perceiving changes in any of the growths' determinants. Hence, the speed of adjustment of the growth model can be captured through the estimation of the error correction model as expressed below:

$$\Delta GROWTH_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta GROWTH_{t-i} + \sum_{i=0}^{q} \beta_2 \Delta KS_{t-i} + \sum_{i=0}^{r} \beta_3 \Delta HC_{t-i} + \sum_{i=0}^{s} \beta_4 \Delta POP_{t-i} + \sum_{i=0}^{t} \beta_5 \Delta FD_{t-i} + \sum_{i=0}^{u} \beta_6 \Delta \inf_{t-i} + \sum_{i=0}^{v} \beta_7 \Delta mis_{t-i} + \beta_8 \ \varepsilon_{t-1} + u_t \quad (7)$$

where, $\varepsilon_{t-1}$ is the error correction term of one period lagged estimated from the equation (7), while the coefficient ($\beta_8$) measures the speed of adjustment of the model's convergence to equilibrium.

The analysis of this study uses quarterly data that covers for the period 1991:1 to 2009:4 with 76 observations. The quarterly frequency data are utilized as monthly data would precludes the use of macroeconomic data such as output growth and monetary. All of these data are primarily gathered from the International Financial Statistics published by the International Monetary Fund, excluding the human capital and capital stock per worker, where are sourced from the World Development Indicator, published by the World Bank.

## EMPIRICAL RESULTS

The estimated ARDL bounds test for the presence of a long-run output growth equation is provided in Table 1. The outcome of the bounds test critically depends on the comparisons of computed *F*-statistics against the critical values extracted from Pesaran *et al.,* (2001), as well as, the critical values that account for small sample sizes provided by Narayan (2005). The result shows that the computed *F*-statistics, $F_{GROWTH}$(GROWTH|KS,HC,POP,FD,inf,mis) = 7.605, is higher than that the upper bound critical value of 4.96 at the 1% significant level. This implies that the null hypothesis (*Ho*: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = 0$) of no long-run coefficient cannot be accepted. There is compelling evidence for cointegration between growth and its determinants. Notice that when the rest of the variables [KS,HC,POP,FD,inf,mis] in the model are repetitively taken as a dependent variable, the calculated *F*-statistics are less than the lower bound critical value at the 1% level.

Thus, the null hypothesis of no cointegration cannot be rejected. Conclusively, a unique cointegration relationship exists among the variables in Malaysian output growth model for the observed period, specifically when economic growth is the dependent variable.

Next, following the order of ARDL (2,2,2,0,0,0) specification as selected through the AIC, the long run parameter estimates of the output growth model are obtained. The results in Table 2 exhibit that the coefficients of the key regressors considered in the equation have a significant and theoretically consistent coefficient estimates at least at 5% significance levels. An appealing part of the results is that the RER misalignment exerts a positive sign and is statistically significant at 1% level. Economically, an increase by one basis point in actual RER misalignment leads the growth rate to increase by 0.07 basis points per quarter. This result implies that the growth rate in Malaysia is enhanced by the RER misalignment (Polterovich & Popov, 2004; Rodrik, 2008; Eichengreen, 2008; Zakaria, 2010; Macdonal & Vieira, 2010). The outcome is in accordance with the theory, which stipulates that currency in relative below of its equilibrium level encourages international competitiveness, embodies better exports performance and output growth (see for example, Razin & Collins, 1997; Dooley *et al.,* 2005; Bhalla, 2007). Therefore, the results confirm the critical nature of RER behavior in determining economic growth.

In Malaysia, a more difficult and sometimes controversial question is the implementation of different exchange rate regimes in moving its economic performance. Although Malaysia has practiced the managed float and pegged regimes, it is evident that RER misalignment appears to be the major concern in the process of economic development. It is the result of relying heavily on the external

TABLE 1
ARDL Bound Test

| | | | | Critical Bound ($F$-test) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Pesaran *et al.* (2001) | | Narayan (2005) | |
| Model | $F$-test | Lag | Critical Value | *I(0)* | *I(1)* | *I(0)* | *I(1)* |
| $F_{GROWTH}$(GROWTH\|KS,HC,POP,FD,inf,mis) | 7.605♣ | 3 | 99% | 3.15 | 4.43 | 3.49 | 4.96 |
| $F_{KS}$(KS\|GROWTH,HC,POP,FD,inf,mis) | 1.586♠ | 3 | 95% | 2.45 | 3.61 | 2.64 | 3.90 |
| $F_{HC}$(HC \|GROWTH,KS,POP,FD,inf,mis) | 2.109♠ | 5 | 90% | 2.12 | 3.23 | 2.24 | 3.39 |
| $F_{POP}$(POP\|GROWTH,KS,HC,FD,inf,mis) | 2.062♠ | 4 | | | | | |
| $F_{FD}$(FD\|GROWTH,KS,HC,POP,inf,mis) | 1.814♠ | 4 | | | | | |
| $F_{inf}$ (inf\|GROWTH,KS,HC,POP,FD,mis) | 2.039♠ | 3 | | | | | |
| $F_{mis}$(mis\|GROWTH,KS,HC,POP,FD,inf) | 1.384♠ | 5 | | | | | |

Notes: Critical values are extracted based on Pesaran *et al.,* (2001) and Narayan (2005), Table (C1.iii), Case III: unrestricted intercept and no trend. The structural lags are determined by using minimum Akaike's Information Criteria (AIC). The superscript ♣ point out that the statistic lies above the upper bound, while superscript ♠ designates that it falls below the lower bound.

sector to further spur the output growth. The finding is also consistent with the view that both exchange rate arrangements, in fixed and floating initiate RER misalignment. The degree of fixity in the exchange rates, the rigidness of prices and the absence of institutional seem to be the key of failure that drawn the RER into a vicious circle of misalignment (Goldstein, 1995, Leape *et al.,* 1997, Razin & Collins, 1997; Edwards & Savastano, 1999). Sekkat and Varoudakis (2000) and Bouoiyour and Rey (2005), for instance, demonstrate that the mismanagement of economic strategies, inconsistency between the monetary policy and fiscal discipline along with exchange rate arrangement may lead developing countries to experience great influence from the presence of RER misalignment on economic performance. This finding further supports the study's contention that RER misalignment cannot be ignored in the analysis of economic development in the output growth model, especially in emerging economies, like Malaysia.

It is also reassuring that capital stock per worker, human capital and financial development have a positive and significant impact on growth. In other words, this finding validates that growth is enhanced by the high capital stock per worker, increased investment in human capital and aggressive financial development. Other control variables show that the inflation rate is significantly negative. As part of a broad macroeconomic stabilization policy, price instability is an important condition to adversely affect growth. Finally, as an agreement with the Solow growth model, the population coefficient appear to be negative and statistically significant.

TABLE 2
ARDL Long-run Estimates

| Dependent Variable: GROWTH | | | | |
|---|---|---|---|---|
| Regressors | | coefficient | *t*-statistics | |
| KS | | 0.039 | 2.046♠ | |
| HC | | 0.034 | 3.102♠ | |
| POP | | -0.171 | -9.103♣ | |
| FD | | 0.065 | 2.360♠ | |
| inf | | -0.096 | -4.194♣ | |
| mis | | 0.073 | 3.322♣ | |
| Constant | | -0.585 | -2.338♠ | |
| Diagnostic test | *AR(2)* | *ARCH(3)* | *JB(2)* | *RESET(2)* |
| $\chi^2$ | 0.397 | 0.109 | 0.321 | 0.335 |
| *p*-value | 0.802 | 0.741 | 0.851 | 0.563 |

Notes: The superscript ♣ denotes statistical significance at the 1% level and ♠ indicates statistical significance at the 5% level. The diagnostic test statistics are: AR(*i*) = LM-type Breusch-Godfrey Serial Correlation LM; ARCH(*i*) = Engle's *i*th order autoregressive conditional heteroskedasticity test; JB[2] = Jarque-Bera test for normality of residual; RESET = Ramsey's test for functional form misspecification.

In addition, the adequacy of the model specification is measured through a number of diagnostic tests. As reported in Table 2, the computed Breusch-Godfrey serial correlation LM test is statistically insignificant at usual significance levels. It suggests that the disturbances are serially non-autocorrelation. On the other hand, the heteroskedasticity test signifies that the residual has a constant variance. The model also passes the Jarque–Bera test for normality and the Ramsey's RESET statistics. This means that the estimated growth models are well specified, which fulfill the conditions of normality of residual and zero mean of disturbance with no serious omission of variables. Hence, the estimated output growth model is sufficient and it can be used to construct the subsequent explanation on the behavior of Malaysian economics development.

Once a stable long-run output growth equation is ascertained, the estimation of short-run dynamics model is carried out through the re-parameterization of the estimated ARDL (2,2,2,0,0,0) model. Based on the results in Table 3, the estimated error-correction term, $ECT_{t-1}$ for the output growth model has its expected negative sign and is highly significant. This ensures that the series is non-explosive and the long-run equilibrium is attainable. According to Kremers *et al.,* (1992), a significant error-correction term is comparatively more efficient to establish cointegration. The ECM coefficient of -0.14 depicts that the speed of adjustment of the output growth in perceiving changes in its determinants is fairly slow before converging to its equilibrium level. This implies that approximately 14 percent of the discrepancy of the previous period's shock adjusts back to the long-run equilibrium in the current quarter.

A significant error-correction term embodies causality from capital stock, human capital, population, financial depth, inflation and RER misalignment to growth. The causality relationship can be captured by the lagged differences and conventional tests of causality through the significance of these terms. The error-correction terms characterize the possibility of deviation evolving

TABLE 3
ARDL Model ECM Results

Estimated coefficients (*t*-statistics)

$$\Delta GROWTH_t = \underset{(8.865)^{\clubsuit}}{0.745\Delta GROWTH_{t-1}} - \underset{(-2.369)^{\spadesuit}}{0.041\Delta HC_t} + \underset{(4.861)^{\clubsuit}}{0.058\Delta HC_{t-1}} - \underset{(-0.949)}{0.177\Delta HC_t} + \underset{(1.817)^{\blacklozenge}}{0.183\Delta HC_{t-1}}$$

$$- \underset{(-2.064)^{\spadesuit}}{0.026\Delta POP_t} - \underset{(-0.978)}{0.016\Delta POP_{t-1}} + \underset{(1.882)^{\blacklozenge}}{0.015\Delta FD_t} - \underset{(-2.989)}{0.032\Delta inf_t} + \underset{(2.222)^{\spadesuit}}{0.023\Delta mis_t} - \underset{(-2.831)^{\clubsuit}}{2.015}$$

$$- \underset{(-2.969)^{\clubsuit}}{0.141ecm_{t-1}}$$

$\bar{R}^2 = 0.78$

Notes: $\Delta$ indicates the first difference and $ECM_{t-1}$ is the error correction term. The superscripts ♣, ♠ and ♦denote statistical significance at the 1%, 5%, and 10% levels, respectively.

from the long-run equilibrium. The size and the significance of the error correction term reflect the propensity of each explanatory variable to fit in the equilibrium of the output growth model. The sign of the individual coefficient of RER misalignment ($mis_t$) appears to be positive and statistically significant at conventional significance levels for the current lag, as displayed in Table 3. The impact of RER misalignment on growth is relatively small, which a 1 per cent increase in RER misalignment leads to induce a 0.02 per cent increase in output growth. The positive sign means that hasten in RER misalignment tends to surge the real balance held in growth.

In order to assess the stability of the long-run relationship between growth and its determinants, the cumulative sum (CUSUM) and the cumulative sum of square (CUSUMSQ) test advocated by Brown *et al.,* (1975) are performed. Fig.2 and Fig.3 illustrate that the plots of CUSUM and CUSUMSQ statistics are well within the critical bounds. That indicates the estimated regressions are stable at 5% significance level. The result justifies that

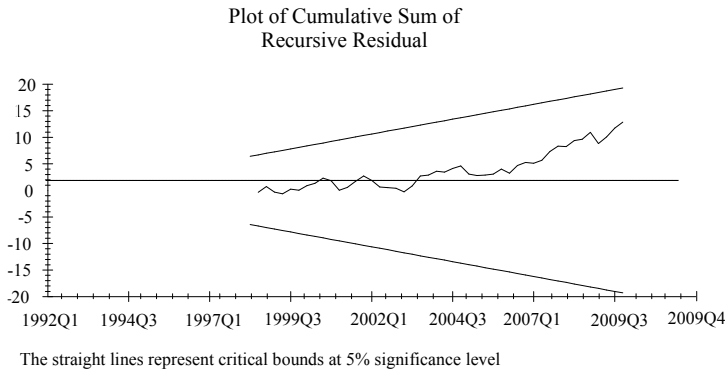



Fig.2: Plot of CUSUM

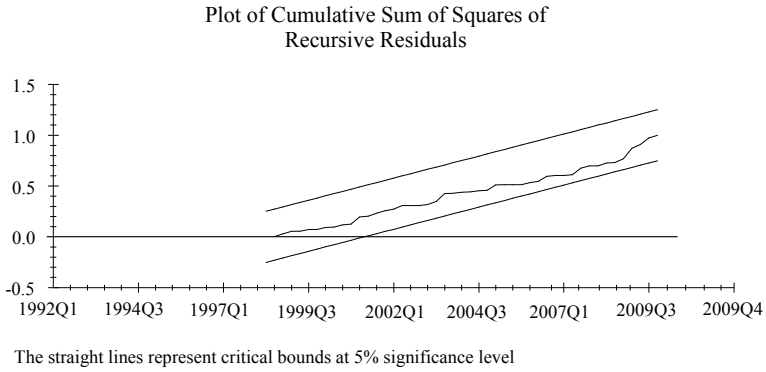



Fig.3: Plot of CUSUM-squared

the presence of RER misalignment turns out to be important in the output growth model, where its exclusion may lead to the function exhibiting some instability. The goodness of fit of the estimated models to the data is also found to be satisfactory, as indicated by the high values of adjusted $R$-squared ($\bar{R}^2$= 0.78). This finding is comforting as it implies that over the periods under consideration, a stable long-term relationship exists between growth, capital stock, human capital, population, financial depth, inflation and RER misalignment.

## ROBUSTNESS CHECK

The sensitivity of the results is ascertained through a number of robustness checks to alternative measure of human capital and growth. The first set of robustness check explores the application of different variables of human capital, such as secondary school enrollment (EDUC). The results obtained in Panel A, Table 4, remain similar to the main results as reported in Table 2. Specifically, the coefficient of EDUC is close to the one described in the main result. In fact, all

TABLE 4
Robustness Check

| Dependent Variable: GROWTH | **Panel A: HC = EDUC** | | **Panel B: GROWTH = Y** | |
|---|---|---|---|---|
| | coefficient | *t*-statistics | coefficient | *t*-statistics |
| KS | 0.043 | 2.608♠ | 0.054 | 2.678♠ |
| HC | 0.029 | 2.059♠ | 0.023 | 2.222♠ |
| POP | -0.287 | -3.758♣ | -0.361 | 4.314♣ |
| FD | 0.057 | 2.174♠ | 0.052 | 4.861♣ |
| inf | -0.061 | -3.129♣ | -0.063 | -4.092♣ |
| mis | 0.084 | 2.497♠ | 0.076 | 2.099♠ |
| Constant | -0.438 | -5.465♣ | -0.616 | 4.202♣ |
| Bound Tests (*F*-stat) | 5.945 | | 7.041 | |
| Diagnostic test (*p*-value) | | | | |
| *AR(2)* | 0.434 (0.514) | | 0.419 (0.811) | |
| *ARCH(3)* | 0.178 (0.673) | | 0.137 (0.713) | |
| *JB(2)* | 0.221 (0.641) | | 0.106 (0.745) | |
| *RESET(2)* | 0.389 (0.533) | | 0.335 (0.563) | |

Notes: EDUC is secondary school enrolment that extracted from Department of Statistics, Malaysia while Y is the real GDP, which gathered from IMF, International Financial Statistics (IFS). The superscript ♣ denotes statistical significance at the 1% level and ♠ indicates statistical significance at the 5% level. Critical values for the ARDL bounds test are extracted based on Pesaran *et al.,* (2001) and Narayan (2005), Table (C1. iii), Case III: unrestricted intercept and no trend. Pesaran *et al.* (2001) (Narayan, 2005) Critical Bound's value at the 1% level – Lower: 3.15 (3.49) and Upper: 4.43 (4.96), at the 5% level – Lower: 2.45 (2.65) and Upper: 3.61 (3.90) and at the 10% level – Lower: 2.12 (3.23) and Upper: 2.24 (3.39). The structural lags are determined by using minimum Akaike's Information Criteria (AIC). The diagnostic test statistics are: AR($i$) = LM-type Breusch-Godfrey Serial Correlation LM; ARCH($i$) = Engle's $i$th order autoregressive conditional heteroskedasticity test; JB[2] = Jarque-Bera test for normality of residual; RESET = Ramsey's test for functional form misspecification.

coefficients still have the expected sign and more or less possess the same magnitude in respect to the results of Table 2. The second set of robustness checks involves different variable of GROWTH. It utilizes the real GDP (Y) as demonstrated in Panel B, Table 4. Again, the empirical results appear to hold intact to those displayed in Table 2. They validate the determinants of growth model. This finding concludes that the nature of the results are robust to the alternative measure of human capital and growth.

## SUMMARY AND CONCLUSION

Based on the economic theory of economic growth, this paper pays a special attention to the influence of RER misalignment on economic growth in Malaysia. By using the RER misalignment constructed by Ahmad *et al.,* (2010a), the empirical estimation of the ARDL bound testing technique to cointegration signifies the presence of a positive and significant relationship between RER misalignment and economic growth. This reflects that the RER misalignment in Malaysia with different exchange rate regimes, Managed float-to-Pegged regimes, is at a moderate level to enhance its economic growth. It leads Malaysia to reap growth benefits by maintaining the RER at its appropriate value. This manifests that the selection of exchange rate arrangement seems to be timely. Meaning that, the Malaysian RER departs from its equilibrium path at the competitive level, where Malaysia remains competent to further generate economic development.

The finding confirms the hypothesis that the correction of RER misalignment and the RER stability are crucial for economic growth in developing countries. It is also important to maintain their continuous improvement in international competitiveness while retaining its balance of payment at a sustainable level. This suggest, the avoidance of a variable that represents the influence of exchange rate risks, such as RER misalignment, can lead to biased results. Therefore, the espousal of policies should encompass optimal measurement in reducing the exchange rate fluctuations and restoring the equilibrium of exchange rate aimed at stabilizing the domestic economy. Hence, acknowledgement of the RER misalignment is pivotal not only for the design of exchange rate policy but also vital in modeling any trade agenda, forecasting and economic development strategy. Maintaining a flexible exchange rate and monetary independence is increasingly important for Malaysia, especially towards more open and greater integration with the rest of the world. As a result, a plausible assessment of RER misalignment effect on economic growth is essential, particularly in an emerging market with the recent dynamic, competitive and globalized international.

## REFERENCES

Acemoglu, D., Johnson, S., Robinson, J., & Thaicharoen, Y. (2003). Institutional causes, macroeconomic symptoms: Volatility, crises and growth. *Journal of Monetary Economics, 50*, 49–123.

Adams, C., & Gros, D. (1986). The consequence of real exchange rate rules for inflation: Some illustrative examples. *IMF Staff Papers, 33*, 439-476.

Agarwala, R. (1983). Price distortion and growth in developing countries. *World Bank Staff Working Papers*, No. 575.

Aguirre, A., & Calderón, C. (2006). Real Exchange Rate Misalignments and Economic Performance. *Central Bank of Chile, Economic Research Division, Working Paper* 315.

Ahmad, M. N. N., Yusop, Z., & Masron, T. A. (2010a). How did the Malaysian real exchange rate misalign during the 1997 Asian crisis? *International Journal of Economics, Management and Accounting*, *18*(2), 161-195.

Ahmad M. N. N, Mohd M. S., & Masron, T. A. (2010b). Exchange rate misalignment, volatility and Malaysian export flows. *International Journal of Business and Society*, *11*(2), 51-70.

Baffes, J., Elbadawi, I., & O'Connell. S., (1997). Single equation estimation of the equilibrium real exchange rate. *The World Bank Policy Research Working Paper* No. 1800.

Barro, R.J. (1991). Economic growth in a cross-section of countries. *Quarterly Journal of Economics, 106*, 407–443.

Benaroya, F., & Janci, D. (1999). Measuring exchange rates misalignment with purchasing power parity estimates. In S. Collignon, J. Pisani-Ferry & Y. C. Park (Eds.), E*xchange rate policies in emerging Asian countries*, Routledge: New York.

Bernanke, B.S., & Gürkaynak, R.S. (2002). Is growth exogenous? Taking Mankiw, Romer, and Weil seriously. NBER Chapters , *in: NBER Macroeconomics Annual 2001, 16*, 11-72.

Bhalla, S. S. (2007). *There are no growth miracles*. Paper Presented at IMF, Washington DC.

Bououiyour, J., & Rey, S. (2005). Exchange rate regime, real exchange rate, trade flows and foreign direct investments: The Case of Morocco. *African Development Review, 17*, 302-334.

Candelon, B., Kool, C., Raabe, K., & Veen, T.V. (2007). Long-run real exchange rate determinants: Evidence from eight new EU member states, 1993-2003. *Journal of Comparative Economics*, *35*, 87-107.

Chinn, M. D. (2000). Three measures of East Asian currency overvaluation. *Contemporary Economic Policy, 18*, 205-214.

Clark, P., Bartolini, L., Bayoumi, T., & Symansky, S. (1994). Exchange rates and economic fundamentals: A framework for analysis. *IMF Occasional Paper,* No 115.

Cottani, J. A., Cavallo, D. F., & Khan, M. S. (1990). Real exchange rate behavior and economic performance in LDCs. *Economic Development and Cultural Change, 39*, 61-76.

Dollar, D. (1992). Outward-oriented developing economies really do grow more rapidly: Evidence from 95 LCDs, 1976-1985, *Economic Development and Cultural Change, 40*, 523- 44.

Domac, I., & Shabsigh, G. (1999). Real exchange rate behavior and economic growth: Evidence from Egypt, Jordan, Morocco, and Tunisia, *IMF Working Paper,* No. 1999 (40).

Dooley, M. P., Folkerts-Landau, D., & Garber P. (2005). An essay on the revived Bretton Woods. *NBER Working Paper*, No. 11771.

Dornbusch, R. (1980). *Open economy Macroeconomics*. New York: Basic Books, Inc. Publishers.

Easterly, W., Loayza, N. & Montiel, P. (1997). Has Latin America's post-reform growth been disappointing? *Journal of International Economics*, *43*, 287-311.

Easterly, W. (2001). The lost decades: Developing countries' stagnation in spite of policy reform 1980-1998. *Journal of Economic Growth, 6*, 135–157.

Edwards, S (1988). *Exchange Rate Misalignment In Developing Countries*. Baltimore& London: John Hopkins University Press.

Edwards, S., & Savastano, M. (1999). Exchange rates in emerging economies: What do we know? What do we need to know?" *NBER Working Paper,* No. 7228.

Edwards, S. (2000). *Exchange rates systems in emerging economies*. Mimeo.

Eichengreen, B. (2008). The real exchange rate and economic growth. *Commission on Growth and Development Working Paper*, No. 4.

Elbadawi, I., & R. Soto. (1994). Capital flows and equilibrium real exchange rates in Chile. *The World Bank Policy Research Working Paper,* No.1306.

Elbadawi, I., & Soto, R. (1997). Real exchange rates and macroeconomic adjustment in Sub-Saharan Africa and other developing countries. *Journal of African Economies*, *6*, 74-120.

Fajnzylber, P., Loayza, N., & Calderón, C., (2005). Economic growth in Latin America and the Caribbean, the World Bank, Washington D.C. *The World Bank Latin America and the Caribbean Regional Studies Program,* No. 156.

Fosu, A. K. (2000). The international dimension of African economic growth. *CID Working Paper,* No 34, Center for International Development, Harvard University.

Frankel, J., & Rose, A. K. (1996). Exchange rate crises in emerging markets. *Journal of International Economics, 41*, 351-368.

Gala, P. (2008). Real exchange rate levels and economic development: Theoretical analysis and econometric evidence. *Cambridge Journal of Economics, 32*, 273-288.

Gandolfo, G. (1981). *Qualitative Analysis and Econometric Estimation of Continuous Time Dynamic Models*, North-Holland Publishing Company.

Gavin, M., Hausmann, R., & Leiderman, L. (1995). The macroeconomics of capital flows to latin america: Recent experienced and policy issues. *IADB Office of the Chief Economist Working Paper,* No. 310. Inter-American Development Bank, Washington, DC.

Ghura, D., & Grennes, T. (1993). The RER and macroeconomic performance in Sub-Saharan Africa. *Journal of Development Economics*, *42*, 155-74.

Goldstein, M. (1995). *The Exchange Rate System and the IMF: A Modest Agenda*, Washington D.C., Institute for International Economics.

Guerguil, M., & Kaufman, M. (1998). Competitiveness and the evolution of the real exchange rate in Chile. *IMF Working Paper,* No. 58.

Gulhati, R., Bose, S., & Atukorala, V. (1985). Exchange rate policies in Eastern and Southern Africa, 1965-1983. *World Bank Staff Working Paper*, No. 720.

Hall, R. E., & Jones, C. I. (1999). Why do some countries produce so much more output per worker than others? *The Quarterly Journal of Economics , 114*, 83-116.

Hausman, R., Pritchett, L., & Rodrick, D. (2005). Growth accelerations. *Journal of Economic Growth, 10*, 303-329.

Hinkle, L. E., & Montiel P. J., (1999). *Exchange Rate Misalignment: Concepts and Measurement for Developing Countries.* New York: Oxford University Press.

Kahn, B. (1994). South African exchange rate policy, 1971-1991. *Center for the Study of the South African Economy and International Finance, Working Paper* No. 7.

Kaminsky, G, Lizondo, S., & C Reinhart (1997). Leading indicators of currency crisis. *Policy Research Working Paper,* No. 1852.

Kaminsky, G., & Reinhart, C. (1999). Currency and banking crises: The early warnings of distress. *American Economic Review, 89*, 473-500.

Klau, M. (1998). Exchange rate regimes and inflation and output in Sub-Saharan countries. *BIS Working Papers,* No. 53 Basle: Bank for International Settlements.

Kormendi, R, & Meguire, P. (1985). Macroeconomic determinants of growth: Cross-country vidence. *Journal of Monetary Economics, 16*, 141–163

Kremers, J. J. M., Ericson, N. R., & Dolado, J. J. (1992). The power of cointegration tests. *Oxford Bulletin Economics Statistics, 54*, 325–347.

Krugman, P.R (1979). A model of balance-of-payments crises. *Journal of Money, Credit, and Banking, 11*, 311–325.

Laurenceson, J.& Chai, C.H.J. (2003). *Financial reform and economic development in China*. Cheltenham, UK: Edward Elgar.

Leape, J., Aron, J., Khatri, Y., & Thomas, L. (1997). Measuring currency misalignment: The importance of real shock and regime changes. *Centre for Research into Economics and Finance in Southern Africa*, Quarterly Review October.

.Levine, R., & Renelt, D. (1992). A sensitivity analysis of cross-country growth regressions. *American Economic Review, 82*, 942–963.

Macdonald, R., Vieira, F. (2010). A panel data investigation of real exchange rate misalignment and growth. *Cesifo Working Paper*, No. 3061.

Mbaye, S. (2013). Currency undervaluation and growth: Is there a productivity channel?. *Economie Internationale, CEPII research center, 133*, 8-28.

Mankiw, N G, Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, *107*, 407–437.

Mongardini, J. (1998). Estimating Egypt's equilibrium real exchange rate. *IMF Working Paper,* No 5.

Naseem, N. A. M, Tan H-B., & Mohd, M. S. (2009) Exchange rate misalignment, volatility and import flows in Malaysia. *International Journal of Economics and Management, 3*(1), 130-150.

Naseem, N. A. M, Tan, H-B., & Mohd, M. S. (2010) Exchange rate regime, exchange rate variability and flows of Malaysian foreign trade. *Jurnal Ekonomi Malaysia, 44*, 35-49.

Narayan, P. K. (2005). The saving and investment nexus for China: Evidence from cointegration tests. *Applied Economic, 37*, 1979–1990.

Nurkse, R. (1945). Conditions of international monetary equilibrium. *Essays in International Finance*, *No. 1945*(4), Princeton University.

Ong, L. L. (1997). Burgernomics: The economics of the big mac standard, *Journal of International Money and Finances,* 16865-78.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*, 289-326.

Polterovich, V., & Popov, V. (2004). Accumulation of foreign exchange reserves and long term growth. In S. Tabata, & A. Iwashita (Eds), *Slavic Eurasia integration into the world economy.* Slavic research center, Hokkaido University.

Razin, O., & Collins, S.M. (1997). Real exchange rate misalignment and growth. *NBER Working Paper,* No. 6174.

Rajan, R. S., Sen, R., & R. Y. Siregar. (2004). Misalignment of the baht and its trade balance consequence for Thailand in the 1980s and 1990s. *The World Economy, 27*, 985-1012.

Richaud, C., Varoudakis, A., & Veganzones, M. (2000). Real exchange rate and openness in

emerging economies: Argentina in the long-run. *Applied Economics, 32*, 1-11.

Rodrik, d. (2008). The real exchange rate and economic growth. *Brookings papers on economic activity*, *2*, 365–412.

Rogoff, K. (2005). *Rethinking exchange rate competition*. The global competitiveness report 2005-2006 in World Economic Forum, Palgrave, New Yoek: MacMillan.

Sachs, J. D., Tornel, A., & Velasco, A. (1996). Financial crises in emerging markets: the lessons from 1995. *Brooking Papers on Economic Activity*, *1*, 147-215.

Sekkat, K., & Varoudakis, A. (2000). Exchange rate management and manufactured exports in Sub-Saharan Africa. *Journal of Development Economics, 61*, 237-253.

Solow, R. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics, 70*, 65-94.

Stein, J. (1994). The natural real exchange rate of the US dollar and determinants of capital flows. In Williamson, J. (Eds.). *Estimating Equilibrium Exchange Rates,* (pp. 133-175). Washington D. C: Institute for International Economics.

Stein, J. (1996). The natural real exchange rate: Theory and application to the real exchange rate of the US dollar relative to the G8 and to the real effective exchange rate of Germany. *Brown University, Working Paper No. 96-4*.

Stein, J., & G. Paladino, G. (1998). Recent developments in international finance: A guide to research. *Journal of Banking and Finance, 21*, 1685-1720.

Stein, J., & G. Lim (2002). Introduction to exchange rates in Europe and Australia: Fundamental determinants, adjustment and policy implications. *Australia Economic Papers, 41*, 329–591.

Stein, J., & Lim, G. (2004). Asian crises: Theory, evidence, warning-signals. *Center for Economic Studies and Ifo Institute for Economic Research, Working Paper,* No. 1159.

Sun, Q., Tong, W. M., & Yu, Q. (2002). Determinants of foreign direct investment across China. *Journal of Money and Finance, 21*, 79-113.

Toulaboe, D. (2006). Real exchange rate misalignment and economic growth in developing Countries. *Southwestern Economic Review, 33*, 57–74.

Williamson, J. (1994) *Estimating Equilibrium Exchange Rates*. Washington, D. C: Institutes for International Economics.

World Bank (1984). *Towards Sustained Development In Sub-Saharan Africa*. New York Oxford University Press.

Zakaria, M. (2010). Exchange rate misalignment and economic growth: Evidence from Pakistan's recent float. *Singapore Economic Review, 55*, 471-489.

Zhang, Z. (2001). Real exchange rate misalignment in China: An empirical investigation. *Journal of Comparative Economics, 29*, 80-94.

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# Short Run and Long Run Ricardian Equivalence: An Evidence from Malaysia

**Muhammad Daaniyall Abd Rahman*, Siong-Hook Law and Zaleha M. N.**

*Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

This paper aims to test the validity of Ricardian equivalence in Malaysian economy with respect to the behavior of government debt and government spending on private consumption. To conduct the test, we choose Giorgioni and Holden (2003) model based on Bernheim (1987) model modifications. Auto-Regressive Distributed Lags (ARDL) Bounds test approach is employed to estimate the model in order to capture the hypothesis existence both in short run and long run. Consequently, the results show that the existence of Ricardian equivalence hypothesis is statistically rejected both cases. It also shows that Malaysians perceive government debt as net wealth and the government spending itself gives complementarity effect on private consumption. Therefore, Malaysian fiscal policy is a good macroeconomic stabilization tool to foster incessant economic growth.

*Keywords:* Government Spending, Private Consumption, Ricardian Equivalence

## INTRODUCTION

The term Ricardian Equivalence Hypothesis, or interchangeably, "Ricardian Equivalence Proposition" and "Ricardian Equivalence Theorem" inevitably embraces current macroeconomics vocabulary. In a seminal paper, Barro (1974) makes his first formal exposition on this theory. While, Ricardo originally states that the fundamental theoretical rationale behind the Ricardian equivalence hypothesis, in the early 19th century (Afonso, 1999).

The main idea of Ricardian equivalence hypothesis, hereafter abbreviated as REH, suggests that a given path of government deficit does have conditions where government deficits neither affect any important macroeconomic variable nor cause distressing effects on economic welfare of any individual (Williamson, 2008

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*E-mail addresses*:
daaniyall@upm.edu.my (Muhammad Daaniyall Abd Rahman),
lawsh@upm.edu.my (Siong-Hook Law),
lehnoor@upm.edu.my (Zaleha M. N.)
* Corresponding author

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pp. 253). In other words, the government deficit spending does not affect the private consumption (Samuelson & Nordhaus, 2005). Ironically, REH suggests that the consumers internalize the government budget constraints. Presumably, they are rational enough to the behavior of government policy. Consequently, it does not matter whether the government finances the spending by issuing its debt or increasing the tax The effects on total aggregate demand or private consumption in the economy remain the same. This reveals the inconsequential effect of government fiscal policy.

Principally, there are few assumptions to be considered in the route of holding the hypothesis. Barro (1974) highlight the foundation of such assumptions to firmly support the theory. The main assumptions in the REH are as follows:

1. The principles of altruism has made the generations linked in the financial intergenerational transfer. In such a way, infinite horizon the consumption decisions might be taken by a hypothetical representative consumers. Consumers are linked to each other and it begins from parents to their children. The process continues to the next generations.
2. The perfect and efficient capital markets are able to provide consumers and the government with the same interest rates on lending and borrowing money and the households not facing liquidity constraints.
3. Rational expectations are economic agents where the consumers have perfect information about their income and taxes. Consumers also are able to fully anticipate their future taxes and underlying new public debt issued.
4. There is no distortionary in taxes and the taxes are in lump sum. In addition, taxes are charged equivalently to all economic agents. However, we are more concerned about validating the theory regarding the effect of government debt and government spending on private consumption. Thus, we accept the underlined assumptions.

## LITERATURE REVIEW

In validating the REH, there are several conceptual frameworks that have been used in the literature. The construction and propriety of using any specific model to test REH are well-debated. Some authors agree to adopt and extend the use of standard consumption function to validate the hypothesis. In fact, the standard consumption function is widely used in the literature. (see Kormendi, 1983; Reid, 1989; Giorgioni & Holden, 2003).

On the other hand, there are some authors who do not completely agree to use the function due to the controversial assumptions spawned about the theory. Thus, they employ other relevant models such as inter-temporal consumption function, infinite horizon representative agent model and rational expectation model (see Blanchard, 1985; Evans, 1988; Graham & Himarios, 1996; Ghatak &

Ghatak, 1996; Walker, 2002). Despite various arguments spurred on the selection of models, we believe that the selection of the best model to assess the REH can be intensely influenced by the study objectives and supported with strong and consistent econometric procedures. The enhanced and advanced modeling embedded with technical econometrics works have made the hypothesis validation more complicated. Therefore, it is common to have mixed results.

The validity of REH is vague especially in developing countries. Khalid (1996) has attempted to analyze the validity of this proposition and the sources of deviation from the REH among the 21 samples of developing countries. Briefly, the REH holds for 12 out of 17 countries in a different level of significance. On the other hand, Giorgioni and Holden (2003), analyzes the existence of REH in 10 less developed countries. They state that the Ricardian equivalence issues in less developed countries are complex but definitely cannot be simply ruled out a priori. Thus, such analysis supports the evidence of mixed validity. Consequently, the economic structure is feasibly the exogenous factor that influences the existence of such hypothesis.

Ghatak and Ghatak (1994), find the failure of REH in India after estimating the multi co-integration analysis on rational expectation model. The less developed economy of India in that period provides an inclusive environment to induce the theory refusal. Imperfect credit markets, liquidity constraints, differential borrowing rates, and finite planning horizons in India invalidate the proposition. Similarly, Siddiki (2010) test the hypothesis in Pakistan. It has discovered that the REH has been invalidated in Pakistan due to the same source of deviations as mentioned by Ghatak and Ghatak (1994). On the other hand, Mohammadi and Moshrefi (2012) find the evidence of Ricardian equivalence consistency based on the relationship between fiscal policy and current account in four East Asian countries such as South Korea, Malaysia, Singapore and Thailand.

Moreover, Giorgioni and Holden (2003), find that the G-7 countries; USA, Japan, Germany, France, United Kingdom, Italy and Canada, except Italy, rejected the REH. Their thorough analysis show that the source of failure is due to the Keynesian effect of the relationship between government spending and private consumption. Cuaresma and Reitschuler (2007) test the hypothesis on EU-15 countries using the model proposed by Leiderman and Razin (1988) and Khalid (1996). They discover that only 8 out of 15 countries hold the existence of REH. However, after justifying the existence of cointegration relationship, only 3 countries show clear results.

Afonso (2008) use the Euler consumption function to test the existence of REH in European Union (EU) countries. The time is separated into two sub-periods; pre-Maastricht and post-Maastricht treaty. Interestingly, he discovers that the REH only exists in post-Maastricht period as the government debt no longer has impact on private consumption. Meanwhile, Choi and

Holmes (2011) investigate the relevance of REH in the US economy using a Markow regime-switching model focusing on the relationship between budget deficit and real interest rate. They realize that the evidence of Ricardian equivalence is regime-specific causing the theory to be rejected for most of the post-WWII period. Whereas, the other period upholds the theory.

## METHODOLOGY AND DATA

The basis of the model development is according to the simple linear consumption function originally constructed by Bernheim (1987). In addition, Giorgioni and Holden (2003), make some modifications on Bernheim (1987) model to capture the following:

i. domestic and foreign debt as well as debt level contingency;

ii. temporary and permanent government spending effect.

Firstly, the original model by Bernheim (1987) is as follows;

$$C_t = \beta_0 + \beta_1 Y_t + \beta_2 DEF_t + \beta_3 G_t + \beta_4 D_t + \beta_5 W_t + \beta_6 X_t + \varepsilon_t$$

1. where, $C_t$ is the private consumption, $Y_t$ is national income (GDP), $DEF_t$ is government deficit or surplus (termed as fiscal balance, hereafter), $G_t$ is government consumption expenditure or government spending, $D_t$ is government debt, $W_t$ is private wealth and $X_t$ is factor of growth. Due to unavailability of data, Bernheim (1987) discards the variable that measures wealth, $W_t$. To adjust for heteroscedasticity, Bernheim (1987), weighs each variable to income, GDP. Specifically, Bernheim (1987) divides the growth factor, $X_t$ into two main components; income growth, $YG_t$ and population growth, $PG_t$. Thus, the model is given by,

$$C_t = \beta_0 + \beta_1 DEF_t + \beta_2 G_t + \beta_3 D_t + \beta_4 YG_t + \beta_5 PG_t + \varepsilon_t$$

2. Giorgioni and Holden (2003) initiate a simple but significant modification on Bernheim (1987) model. They split the government debt into two variables, namely the domestic debt, $D_t$, and foreign debt, $FD_t$. They also capture the effect of debt level by introducing dummy variable, domestic debt, *DUMD*, and foreign debt, *DUMFD*. The level of debt is established based on the mean value of the domestic and foreign debt (as suggested by Dalamagas, 1992a, 1992b cited in Giogiorni & Holden, 2003). The dummy of high debt for domestic debt variable is taken based on the average ratio of domestic debt. If the individual data of domestic debt is above the mean value of the ratio, then the high-indebtedness takes value of 1. Otherwise, low debt is represented as 0, when the individual value of domestic debt, $D_t$ is lower than the mean value of $D_t$. Following that basis, the procedure of determining the dummy for the foreign debt, $FD_t$, is also applied. In this paper, the average domestic debt is 0.426 and the foreign debt is

0.136. Furthermore, the decomposition of the government spending is divided into two components, namely temporary government spending and permanent government spending. This is implemented by using Hodrick-Prescott filter. Giorgioni and Holden (2003), drops the factor of growth due to the ineffectiveness influence of the variables to the overall conclusion. This conjecture is consistent with Bernheim (1987) findings. Therefore, below is the proposed estimation model:

$$C_t = \beta_0 + \beta_1 DEF_t + \beta_2 G_{t,\ Permanent} + \beta_3 G_{t,\ Temporary} + \beta_4 D_t + \beta_5 FD_t + \beta_6 DUMD + \beta_7 DUMFD + \varepsilon_t$$

3. To prove the existence of the REH, the coefficient of $DEF_t$, $D_t$, and $FD_t$ are expected to be equal to zero (Bernheim, 1987). This means that the changes of government deficit and government debt have no impact on private consumption. In order to validate REH, Kormendi (1983) and Siddiki (2010), mention that the government spending crowds out effect on private consumption. The coefficient of $G_t$ and $G_{t,\ Permanent}$ are less than zero. Giorgioni and Holden (2003), finds that $G_{t,\ Temporary}$ is insignificant due to less effectiveness of temporary changes of government spending on private consumption. All data are collected from International Financial Statistics Yearbook of 2003 and 2006 series.

The ARDL Bounds test approach is developed by Pesaran *et al*. (2001) based on ordinary least square (OLS) estimation. The usage of ARDL approach is to discover the long run and the short run coefficients to validate the REH. Performing the ARDL approach allows us to derive the dynamic error correction model (ECM) with a simple linear transformation (Bannerjee *et al*. 1993). The ECM is useful to integrate the short run and the long run equilibrium without losing long-run information (Shrestha & Chowdury, 2005 cited in Hoque & Yusop, 2010). For the purpose of the paper, succeeding Pesaran *et al*. (2001), our model can be expressed into the error correction representation of the ARDL specification model. The specifications are as follows,

For model (3)

$$\begin{aligned}\Delta C_t = {} & \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta C_{t-i} + \sum_{i=0}^{p} \alpha_2 \Delta DEF_{t-i} \\ & + \sum_{i=0}^{p} \alpha_3 \Delta G_{t-i,Temporary} + \sum_{i=0}^{p} \alpha_4 \Delta G_{t-i,Permanent} \\ & + \sum_{i=0}^{p} \alpha_5 \Delta D_{t-i} + \sum_{i=0}^{p} \alpha_6 \Delta FD_{t-i} + \beta_1 C_{t-1} \\ & + \beta_2 DEF_{t-1} + \beta_3 G_{t-1,Temporary} + \beta_4 G_{t-1,Permanent} \\ & + \beta_5 D_{t-1} + \beta_6 FD_{t-1} + \beta_7 DUMD \\ & + \beta_8 DUMFD + \mu_t\end{aligned}$$

where $\Delta$ denotes the first difference operator, $\alpha_0$ is the intercept term, $\varepsilon_i$ is the usual white noise residuals, and the remaining variables are as defined earlier. The addition of lagged-level variables linear combination in model (4) is functional as proxy for lagged error terms in standard VAR model. It measures the departure of the dependent variable

from the explanatory variables in model (3) (see Baharumshah *et. al*, 2009). Most importantly, Pesaran *et al*. (2001) emphasize on choosing lags; where, sufficiently large lags help to deal with serial correlation problem. At the same time, small lags avoid unduly over-parameterization. Since we are dealing with annual data, we imitate Pesaran and Shin (1999) and choose 2 lags for our error correction model. In determining the appropriate lags, we start with estimation of model (4) with 2 lags using OLS method and obtain the general ARDL models. After that, in order to acquire parsimonious models, we replicate Hendry's (1995) general-to-specific modeling approach. It is done through eliminating the insignificant variables and lags from the model. Finally, the best lags are determined based on Schwartz Information Criterion (SIC).

In order to test the ARDL for cointegration, we use Wald coefficient test procedure. This is to determine the joint significance of the lagged levels of the variables in model (4) by obtaining the F-statistic. Narayan (2005) provide a set of critical values for the F-test for small sample estimation. The null hypothesis of no cointegration for model (4) denotes the following:

$$F_C\,(C|DEF,\ G_{Temporary},\ G_{Permanent}, D,\ FD)$$

The null hypothesis is $H_{0:}\ \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$ against $H_{1:}\ \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$.

Therefore, if the estimated F-statistic appears to be larger than the upper bounds of the critical value, the null hypothesis of no cointegration is statistically rejected. This indicates that the variables in the error correction representation models are cointegrated. Possibly, if the calculated F-statistic is smaller than the critical value, the conclusion may appear to support the non-existence of cointegration within the variables. Conversely, if the computed F-statistic falls within the bounds, the order of cointegration of the explanatory variables must be known to determine the conclusion (Baharumshah *et al*., 2009). Tang (2003) argue that under this situation, the variables are cointegrated on the basis of lower bounds when the variables are $I(0)$. On the contrary, if the variables are $I(1)$, the variables are not cointegrated on the basis of the upper bounds.

To determine the long-run coefficient, we use the Wald coefficient test on the long run model as follows:

$$\begin{aligned} C_t = \alpha_0 &+ \sum_{i=1}^{p} \alpha_{1+i} C_{t-i} + \sum_{i=0}^{p} \alpha_{2+i} DEF_{t-i} \\ &+ \sum_{i=0}^{p} \alpha_3 + iG_{t-i,Temporary} \\ &+ \sum_{i=0}^{p} \alpha_{4+i} G_{t-i,Permanent} \\ &+ \sum_{i=0}^{p} \alpha_{5+i} D_{t-i} + \sum_{i=0}^{p} \alpha_{6+i} FD_{t-i} \\ &+ \alpha_{7+i} DUMD + \alpha_8 DUMFD + \varepsilon_t \end{aligned}$$

4. The estimation of long run models follow the same procedure as ARDL Bounds test for cointegration as stated earlier. To generate the long-run coefficients, the coefficient of each of the independent lagged variables is divided by the coefficient of lagged

dependent variable and multiplied with negative sign (Hoque & Yusop, 2010). As for the dummy variables, we directly take the coefficients generated in the long run estimation as suggested by Choong *et al*. (2005).

The determination of the short-run coefficient is based on the first difference variables of error correction model inclusive of error correction term (ECT). So, the ARDL short run models are derived based on re-parameterization of ARDL long run models, where ARDL short run model is as follows:

$$\Delta C_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1+i} \Delta C_{t-i} + \sum_{i=0}^{p} \alpha_{2+i} \Delta DEF_{t-i} + \sum_{i=0}^{p} \alpha_{3+i} \Delta G_{t-i,Temporary} + \sum_{i=0}^{p} \alpha_{4+i} \Delta G_{t-i,Permanent} + \sum_{i=0}^{p} \alpha_{5+i} \Delta D_{t-i} + \sum_{i=0}^{p} \alpha_{6+i} + \alpha_7 DUMD + \alpha_8 DUMFD + \gamma ECT_{t-1} + \varepsilon_t$$

5. Again, we use Wald coefficient test to generate the short-run coefficient as described for the long-run coefficient. Finally, to test the goodness-of-fit of the ARDL models, we conduct the diagnostic and stability tests which examine the normality (Jarque-Bera normality test), serial correlation (Breusch-Godfrey LM test), heteroscedasticity (ARCH test), specification error (Ramsey's RESET test) and model stability (CUSUM and CUSUM square test).

## RESULT AND DISCUSSION

### *The Unit Root Test Results*

Conventionally, the ARDL bounds test for cointegration does not explicitly require the order of integration. Liu (2009) mention that the procedure also does not require the variables to be particularly integrated of order 1, *I*(1). However, it is crucial to employ the stationarity test to ensure that the variables are not integrated of order 2, *I*(2). The F-test critical values computed by Pesaran *et. al* (2001) and Narayan (2005) are assumed to be *I*(0) and *I*(1) for all variables. Therefore, the presence of *I*(2) will cause the F-test to be spurious.

Enders (1995) mention that two types of unit root tests should be considered in order to have a safe choice on the unit root test, namely the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. We will have big confidence on the results if both tests strengthen each other. Therefore, we agree to conduct two widely used unit root tests methods in this paper. The unit root tests selected are ADF and the Phillips-Perron (PP) test on the models variables. The unit root tests are performed at the level and the first difference for both with the intercept and trend term. The results of the ADF and Phillips-Perron unit root test are presented in Table 1. From the table, we can make a general conclusion that both unit root tests reinforce each other to conclude that all variables are non-stationary at 1% to 5% significant levels.

However, all variables are stationary in first difference except for government spending variable in Philipp-Perron test and domestic debt variables on both tests specifically with intercept and trend term. Overall, all variables in the models are non-stationary in level and stationary at their first difference.

*ARDL Bounds Test Results*

In order to examine the REH existence, the UECM version of the ARDL model with lag two of the consumption function, specifically model (4) is estimated to ascertain the long run relationship among the variables. The parsimonious model is selected based on SIC. The results on model (4) are presented in Table 2.

Apparently, the results confirm that model (4) has sufficient characteristics to prove the existence of cointegration. The F-statistic of model (4) is 20.509 indicating that it is greater than the upper bound of

TABLE 1
The results of the ADF and Phillip-Perron unit root test statistics

| | ADF | | Phillip-Perron | |
|---|---|---|---|---|
| Level | | | | |
| | Intercept | Intercept and trend | Intercept | Intercept and trend |
| $C_t$ | -2.108 | -3.382 | -2.108 | -3.385 |
| $DEF_t$ | -1.490 | -1.855 | -2.034 | -2.332 |
| $G_t$ | -1.956 | -3.126 | -1.956 | -3.153 |
| $D_t$ | -1.738 | -1.728 | -1.550 | -1.558 |
| $FD_t$ | -1.573 | -1.710 | -1.410 | -1.516 |
| First Difference | | | | |
| $C_t$ | -6.296*** | -6.321*** | -6.480*** | -6.647*** |
| $DEF_t$ | -5.924*** | -5.801*** | -6.780*** | -6.934*** |
| $G_t$ | -3.861*** | -3.951** | -8.964 | -10.629 |
| $D_t$ | -3.536** | -3.477 | -3.556** | -3.499 |
| $FD_t$ | -3.567** | -3.595** | -3.567** | -3.629** |

Note: Unit root tests were performed by using Eviews 7.0 version. ** 5% significant level, ***1% significant level

TABLE 2: ARDL Cointegration Test on model (4)

| Lag Structure | 1,2,1,2,2,1 | |
|---|---|---|
| Bounds Test Critical Value | Lower | Upper |
| 1% significance level | 4.257 | 6.040 |
| 5% significance level | 3.037 | 4.443 |
| 10% significance level | 2.508 | 3.763 |
| *F*-statistic | 20.509 | |

The F-statistic from Wald coefficient test is used to test the joint coefficient of the lagged variables in the ARDL model. The critical values are referred from table case 3: unrestricted intercept and no trend, Narayan (2005), page 1988. 5 explanatory variables are estimated in model 4.

the bound test critical values. Thus, the null hypothesis of no cointegration is ominously rejected at 1% level of significance.

The objective of this paper is to validate the existence of REH in Malaysia. Therefore, as aforementioned, to prove the hypothesis existence and its validity, the following underlined restriction should be complied; where the coefficient of $DEF_t$, $D_t$, and $FD_t$ is equal to zero, and the coefficient of $G_t$ and $G_{t,\ Permanent}$ is less than zero. Noticeably, as suggested by De Vita and Abbott (2002) and Kollias *et al*. (2008), the estimated coefficients obtained from the regression process represent the relationship between the dependent and independent variables. The strong relationship arises when the coefficients are statistically-larger than one. Whereas, weak relationship is discovered when the coefficients are significantly below one. From the result in Table 3, in the long run, the fiscal balance is significant in Giorgioni and Holden (2003) model with a strong negative relationship (-1.353), hereafter abbreviated as G-H (2003) model. Perrotti (1999), Giavazzi and Pagano (1990, 1996) and Cuaresma and Reitschuler (2007) imply that the negative effect of fiscal balance shows that there is non-Keynesian effect of fiscal policy in the case of high debt-to-GDP ratio and possibilities of large and persistent fiscal corrections in the country. Meanwhile, in the short run, the results show there is positive relationship between fiscal

TABLE 3
ARDL Bounds Test Results for G-H (2003) model

| Model | Giorgioni and Holden (2003) | |
|---|---|---|
| Variables | Short Run | Long Run |
| Lag Structure | 1,1,2,1,2,1 | 1,1,2,1,2,1 |
| Constant | 9.17E-5 (0.044) | 0.311 (9.968)*** |
| $DEF_t$ | 0.307 (3.302)*** | -1.353 (-3.554)*** |
| $G_{t,\ Temporary}$ | -3.746 (-2.796)** | -3.490 (-4.899)*** |
| $G_{t,\ Permanent}$ | 2.352 (3.446)*** | 0.195 (0.473) |
| $D_t$ | -0.384 (-3.434)*** | 0.266 (2.615)** |
| $FD_t$ | -0.068 (-1.086) | -0.201 (-1.494) |
| *DUMD* | -0.008 (-2.078) | -0.039 (-2.533)** |
| *DUMDD* | 0.007 (1.194) | 0.002 (0.179) |
| Diagnostic Tests | | |
| Jarque-Bera | 0.132 [0.936] | |
| LM test (1) | 3.946 [0.047] | |
| LM test (2) | 5.213 [0.074] | |
| ARCH test | 0.447 [0.504] | |
| Ramsey RESET test | 0.716 [0.410] | |
| CUSUM test | Stable | |
| CUSUMSQ test | Stable | |

Notes: t-value in the parentheses (...) and p-value for diagnostic test in parentheses [...]. **significant at 5% level, ***significant at 1% level.n/a imply that the variable is not applicable in the estimation.

balance and private consumption.

In the aspect of debt variables, $D_t$, and $FD_t$, the domestic debt is significant in both regimes, but with different signs. However, in the long run, G-H (2003) model infer the significance of domestic debt to positively influence the private consumption. Overall, the domestic debt seems to have stimulation effect on private consumption in the long run. It means that the debt is perceived as net wealth by the individuals (Schlicht, 2006; Marinheiro, 2008). As for foreign debt, it is insignificant in the short run and the long run, but with expected sign for Malaysia case. Baharumshah *et al*. (2003) explain that in the long run, the large and persistent current account deficit tends to increase domestic relative to foreign interest rates. The accumulation of larger debt will imply increasing interest payments. Consequently, lower the standard of living.

Another restriction of validating the REH is that the government spending produces crowding out effect on private consumption. As per the G-H (2003) model, the permanent government spending has a positive influence on private consumption in the short run (2.352). However, in the long run the impact is insignificant but with the same positive sign. This shows that there is complementarity effect of government spending on private consumption in Malaysia. Such finding is in line with Tagkalakis (2008). In contrast, the temporary government spending has crowding out effect both in the short run and the long run. A strong and significant effect is discovered but this result contradicts with that of Giorgioni and Holden (2003). However, it is consistent with Ihori (1987) where the permanent government spending has more expansionary impact on private consumption, compared to temporary government spending.

From the above explanation, we find that the REH is resoundingly rejected in Malaysia. It is due to the fact that the Keynesian effect is more likely influence the individual decisions in Malaysia. The perception that government spending and debt equivalent to net wealth promotes Malaysian private consumption. Presumably, these could be the factors that deviates this country from the REH proposition. Schclarek (2007) state a meaningful explanation on this result where government spending in the developing countries has larger Keynesian effects on private consumption, compared to developed countries.

To confirm the validity of the estimated models, we employ five diagnostic tests, namely the Jarque-Bera normality test, the Breusch-Godfrey serial correlation Lagrange multiplier (LM) test, the Auto-regressive conditional heteroscedasticity (ARCH) test, Ramsey RESET test on model specification and the CUSUM and CUSUM square test to test for model stability. Th diagnostic tests are performed on model (5) for long-run coefficient estimation. From the result of the diagnostic tests, the models‑fulfill the requirement of standard assumptions of regression. The Jarque-Bera test statistics confirm that the residuals are normally distributed. The Breusch-Godfrey test statistics also fail to reject the null

hypothesis of no serial correlation, in the first and second order serial correlation at 1% to 5% level of significance. Therefore, the ARDL models are robust to residual serial correlation. The residuals are also tested on the constant variance. We find that the residuals are all homoscedastic. Evidently, the Ramsey RESET test confirms the correct functional form of the model, at 1% to 5% significant level. Finally, the CUSUM and CUSUM square tests proposed by Brown *et al.* (1975) were developed to test for long-run parameter stability. The test plots the cumulative sum of recursive residuals and certifies the estimated stability if the CUSUM statistics stays within 5% significance level (Baharumshah *et al.*, 2009). CUSUM square statistics is based on the squared recursive residuals. As we can see in Fig.1, the plotted CUSUM and CUSUM squared statistics of the model stay within a pair of straight lines which represent the 5% significance critical bounds to indicate the stability of the estimated models.

## CONCLUSION

The objective of this paper is to validate the existence of Ricardian equivalence hypothesis (REH) in Malaysia in the short run and the long run, compliant with the effect of government debt and government spending on private consumption using ARDL Bounds test approach. The assessment of the results portrays the evidence of the hypothesis validity in Malaysia is statistically rejected. In summary, the finding has suggested that the inference that Malaysians perception on government debt is equivalent to net wealth and the government spending has complementarity effect on private consumption. Accordingly, the government activity through the fiscal policy is a good macroeconomic stabilization tool in Malaysia.

## REFERENCES

Afonso, A. (1999). *Public Debt Neutrality and Private Consumption Some Evidence from the Euro Area*. (Part of PhD Thesis Dissertation). Portugal: Universidade Tecnica de Lisboa.

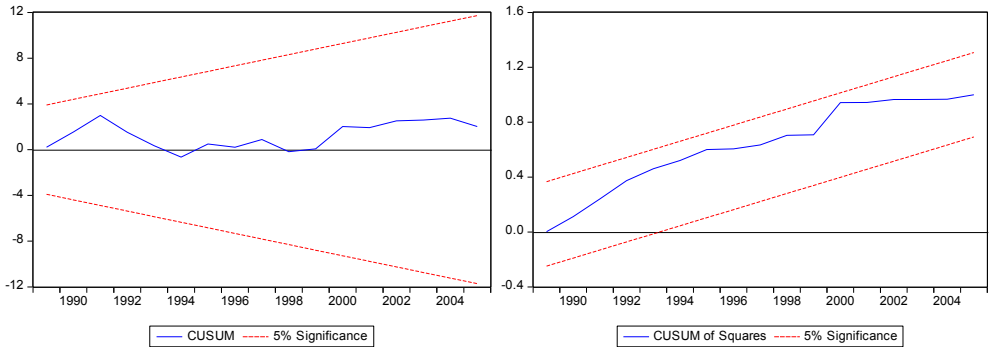


Fig.1: Result of CUSUM and CUSUM square test on long run model (5)

Afonso, A. (2008). Euler Testing Ricardo & Barro in EU. *Economic Bulletin*, *5*(16), 1-14.

Baharumshah, A. Z., Evan, L., & Fountas, S. (2003). On the Sustainability of Current Account Deficits: Evidence from Four ASEAN Countries. *Journal of Asian Economics*, *14*, 465-487.

Baharumshah, A. Z., Mohd, S. H., & Masih A. M. M. (2009). The Stability of Money Demand in China: Evidence from the ARDL Model. *Economic Systems*, *33*, 231-244.

Bannerjee, A., Dolado, J. J., Galbraith, J. W., & Hendry, D. F. (1993). *Co-Integration, Error Correction, and the Econometric Analysis of Non-Stationary Data*. Oxford: Oxford University Press.

Barro, R. J. (1974). Are Government Bonds Net Wealth? *The Journal of Political Economy*, *82*(6), 1095-1117.

Bernheim, D. (1987). Ricardian Equivalence: An Evaluation of the Theory and Evidence. *NBER Macroeconomics Annual 1987*. Cambridge, Mass.: MIT Press. pp.263-304.

Blanchard, O. J. (1985). Debt, Deficits and Finite Horizons. *Journal of Political Economy*, *93*, 223-247.

Brown, R.L., Durbin, J., Evans., (1975). Techniques for Testing the Constancy of Regression Relationship Over Time. *Journal of the Royal Statistical Society.* Series B (Methodological), *37*(2), 149-192.

Choong, C. K., Law, S. H., Yusop, Z., & Choo, S. S. (2005). Export-Led Growth Hypothesis in Malaysia: A Revisited. *The ICFAI Journal of Monetary Economics*, *3*(4) ,26-42.

Choi, D. F. S., & Holmes, M. J. (2011). Budget deficits and real interest rates: A regime-switching reflection on Ricardian Equivalence. *Journal of Economics and Finance*. DOI 10.1007/s12197-011-9212-9.

Cuaresma, J. C., & Reitschuler, G. (2007). Is the Ricardian Equivalence proposition an 'Aerie Fairy' Theory for Europe?. *Economica*, *74*, 682-694.

De Vita, G., &Abbott, A. (2002). Are saving and investment cointegrated? An ARDL bounds testing approach. *Economics Letters*, *77*, 293-299.

Enders, W. (1995). *Applied Econometric Time Serie*s. New York: John Wiley & Sons Inc.

Evans, P. (1988). Are consumers Ricardian? Evidence for the United States. *Journal of Political Economy*, *96*, 983-1004.

Ghatak, A., & Ghatak, S. (1996). Budgetary Deficits and Ricardian Equivalence: The Case of India, 1950-1986. *Journal of Public Economics, 60*, 267-282.

Giavazzi, F., & Pagano, M. (1990). Can Severe Fiscal Contractions be Expansionary? Tales of Two Small European Countries. *NBER Macroeconomics Annual*. pp. 75-110.

Giavazzi, F., & Pagano, M. (1996). Non-keynesian effects of Fiscal policy changes: International evidence and the Swedish experience. *Swedish Economic Policy Review*, *3*, 67-103.

Giorgioni, G., & Holden, K. (2003). Does the Ricardian Equivalence proposition hold in less developed countries?. *International Review of Applied Economics*, *17*, 209-221.

Giorgioni, G., & Holden, K. (2003b). Ricardian Equivalence, expansionary fiscal contraction and the stock market: A VECM Approach. *Applied Economics*, *35*(12), 1435-1443.

Graham, F. C., Himarios, D. (1996). Consumption, wealth, and finite horizons: Test of Ricardian Equivalence. *Economic Inquiry, 34*,527-544.

Hendry, D. F. (1995). *Dynamic Econometrics*. Oxford: Oxford University Press.

Hoque, M. M., & Yusop, Z. (2010). Impacts of trade liberalisation on aggregate import in Bangladesh: An ARDL bounds test approach. *Journal of Asian Economics, 21*, 37-52.

Ihori, T. (1987). The size of government spending and private sector's evaluation. *Journal of The Japanese and International Economies*, *1*, 82-96.

Khalid, A. M. (1996). Ricardian Equivalence: Empirical evidence from developing economies. *Journal of Development Economics, 51*, 413-432.

Kollias, C., Mylonidis, N., & Paleologou, S.M. (2008). The Feldstein-Horioka puzzle across EU members: Evidence from the ARDL bounds approach and panel data. *International Review of Economics and Finance*, *17*, 380-387.

Kormendi, R. C. (1983). Government debt, government spending, and private sector behavior. *The American Economic Review, 73*, 994-1010.

Leiderman, L., & Razin, A. (1988). Testing Ricardian Neutrality with an intertemporal stochastic model. *Journal of Money, Credit and Banking*, *20*(1), 1-21.

Liu, Y. (2009). Exploring the relationship between urbanization and energy consumption in China using ARDL (Autoregressive Distributed Lag) and FDM (Factor Decomposition Model). *Energy*, *34*, 1846-1854.

Marinheiro, C. F. (2008). Ricardian Equivalence, twin deficits, and the Feldstein-Horioka puzzle in Egypt. *Journal of Policy Modelling*, *30*, 1041-1056.

Mohammadi, H., & Moshrefi, G. (2012). Fiscal Policy and the current account new evidence from four East Asian countries. *Applied Economics Letters*, *19*, 167-173.

Narayan, P. K. (2005). The saving and investment Nexus for China: Evidence from cointegration tests. *Applied Economics*, *37*(17), 1979-1990.

Perrotti, R. (1999). Fiscal Policy in Good Times and Bad. *Quarterly Journal of Economics*, *114*(4), 1399-1436.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bound testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*, 289–326.

Pesaran, M. H., & Shin, Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis. Chapter 11 in *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium*. Cambridge University Press: Cambridge.

Reid, B. G. (1989). Government budget and aggregate consumption: cross-sectional evidence from Canadian Provincial data. *Journal of Macroeconomics*, *11*, 121-132.

Samuelson, P. A., & Nordhaus, W. D. (2005). Chapter 17: The Warring School of Macroeconomics. In *Macroeconomics 18th (ed.)*. pp. 362. McGraw Hill Irwin.

Schclarek, A. (2007). Fiscal policy and private consumption in industrial and developing countries. *Journal of Macroeconomics*, *29*, 912-939.

Schlicht, E. (2006). Public Debt as Private Wealth. Munich Discussion Paper. No. 2008-13. Reprint from: *Metroeconomica*, *57*(4), 594-520.

Siddiki, J. U. (2010). The Ricardian Equivalence hypothesis: Evidence from Bangladesh. *Applied Economics*, *42*(11), 1419-1435.

Tagkalakis, A. (2008). The effect of fiscal policy on consumption in recessions and expansions. *Journal of Public Economics*, *92*, 1486-1508.

Tang, T. C. (2003). Japanese aggregate Iiport demand function: Reassessment from 'bound' testing approach. *Japan and the World Economy*, *15*(4), 419–436.

Walker, W. C. (2002). Ricardian Equivalence and fiscal policy effectiveness in Japan. *Asian Economic Journal, 16*, 285-302.

Williamson, S. D. (2008). Chapter 8: A two-period model: Consumption-savings decision and credit markets. In *Macroeconomics (3rd ed.)*. (pp. 281-298). Pearson International Edition.

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# Determinants of Flood Fatalities: Evidence from a Panel Data of 79 Countries

**Jaharudin Padli[1], Muzafar Shah Habibullah[1]* and A. H. Baharom[2]**

[1]*Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*
[2]*Taylor's Business School, Taylor's University, No. 1, Jalan Taylor's, 47500 Subang Jaya, Selangor, Malaysia*

## ABSTRACT

There is available evidence from different parts of the world that floods and storm account for about 67 percent of the natural disasters. While, earthquake, landslides, drought, extreme temperature, wildfire and volcano eruptions contribute to the remaining 23 percent. In many developing countries, the frequent occurrences of natural disasters, particularly floods are not uncommon. Yearly recurrence of floods bring devastate economies. The objective of the present study is to investigate factors that can mitigate the impact of floods on human fatalities and damages. We use a panel of 79 countries for the period of 1981-2005 and employ the two-step system GMM estimator to show that the level of economic development, population, investment, openness and education impact flood fatalities, total people affected and total cost of damages.

*Keywords:* Natural disasters, floods, GMM, developing economies

## INTRODUCTION

Natural disasters are common event. Drought, earthquake, extreme temperature, floods, cyclone, volcanic eruptions, wildfires and landslide are natural phenomenon that occur from time to time. For example, The Asian Disaster Reduction Center (ARDC, 2009) reports that 399 natural disasters occurred in 2009 worldwide, killing almost 16,000 people and affecting over 220 million people. The estimated amount of economic damage came close to US$50 billion. By geographical region, Asia is the highest in all four accounts: 35.8 percent of disaster occurrences; 52.1 percent of total number of people killed; 78.3 percent of total number of affected people; and 44.9 percent of amount of economic damages.

Within the Southeast Asian region, in 2009, Indonesia was impacted by 5 occurrences of earthquakes, 5 occurrences

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*E-mail address*:
muzafar@upm.edu.my (Muzafar Shah Habibullah)
* Corresponding author

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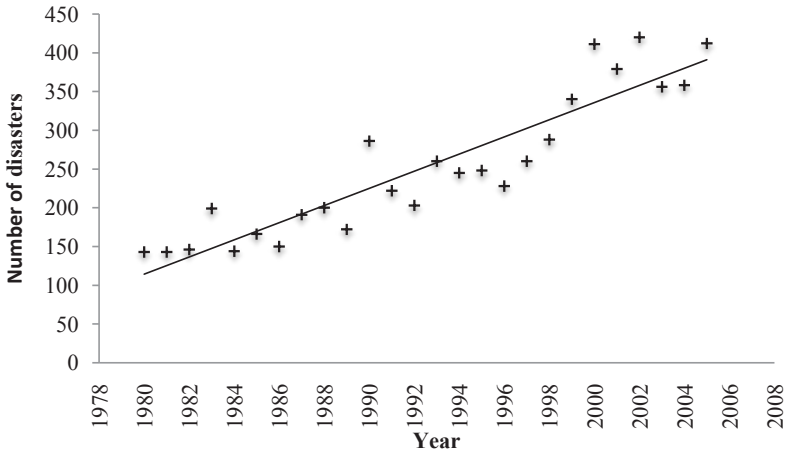
of floods and 2 occurences of landslides. The earthquake caused 1,330 deaths and affected more than 2.8 million people. The estimated cost of damages reached about US$2.8 billion. Floods has killed 126 people and affected more than 26,000 people. While, the landslides killed 29 people over the two occasions. On the other hand, the Philippines accounted for more three types of natural disasters that included earthquake, flood, landslide, storm and volcanic eruptions. Storm or cyclone accounted for most damages. In 2009, cyclone wrecked havoc in the Philippines 14 times that killed 1,242 people, affected more than 12 million people and causing more than US$900 million in damages. Eight occurrences of flood caused 55 deaths, affected more than 1 million people, and caused US$29 million in damages. In 2009, volcanic eruption affected more than 47 thousand people in the Philippines. However, Malaysia only experienced two occasions of floods in 2009. These two occasions of flood affected more than 10 thousand people.

There is available evidence from different parts of the world that there is a rising trend of natural disasters from 1978 to 2008 (see Fig.1). A total of 6,991 natural disasters occur during this period. Flood and storm accounted for about 67 percent of the natural disasters. While, earthquake, landslides, drought, extreme temperature, wildfire and volcano eruptions accounted for the remaining 23 percent (see Fig.2). Table 1 exhibits the 25 worst disasters based on number of people killed in Asia in 2009. It shows that flood has been the most frequent occurring natural disaster with 151 times of occurrences. The floods caused more than 3,000 deaths and 57.7 million people affected and damages reaching US$8 billion (ADRC, 2009). As shown in Table 1, flood also created havoc in other countries. India




Sources: EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.

Fig.1: Number of Disaster from 1978-2008

TABLE 1
The 25 Worst Disasters in Asia by Number of People Killed, 2009

| Disaster Type | Country | Date Started | Killed | Total Affected | Damages (US$ million) |
|---|---|---|---|---|---|
| Earthquake: | Indonesia: | 2-September | 128 | 339,792 | 160 |
| | | 30-September | 1,195 | 2,501,798 | 2,200 |
| Flood: | India: | July | 992 | 1,886,000 | 220 |
| | | 25-September | 300 | 2,000,000 | 2,150 |
| | | 3-November | 70 | 8 | 64 |
| | Saudi Arabia | 24-November | 161 | 10,000 | 900 |
| | China P. Rep. | 1-July | 90 | 39,372,000 | 1,000 |
| | Nepal | 4-October | 87 | 257,786 | 60 |
| | Indonesia | 26-March | 64 | 1,600 | 0 |
| Storm: | Taiwan (China) | 7-August | 630 | 2,307,523 | 250 |
| | Philippines: | 7-May | 77 | 401,007 | 30 |
| | | 24-September | 501 | 4,901,763 | 237 |
| | | 29-September | 512 | 4,478,491 | 585 |
| | Bangladesh | 25-May | 190 | 3,935,341 | 270 |
| | Vietnam: | 28-September | 182 | 2,477,315 | 785 |
| | | 2-November | 124 | 500,145 | 280 |
| | India | 25-May | 96 | 5,100,000 | 0 |
| | China P. Rep. | 3-June | 52 | 215 | 625 |
| Epidemic: | Sri Lanka | January | 346 | 35,007 | 0 |
| | Nepal | 1-May | 314 | 58,874 | 0 |
| | India | January | 311 | 1,521 | 0 |
| Extreme Temperature: | Bangladesh | 15-December | 135 | 50,000 | 0 |
| | India | 14-April | 120 | 25 | 0 |
| Mass Movement: | China P. Rep.: | 5-June | 65 | 0 | 0 |
| | | 14-July | 54 | 10,004 | 139 |

Source: ADRC Natural Disasters Data Book 2009.

had it in July, September and November, Saudi Arabia in November; China in July, Nepal in October and Indonesia in March. As a result, total death reached to 1,764 people, 43.5 million people affected and economic losses reached close to US$4.4 billion.

Obviously, natural disasters such as earthquakes, storms and floods have readily perceptible effects. At the same time, natural disaster has gradual impact or long lasting impact following the event. For instance, invasion of crop pests arriving in the wake of the disaster and shortages of essential products arising several months after the catastrophe. As a matter of fact, the effects of a natural disaster have been classified as follows:

a. direct damage - the effects on property;

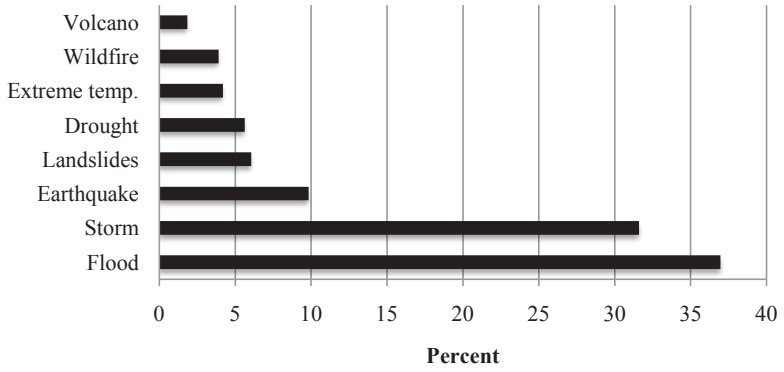
b. indirect damage - the effects on goods and services production flows;

c. secondary effects - the effect on the behavior of the main macroeconomic aggregates.

The first effects more or less coincide with the disaster or occur within hours of the event. While, the others occur over a period of time. Based on the practical experiences, the period can as long as five years, depending on the magnitude of the disaster. For example, according to Tobin and Montz (1997), their study indicate that the residents of Linda and Olivehurst in California that have experienced the most severe flooding, see long lasting impacts on the house price. Following floods, some houses experience certain degree of damages causing the owners repainting, replacing all the appliances and carpets. As a consequent, the house prices have to be increased.

On the other hand, a study by Leiter *et al.* (2009) demonstrate that in the short-run, companies in regions hit by a flood show an average higher growth of total assets and higher employment compared to those firms in regions unaffected by flood. They also find that some part of the capital is less vulnerable to disasters. Companies with larger shares of intangible assets prevail with positive effect. Leiter *et al*. point out that after floods, firms with low fraction of tangible assets experience increase accumulation in physical capital. As a result, the negative effects on firm's productivity declines with an increasing share of intangible assets.

Alexander (1993) indicate that in developing countries floods have distinctive long-term effects. Floods affect human health including death, physical injury, disease transmission, malnutrition and loss




Sources: EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.

Fig.2: The Percentage of Different Natural Disaster as a Percent of Total Number of Disasters During 1978-2008

of morale. Floods affect the agricultural sector by destroying crops, livelihood of the people, and also destroy homes and infrastructures. For example, during the two years of 1987 and 1988 flood in Bangladesh, flood waters has increased risk of cholera, dysentery and rapid growth in the incidence of malaria and yellow fever. Furthermore, the time duration the water remains on the land also affects the agricultural prospects (Gruntfest, 1995). The long-term disruption of livelihoods and the loss of land and other assets will increase the long-term vulnerability to flood and poverty.

In Malaysia, floods occur on an annual basis causing misery, damage to properties and loss of life (Chan, 1997; Chan & Parker, 1996). Flooding is the most significant natural hazard in terms of people affected, frequency, area extent, flood duration and social economic damages. Since 1920, Malaysia has experienced major floods in the years of 1926, 1963, 1965, 1967, 1969, 1971, 1983, 1993, 1998, 2005, 2006 and 2007. The flood that occurred in Johor during period of 2006-07 was due to abnormally heavy rainfall. The massive floods has caused a loss in damages amounting to RM1.5 billion. To-date, it has been considered as the most costly flood events in Malaysian history. The rapid urbanization in the state of Johor amplifies the cost of damage in infrastructures, bridges, roads, agriculture, private commercial and residential properties. During that period, 110,000 people have been evacuated and sheltered in relief centers. the reported death toll is 18 people (Ketua Pengarah, 2007). As shown in Table 2, from 1960 to 2009, flood has been the number one type of disaster that have devastated the Malaysian population with a total death of 607 people, affecting more than 1.2 million people and economic loss of about US$1.08 billion. Other disasters that have created havoc to the Malaysian people include storms (296 death, 57,946 people affected; US$53 million damages), epidemic (540 death; 32,047 people affected), landslide (152 death; 285 people affected), wildfire (3,000 people affected; US$302 million), drought (5,000 people affected) and tsunami (80 death; 5,063 people affected; US$500 million in damages).

The objective of this paper is to investigate factors affecting flood damages and fatalities in 79 selected countries. In this study we have identified several potential determinants of floods namely, the level of economic development, population, population density, unemployment, real investment, real government consumption, openess, education and corruption. These socio-economic and macroeconomic variables are found to have impacted natural disasters fatalities in numerous studies. The paper has been organized in such a way that the next section discusses some factors discovered to have imparted natural disaster's fatalities in the past. It is followed by a discussion on the estimating model used in the study in section Methodology. While, section Empirical Results shows the empirical results. Finally, the last section exhibits our conclusion.

Table 2
Type of Natural Disasters Occurrence in Malaysia, 1965-2009

| Disaster Type | Sub Type | Name | Date Started | Killed | Total Affected | Damages US$ million |
|---|---|---|---|---|---|---|
| Flood | | | 3/12/1965 | 6 | 300,000 | 1 |
| Flood | | | 00/01/1967 | 50 | 140,000 | 25.6 |
| Flood | | | 26/12/1970 | 61 | 243,000 | 37 |
| Flood | | | 00/12/1978 | | 3,000 | |
| Flood | | | 00/12/1983 | 10 | 15,000 | |
| Flood | | | 28/11/1986 | 11 | 25,000 | 11.5 |
| Flood | | | 00/12/1987 | 3 | 2,576 | |
| Flood | General flood | | 12/11/1988 | 27 | 60,000 | |
| Flood | General flood | | 22/12/1993 | 30 | 25,000 | |
| Flood | General flood | | 11/2/1996 | | 418 | |
| Flood | | | 19/11/1998 | | 2,500 | |
| Flood | General flood | | 1/1/1999 | 1 | 2,000 | |
| Flood | Flash flood | | 21/11/2000 | 12 | 8,000 | 1 |
| Flood | Flash flood | | 19/08/2001 | | 10,000 | |
| Flood | | | 00/10/2001 | | 5,000 | |
| Flood | | | 30/10/2001 | | 200 | |
| Flood | General flood | | 22/12/2001 | 11 | 18,000 | |
| Flood | Flash flood | | 29/11/2003 | 5 | 3,000 | |
| Flood | General flood | | 17/12/2003 | | 2,000 | |
| Flood | General flood | | 3/10/2003 | 3 | 13,800 | |
| Flood | General flood | | 24/01/2004 | 3 | 6,900 | |
| Flood | General flood | | 8/3/2004 | | 9,138 | |
| Flood | General flood | | 10/12/2004 | 13 | 15,000 | 10 |
| Flood | Flash flood | | 17/07/2005 | 4 | 600 | |
| Flood | Flash flood | | 23/11/2005 | 9 | 30,000 | |
| Flood | General flood | | 9/1/2006 | | 1,112 | |
| Flood | General flood | | 10/2/2006 | | 4,906 | |
| Flood | General flood | | 20/04/2006 | | 500 | |
| Flood | Flash flood | | 19/12/2006 | 6 | 100,000 | 22 |
| Flood | General flood | | 11/1/2007 | 17 | 137,533 | 605 |
| Flood | General flood | | 7/12/2007 | 29 | 29,000 | 363 |
| Flood | General Flood | | 1/12/2008 | | 2,000 | |
| Flood | Flash Flood | | 28/12/2008 | | 6,000 | |
| Flood | General Flood | | 23/11/2009 | | 1,793 | |
| Flood | General Flood | | 20/11/2009 | | 9,082 | |
| Storm | | | 7/1/1968 | 21 | 10,000 | |
| Storm | Tropical cyclone | Greg | 26/12/1996 | 270 | 4,176 | 52 |

Table 2 (continue)

| Disaster Type | Sub Type | Name | Date Started | Killed | Total Affected | Damages US$ million |
|---|---|---|---|---|---|---|
| Storm | Tropical cyclone | Zita | 23/08/1997 | 2 | 2,115 | 1 |
| Storm | | | 27/09/2000 | | 500 | |
| Storm | Local storm | | 30/03/2002 | 2 | 155 | |
| Storm | | | 16/07/2004 | | 1,000 | |
| Storm | | | 6/11/2004 | 1 | 40,000 | |
| Epidemic | Bacterial Infectious Diseases | Cholera | 00/05/1968 | 2 | 5 | |
| Epidemic | Bacterial Infectious Diseases | Typhoid | 00/05/1977 | | 50 | |
| Epidemic | Viral Infectious Diseases | Dengue fever | 00/00/1991 | 263 | 3,750 | |
| Epidemic | Viral Infectious Diseases | Dengue/ dengue haemorrhagic fever | 00/05/1996 | 13 | 4,800 | |
| Epidemic | Bacterial Infectious Diseases | Cholera | 11/5/1996 | | 607 | |
| Epidemic | Bacterial Infectious Diseases | Coxsackievirus | 5/11/1997 | 17 | | |
| Epidemic | Viral Infectious Diseases | Dengue and dengue Haemorrhagic fever | 00/01/1997 | 50 | 19,544 | |
| Epidemic | | Fatal myocarditis | 13/04/1997 | 28 | 2,140 | |
| Epidemic | Viral Infectious Diseases | Encephalitis | 00/09/1998 | 105 | 160 | |
| Epidemic | | | 00/01/2000 | 2 | 480 | |
| Epidemic | Viral Infectious Diseases | Hand foot and mouth disease | 00/10/2000 | 2 | 508 | |
| Epidemic | Viral Infectious Diseases | Acute respiratory syndrome (SARS) | 14/03/2003 | 2 | 3 | |

Table 2 (continue)

| Disaster Type | Sub Type | Name | Date Started | Killed | Total Affected | Damages US$ million |
|---|---|---|---|---|---|---|
| Epidemic | Viral Infectious Diseases | Dengue | 00/07/2007 | 56 | | |
| Mass movement dry | Landslide | | 11/12/1993 | 72 | | |
| Mass movement wet | Landslide | | 30/06/1995 | 20 | 23 | |
| Mass movement wet | Landslide | | 30/08/1996 | 50 | 262 | |
| Mass movement wet | Landslide | | 31/01/2002 | 10 | | |
| Wildfire | Forest fire | | 3/5/1995 | | 3,000 | |
| Wildfire | Forest fire | | 21/08/1997 | | | 300 |
| Wildfire | Forest fire | | 4/3/1998 | | | 2 |
| Wildfire | Forest fire | | 9/8/2005 | | | |
| Drought | Drought | | 00/03/1998 | | 5,000 | |
| Earthquake (seismic activity) | Tsunami | | 26/12/2004 | 80 | 5,063 | 500 |

Source: ARDC Natural Disasters Data Book, various issues

## LITERATURE REVIEW

Empirical evidences suggest that natural disasters produce a devastating impact on macroeconomic conditions in the short run. They cause sudden collapsed in domestic production and more pronounced slowdown in national income. In line with the collateral damages, they trigger irreversible loss of human capital, affect the standard of living, increase level of poverty Eventually, it leads to a more chronic economic decay. In line with the increasing frequency of natural disasters in recent years, its impact on social, economic and physical heighten public awareness and bring the issue to the forefront of public attention worldwide.

According to Wildavsky (1988), safety is a natural product of a growing market economy. Since the demand for safety rises with income, a nation's per capita income is a good first approximation of the degree of safety it enjoys. Furthermore,

a rise in income provides general safety. Its protection can specifically be directed to mitigate the impact of natural disasters fatalities and damages (Horwich, 2000). Albala-Bertrand (1993) argue that the higher the level of economic development, the smaller the number of deaths, injuries, deprived and relative material losses. The level of economic development includes income per capita, income distribution, economic diversification and social inclusion, institutionalization, participations, education, health, choices and protections.

In fact, Kahn (2005) point out that the impact of natural disasters can be substantially different between richer and poor nations. According to Kahn, although richer nations experience natural disasters as much as the poorer nations, the former suffer lesser number of deaths from the events. It is due to richer nations' ability to provide self-protection through a number of strategies in mitigating their natural disaster risk exposures. Furthermore, the government of a richer nation can provide implicit disaster insurance through effective regulation, strategies and quality infrastructure. Kahn further argue that nations with stronger institutions, demonstrating democratic and low income inequality nations, suffer lower number of deaths resulting from disasters. Raschky (2008) support the idea that institutions play important roles where the institutional framework is a key socio-economic determinant of a nation's vulnerability against natural disasters.

On the other hand, Tol and Leek (1999) argue that the positive effect of GDP can be readily explained since natural disasters destroy the capital stock. While, the GDP measure focuses on the flow of new production. They emphasize the incentives for saving and investment mitigating and recovery efforts. Furthermore, should sufficient re-investment from designated reserves takes place, the loss of capital in longer term may have a positive impact,.

Haque (2003) investigate the impact of socio-economic and demographic factors on natural disaster fatalities. Empirical evidence shows that socio-economic and the demographic factors have a very significant relationship to disaster-related deaths and economic losses in East, South Asia and the Pacific islands. It is also argued that the emergency preparations and swift action in handling the dangerous situation in such disastrous events will lessen the severity of bad impact of each event. At the same time the studies also point out the importance of having special training programs such as disaster management program to the teachers, volunteers, public and social workers, local emergency agencies such as the police, fire department and etc. in order to minimize the risks and promote the awareness of the natural disasters.

Research by Skidmore and Toya (2007) focus on the degree to which human and economic losses resulted from natural disasters are reduced as economies developed. The sample includes annual data of every recorded natural disaster from 151 countries over the period range from 1960–2003. Empirical evidences show that higher income, higher educational

attainment, greater openess, more complete financial systems and smaller government lead to fewer losses.

Raschky (2008) investigate the relationships between economic development and vulnerability against natural disasters. The sample consists of 2792 events where numbers of natural disaster victims and 1103 events with figures on economic losses are available. Empirical results show that countries with high quality of institutions experience less victims and lower economic losses from natural disasters. Raschky also discover that there is non-linear relationship between economic development and economic disaster losses. This contention is further supported by Kellenberg and Mobarak (2008) where disaster-related deaths increase with rising income. According to Kellenberg and Mobarak, the inverted-U non-linearities appear to be stronger for floods, landslides and windstorms compared to extreme temperature events or earthquakes.

On the one hand, Padli and Habibullah (2009) investigate the relationship between natural disaster fatalities with the level of economic development, years of schooling, land area and population for a panel of fifteen Asian countries from 1970 to 2005. They find that the relationship between natural disaster losses and the level of economic development is non-linear in nature. It suggests that at lower income level, a country is more natural disaster resilient; but, at higher income level, an economy become less natural disaster resistant. The level of education is another natural disaster determinant that suggests educational attainment reduces human fatalities as a result of natural disaster. In addition, larger population increases death tolls and larger land areas reduce natural disaster fatalities.

On the other hand, Padli *et al*. (2010) investigate the relationship among the impact of natural disaster such as number of death per capita, total affected and total damage/GDP and macroeconomic variables namely Gross Domestic Product per capita (as a proxy for the level of economic development), GDP per capita squared to identify the linearity or non-linear of the relationship, government consumption, ratio of M2 over GDP as a proxy for financial deepening, years of schooling attainment, land area and population as a dependent variable by using cross-sectional analysis. Three different point of time are regressed, namely 1985, 1995 and 2005 encompassing 73 countries. It is discovered that wealthy nations and their citizens are better prepared for natural disasters. Preparations may lessen the aftermath economic impact of natural disasters. The size of the government is also found significant and inversely related. It strengthens the understanding of government intervention and consumption on minimizing the impact of natural disaster.

Kahn (2005), Skidmore and Toya (2007), Raschky (2008), Noy (2009) have tested the idea that better institutions reduce the adverse effects of natural disasters. It is concluded that countries with higher-quality institutions suffer less death tolls and economic losses from natural disasters.

It has been argued that damages resulted from natural disasters are dependent on good governance. Studies on the impact of public sector corruption on fatalities are evident Anbarci *et al*. (2006), Escaleras *et al.* (2007) and Yamamura (2013). In their studies on traffic fatalities in 10 selected countries, Anbarci *et al.* (2006) discover that as public sector corruptions increase in these countries, traffic fatalities rise significantly. Escaleras *et al*. (2007), on the one hand, when analyzing 344 earthquakes from 42 countries occurring between 1977 and 2003, found that public sector corruption is positively related to earthquake deaths. Furthermore, Escaleras *et al.* (2007), discover that public sector corruption is positively related to earthquake deaths in the analyses of 344 earthquakes from 42 countries occurring between 1977 and 2003. On the other hand, Yamamura (2013) focus on the probability of the occurrence of disasters using panel data from 98 countries. It is discovered that the public sector corruption increases the probability of technological disasters in those countries.

## METHODOLOGY

Based on the work of Kahn (2005), Skidmore and Toya (2007) and Raschky (2008), we specify the following general functions for the determinants of flood damages and fatalities:

$$FLOOD_j = f\{RGDPc, RGDPc^2, pop, pop\_dens, unemp, rinv, rgc, open, edu, corr\} \quad (1)$$

The following regression specifies Equation (1) in a log-log regression:

$$\begin{aligned} &\ln FLOOD_{ijt} \\ &= \beta_0 + \beta_1 \ln RGDPc_{it} + \beta_2 \ln RGDPc^2{}_{it} \\ &+ \beta_3 \ln pop_{it} + \beta_4 \ln pop\_dens_{it} \\ &+ \beta_5 \ln unemp_{it} + \beta_6 \ln rinv_{it} + \beta_7 \ln rgc_{it} \\ &+ \beta_8 \ln open_{it} + \beta_9 \ln edu_{it} + \beta_{10} corr_{it} + \varepsilon_{ijt} \end{aligned} \quad (2)$$

where $i$ denotes country *1, 2, 3,……N*, $j$ signifies type of flood fatalities and $\varepsilon_{ijt}$ represents the error term. $FLOOD_j$ is the measurement for flood fatalities which consists of three measurements, namely total number of death (*TD*), total number of affected per capita (*TAFFc*) and total economic losses (*TC*) caused by floods. As for the regressors, $RGDPc_{it}$ is the real gross domestic product per capita. $RGDPc^2{}_{it}$ is the square of real gross domestic product per capita which measures for non-linear relationships. In addition, $pop_{it}$ is the total population, $pop\_dens_{it}$ is the population density, $unemp_{it}$ is the unemployment rate, $rinv_{it}$ is the ratio of real investment to GDP, $rgc_{it}$ is the ratio of real government consumption to GDP, $open_{it}$ is openness measured as (export+import) / GDP, $edu_{it}$ is education level; that is based on number of students enrolled in higher education, primary and secondary school, and $corr_{it}$ is corruption index. Finally *ln* denotes natural logarithm of the variables used in the study.

From Equation (1), we would expect that GDP per capita is negatively related to *TD*, *TAFFc* and *TC*. Economists have discovered that safety is generally a normal or luxury good. As people become wealthier and secure the necessities of life, they start

focusing on reducing risks of premature deaths. However, based on past literatures, the relationship between GDP per capita and natural disasters show mixed results. It has negative or positive impact on natural disaster fatalities. We expect the results on population and population density to have positive impact on natural disaster fatalities due to urbanization. The unemployment rate is also expected to have mixed results. There are positive impact on total deaths and negative impact on total affected and economic losses due to limited or no income and wealth or resources. We expect negative relationship between sign of real investment and openness on damages and fatalities. As there is more investment, there is more research and development activities, more avenue to absorb new idea in natural hazard preparedness and finally will reduce the impact of natural disaster fatalities. The more investment channeled, the more research and development activities are designed. They functioned as avenues absorbing and generating new ideas in natural hazard preparations. Consequently, it reduces the impact of natural disaster fatalities. Similarly, from the aspect of government consumption, we expect a negative relationship on human fatalities and positive impact on economic losses. In addition, education attainment is also expected to have a negative relationship on losses due to natural disaster. As people become more educated and knowledgeable, they are more aware, alert and more prepared for any natural disaster events. Finally, corruption as a measurement of institutional factor is expected to show positive impact on disaster damages and fatalities. Natural disasters are the direct outcome of deviant political and economic decisions and actions by institutional participants.

To add dynamic to the panel data analysis, we include lagged one period of the dependent variable in each of equation for *TD, TAFFc* and *TC*. The general way to deal with dynamic panel data is to apply first-differenced General Method of Moment (GMM) estimators using the levels of the series lagged two periods or more as instrumental variables. However, when the number of time series observations is small, the first-differenced GMM may behave quite poorly It is due to lagged levels of the variables being weak instruments for subsequent first-differences (Bond *et al*., 2001). This problem may be alleviated by introducing the system GMM estimator suggested by Arellano and Bover (1995) and Blundell and Bond (1998). The assumption used is that first-differences are not correlated with country specific effects. The basic idea of system GMM is to combine both equations in first-differences, taking the lagged level variables as instruments, with equations in levels with lagged first-differences as instruments.

To establish the validity of instrumental variables, specification test are conducted using the Hansen test. Based on the Hansen test, the null hypothesis is that there is no correlation between instruments and errors, and failure to reject the null can be viewed as evidence in favor of using valid instruments. The next test is for the errors that are not

serially correlated in first-differenced equation. By construction, the differenced error term may be first-order serially correlated even if the original error term is not (Carkovic & Levine, 2002). Thus, if the null hypothesis of no serial correlation of AR(2) model cannot be rejected, it can be viewed as evidence supporting the validity of instruments used.

*Descriptions and Sources of Data*

The data set consists of a panel of observation for 79 countries, including developed and developing countries, for the period 1981 – 2005. The data used in the analysis are five years averages: 1981-1985, 1986-1990, 1991-1995, 1996-2000 and 2001-2005. The list of countries used is shown in Table 3. Data on the impact of flood such as the number of deaths, number of affected per capita, and cost of damages are taken from the OFDA/CRED Centre for Research on the Epidemiology of Disasters. CRED has maintained the Emergency Events Database (EM-DAT) since 1988. It is accessible at http://www.emdat.be. Other regressors are obtained from various sources which are summarized in Table 4. All variables, except corruption (corr), are transformed into natural logarithm before estimation.

## THE EMPIRICAL RESULTS

Table 5 shows the results of the two-step system GMM illustrating the estimated coefficients, sign and significance of several economic factors affecting flood fatalities and damages. In Total Death equation, the only variable that contributes to changes

TABLE 3
Lists of Countries included in the Study

| | | |
|---|---|---|
| Algeria | Italy | Thailand |
| Australia | Jamaica | Trinidad & Tobago |
| Austria | Japan | Turkey |
| Bangladesh | Kenya | Uganda |
| Belgium | Korea Rep | United Kingdom |
| Bolivia | Luxembourg | United State |
| Brazil | Madagascar | Uruguay |
| Bulgaria | Malawi | Venezuela |
| Cameroon | Malaysia | Vietnam |
| Canada | Mexico | Yemen |
| Chile | Mozambique | Zimbabwe |
| China P Rep | Netherlands | |
| Colombia | New Zealand | |
| Costa Rica | Nicaragua | |
| Czech Rep | Pakistan | |
| Dominican Rep | Panama | |
| Ecuador | Papua New Guinea | |
| Egypt | Paraguay | |
| El Salvador | Peru | |
| France | Philippines | |
| Germany | Poland | |
| Ghana | Portugal | |
| Greece | Romania | |
| Guatemala | Russia | |
| Haiti | Senegal | |
| Honduras | Slovakia | |
| Hong Kong | Slovenia | |
| Hungary | South Africa | |
| Iceland | Spain | |
| India | Sri Lanka | |
| Indonesia | Sudan | |
| Iran Islam Rep | Sweden | |
| Ireland | Switzerland | |
| Israel | Tanzania | |

TABLE 4
Description of Variables and Sources of Data Used in the Study

| Variables | Brief Description | Sources of Data |
|---|---|---|
| Number of death | Persons confirmed as dead and persons missing and presumed dead | EM-DAT |
| Number of total affected per capita | Sum of injured, homeless, and affected | EM-DAT/ Penn World |
| Total damage cost | Estimates include both direct costs (such as damage to property, infrastructure, and crops) and the indirect losses due to reductions in economic activity. | EM-DAT |
| Income per capita | Real Gross Domestic Product per capita | WDI/IMF |
| Population | Total population | Penn World |
| Population Density | Total population divide by land area sq/km | Penn World / WDI |
| Unemployment | The rate of unemployment | WDI |
| Investment | Real investment percentage of GDP | WDI |
| Openness | Export plus import divided by GDP | Penn world |
| Government Consumption | Real government Expenditure percentage of GDP | WDI/IFS |
| Education | Number of schooling attainment | Barro and Lee (2010) |
| Corruption | The extent to which public power is exercised for private gain, including petty and grand forms of corruption, as well as "capture" of the state by elites and private interests | ICRG (International Country Risk Guide) |

in total deaths is openness. The inverse relationship between openness and total deaths suggest that by opening the economy to the outside world. For example, it is implemented through liberalizing trade or foreign direct investment. It promotes knowledge absorbing, technology transfer, effective regulation and planning as well as quality infrastructure. Consequently, total deaths may be reduced during floods.

In the aspect of the Total Number of Affected per Capita, our results suggest that the level of economic development, population, investment and openness are statistically significant different from zero, at least, at 5 percent level. On the other hand, economic development, population, investment and education are important determinants for the Total Economic Loss (Damages) Equation. An increase in the level of economic development, measured by income per capita, reduces both total affected and total damages due to floods. It can be observed that a 1 percent increase in the level of economic development can contribute to a more than 5 percent in total economic losses or damages. Opening the economy coupled with increase in investment and population, most likely, lead to migration from rural to urban areas. It enhances rapid urbanization. As a result, these activities lead to increase in the number

TABLE 5
Results of Dynamic Panel Data Two-Step System GMM Estimations

| Variable | Total Death $LnTD_t$ | Total Affected per Capita $LnTAFFc_t$ | Total Economic Losses $LnTC_t$ |
|---|---|---|---|
| $LnTD_{t-1}$ | 0.143<br>(1.31) | | |
| $LnTAFFc_{t-1}$ | | -0.051<br>(-0.71) | |
| $LnTC_{t-1}$ | | | -0.020<br>(-0.25) |
| $LnRGDPc_t$ | -0.055<br>(-0.16) | -1.074***<br>(-3.72) | -5.418***<br>(-2.58) |
| $Lnpop_t$ | - | 0.770***<br>(3.01) | 1.752***<br>(3.06) |
| $Lnrinv_t$ | 0.226<br>(0.99) | - | - |
| $Lnrinv\_pc_t$ | - | 0.223***<br>(3.65) | 5.472***<br>(1.570) |
| $Lnopen_t$ | -1.688**<br>(-2.33) | 2.557***<br>(2.99) | - |
| $Lnedu_t$ | 1.370<br>(1.53) | - | -2.080*<br>(-1.64) |
| Observation | 295 | 295 | 294 |
| No. of Countries | 79 | 79 | 79 |
| Dummy | Yes | No | No |
| AR(1) *p*-value | 0.021** | 0.002*** | 0.006*** |
| AR(2) *p*-value | 0.464 | 0.169 | 0.335 |
| Hansen test *p*-value | 0.862 | 0.518 | 0.635 |

Notes: Figures in parenthesis are *t* -statistics. Asterisks (***), (**), (*) denote statistically significant at the 1%, 5%, 10% level, respectively. Other variables that are not statistically significant different from zero were dropped from the final estimated models.

of people affected by floods and also increase in total damages considering buildings and infrastructures are more concentrated in urban areas. Lastly, education level plays a role in affecting losses due to floods. More people those are well informed and knowledgeable about the consequences of flood contribute to reducing damage costs as a result of flood. The extent of information and knowledge people comprehend about the consequences of flood contributes to reducing damage costs.

## CONCLUSION

The purpose of this study is to investigate factors that contribute to the mitigation of flood fatalities and damages using a panel of data from 79 countries. We have identified several economic variables that may affect flood fatalities and damages. These variables

include: income per capita, total population, investment, openness and education.

Generally, our study suggests that among others, enhancing economic development can help in reducing the impact of flood on human fatalities or total people affected and economic losses. Countries with higher income are more prepared to face future devastation due to floods. The investment on flood relief centers, preparation programs on flood, early warning systems, enforcement of building regulation to flood prone areas etc, lessen the impact of flood on the public and damages on the infrastructures. Furthermore, higher investment and expanded public education lead to reduction in human fatalities. Well informed citizen are more sensitive to preparations against any ill-effect as a result of floods. For example, they buy homes located in areas that are less prone to floods or take extra precautions to face future disasters.

One important policy implication is that programs and policies focussing on increasing people income level should be given priorities. Indirectly, in the long run, it may work positively in mitigating and reducing the damages, losses and fatalities resulting from natural disasters. Furthermore, the expenditure and consumption of the government also need to be carefully planned and cautiously implemented. It is supported by this study that has proven government consumption is an important tool. If it is used wisely and vigilantly, it mitigates the losses and reduces the negative impact of natural disasters. The government also needs to allocate a big proportion of its budget on mitigating factors and facilities such as retainable wall or establishing adequate forest reserves to act as cushions to prevent or minimize the damages.

## REFERENCES

Albala-Bertrand, J. M. (1993). *Political Economy of Large Natural Disasters*. New York: Oxford University Press.

Alexander, D. (1993). *Natural Disasters*. New York: Chapman & Hall.

Anbarci, N., Escaleras, M., & Register, C.A. (2006). Traffic Fatalities and Public Sector Corruption. *Kyklos*, *59*(3), 327-344.

Arellano, M., & Bover, O. (1995). Another Look at the Instrumental Variable Estimation of Error-Component Models. *Journal of Econometrics*, *68*, 29-52.

Asian Disaster Reduction Center (ARDC). (2009). *Natural Disaster Data Book 2009*. ARDC.

Barro, R., & Lee, J.W. (2010). A New Data Set of Educational Attainment in the World, 1950-2010. *NBER Working Paper* No. 15902.

Bond, S., Hoeffler, A., & Temple, J. (2001). *GMM Estimation of Empirical Growth Models*. Oxford University, Mimeo.

Blundell, R. W., & Bond, S. R (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometric*, *87*, 115-143.

Carkovic, M., & Levine, R. (2002). *Does Foreign Direct Investment Accelerate Economic Growth?* University of Minesota Department Finance Working Paper.

Chan, N. W. (1997). Increasing flood and risj in Malaysia: Causes and solutions. *Disaster Prevention and Management*, *6*(2), 72-86.

Chan, N. W., & Parker, D. J. (1996). Response to dynamic flood hazard factors in Peninsular Malaysia. *The Geographical Journal*, *162*(3), 313-325.

Emergency Events Database (EM-DAT). *The OFDA/CRED International Disaster Database*. Universite Catholicque de Louvain, Brussels, Belgium. Retrived from www.em-dat.be.

Escaleras, M., Anbarci, N., &Register, C. A. (2007). Public sector corruption and major earthquakes: A potentially deadly interaction. *Public Choice*, *132*, 209-230.

Gruntfest, E. (1995). *Long-term social and economic impacts of extreme floods*. Paper presented at the U.S.-Italy research workshop on the hydrometeorology, impacts and management of extreme floods. Perugia, Italy.

Haque, C. E. (2003). Perspectives of Natural Disaster in East and South Asia, and the Pacific Island States: Socioeconomic Correlates and Need assessment. *Natural Hazards*, *29*, 465-483.

Heston, A., Summers, R., & Aten, B. (2009). Penn World Table Version 6.3. Centre for international comparisons of production, income and prices, University of Pennsylvania.Horwich, G. (2000). Economic lessons from the Kobe earthquake. *Economic Development & Cultural Change*, *48*, 521-542.

International Financial Statistics (IFS), (2008). *International Monetary Fund CD-ROM*. Retrieved from www.imf.org.

International Monetary Fund (IMF). (2003). F*und Assistance for Countries Facing Exogenous Shocks*. Retreived from http://www.imf.org/external/np/pdr/sustain/2003/080803.pdf.

Kahn, M. E. (2005). The death toll from natural disaster: The role of income, geography and institutions. *The Review of Economics and Statistics*, *87*(2), 271-284.

Kellenberg, D. K., & Mobarak, A. M. (2008). Does rising income increase or decrease damages risk from natural disaster. *Journal of Urban Economics, 63*, 788-802.

Ketua Pengarah. (2007). *Flood and drought management in Malaysia*. Ministry of Natural Resources and Environment. Mimeo.

Leiter, A. M., Oberhofer, H., & Raschky, P. A. (2009). Creative disasters? Flooding effects on capital, labour and productivity within European Firms. *Environmental and Resource Economics*, *43*, 333-350.

Noy, I. (2008). The macroeconomic consequences of disasters. *Journal of Development Economics*, *88*(2), 221-231.

Padli, J., & Habibullah, M. S. (2009). Natural disaster and socio-economic factors in selected Asian countries: A panel analysis. *Asian Social Science*, *5*(4), 65-71.

Padli, J., Habibullah, M. S., & Baharom, A. H. (2010). Economic impact of natural disasters' fatalities. *International Journal of Social Economics*, *37*(6), 429-441.

Raschky, P. A. (2008). Institution and the losses from natural disasters. *Natural Hazards and Earth System Sciences*, *8*, 627-634.

Skidmore, M., & Toya, H. (2007). Economic development and the impact of natural disasters. *Economics Letters*, *94*, 20-25.

Tobin, G., & Montz, B. (1997). *The impacts of a second catastrophic flood on property values in Linda and Oliverhurst, California*. Quick Response Report #95, University of Colorado at Boulder.

Tol, R., & Leek, F. (1999). Economic analysis of natural disasters. In T. Downing, A. Olsthoorn & R. Tol (Eds.), *Climate Change and Risk*. London: Routledge. pp. 308–327.

United Nations Economics & Social Commission for Asia & the Pacific (UNESCAP). (2007). *Statistical Yearbook for Asia & the Pacific 2007*. Washington, D.C.: United Nation. Retrieved from http://www.unescap.org/stat/data/syb2007/17-Information-and-communication-technology.asp

World Development Indicator (WDI). (2008). *World Development Indicators on CD-ROM*. The World Bank

Wildavsky, A. (1988). *Searching for Safety*. New Brunswick, N. J.: Transaction.

World Disasters Report. (2007). *Discrimination in Disasters*. Retrieved from http://www.ifrc.org/docs/pubs/disasters/wdr2007/wdr2007-english.pdf

Yamamura, E. (2013). *Public Sector Corruption and the Probability of Technological Disasters*. EERI Research Paper Series No 02/2013. Economics and Econometrics Research Institute.

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# Cigarettes Demand and Tax Strategy in Malaysia

**Norashidah M. N.*, Nik Mustapha R. A. and Mastura Y.**

*Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

Taxation is one of the effective tools to discourage smoking. Increase of cigarette tax has a significant effect in generating additional revenue to the government due to the inelastic nature of the cigarette. In this study, the estimated price elasticity of demand for cigarettes in Malaysia is -0.28 and -0.49 in short run and long run; respectively. Hence, demand for cigarettes is inelastic or less responsive to the changes in price. Therefore, estimating the optimal cigarette tax rate is one of the strategies to ensure that the price of cigarette, after tax, is high enough to reduce consumption of cigarette. At the same time, it generates maximum tax revenue for the government. Using yearly time series data from 1980 until 2009, a Fully Modified Ordinary Least Square (FMOLS) method is applied to estimate the demand elasticity of cigarettes and the optimal cigarettes excise tax. In this study, the estimated optimal real excise tax rate is 0.186 sen per stick which is 27.4% higher than the real excise tax in 2009. The increase in real revenue earned after imposing an optimal excise tax is 24.25% in the short run and 21.89% in the long run. Consequently, the expected reduction in consumption per capita of cigarette is 10.41% in the short run and 12.88% in the long run. Maximum revenues from the optimal cigarettes tax can be earmarked to fund a specific tobacco control policy in Malaysia

*Keywords:* Elasticity of demand, optimal tax rate, tax revenue

## INTRODUCTION

Malaysia enacted Control of Tobacco Products Regulation (CTPR) in 1993, under the Food Act of 1983. CTPR Act 1993 was officially implemented on 15th May, 1994. Though amended a number of times, these regulations remain the primary legislative mechanism used to regulate tobacco in Malaysia. Cigarettes taxation is one of the important tools for tobacco control in Malaysia. According to Chaloupka *et al*.

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*E-mail address*:
norashidah@upm.edu.my (Norashidah M. N.),
* Corresponding author

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(2000), one of the effective methods to deter smoking behavior is through taxation. In addition, Shibuya *et al*. (2003), describes that taxing of tobacco as the most cost effective tobacco control option in all regions.

In Malaysia, cigarette tax is imposed on cigarette manufacturers or cigarette importers. Until 2004, taxes on tobacco were levied according to their weight. Since 2005, Malaysia has been adopting a specific excise tax per stick. This tax structure is easier to administer since it requires only counting the sticks without weighing them. There are two different tax structures for domestic and imported cigarettes. In 2010, excise tax of RM0.26 per stick was levied on locally produced cigarettes sold in Malaysia; while, import duty was levied on imported cigarettes. Imported cigarettes from non-ASEAN countries are subjected to an import duty of RM0.20 (US$0.05) per stick; while, cigarettes imported from ASEAN countries are levied RM0.10 (US$0.03) import duty per stick. Both domestic and imported cigarettes are subjected to 25% sales tax added above the factory value with excise tax for domestic or above custom declared value for the imported ones.

Currently, locally produced cigarettes capture over 95% of the market. The excise tax on locally produced cigarettes is RM0.26 per stick which represents about 52% of retail price. This is below the recommendation of Framework Convention on Tobacco Control (FCTC) which is 65% of the price per pack. Table 1 shows the cigarette taxes imposed by the Malaysia government from 1990 until 2010.

From 1990 until 2004, excise tax on cigarette was imposed on the weight of cigarette (per kg) Following 2004, it has been imposed that measurement based on per stick of cigarette. The excise tax and the import tax imposed on cigarettes have been increasing. However, the sales tax has remained fixed at 15% from 1990 to 1999. It has increased to 25% from 2001 to 2010.

The Malaysian Government earns a large amount of revenue from its involvement in the tobacco industry. In 2010, revenue from the excise tax on cigarette was 2% from the total revenue of excise tax collected by the government. The tobacco industry ranked 5$^{th}$ out of 92 sectors. The total economic output of this industry has reached RM1.7 billion representing about 3% of Malaysia's Gross Domestic Product in 2004.

Fig.1 shows the relationship between the excise tax on cigarette and tax revenue generated by government. The figure reveals that the increase in excise tax on cigarette imposed by the government leads to persistent increase in tax revenue from 1990 to 2009.

### *Cigarettes Demand and Cigarette Tax in Malaysia*

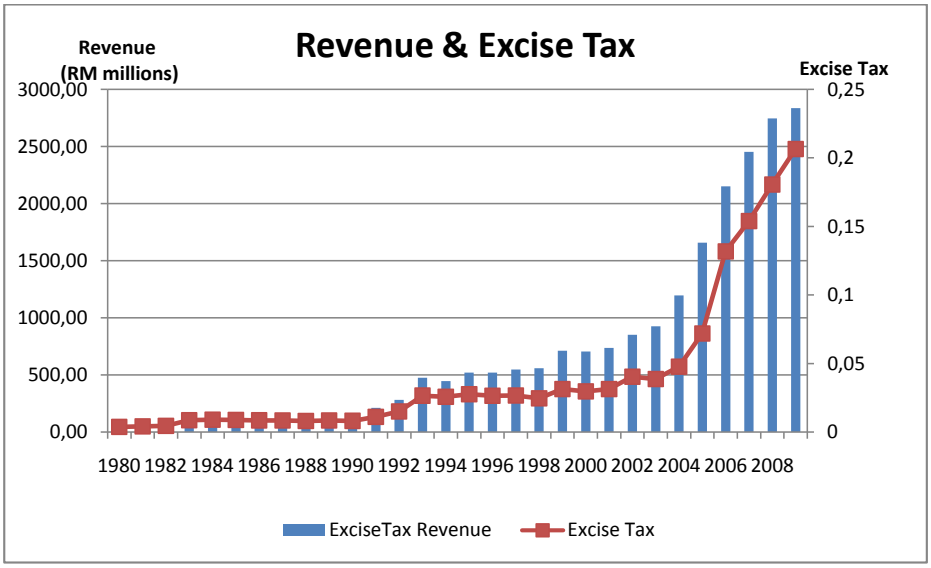
Basically, price elasticity of demand is measures the responsiveness of quantity demanded to a change in price. In this context, it measures the percentage changes in quantity demanded for cigarette due to a change in a price of cigarette. A study

TABLE 1
Cigarette Taxes 1990 – 2010

| Year | Import Tax RM/kg or RM/stick | Excise Tax RM/kg or RM/stick | Sales Tax % |
|---|---|---|---|
| 1990 | 85/0.08 | 13/0.013 | 15 |
| 1991 | 135/0.12 | 14/0.014 | 15 |
| 1992-1998 | 162/0.15 | 28.60/0.028 | 15 |
| 1999-2000 | 180/0.16 | 40/0.039 | 15 |
| 2001 | 180/0.16 | 40/0.039 | 25 |
| 2002 | 216/0.2 | 48/0.047 | 25 |
| 2003 | 259/0.24 | 58/0.056 | 25 |
| 2004 | 200/0.18 | 58/0.056 | 25 |
| 2005* | 0.20 | 0.081 | 25 |
| 2006 | 0.20 | 0.12 | 25 |
| 2007 | 0.20 | 0.15 | 25 |
| 2008 | 0.20 | 0.18 | 25 |
| 2009 | 0.20 | 0.225 | 25 |
| 2010 | 0.20 | 0.26 | 25 |

*Specific tax per stick was introduced (1 kg = 1100 sticks)

Source: Royal Custom Malaysia and Confederation of Malaysia Tobacco (CMTM), various years.



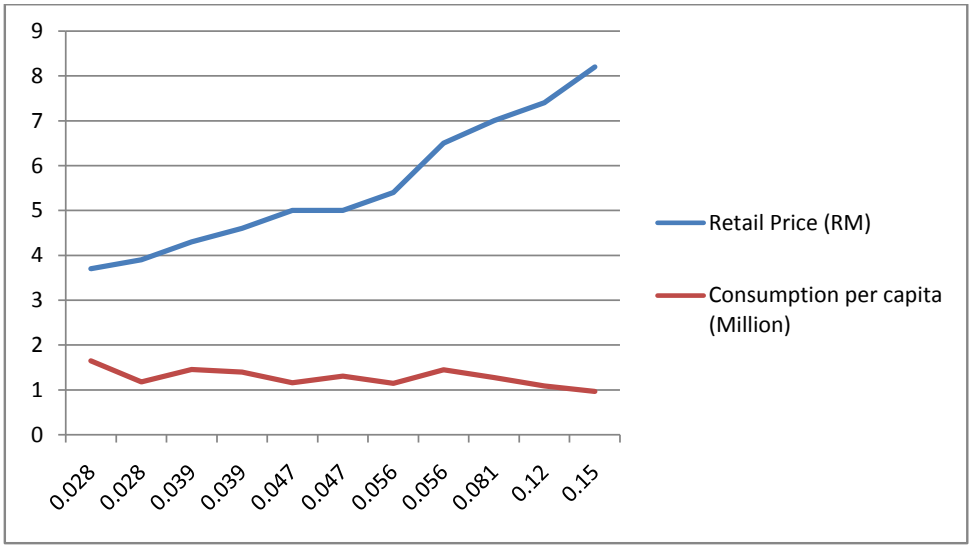

Source: Royal Malaysian Custom various years.

Fig.1: Tax Revenue vs Excise Tax Rate (1990 – 2009)

conducted by Hana and Nabila, (2007) using data on cigarette consumption, cigarette prices and public policies in Malaysia for the period from 1990 to 2004 indicates the estimated long-run and short-run price elasticity of demand was -0.57 and -0.08; respectively. It implies that demand is less responsive to price or inelastic. On the other hand, they have discovered that 25% increase in cigarette tax in 2007 has led to a 5.9% increase in the price of cigarette and 3.37% of reduction in consumption. In view of demand for cigarettes is inelastic, it indicates that lack of awareness on the effect of cigarettes on health, addiction and availability of illegal cigarettes as substitute. The higher excise tax on cigarette leads to only a slight decrease in consumption of cigarettes, as illustrated in Fig.2.

Currently, Malaysia does not have any clear tobacco tax policy objectives. Although there have been several increase on cigarette tax in the past decade, their purpose was mainly to raise government revenue (Hana & Nabilla, 2007). Some aspects of the tobacco tax policy are driven by economic interests of tobacco farmers and cigarette producers. Despite these concerted effort to curb smoking through the enforcement of tobacco control policies, Malaysian efforts are still lagging behind neighboring countries such as Singapore and Thailand. The lack of effective coordination among the agencies involved in tobacco control often leaves obvious violations of CTPR unpunished.

The reasons of raising cigarette excise taxes,are to increase government revenue, to protect children and youth, to improve public health and to correct externalities. The entire reasoning further poses a question as to what extent the optimal tax should be




Source: Royal Custom Malaysia and Confederation of Malaysia Tobacco (CMTM), various years.

Fig.2: Retail Price of Cigarette and Consumption Per Capita vs Excise Tax Rate (1990 – 2008)

imposed on cigarette. From the economic perspective, the optimal tax can be achieved when the marginal cost of the last cigarette consumed equals to its marginal social benefits. However, according to Warner, Chaloupka and Cook (1995) and Chaloupka *et al* (2000), evaluation and identification of the negative externalities associated with direct smoking and direct environmental effect from tobacco smoke are abundant and complicated. Therefore, in order for a country to set the optimal level of tax, it should take into account the national health objectives. Such objectives depend on societal value such as the extent to which the children should be protected from the effect of smoke polluted environment. Apart from the health and social objectives of imposing tax on cigarettes, some governments may levy taxes with the intention of maximizing revenues. An empirical evidence from a study in South-East Asia reports on the potential revenue generated from tobacco taxes, Arunatilake (2003). This study assumes that the real GDP per capita in the region is growing at 4% annually. With that assumption, a 5% increase in real cigarette prices induced by higher taxes would generate substantial additional revenue for the region by 2010. Hence, this paper estimates the price elasticity of demand for cigarette and evaluates the effect of cigarette excise tax on cigarette consumption. The determination of the optimal excise tax rate is essential to ensure maximum tax revenue is generated. Thus, it can be channeled towards tobacco control programs with the aim to reduce prevalence of smoking and ultimately change the consumption behavior of smoking.

## LITERATURE REVIEW

The estimation on demand for cigarette has been of great interest to many economists since the Surgeon General's warning in 1964 on the causal relationship between cigarette smoking and smoking related diseases. Smoker's responsiveness to changes in cigarette price has been estimated in many studies from different countries over varying time periods. Price is only one of several factors which may influence demand. Analyses usually attempt to assess simultaneously the effect of price and other major potential influences such as income, public information policies and cigarette advertising. The extent to which demand for cigarettes responds to changes in price can be measured using price elasticity of demand. Majority of the empirical evidence available are based on studies of populations in developed countries. They suggest that 10% increase in cigarette prices will result in 2.5% to 5% reduction in cigarette demand (Chaloupka & Warner, 2000). In low and middle-income countries, the study on demand for cigarette has utilized the national-level aggregate consumption data and individual or household-level survey data. Hu and Mao (2002) estimates the aggregate time series data for China. The finding is that the price elasticities of demand range from -0.54 to -0.64. The same study has been conducted, in Malaysia, using data on cigarette consumption, cigarette prices and public policies for the period

from 1990 to 2004 (Hana & Nabila, 2007). The study employs time-series regression analysis applying the error-correction model (ECM). The estimated long-run and short-run price elasticity of demand are -0.57 and -0.08; respectively. It indicates that demand is less responsive to price in the short-run. Similar studies have been conducted in other countries including Vietnam and Myanmar, It has been reported that Vietnam's price elasticity has reached -0.53 (Eozenou & Fishburn, 2009) and Myanmar with -0.128 (Nyo *et al.*, 2003). Although different countries may have used different methods and data set to estimate the impact of cigarette price on cigarette demand, those studies have shown that increase in the price of cigarettes will lead to significant reductions in cigarette smoking.

Cigarette consumption imposes externalities through greater health care expenditure, negative effects on second hand smokers and loss of productivity. In view of these externalities, smokers make socially inefficient consumption decisions which lead to social welfare loss. Efficient government intervention might be better to facilitate the internalization of externalities through Pigouvian taxes (Pigou, 1962). Thus, bringing consumption closer to the Pareto-efficient level by raising the price (Holcombe, 1996). Pigouvian taxes are known as "sin taxes" imposed on goods such as alcohol and tobacco.

Evidence from developed and developing countries show that price increase on cigarette are highly effective in reducing demand (Chaloupka *et al.,* 2000). These findings suggest that raising taxes on cigarettes can be an effective policy in reducing smoking. Higher taxes cause higher price of cigarettes. Hence, induce some smokers to quit and deter others to start smoking. The higher price of cigarettes reduces the number of ex-smokers returning to cigarettes and decreases the amount of cigarettes consumption among existing smokers. Ahmad and Franz (2008) concludes that a higher cigarette price through taxes reduces smoking prevalence, improves the population health, reduces medical cost and net gain in tax revenue for the government.

Raising cigarette tax is advantageous to governments in terms of increasing revenue. In an estimate by Sunley, Yurekli and Chaloupka (2000), an increase of 10% in cigarette taxes leads to an increase of almost 7% on average in cigarette tax revenues. An effective tax policy by the government is to set taxes on products that create the least economic distortion. Ramsey (1927) designs an optimal tax theory which identifies distortion minimizing tax policy and the second best levels of taxes. The "Ramsey Rule" states that tax rate should vary inversely with the elasticity of demand for products by holding the elasticity of supply constant. Given the evidence that demand for cigarette is relatively inelastic in developed and developing countries (Chaloupka *et al*., 2000), the Ramsey Rule on cigarettes taxes hold.

As dictated in "Ramsey Rule" (Ramsey, 1927), the level of taxes is inversely related to the price-elasticity of demand by holding

the supply elasticity constant. Thus, an increase in tax minimizes the welfare loss. At the same time, it leads to a significant increase in tax revenue. Townsend (1996) indicates that for every one percent increase in the excise tax, government revenue in UK is expected to increase between 0.6 and 0.9%.

The rate of cigarette excise tax that maximizes revenue is illustrated using the Laffer curve. An economist, Arthur Laffer (1986), suggests that beyond some tax rate, higher tax rate will reduce the tax base so much that revenues will actually decline.

The following Laffer Curve illustrates the relationship between tax revenue and the tax rate.

Using the Laffer Curve model to derive the relationship between the excise rate and budget revenue in Ukrainian tobacco industry, Krasovsky *et al.*, (2001), it is estimated the revenue maximizing excise rate to be approximately 11.3% in constant 1997 Hryvnias currency. The excise rate, in Ukraine, in 2001, shows an upward sloping portion of the Laffer Curve. Therefore, budget revenues can be significantly increased if the excise rate is increased. A study in South Africa by Van Walbeek, 2000, using a Laffer Curve theory for years 1998 and 1999, shows that if the government had set the tax at the revenue maximizing levels, an additional revenue of R700 million and R300 million for those two years could be generated. Theoretically, there is a trade off in raising cigarette taxes. Government gets more revenue on the packs of cigarettes sold. However, there is likely to be fewer packs sold as the tax rates increase. Eventually, tax revenue declines. Apart from taxes, other effective tobacco control measures include information campaigns, comprehensive bans on advertisement and promotion, prominent warning labels, and clean indoor air restrictions (Kenkel & Chen, 2000; Woolery *et al.*, 2000).

## MODELS AND METHODOLOGY

Following the methodology considered by Townsend, Roderick and Cooper (1994), a single equation model with an assumption that the consumption function is a log-linear function is employed. The log linear demand model that is estimated in this study:

$$\ln C_t = \beta_0 + \beta_1 \ln P_t + \beta_2 \ln GDP_t + \beta_3 T_t + \beta_4 \ln Rg_t + \varepsilon \quad [1]$$

where $C_t$ is the quantity or number of cigarette sticks consumed per capita in year t, $P_t$ is the real pre-tax price of cigarettes in year t, $GDP_t$ is real GDP per capita in year t $Rg_t$ is the tobacco regulation and $T_t$ is the cigarette excise tax rate.

All the variables are in natural logarithms. However, $Rg_t$ is represented by dummy variable (DMY) to allow the estimates of model parameters to be interpreted as elasticities. Consumption per capita is the total quantity of domestic cigarettes plus imported cigarettes, measured by number of cigarette sticks, divided by the size of population aged 18 years and above. $P_t$, is the pre-tax price of cigarettes equivalent to current price of cigarettes minus the excise cigarettes tax and GDP per capita is the real

GDP divided by the number of population. T is an excise tax in the form of per unit tax levied on locally produced cigarettes sold in Malaysia and Rg is non-price instruments. The '*TakNak*' or '*Don't Want'* national anti-smoking campaign is considered as a regulation dummy, DMY. The '*TakNak*' anti-smoking campaign was launched on 9 February, 2004. The campaign was a 5 year program with initial budget allocation of RM20 million. This campaign is considered in this study since the total budget for this 5 year program is RM100 million. Given the vast expenditure dedicated to this mass media campaign, an empirical estimation of its effectiveness is important to discern how it influences demand for cigarettes.

The basic unit root tests are performed in this analysis to determine the order of integration of the series. The classical unit root tests, namely the Augemented Dickey-Fuller (ADF) test (Dickey & Fuller, 1981, Said and Dickey, 1984), Phillips and Perron (PP) (1998) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) (1992) test have been carried out on the variables at levels and in first differences, with the optimal lag lengths for each test chosen automatically by the E-views 6 software. In order to examine the long run relationship among the variables, this study employs the method of Fully Modified Ordinary Least Square (FMOLS) developed by Phillips and Hansen (1990). In applying the FMOLS, the existence of co-integration relation between a set of *I(1)* variables must be satisfied. The FMOLS estimator corrects the demand model's variables for endogeneity due to co-integration and modifies least square to account for serial correlation effects. FMOLS yields t-ratios that is asymptotically normally distributed and independent of the correct choice of lag length of the underlying vector auto-regression. According to Borland and Quliaris (1994), the FMOLS estimator permits inference based on normal distribution theory 'by means of a non-parametric correction' to the data that effectively eliminates any long-run dependence between the true residuals of the co-integrating regression and the innovations of the explanatory variables. Residuals generated from each co-integrating relations represent deviations from the long-run equilibrium. It can be used to estimate the short run dynamics of demand models using the Error- Correction Model:

$$\Delta C_t = \beta_t - \lambda_t ecm_{t-1} + \sum_{i-1}^{k_t} \pi_t \, \Delta p_t - j + \sum_{j=0}^{k_t} \mu_t \Delta m_{t-j} + \sum_{j=0}^{k_t} \pi^*{}_j \, \Delta p^*{}_{t-j} + \beta_1 D1 + \beta_B DB + \beta_T D_T + \upsilon_t$$

Where $ecm_{t-1}$ is the residual from estimating demand models using FMOLS. The estimation of the error correction parameter in the model, λ is to measure the speed of adjustment of the system to disequilibrating shock. The coefficients with negative and larger values indicate faster adjustment to economic shocks. Bannerjee *et al.*, (1993) shows that a highly significant error correction term with a negative co-efficient is a further proof of the existence of stable long run relationship and relatively

more efficient method of establishing Co-integration.

The optimal excise tax rate is estimated based on a basic equation of Laffer Curve: $R(T) = \alpha T - \beta T^2$ where R(T) is tax revenue and T is tax rate, the estimated regression of optimal cigarette excise tax:

$$R_t = \alpha_0 + \delta_1 T_t + \delta_2 T^2_t + \delta_4 GDP_t + \varepsilon_t, \quad [2]$$

where *t* indicates years, *R* is real tax revenue from cigarettes, *T* is the real excise tax on per stick of cigarette measured in Ringgit, *GDP* is real income per capita and transformed into natural logarithm, and $\varepsilon_t$ is the error term. $T^2$ is real excise tax squared. The inclusion of both tax rate and its square in the regression equation is to allow the relationship between revenue and tax rate to be non-linear as depicted by Laffer curve model. Both *R* and *T* are adjusted for the inflation using the consumer price index (CPI) with year 2000 as the base year.

All the variables of the Laffer Curve in equation 1 are also tested for their stationarity and FMOLS is applied to estimate the parameters. All the standard diagnostic tests are applied for these time series data

In order to estimate the impact of increase excise tax rate of cigarette on the expected government revenue, the following mathematical relationship between the changes in the excise tax rate and government revenue is applied:

$$\frac{d(TR)}{TR} = \frac{d(T)}{T}[1 + (\mu_\mu x \frac{T}{P})] \quad [3]$$

where $\frac{d(TR)}{TR}$ is the percentage change in goverment revenue. $\frac{d(T)}{T}$ is changes in the excise tax rate, $\mu_\mu$ is the price elasticity of demand, and $\frac{T}{P}$ is the tax proportion of the retail price of cigarette.

Equation 3 shows that an increase in government revenue, as a result of an increase in the tax rate, is inversely proportional to the absolute size of the price elasticity. A relatively inelastic demand implies greater revenue potential and vice versa.

The empirical analysis for price elasticities and optimal tax rate in this study use annual data from 1980 to 2009. These data were obtained from the Royal Custom of Malaysia and Department of Statistic Malaysia.

## RESULTS AND DISCUSSION

The empirical results of ADF, PP and KPSS show that all the variables in both models are stationary at first difference. Since all the variables are I(1), Fully Modified Ordinary Least Square (FMOLS) is employed to estimate the long run elasticity of the models. Followed by Error Correction Model (ECM) to determine the short run elasticity

From the above estimations, price of cigarettes and real excise tax rate have a negative and significant impact on consumption of cigarettes in long run and

short run. Demand for cigarettes is inelastic in short run and long run. However, price is less sensitive in the short run where an increase in cigarette price by 10% reduces cigarette consumption by 2.8% in short run, and 4.9% in the long run. The coefficient of excise tax is tax elasticity which measures the responsiveness of changes in consumption per capita due to changes in the excise tax rate. Hence, from the result shown in Table 2 and Table 3, the coefficients of excise tax rate is highly significant at 1% level and gives a negative impact on the cigarette consumption in short run and long run. In this study, real income per capita (GDP) is found to have a negative relationship on cigarette consumption in short run and positive relationship in

TABLE 2
Estimation of Long-run Elasticity

| | Dependent Variable: lnC | |
|---|---|---|
| | Coefficient | T-ratio |
| Constant | 4.5040 | 6.3804*** |
| lnP | -0.4941 | -2.4396** |
| lnT | -0.4739 | -13.466*** |
| lnGDP | 0.3753 | 4.4833*** |
| DMY | 0.0584 | 1.528 |

Notes: The following notation applies; C= Consumption per capita, P= real pretax price, T=real excise tax rate, GDP = real GDP per capita and DMY represent Rg, non price instrument (Dummy variable) '***' indicates the test statistic is significant at the 1% significance level, '**' indicates the 5% significance level, and '*' indicates the 10% significance level.

TABLE 3
Estimation of Short-run Elasticity

| | Dependent Variable:ΔlnCPC | |
|---|---|---|
| | Coefficient | T-Ratio |
| Constant | -0.0042 | -0.5195 |
| ΔlnP | -0.2808 | -2.5340** |
| ΔlnT | -0.3843 | -13.665*** |
| ΔlnGDP | -0.0412 | -0.2965 |
| DMY | 0.0175 | 1.5470 |
| $ECTC_{t-1}$ | -0.6814 | -7.3003*** |
| | R-Squared = 0.717 | |
| | R-Bar-Squared = 0.647 | |
| | F-stat = 10.174[0.000] | |
| | Standard Error of Regression = 0.055 | |

Notes: The following notation applies; ΔC= Consumption per capita, ΔP= real pretax price, ΔT=real excise tax rate, ΔGDP = real GDP per capita and DMY = Non price instrument (Dummy variable) Δ = first difference.'***' indicates the test statistic is significant at the 1% significance level, '**' indicates the 5% significance level, and '*' indicates the 10% significance level.

long run. It implies that cigarettes are an inferior goods in the short run yet normal goods in the long run. However, real income per capita is only significant in the long run. Finally, the results of dummy variable (DMY) that represent government non-price instrument $R_g$, indicate that the government campaign is ineffective either in short run or long run. The campaign is successful in increasing the awareness of the anti-smoking messages (Foong, 2005). However, the positive relationship between the variable and consumption of cigarette in this study implies that the government's objective to reduce cigarette consumption is unsuccessful. The coefficient of $ECTC_{t-1}$ is equal to -0.68,which implies that deviation from the long-run equilibrium in demand for cigarette is corrected by 68% over annually at 1% level of significance. The higher significant error correction term, the further is proof of the existence of a stable long run relationship**.** Bannerje *et al.,* (1993) argues that testing the significance of error correction term with negative coefficient is supposed to be relatively more efficient way of establishing cointegration.

In view of demand for cigarette in short run and long run is inelastic, an increase of tax on cigarette fits into the 'Ramsey Rule' (Ramsey, 1927). Evidently, increases of tax on cigarette leads to significant reduction in cigarette consumption and, at the same time, increases tax revenue. The optimal tax is estimated to ensure a maximum tax revenue to the government. The following Table 4 shows the estimation results from the FMOLS analysis for the optimal tax model. The diagnostic tests show all the variables are I(1) or stationary at first difference. The following Table 4 shows the estimation results from the FMOLS analysis.

The estimated coefficient of T is positive and significant at 1% level. The positive sign of T implies that increases in real excise tax rate will increase the tax revenue. The opposite sign for the tax rate squared ($T^2$) captures the diminishing effects of the tax in the parabolic equation which is a pattern consistent with the shape of Laffer Curve shape. The estimated coefficients of real GDP which is positive is also highly significant determinant of real excise tax revenue in this model.

TABLE 4
Results of the FMOLS Estimation

| | | | | |
|---|---|---|---|---|
| $R =$ | $-5.2437$ + | $19.9882T_t$ – | $53.6910T^2_t$ + | $1.8609\ \ln GDP_t$ |
| | (-2.6953)** | (2.8531)*** | (-1.2859) | (8.3118)*** |

Notes: The following notation applies; R= Real Revenue, T=real excise tax rate, RGDP = real income per capita and $T^2$ = real excise ta squared "***" indicates the test statistic is significant at the 1% significance level, "**" indicates the 5% significance level and "*" at 10% significance level. Figures in parentheses ( ) refer to t statistics.

To determine the optimal tax rate that maximizes tax revenue, the real revenue (R) is differentiated with respect to real tax rate (T),

$$R = -5.2437 + 19.9882T_t - 53.6910T^2_t + 1.8609\ln GDP_t$$

$$\partial R/\partial T = 19.9882 - 2(53.6910)T_t$$

A necessary condition for revenue maximization is $\partial R/\partial T = 0$.

Therefore, real excise tax rate (T) is 18.6% or nominal excise tax rate is 28.7%.

Considering $\partial^2 R/\partial T^2$ = negative, it confirms that T = 18.6% which is the optimal real excise tax rate that maximizes tax revenue. The calculated optimal real excise tax rate is 27.4% higher than the real excise tax rate of is 14.6% in 2009.

From the above estimated price elasticity of demand for cigarette and the applied mathematical relationship between changes in tax revenue and changes in the excise tax rate derived in Equation 3, the expected increase in government revenue will be 24.25% in the short run and 21.89% in the long run. It is due to 27.4% increase in real excise tax rate. It should also note that the excise tax proportion of the retail price of cigarette is 41% in 2009. At the same time, using the estimated tax elasticity of demand, -0.38 in the short run and -0.47 in the long run, 27.4% change in the excise tax rate will reduce cigarette consumption by 10.41% and 12.88% in the short run and long run; respectively.

## CONCLUSION

Demand for cigarettes in Malaysia is inelastic in both short run and long run. Price is highly significant determinant of demand. It is consistent with the theory that the long run price elasticity of demand is higher than the short run. Excise tax is one of the instruments frequently used as a government policy tool to reduce consumption of cigarettes. The significant and negative impact of excise tax rate on consumption of cigarettes, both in short run and long run shows that the policy of increasing excise tax rate on cigarettes is an effective measure to reduce consumption of cigarettes. Although tax has a significant effect in reducing cigarette consumption, the inelastic demand for cigarette will continue to generate additional tax revenue. As the tax rate is increased, the quantity of cigarette purchased will decline less than increase in price. Thus, the tax revenue is derived from people who continuously purchase cigarettes. Determining the optimal cigarette excise tax rate is one of the cigarette tax strategies that the government should pursue. The current excise tax rate provides ample opportunities for the government to increase excise tax with the objectives of generating maximum tax revenue and reducing cigarette consumption.

The estimation of optimal cigarette tax is done using the Laffer curve model. It is estimated that the optimal real excise tax is 0.186 sen per stick or 0.287 sen nominal excise tax per stick. That is about 27.4% higher than the excise tax rate in 2009. Based on the findings of this study, Malaysian

government should continue increasing the excise tax rate until the optimal level of tax rate is achieved. Imposing the optimal tax on cigarettes will increase tax revenue to the government. The expected increase in government revenue in short run is 24.8% and long run 21.89%. Higher excise tax rate on cigarette will be passed to the consumer in terms of higher price of cigarette. The negative relationship between price and demand of cigarette will further decrease consumption of cigarettes. It is estimated at 10.41% and 12.88% in the short run and long run, respectively.

In the attempt to maximize the taxation effect and reduce smoking, government should efficiently allocate the tax revenue towards tobacco control program and strategies. According to Hanna and Nabila (2007), there is no tax or pricing policy in Malaysia that aims to contribute towards health objectives. It is timely that the government considers having a specific tobacco control policy funded from earmarking of revenues, cigarette tax increases or "sin tax". The policy funded by earmarked fund should be targeted to increase awareness about the consequences of smoking habits, to reduce larger proportion of tobacco consumption and to reduce tobacco-related illness and death. The collected revenue from the "sin tax" can be channeled to more comprehensive programs addressing the issues of health resulting from tobacco usage, increasing the awareness and educate the public on the danger of smoking, implementing educational strategies to prevent smoking and other related activities. The source of funding for those health programs through earmarking of tax revenue will eradicate any conflict of interest between non-smoker taxpayers and smokers since the earmarked revenue is generated from the tobacco consumers.

Although the result of this study shows that anti-smoking campaigns in Malaysia is ineffective, there are evidence that the anti-smoking campaigns in America have proven to be an effective tools in reducing cigarette consumption and encouraging people to quit smoking (Siegel, 1998). Further supported by a report from National Cancer Institute, USA (2008), it also concludes that anti-tobacco media campaigns are effective in reducing smoking among youths and adults. Despite the insignificance of "*TakNak* or *"Don't Want*", anti-smoking mass media campaign must continue. The general public in Malaysia gives high support towards the implementation of anti-smoking campaign in the community (Halimah, 2005). The five years duration of "*TakNak*" campaign may not be sufficient to see the positive impact of the campaign. Levy and Friend (2001) suggests that the duration of campaign must be long enough to allow the effects of the campaign in changing social norm where smoking should be viewed as unacceptable. Siegel (1998) suggests that the campaigns need a consistent source of funding to ensure that the message is transmitted from various sources, consistent and repeated over a long period. Therefore, to maintain continuous running of the campaigns, it is recommended that earmarking of cigarette tax revenue is

vital to ensure sustained funding. The campaign must also be protected from any political attempts to divert funding or limit their scope from delivering the message. In the "*TakNak*" campaign, the message is to increase awareness among public, especially youths, on why they should not smoke and why they should quit smoking. However, some studies highlight that the combination messages of 'why to quit' and 'how to quit" are more effective in changing smoker's behavior (Wilson, 2005; Hammond et al., 2006). Thus, besides the "*TakNak*" message in the anti-smoking mass media campaign, the 'how to quit' message should be integrated into the campaign.

## REFERENCES


Ahmad, S. , & Franz, G.A. (2008). Raising taxes to reduce smoking prevalence in the USA: Asimulation of the anticipated health and economic impacts, *Public Health, 122*, 3-10.

Arunatilake, N. (2003). An economic analysis of tobacco demand in Sri Lanka, *Economic Journal, 3*(1), 96-120.

Banerjee, A, Dolado, J. J., Gailbraith, J. W., & Hendry, D. F. (1993). Co-integration, error-correction, and the econometric analysis of non-stationary data, *Advanced Texts in Econometrics.* Oxford University Press.

Chaloupka, F. J., Hu T., & Warner, K. E., *et al*. (2000). The taxation of tobacco products. In P. Jha & F. J. Chaloupka (Eds), *Tobacco Control in Developing Countries*. Oxford University Press.

Chaloupka, F. J., Hu, T., Warner, K. E., Jacobs, R. & Yurekli, A. (2000). The taxation of tobacco products. In P. Jha & F. J. Chaloupka (Eds) *Tobacco Control in Developing Countries*, Oxford University Press.

Chaloupka, F. J., Warner, K. E. (2000). The Economics of Smoking. In: Culyer A. J., Newhouse J. P. (Eds), *Handbook of Health Economics*. Amsterdam: North-Holland, pp.1539-1627

Eozenou, P., & Fishburn, B. (2009). Price Elasticity Estimates of Cigarette Demand in Vietnam, *The DEPOCEN Working Paper Series*, 2009/05, Vietnam

Foong, K., Maizurah, O., Razak, L., Rahmat, A., Tan, Y. L., & Yong ,C. Y. (2005). Report: Evaluation of the national anti-smoking campaign in Malaysia. *Clearing house and research network for tobacco control*, National Poison Center of Malaysia, USM, Malaysia.

Hana, R., & Nabilla, A. M. (2007). Demand Analysis of Tobacco Consumption in Malaysia, *Nicotine & Tobacco Research*, *9*(11), 163-1169.

Holcombe, R. G.(1996). *Public Finance: Government revenues and expenditures in the United States economy.* Minneapolis: West Publishing Co.,

Hu, .W., & Mao, Z. Z. (2002). *Economic analysis of tobacco and options for tobacco control: China case study*. HNP discussion paper, economics of tobacco control paper No. 3.

Kenkel, D., & Chen, L. (2000). Consumer information and tobacco use. In *Tobacco Control in Developing Countries*, Oxford, England: Oxford University Press.

Krasovsky, K., Andreeva, T., Krisnov, D. Masliakivsky, M., & Rud, G. (2001). *Economics of tobacco control in Ukraine from the public perspective*. Alcohol and drug information centre (ADIC), Ukraine.

Nyo Nyo, K., Zaw, K. K., & Naing, K. K. (2003). *The economics of tobacco control in Myanmar*. HNP Discussion Paper, Economics of Tobacco Control Paper No. 14, Washington: World Bank.

Pigou, A. C. (1962). *A study in public finance. 3rd Edition*. Macmillan and Co., London

Ramsey, F. P. (1927). A contribution to the theory of taxation. *Economic Journal, 37*, 47-61.

Van Walbeek, C. P. (2000). *The economics of tobacco control in South Africa*. Paper presented at 11th conference on Tobacco OR Health. Applied Fiscal Research Centre, Cape Town

Shibuya, K., Ciecierski, C., Guindon, E., Bettche, D. W., Evans, D. B., & Murray C. J. (2003). WHO framework convention on tobacco control: Development of an evidence based global public health treaty, *British Medical Journal*, *327*(7407), 154–157.

Sunley, E. M, Yurekli, A. A., & Chaloupka, F. J. (2000). The design, administration and potential revenue of tobacco excises. In Jha, P and Chaloupka, F. J. (Eds.), *Tobacco control in developing countries*, Oxford, England: Oxford University Press.

Townsend, J. (1996). Price and consumption of tobacco. *British Medical Bulletin*, *52*(1), 132-142.

Warner, K. E., Chaloupka, F. J., & Cook, P. J. (1995). Criteria for determining an optimal cigarette tax, *Tobacco Control, 4*, 380-6.

Woolery, T., Asma, S., & Sharp, D. (2000). Clean indoor-air laws and youth access. In Jha P, Chaloupka F. J., (Eds.), *Tobacco control in developing countries*. Oxford, England: *Oxford* University Press. pp.273-286.

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# The Effects of ASEAN Free Trade Agreement (AFTA) on Intra ASEAN Trade: 1986-2010

**Normaz Wana Ismail* and Collin Wong Koh King**

*Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

The ASEAN Free Trade Agreement (AFTA) was set up in 1993 and has already shown significant effects by 2010. This study empirically investigates the effect of trade creation on intra-ASEAN trade for the period of 1986 to 2010. Using the gravity model, we find that major determinants of bilateral trade in ASEAN are GDP, population, relative endowment, distance and common border. A dummy variable is introduced to measure the intra-ASEAN trade and trade creation among five ASEAN member countries. Our finding suggests that trade between the selected member countries remains strong even during the 1997 Asian Financial Crisis and the 2008 Global Financial Crisis.

*Keywords:* AFTA, Intra-ASEAN trade, gravity model, AEC

## INTRODUCTION

ASEAN is among the first agreements on regional economic co-operation in East Asia. Unlike other regional associations in the world, ASEAN has no supranational authority or responsibility. The ASEAN Secretariat conducts annual meetings to discuss issues concerning the relationship between member countries such as trade, investment, security, custom, and tourism. ASEAN was formed on 8 August 1967 in Bangkok with five original members namely Indonesia, Malaysia, Thailand, the Philippines and Singapore (ASEAN-5). Cooperation in the economic, social, cultural, technical and educational areas is the main objective in the Bangkok declaration. Other objectives include promoting regional peace and stability through respect for justice, the rule of law in the region and adherence to the principles of the United Nations Charter. The expansion of ASEAN's membership is the peak of the gradual rapprochement process between the original ASEAN members and

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*E-mail address*:
nwi@upm.edu.my (Normaz Wana Ismail),
lawsh@upm.edu.my (Collin Wong Koh King)
* Corresponding author

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other neighboring countries namely Brunei, Cambodia, Laos, Vietnam and Myanmar. On 8 January 1984, Brunei became the sixth member of ASEAN followed by Vietnam on 28 July 1995, Laos and Myanmar on 23 July 1997, and Cambodia on 30 April 1999. In the early beginning after the birth of ASEAN, relationships among members have focused on political, social and security matters, with less focus on economic considerations.

The process of regional economic integration in ASEAN began with the formation of the ASEAN Free Trade Area (AFTA) at the fourth summit was held in Singapore in 1992. ASEAN became the first organization in the East Asian region that agreed to promote integrated economic cooperation. The main objective of AFTA is to increase the region's competitive advantage as a single production unit. The key element in AFTA is the Common Effective Preferential Tariff (CEPT) Scheme which covers manufactured products and agricultural products. Under the CEPT scheme, tariffs for ASEAN-5 members on a wide range of products traded within the region should be eliminated by 2010. According to ASEAN Secretariat Report (2011), by 2010, ASEAN-6[1] has already eliminated 54,467 tariff lines or 99.65 per cent of the traded tariff lines under CEPT. The total ASEAN trade has expanded more than double from US$82.46 billion in 1993 to US$174.25 billion in 2003. In 2010, total ASEAN trade has reached more than US$1.5 trillion.

[1]ASEAN-6 includes Brunei.

In 2007, ASEAN leaders agreed to sign the ASEAN Economic Community (AEC) blueprint with the objective of making ASEAN a single market and production base by 2015. The AEC aims to create a highly competitive economic region with equitable economic development and fully integrated into the global economy. The AEC is also said to be beneficial to the expansion of intra-ASEAN trade and improvement of the regional economy through greater gains from trade and FDI (Plummer, 2006). This led the members to sign the ASEAN Trade in Goods Agreement (ATIGA) in 2009. ATIGA replaces the role of CEPT with a broader coverage of tariff and non-tariff barriers liberalizations, rules of origin, trade facilitation, customs, standards and conformance, sanitary and phytosanitary measures.

In light of the removal of tariff among members and the implementation of stronger economic integration through AEC, this study aims to provide empirical evidence of the significance of AFTA on intra-ASEAN trade. ASEAN has faced many challenges and undertaken several reformations by 2010. Firstly, there was the establishment of AFTA in 1993, followed by two episodes of financial crises in 1997/1998 and 2007/2008 and the implementation of AEC in 2007. This study focuses on the original ASEAN (ASEAN-5), expecting to observe positive effects on intra-ASEAN trade.

## LITERATURE REVIEW

Previous studies have analyzed the effects of Regional Trade Agreements (RTAs) or

Preferential Trade Agreements (PTAs) in terms of the volume of trade. The literature on trading blocs typically concentrates on the Vinerian principles of trade creation and trade diversion (Aitken, 1973; Bergstrand, 1985; Hamilton & Winters, 1992; Frankel *et al*, 1995; Frankel & Wei, 1997; Endoh, 1999; Sharma & Chua; 2000; Soloaga & Winters, 2001; Thorton & Goglio, 2002; Clerete *et al*., 2003; Elliot & Ikemoto, 2004).

A number of studies examine the effects of PTAs, such as European Union, North America Free Trade Area (NAFTA), the Andean Pact, and Latin America Free Trade Area (LAFTA), on bilateral trade. Thorton and Goglio (2002) investigate the degree of regional bias in intra-Southeast Asian trade involving Malaysia, Indonesia, Philippines, Thailand and Singapore. They find that ASEAN membership promotes intra-regional trade. Meanwhile, Soloaga and Winters (2001) modify the gravity equation to test for significant changes in trade patterns by separating the effect of PTAs. The studies include ASEAN. Their results are similar to Frankel (1997) which show a negative intra-bloc trade coefficient for ASEAN. However, they also find that the coefficients for overall bloc imports is statistically significant and positive. Another study by Clarete, Edmonds and Wallack (2003) on various PTAs and trade flows with Asian countries, find no significant impact on intra-bloc trade in ASEAN. In fact, they find an evidence of a reduction in imports and exports in that region that includes all its ten members.

Frankel and Wei (1997) study the trade and FDI among ASEAN economies by using gravity equation for 1980, 1990, 1992 and 1994. They conclude that the trade among ASEAN countries is higher in trade creation than trade diversion. With limited data, they predict that new ASEAN members, particularly Vietnam and Indochinese countries, will have a seven-fold trade expansion in the next decade. Sharma and Chua (2000) use the gravity model to examine the impact of the APEC on the ASEAN integration on five ASEAN countries, namely Malaysia, Indonesia, Philippines, Thailand and Singapore for the period of 1980 to 1995. They find that dummy variables for intra-ASEAN trade are negative for all ASEAN-5 countries, except the Philippines. They conclude that the ASEAN, excluding the Philippines, PTA does not increase intra-ASEAN trade.

An interesting study by Elliot and Ikemoto (2004) examine intra-and-extra bias in bilateral trade flows pre and post signing of AFTA, the year prior to Asian crisis and its subsequent year. Their analysis cover the period of 1983 to 1999 where trade flows are found to be insignificantly affected immediately after 1992 but gradually increased the following years. This result suggests that the Asian crisis has worked as a trigger to a further acceleration of economic integration in the region. Similarly, Sudsawasd and Mongsawad (2007), tend to show that ASEAN-5 can realize the potential gain from stronger regional economic cooperation through full trade liberalization. Facilitating trade

among member countries and selected FTA partners promotes a potentially higher GDP growth and an increase in welfare gains. Another important study to see the effects of AFTA, done by Hapsari and Mangunsong (2006), reveals that the reduction of tariff among members does play important role in increasing intra ASEAN trade. The study covers the 10 year period after the implementation of AFTA (1993-2003) and it comprises of 19 countries including ASEAN countries.

On the other hand, Tho (2002), use a gravity model and a trade matrix analysis of manufactured products for ASEAN-5 and three major non-ASEAN partners, namely Japan, China and South Korea. It is discovered that the effect of AFTA on trade and investment effect is not as strong as predicted by the theory of free trade area. Park (2008) use a Computable General Equilibirum model (CGE) on the proposed East Asian RTA strategies. Multi-sector and multi-country CGE models are applied to evaluate the impact on welfare, GDP, export, and income. The finding reveals that the AFTA has a positive effect on the ASEAN members but negative effect on Northeast Asian neighbors. However, the gains from trade can reach its full potential if ASEAN members pursue the ASEAN Hub which applies the hub-and-spoke type of overlapping RTA strategy. Meanwhile, Plummer (2006) examine various economic and political related issues associated with the formation of AEC. It is noted that the potential benefit of AEC is much higher compared to AFTA. AEC needs to be outward oriented and liberal.

In summary, previous studies on the role of AFTA has yielded mixed results. This study offers current insight using recent data to estimate a period spanning seventeen years after the implementation of AFTA.

## METHODOLOGY

The basic gravity equation explains the volume of bilateral exports from country i to country j by three factors. The first indicates the potential supply of the exporting country (i), the second explains the potential demand of the importing country (j), and the third includes the factors representing the resistance to trade flow between countries. In its basic form, bilateral exports from country i to country j are determined by the economic size, population, relative endowment, and geographical distances variables such as distance and border. Generally, the gravity model is specified as:

$$Ln\ X_{ijt} = a + a_1 lnY_{it} + a_2 lnY_{jt} + a3 lnPOP_{it} + a_4 lnPOP_{jt} + a_5 lnENDOW_{ijt} + a_6 lnDIST_{ij} + a_7 BOR_{ij} + e_{ijt} \quad (1)$$

where,

$X_{ijt}$ = Total export at time t,

$Y_{it}$ and $Y_{jt}$ = GDP of the exporting and importing countries at time t,

$POP_i$ and $POP_j$ = Population of the exporting and importing countries at time t,

$ENDOW_{ijt}$ = Absolute difference between GDP per capita of the exporting and importing countries at time t,

$DIST_{ij}$ = Distance between two countries,

$BOR_{ij}$ = Dummy variable which takes the value of 1 if the two countries share the common border and zero if otherwise,
$e_{ij}$ = error terms.

GDP indicates the economic size of two countries in terms of production capacity and market size. The gravity model predicts that larger countries with greater production capacity are more likely to achieve economies of scale and enhance their exports based on comparative advantage. They also have large domestic markets which are able to attract more imports. Therefore, increases in GDP of the two countries are likely to increase bilateral trade volumes. On the other hand, the coefficient for population of the exporting country may have a positive or negative sign. The sign depends on whether the country exports less as it has large absorption capability or whether a large country exports more due to economies of scale, compared to a small country. For similar reasons, the coefficient for the importing country's population may have a negative or positive sign (Martinez-Zarzoso and Nowak-Lehmann, 2003). Another variable to be included is ENDOW. It is the per capita GDP difference between country i and j, expressed in absolute terms. A positive coefficient indicates that higher difference in per capita income has positive effect on the bilateral trade flows.

Distance serves as a proxy for transportation costs. Shorter distance implies lower transportation costs and higher volume of trade between two countries. In addition, the distance between pairs of countries is considered as an important linkage factor that affects trade flows. A dummy variable (binary variable) for common border is used to identify countries sharing a border. It enables border trade. Hence the estimated coefficient is expected to show a positive sign.

$$Ln\ X_{ijt} = a + a_1 lnY_{it} + a_2 lnY_{jt} + a3lnPOPit + a_4 lnPOP_{jt} + a_5 lnENDOW_{ijt} + a_6 lnDIST_{ij} + a_7 BOR_{ij} + a_8 AFTA + e_{ijt} \quad (2)$$

Equation 2 is an augmented gravity model which includes AFTA as a dummy where it takes the value of one if the exporter and importers are ASEAN members starting from 1993 to 2010, and zero otherwise. Thus, the dummy represents the period when AFTA was implemented until the full effects of AFTA. Thus, the dummy represents the period AFTA implementation till its effects. Following Ghosh and Yamarik (2004), a positive value of the estimated coefficient can be interpreted as trade creation. It indicates that the two countries trade more with each other. Therefore, the size and statistical significance of the coefficient on the AFTA suggests the existence of intra-regional trade between the five ASEAN economies. On contrary, negatively significant coefficient implies that they trade less with each other. Dummy variables for the Asian Financial Crisis (Crisis1) and the Global Financial Crisis (Crisis2) are added into the model to represent financial crises which occurred in 1997/998 and 2007/2008 (Equation 3).

$$Ln\ X_{ijt} = a + a_1 lnY_{it} + a_2 lnY_{jt} + a3lnPOPit + a_4 lnPOP_{jt} + a_5 lnENDOW_{ijt} + a_6 lnDIST_{ij} + a_7 BOR_{ij} + a_9 AFTA + a_{10} Crisis1 + a_{11} Crisis2 + e_{ijt} \quad (3)$$

This study employs a panel of five ASEAN countries for the period of 1986 to 2010. The methods used are Pooled Ordinary Least Square (POLS) and Random Effects Model (REM). Contrary to previous studies, we choose REM over the Fixed Effects Model (FEM) to avoid omitting hypothesized variables, namely the dummies for AFTA and financial crises.

## DATA DESCRIPTION

The estimation of panel data for 25 years (1986 to 2010) includes five exporting countries from ASEAN, namely Malaysia, Indonesia, Singapore, the Philippines and Thailand. There are thirty nine selected importing countries[2], mainly from Asia and some other developed and developing countries. Overall, our data consists of an unbalanced panel of 190 trading pairs with 4534 observations. Bilateral export data are in Dollar terms based on current rate taken from COMTRADE database, as published by the United Nation. Data for GDP, per capita GDP, and population are extracted from the World Development Indicators, as published by the World Bank. Measurement for distance and common border are derived from Centre D'Etudes Prospectives Et D'Informations Internationales (CEPII)[3]. In addition, information about free trade agreement is compiled from published information by the ASEAN secretariat.

## EMPIRICAL RESULT AND DISCUSSION

Table 1 summarizes the estimation results, where Columns (1) to (3) show the POLS results and Columns (4) to (6) present the REM results. The coefficients for market size of exporting countries (*lnYi*) and importing countries (*lnYj*) are positive and statistically significant. This suggests that bigger market size implies higher trade flows to and from the countries. However, the coefficients for population ($lnPOP_i$) of exporting and importing countries are negative and statistically significant. This suggests that a highly populated ASEAN country, such as Indonesia, might focus on producing goods for domestic consumers and trade less with other countries. Meanwhile, a country with a small population, such as Singapore, tends to trade more with others. The coefficient for relative endowment ($lnENDOW_{ij}$) is positive and statistically significant. It implies that larger difference in relative endowment encourages more trade between two countries. Such implication supports the Hecksher-Ohlin hypothesis. The coefficient for border ($BOR_{ij}$) shows a positive sign in POLS. It suggests that neighboring countries

[2]A list of the selected importing countries is included in the appendix.

[3]Distances are calculated following the great circle formula, which uses latitudes and longitudes of the most important city (in terms of population) or of its official capital.

tend to trade more with each other. However, this coefficient is found to be statistically insignificant in REM. The coefficient for distance ($lDIST_{ij}$) is negative and statistically significant. It supports higher trade volume with lower transportation costs.

The coefficient for the AFTA dummy is positive and statistically significant in both models (see Column 3). It confirms that free trade agreement encourages trade. This finding confirms the evidence from Hapsari and Mangunsong (2006) which find the reduction of tariff among members increase bilateral export of ASEAN members. This also supports that the CEPT scheme with tariff removal among its members has successfully promoted intra-ASEAN trade. This finding also captures the full effects of AFTA which was implemented in 1993 and ended in 2010. Within this

TABLE 1
The Impact of AFTA on ASEAN Trade: 1986-2010

| | POLS | | | | REM | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| $lnY_i$ | 1.69[a]<br>(32.82) | 1.63[a]<br>(30.98) | 1.63[a]<br>(30.98) | 1.71[a]<br>(30.84) | 1.82[a]<br>(14.14) | 1.77[a]<br>(13.78) | 1.77[a]<br>(13.79) | 1.82[a]<br>(14.17) |
| $lnY_j$ | 1.06[a]<br>(53.31) | 1.07[a]<br>(53.86) | 1.07[a]<br>(53.89) | 1.08[a]<br>(54.23) | .759[a]<br>(4.64) | .729[a]<br>(4.61) | .737[a]<br>(4.64) | .787[a]<br>(5.27) |
| $lnPOP_i$ | -.598[a]<br>(-34.17) | -.593[a]<br>(-33.7) | -.592[a]<br>(-33.75) | -.604[a]<br>(-33.82) | -.626[a]<br>(-17.06) | -.619[a]<br>(-16.93) | -.619[a]<br>(-16.94) | -.626[a]<br>(-17.17) |
| $lnPOP_j$ | -.231[a]<br>(-0.34) | -.237[a]<br>(-14.69) | -.236[a]<br>(-14.69) | -.237[a]<br>(-14.81) | -.033<br>(-0.71) | -.034<br>(-0.62) | -.035<br>(-0.76) | -.044<br>(-0.94) |
| $lnENDOW_{ij}$ | .036[a]<br>(2.33) | .032[a]<br>(2.08) | .032[a]<br>(2.11) | .033[a]<br>(2.15) | .094[a]<br>(2.26) | .091[a]<br>(2.20) | .091[a]<br>(2.22) | .093[a]<br>(2.24) |
| $lnDIST_{ij}$ | -1.35[a]<br>(-40.2) | -1.26[a]<br>(-33.42) | -1.26[a]<br>(-33.48) | -1.27[a]<br>(-33.70) | -.649[a]<br>(-2.91) | -.649[a]<br>(-2.67) | -.651[a]<br>(-2.66) | -.444[a]<br>(-2.24) |
| $BOR_{ij}$ | .521[a]<br>(6.79) | .451[a]<br>(5.59) | .452[a]<br>(5.62) | .453[a]<br>(5.60) | .974<br>(1.61) | .949<br>(1.55) | .952<br>(1.55) | .9547<br>(1.55) |
| AFTA | | .473[a]<br>(5.46) | .462[a]<br>(5.32) | .452[a]<br>(5.22) | | .593[a]<br>(3.60) | .569[a]<br>(3.45) | .544[a]<br>(3.34) |
| Crisis1 | | | .183[a]<br>(2.82) | .151[a]<br>(2.33) | | | .1875[a]<br>(4.48) | .149[a]<br>(4.13) |
| Crisis2 | | | | -.356[a]<br>(-4.95) | | | | -.323[a]<br>(-7.36) |
| Constant | -25.0[a]<br>(-20.86) | -24.73[a]<br>(-20.60) | 24.75[a]<br>(-20.61) | 26.52[a]<br>(-20.93) | -29.74[a]<br>(-6.40) | -28.25[a]<br>(-6.29) | -28.36[a]<br>(-6.29) | -30.58[a]<br>(-7.36) |
| No. Obs. | 4479 | 4479 | 4479 | 4479 | 4479 | 4479 | 4479 | 4479 |
| F-statistics/ Wald test | F<br>(7, 4471)<br>= 882.79[a] | F<br>(8, 4470)<br>= 809.99[a] | F<br>(9, 4469)<br>= 720.39[a] | F<br>(10, 4468)<br>= 650.00 | 547.17[a] | 581.85[a] | 620.25[a] | 693.30[a] |
| $R^2$ | 0.6867 | 0.6893 | 0.6897 | 0.6912 | 0.6569 | 0.6639 | 0.6646 | 0.6676 |

Notes: Numbers in parentheses are t-values. Notations [a], [b], [c] indicate significance at 1 per cent, 5 per cent and 10 per cent levels.

period, the trade among ASEAN members has increased about 72%[4]. Our finding also reveals that even during the financial crises, the intra-ASEAN trade remains strong with a significantly positive coefficient. This finding is in line with Elliot and Ikemoto (2004) which support evidence of intra ASEAN trade increases during Asian financial crisis. In fact, during the 1997 Asian Financial Crisis, currency depreciation makes trading among members more favorable compared to the effect of the 2008 Global Financial Crisis (Columns 3 and 4).

## CONCLUSION

In this study, the effects of AFTA are estimated for the period from 1986 to 2010. The gravity model is employed in examining bilateral trade between selected ASEAN countries. The estimated coefficients are correctly signed and statistically significant for GDP, population, relative endowment and distance. It implies that these factors influence bilateral trade flows. The AFTA dummy shows that trade between member countries increases after the implementation of AFTA. This study captures the full effect of AFTA since original ASEAN members have totally removed tariff and non-tariff barriers among each other by 2010. Thus, trade between members becomes cheaper and countries even trade more during the 1997 Asian Financial Crisis compared to the 2008 Global Financial Crisis.

In summary, the AFTA benefits ASEAN members with trade. In the beginning, the CEPT scheme helps in enhancing international trade liberalization. It is substituted with ATIGA that focuses more on comprehensive legal instrument for trade facilitation. The implementation of AEC in 2007 goes beyond removing tariff and non-tariff barriers. 87 measures out of 277 have been completed during the review of Phases 1 and 2 for ASEAN Scorecard dated from 2008 to 2011. The AEC aims to achieve a single market and production base by the year 2015. However, based on the experience of AFTA which took seventeen years to complete instead of the projected ten years, ASEAN may need more time to realize the full potential of AEC.

[4](Exp (0.544) – 1) x 100 = 72.2%

## REFERENCES

Aitken, N. (1973). The effect of EEC and EFTA on European trade: A temporal cross section snalysis. *American Economic Review*, *63*(5), 881-92.

Bergstrand, J. H. (1985). The gravity quation in international trade : Some microeconomic foundations and empirical evidence. *Review of Economics and Satistics, 67*, 474-481.

Brada, J. C. & Mendez, J. A. (1985). Economic integration among developed, developing and centrally planned economies: A comparative analysis. *The Review of Economics and Statistics*, *67*(4), 549-556.

Clarete R., Edmonds C., & Wallack, J. S. (2003). Asian regionalism and its effect on trade in the 1980s and 1990s. *Journal of Asian Economics*, *14*, 91 – 129.

Elliot, J. R., & Ikemoto, K. (2004). AFTA and the Asian crisis: Help or hindrance to ASEAN intra-regional Trade. *Asian Economic Journal*, *18*(1), 23.

Endoh, M. (1999). Trade creation and trade diversion in the EEC, the LAFTA and the CMEA: 1960-1994. *Applied Economics*, *31*, 207-216

Frankel, J., Stein, E., & Wei, S. J. (1995). Trading blocs and the americas: The natural, the nnnatural, and the super-natural. *Journal of Development Economics*, Elsevier, *47*(1), 61-95

Frankel, J., & Wei S. J. (1997). ASEAN in a regional perspective. *CIDER Working Paper No. C96-074.* Berkeley: University Of California.

Frankel, J. A. (1997). *Regional Trading Blocs in the World Economic System*. Institute for International Economics, Washington, DC.

Ghosh, S., & Yamarik, S. (2004a). Are regional trading arrangements trade reating? An Application Of extreme bounds analysis. *Journal of International Economics*, *63*, 369-395.

Ghosh, S., & Yamarik, S. (2004b). Does trade creation measure up? A reexamination of the effects of regional trading arrangements. *Economics Letters*, *82* , 213–219.

Hamilton, C. B., & Winter, L. A. (1992). Opening up international trade with Eastern Europe. *Economic Policy*, *14*, 78-116.

Haspari, I. M., & Mangunsong, C. (2006). Determinants of AFTA Members' Trade Flows and Potential for Trade Diversion. *Asia- Pacific Research and Training Network on Trade Working Paper Series*, No. 21, November 2006.

Ismail, N. W., Smith, P., & Kugler, M. (2007). *Regional economic integration and intra regional trade: The evidence from the association of Southeast Asian Nations (ASEAN) free trade area*. In the Proceedings of the Singapore Economic Review Conference (SERC) 2007, (pp.1-13). Singapore: Meritus Mandarin Singapore.

Sharma, S.C., & Chua, S. Y. (2000). ASEAN: Economic integration and intra-regional trade. *Applied Economics Letters*, *7*, 165 – 169.

Soloaga, I., & Winters, L. A. (2001). Regionalism in the nineties: What effect on trade? *North American Journal of Economics and Finance*, *12*, 1-29.

Sudsawasd, S., & Mongsawad, P. (2007). Go with the Gang, ASEAN!. *ASEAN Economic Bulletin*, *24*(3), 339-356.

Park. (2008). *Regional Trade Agreements in East Asia: Will They Be Sustainable?*. Munich Personal RePEc Archive (MPRA).

Tho, T.V. (2002). *AFTA in the Dynamics Perspective of Asian Trade*. JCER DISCUSSION PAPER No.77, Tokyo, Japan: Japan Centre for economic research.

Thorton, J., & Goglio, A. (2002). Regional bias and intra-regional trade in Southeast Asia. *Applied Economic Letter*, 9, 205-208

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# The Probability to Be Persistent Poor in Malaysia: New Evidence from Panel Data

**Zunika Mohamed and Rusmawati Said***

*Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

We examine the demographic characteristics of the poor that influence chances to continue to be poor by applying the binary response variable. It is based on a country representative micro data from two waves of panel household income survey 2004 and 2007. The results show that household's characteristics, present economics and spatial disadvantages significantly influence the chances of continued poverty. The poor are either those with large household and few income earners from East Malaysia or those with low education level. They have higher risks to be trapped in poverty. Interestingly, gender and marital status are insignificant contributing factors. To help the disadvantage group, we propose improvement of the existing programmes and policy revisions to focus on other dimensions of poverty besides income and to address social exclusion issues.

*JEL Classification:* I32, R23

*Keywords:* Poverty, regional disparities, economic development

## INTRODUCTION

In the league of developing countries, Malaysia stands out as one of the successful nations in eradicating poverty. The success is evident in the dramatic drop of the overall incidence of income poverty from 49% in 1970 to 3.6% in 2007 (United Nations Development Program (UNDP), 2007) and a slight increase at 3.8% in 2009 (Economic Planning Unit, 2010). In the case of hardcore or acute poverty, it has shown a successful reduction to 0.7% in 1989. This success is mainly attributed to government's introduction to various socio-economic policies. Malaysian policy related to poverty was first implemented and coordinated in 1971 with the introduction of New Economic Policy (NEP). It has provided coherent economic opportunities for the disadvantage groups (Mc Naab &

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*E-mail address*:
rus_said@yahoo.com (Rusmawati Said)
* Corresponding author

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Said, 2013). Since then, its basic features are retained, although modifications have been made over the years. Despite the overall success in alleviating poverty, it is important to note that it has not been equally effective across all states or regions in Malaysia. For example, data in 2007 has reported that poor households in the state of Sabah has comprised nearly 41% of the total poor The data has been considered as relatively higher than other states in Malaysia.

Previous studies on determinant of poverty using country representative data based on a static approach have identified several key factors that influence people to be poor. For instance, the study by UNDP (2007) based on Household Income Survey (HIS) 2004 data shows that being unemployed or living in poor states such as Sabah, Sarawak and Kelantan increases the chances of being poor. In addition, being an ethnic minority from rural areas, particularly those in Sabah, also increases the chances of being poor. A study by Mok *et. al.* (2007) on the determinant of poverty in the urban areas, based on Household Expenditure Survey (HES) data 2004, more or less provides the same conclusion. They highlight that education, region of residence and household size are significant determinants of urban household to be more prone to poverty. Even though the empirical literature on poverty seems to have consensus on keys factors that determine poverty in Malaysia, these studies are done based on a static approach. Study that takes into account the element of time in this aspect is almost non-existence. So far, we have no information about the extent of persistent or chronic poverty and the determinant factors that draw the poor to be persistently poor.

This paper seeks to fill a significant gap found in previous literature on the approach to poverty study in Malaysia. This study is a timid attempt in approaching poverty analysis from a dynamic perspective. Despite the voluminous studies undertaken on the determinants of poverty in Malaysia, the approach is usually based on a static approach. The dynamic approach to poverty study emerges in the literature partly as consequence of combating hard to reach poverty types such as chronic or persistent poverty that are linked to long duration of poverty spell.

It is important to differentiate the different kinds of poverty to effectively eradicate poverty. According to Hulme and Sheppard (2003), different types of poverty require a different quantum of national resources as well as different kind of programs. For example, when poverty is chronic, a large amount of resources is needed and suitable policies should include asset redistribution, investment for basic physical infrastructure, reduction of social exclusion generated in the markets and from public institutions as well as provision of a long-term social security. Temporary poverty is best addressed through welfare grant such as transfer programs or credit accessibility. While, persistent poverty is best mollified by development programs such as income generating activities (Salehi-Isfahani & Majbouri, 2010). In addition, the dynamic

of poverty affects individual differently in terms of economic disadvantages that might lead to social exclusion (Mendola *et al.* 2009).

Recently, the government has launched the Malaysian Transformation Program in their continuous effort to achieve a developed nation status by 2020. Under this program, the government calls for "inclusive development approach to ensure equitable access to economic participation among all Malaysians in moving towards a fair and socially just society" (Economic Planning Unit, 2010). This approach requires appropriate welfare or development programs to specifically address poverty issues most apt to the needs of specific target groups, currently experiencing serious economic disadvantages. In line with this development, it is critically important that the determinants of poverty be specified further in order to alleviate the poverty group.

The analysis on the underlying causes that trap people into the different types of poverty incidence will be more meaningful if we are able to identify the type of poverty that the poor experience. For example, in Iran, the persistent poverty dominates the characteristic of urban society where employment opportunity depends on the non-agriculture sector. On contrary, rural poverty tends to be temporary due to fluctuation in agricultural output and prices. The persistent poverty or chronic poverty is more prominent among minority compared to other groups (Salehi-Isfahani & Majbouri 2010).

Another key contribution to this paper is to reconcile the data by providing a detailed analysis from the micro perspectives. The analysis uses information at household level that is nationally represented. Previously, lack of country representative sample data constraints most of the studies in Malaysia towards specific case studies based on state and district levels or based on economic activities such as in agriculture or fishery sectors. Deaton (1997) suggests that information at micro level is very useful to inspect policy implication and evaluate welfare benefits of public programs. It reflects the outcomes of policy variables such as income level, educational attainment and health status. These information enables economists to conduct analysis at disaggregate level in various perspective of distributions. The availability of data from panel Household Income Survey (PHIS) from the year 2004 and 2007 allows us, for the first time, to inspect the dynamic of poverty in terms of people moving out or remaining in poverty during the duration of four years. We can only explore factors underlying the incidence of persistent poverty in Malaysia since this set of data does not allow us to investigate the movement and flow of the respondents that characterized temporary poverty. In this study, we define persistent poverty as those households that have been poor for at least four years. As such, a poor household, both in the first and second wave of the PHIS, is considered as persistent poor. Calculation based on data from the PHIS reveals that about one third or 34 %

of the total poor household in 2004 can be categorized as persistently poor in view of the mean income of RM 712 in 2007. It is important to pay special focus on this group since there is a high tendency of persistent poor continues to be poor and to be socially excluded in the future.

The organization of this paper is as follows:

a. Background and literature review presents some background and studies depicted in previous literature;
b. Methodology and Data provides a detailed description of the methodology and source of data;
c. Findings expounds the descriptive statistics and empirical analysis;
d. Conclusions and policy recommendations concludes with policy implication drawn from this study.

## BACKGROUND AND LITERATURE REVIEW

In Malaysia, poverty reduction has remained to be an integral component of major national polices; the NEP, NDP and vision 2020. The national policies reflect its continuous importance and commitment of the government. The current measurement of poverty in Malaysia is based on 'costs of basic needs' approach. This approach identifies the consumption bundle that deemes to be sufficient in meeting the household needs. The amount of income needed to purchase this bundle is set as a benchmark to determine the status of a household, known as the poverty line income (PLI). In other words, PLI is defined as the minimum monthly household income that enables a household to achieve an adequate standard of living. It can be categorized into two; the overall PLI and the food PLI. While, PLI measures poverty; the latter focuses, on hardcore poor. PLI of Peninsular Malaysia has increased from RM660 per month in 2004 to RM720 in 2007. While, food PLI has increased from RM400 to RM430 during the same period. Two main factors contributing to these differences in PLI are the disparity in retail prices of goods and the average size of household.

Malaysia, a country comprises of 13 states and three Federal Territories, has recorded substantial growth in income with an average growth of more than 5% for the last four decades. It has been reported that Malaysia is recognized as one of the 13 countries in the world with sustained growth of more than 7% over 25 years since 1950. In 2010, the gross national income per capita has reached USD 8,256. Nevertheless, there are wider opportunities for improvement in terms of wealth distribution among the states. Reducing regional disparities continues to top the list as one of the main agenda for growth. In terms of growth, states in the west coast of Peninsular Malaysia continue to dominate as compared to the lagging states in the Borneo Island and north and east coast states of Peninsular. In 2009, states in the Peninsular Malaysia has contributed an enormous 84% of the nation Gross Domestic Product (GDP). While, Sabah, Sarawak and Labuan in the Borneo

Island have only contributed the rest of 16%. There is a correlation between the incidence of poverty and economic growth among the states. Peninsular Malaysia, as a whole has recorded an incidence of poverty at 2% in the same year. While, Sabah has scored up to 19.2% and Sarawak at 5.3%.

There is already an expounding literature on studies of poverty. Originally, these studies are based on spatial horizons that frame the evaluation process at one point in time. The studies, then, focus on the social, economic and structural perspectives that shape people's opportunities or disadvantages (Cotter, 2002). As time progresses, the frame has been expended to include the element of time by looking at dynamic of poverty.

Under the dynamic approach, people are categorized according to duration of time that they are in a particular situation. In general, dynamic of poverty situation is usually categorized as, either, temporary or long term. Hulme and Shepherds (2003) present a clear definition of poverty dynamic. They categorize poverty into five types:

*a.* *the always poor* means poverty score is below a defined poverty line in every period);

*b.* *the usually poor* means poverty score over all periods is less than the poverty line but are not poor in every period;

*c.* *the churning poor* means poverty score around the poverty line but are poor in some periods but not in others;

*d.* *the occasionally poor* means poverty score is above the poverty line but have experienced at least one period in poverty; and

*e.* *the never poor* means poverty scores in all periods above the poverty line.

These categories are then aggregated into three types:

a. the chronic poor are always poor and usually poor;

b. the transient poor are churning poor and occasionally poor; and

c. the non-poor are the-never poor.

Empirically, Bigsten and Shimeles (2008) analyze the persistence of poverty in Ethiopia based on spell approach using a panel data set that covers 10 years (1994–2004) in five waves. Salehi-Isfahani and Majbouri (2010), on the other hand, look at transient and chronic poverty in Iran by defining transient as temporary and chronic as long term.

Previous studies under the static framework have revealed the facts that social demographic matters significantly in determining poverty. Paugam (1995) and Szeles and Tache (2008) highlight the importance of social demographic factors such as education, work experience, marital status, family size, race or ethnic, social assistance dependence and past poverty experience. Szeles and Tache (2008) assert that the most vulnerable groups of population are the young, lowly educated, unemployed, single parents, non-active or mono-active household, single and over-crowded household.

Based on dynamic approach, using panel data of about 1,200 households from Uganda, during the period of 1992 to 2000, Deininger and Okidi (2003) unveil the determinants of growth and poverty reduction lies on a person's initial asset ownership, health status, education and infrastructure. It is interesting to note that the effects of education on human capital are closely interwoven with the accessibility of modern infrastructure. These variables counteract with any convergence effects including income. This finding is parallel with the study by Dekkers (2008) based on 7 waves panel data from 1994 to 2000. The study calculates the probability of a non-poor individual becomes poor after one to seven years, given that it has never happened before. It confirms that health and education are the two important variables in determining poverty. In addition, he stresses that poor health or disability coupled with low education level increases the probability of falling into poverty in Belgium. Other important variables, in the case of Belgium, are ethnicity and the possession of Belgium nationality which significantly determine the chance of getting a job.

From gender perspectives, recent empirical findings (Giang ang Pfau, 2009; Dekkers, 2008; Deininger & Okidi, 2003) suggest that gender is immaterial in determining the likelihood of poverty. On contrary, Betti *et al.* (2003) stresses that gender aspect is indeed significant in determining the poverty risk. Using British Household Panel Survey (BHPS) data set from 1991 to 1997, their results suggest that households headed by men face lesser risk of poverty. In terms of regional factor, they also report that the risk of poverty is higher in Northern and Western Britain relative to Eastern region.

The empirical works on poverty in Malaysia based on micro perspective are mostly dated back since 1990s. Examples of such studies discussed in Ragayah and Krongkaew (2008) are Jomo, *et al*. (1996); Shireen (1998); Fatimah (1991); Bhalla and Kharas (1992); Ishak (2000); and Roslan (2004). A study by Shireen (1998) identifies education as the main determinant in influencing poverty. Poverty is proxy by either headcount, severity of poverty or Sen Index. Recently, Pramanik *et al*.(2008) has conducted a case study on poverty by looking at the multi-dimensional attributes that help explain poverty in four states in Malaysia. Their results suggest that family having less number of economically active labor forces; female headed household; and family size bigger than seven are among the significant demographic factors that influence poverty. Social factors related to education; owning a house; and access to pipe-water supply are also associated with poverty. They also find that involvement in agriculture without owning physical assets like land as well as having high marginal propensity to consume with low marginal propensity to save, also worsen poverty.

## METHODOLOGY AND DATA

This study continues from the recent study by UNDP (2007) in analyzing the determinants of poverty in Malaysia. We

deviate from the UNDP in considering the time element in our analysis. The analysis uses the panel data from PHIS that covers two waves of 2004 and 2007, instead of only using HIS data. We also apply additional predictors obtained from previous studies on the determinants of poverty. A Logit binary model is employed to investigate the probability that the household will be persistent poor:

$$\log it\left[\theta(x)\right] = \log\left[\frac{\theta(x)}{1-(x)}\right]$$
$$= \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_i x_i \quad (1)$$

where $\alpha$ = constant of the equation and, $\beta$ = the coefficient of the predictor variables $x_1$ to $x_i$. The dependent variables are households that have been assigned with the value of 1, if the household is poor in 2007; and 0 if the household is non-poor.

Predictors $x_1$ to $x_i$ are based on characteristics of the head of the household in 2007.

1. *hoh_age*: Age of the head of household (in years).
2. *dno_inc*: Dummy for number of income earner: for more than one earners, value=1; for multiple earners, value=0.
3. *hh_size:* Household size (in unit).
4. *dcert*: Dummy for level of education: for head of household without any type of certificate and / or without primary / secondary education, value=1; for those with at least middle school certificate (form 3), value=0.
5. *dactivity*: Dummy for type of employment activity: for head of household who is employed or self-employed, value=1; where head of household is unemployed, value=0.
6. *dbuminonbumi:* Dummy for race: Native (*Bumiputra*), value=1; for others, value=0.
7. *dmarital*: Dummy for marital status: for single or widow or separated, value=1; for married, value=0.
8. *hoh_gen:* Dummy for gender difference: male, value=1; for female, value=0.
9. *dregion1*: Dummy for region: Sabah, value=1; other regions, value=0.
10. *dregion2*: Dummy for region: Sarawak, value=1; other regions, value=0.

The states of Sabah and Sarawak are singled out as separate regions to evaluate the factors related to differences in economic structure. People living in less developed region usually possess more economic disadvantages than those in a more advanced region. It is due to the fact that economic activities and employment opportunities are usually concentrated in the latter.

The results of these analyses are in the form of odd ratios since logistic regression calculates the probability of success over the probability of failure. More useful result can be generated from this process such as the predicted probability of the occurrence of an event. In this case, the result predicts the probability that a household shall continue to be poor, given the set of predictors.

Logistic regression makes no assumption about the distribution of the independent variables. Hence, they do not have to be a normal distribution, a linear relation or of equal variance with each other. Problems associated with bias estimation from collinearity of the independent variables are addressed by calculating tolerance and variance inflation factor (VIF). VIF value of greater than 10 indicates the existence of high collinearity (Stata FAQ 2010). We do not foresee other estimating bias caused by the predictors that can significantly affect our estimation. As recommended by Bewick *et al.* (2005), a significant test of the individual co-efficient will be performed using Wald statistic and Likelihood Ratio Test. A Wald test is based on squared Z statistic with *chi*-square distribution. Since the number of observations in this study is fairly large with 2,264 households, there is no problem associated with small sample size in applying the Wald test. The testing for goodness of fit of the model is done using the Hosmer-lemeshow test which allows any numbers of explanatory variables. The Hosmer-lemeshow statistic evaluates the goodness of fit by creating 10 ordered group subjects and comparing the numbers between the observed and the predicted from the regression. The smaller the differences between the observed and the predicted, the better the model fits.

*Data*

The data Panel Household Income Survey (PHIS) 2007 is derived from a special panel survey of the HIS that is undertaken by Department of Statistic, in Malaysia, in 2007. The data involves a total of 2,181 households that have been identified as poor and vulnerable in 2004. The poor is defined as income poor according to PLI in 2004. While, the vulnerable is the household whose income is 20 percent above their PLI. The data collection process involves going back to these same households to get their profiling in 2007. The purpose of this panel survey is to supplement the bi-annual HIS survey which is normally done by the department. Specifically, the availability of the data on poor households across time will enable the government to develop a better approach of eradicating poverty in the country. The reference period for this survey is 12 months. It covers only those living in private dwellings. Similar to HIS, the main components of the data include income, sources of income, demographic characteristic of the head of households such as strata, state, age, gender, educational level and marital status. Employment characteristics of each member are divided into types of activities, categories of occupations and types of industries. The unit of measurement for this test is the household and the predictors are referred as the characteristics of the head of household.

The distribution of the respondents for PHIS 2007 is shown in Table 1. About 18 percent of the respondents are from the urban area; while, the rest is from the rural areas. The male headed household constitutes about 85 percent of the respondents. In terms of poverty status, those who are

poor constitute about 86.5 percent of the respondents and 82 percent of them live in the rural area, in 2004. About 65 percent of these poor has escaped poverty in 2007. As such, the focus of this study is on the balance 35 percent of the respondents who have not been able to get out of poverty. In total, this group makes up more than 90 percent of those are poor in 2007.

There are noticeable similarities and differences with respect to other characteristics of the household. The general level of education has improved over the years where the share of household with low education dropped by 3% Ironically, the poor population below the productive age of 55 is very high, comprising nearly 83% of total poor households in 2007. Family size matters significantly in determining poverty. It shows similar trend in 2004 and 2007. About 72% of poor households have large family size, defined as family members exceeding 5 headcounts, in 2004. The percentage continues to increase to 83% in 2007.

## FINDINGS

### *Testing Goodness of Fit of the Estimates*

Two sets of logit equations are regressed to determine the best fitted model. The results of the two estimates are shown in Table 1. Model 1 consists of all nine predictors set out in Methodology and Data. Overall, the likelihood ratio, chi-square value of 394.4 and p-value of 0 indicate that this model is much better than an empty model. Based on the table of predicted probability, Model 1 provides 74% corrected classified estimate with a 50% cut-off point for predicted probability. The Hosmer-lemeshow statistics show the value of 4.81 with p-value of 0.78. Therefore, it can be concluded that the predicted values from the model are significantly similar to the observed. Model 2 is constructed by using the actual number of income earners without converting it into dummy as an alternative model. Model 2 provides a value of 73.8% corrected classified estimate with a 50% cut off point for predicted probability.

Comparing the two models, the results are based on Hosmer-lemeshow statistics and Bayesian Information Criterion (BIC)

TABLE 1
Distribution of Respondents by Gender and Poverty Status

| Strata | Male | Female | Non_poor 2004 | Poor 2004 | Non_poor 2007 | Poor 2007 | Total |
|---|---|---|---|---|---|---|---|
| Urban | 378 | 83 | 53 | 408 | 333 | 128 | 461 |
| % | 20.42 | 25.15 | 17.97 | 21.63 | 22.67 | 17.98 | 21.14 |
| Rural | 1,473 | 247 | 242 | 1,478 | 1,136 | 584 | 1,720 |
| % | 79.58 | 74.85 | 82 | 78 | 77.33 | 82.02 | 78.86 |
| Total | 1,851 | 330 | 295 | 1,886 | 1,469 | 712 | 2,181 |
| % | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

indicates that Model 2 is preferred. The value of Hosmer-lemeshow statistics increases by 0.59; while, the McFadden's Adj $R^2$ improves to 0.168. The BIC has a difference in value of 86.749 which provides a very strong support for Model 2. The problem of collinearity among predictors does not exist as all the values of VIF are less than 10.

Test statistics for each coefficient in Model 1 reveals that eight out of 10 parameters are significantly different from zero, based on Wald statistic at 5% significant level. Age factor becomes insignificant in Model 2. These factors are directly or indirectly related to the opportunity or ability to earn income. Age is closely linked with experience. The more experience one acquires, the greater opportunity he or she has in securing employment and increasing productivity. In the case of Romania, Molnar *et al*. (2006), young people aged between 15-24 years and children aged between 0-14 years are more frequently

TABLE 2
Results of the regression

| Model 1Logistic regression | | | | Model 2 Logistic regression | | |
|---|---|---|---|---|---|---|
| Number of obs | | 2264 | | | | 2264 |
| LR chi2(10) | | 413.73 | | | | 500.68 |
| Prob > chi2 | | 0 | | | | 0 |
| Log likelihood | | -1215 | | | | -1171.6 |
| Pseudo R2 | | 0.1455 | | | | 0.1760 |
| povind_l | Coef. | Z | P>\|z\| | Coef. | z | P>\|z\| |
| hoh_age | -.0136713 | -2.62 | 0.009 * | -.008486 | -1.60 | 0.109 |
| dno_inc | 1.47422 | 13.18 | 0* | | | |
| no_incr | | | | -1.04316 | -14.52 | 0.0000* |
| hh_size | .2866388 | 12.27 | 0* | 0.3712379 | 14.43 | 0.002* |
| dcert | .3100447 | 2.65 | 0.008* | .3678757 | 3.09 | 0* |
| dactivity | -.7361022 | -3.98 | 0* | -.8253493 | -4.35 | 0* |
| dbuminonbumi | .3815818 | 2.05 | 0.041* | .3913763 | 2.07 | 0.038* |
| dmarital | -.0512555 | -0.25 | 0.800 | -.1836416 | -0.90 | .369 |
| hoh_gen | .2710113 | -1.40 | 0.160 | -.2209443 | -1.14 | 0.255 |
| dregion1 | .7724938 | 6.79 | 0* | .8639514 | 7.41 | 0* |
| dregion2 | .4606124 | 2.56 | 0.011* | .6259698 | 3.42 | 0.001* |
| _cons | -2.568273 | -4.54 | 0* | -.7779216 | -1.41 | -0.157 |
| * Significant at 5% | | | | | | |
| Hosmer-Lemeshow chi2(8) | | | 4.23 | | | 4.82 |
| Prob > chi2 | | | 0.8355 | | | 0.7764 |
| BIC' | | | -423.230 | | | -336.481 |

exposed to poverty risk with percentage of 31.9% and 29.9%; respectively. The level of education and the status of employment are among the main determinants that affect the income flow of family. Naturally, with better education, the chances of engaging a better paid job will be higher. Having a stable employment, either self-employed or employed, can more or less ensure a steady flow of income for the family. Similar to previous studies (UNDP 2007; Szeles & Tache 2008; Decker 2008), we also find that ethnic background does play an important role in determining poverty. However, a unique finding of this study is that marital status and gender of the household are found not to be statistically significant. It contrasts with studies by Szeles and Tache (2008) that identify single mother with children, single parents and mono-active households as the most vulnerable deprived group. With respect to gender, Bigsten and Shimeless (2008) discover that male headed household have bigger chances to escape transition poverty in Ethiopia. One possible explanation for the different result with respect to gender in Malaysia is that, gender is not a critical issue in this country. Malaysian women labor force participation rate is among the highest in Asia. It reaches as high as 47% in 2000 (ILO, 2003). This is supported by the fact that a total of 34% of women aged 15 years and above complete secondary school in 2000 (Barro and Lee, 2010). The significant of regional dummies indicates the importance of spatial economic factors in Malaysia.

*Probability Estimates of the Predictors*

The next step is to interpret the predictors with regard to probability of being poor. It is accomplished by using Model 2 since it scores better. Co-efficient of the model can be interpreted as the log odd of being poor with one unit increase in the value of the predictors. Given the categorical nature of the variables, the direct interpretation does not make much sense. Thus, we proceed to interpret the probability of falling into poverty given the conditions of the predictors.

The probability of the household continues living in poverty for each of the determinants given that the values of other determinants are held at their means is described below. The sign of the probabilities for most of the predictors is consistent with the previous findings. The age of the head of household denotes that, the younger the head of the household, the higher the probability for him or her to be poor. It implies that older head of household has a better opportunity to get out of the poverty spell. As one gets older and more experienced, he or she stands a better chance of earning more income. The probability of remaining poor is predicted to be between 0.38 to 0.29 if the head of household aged between 16 to 40 years. The probability decreases between the range of 0.26 and 0.22 if the head of household aged between 60 to 80 years. This result is not contrary to the higher share of productive age among the poor as stated earlier. The number of income recipients in a household also plays a significant role in determining the

poverty status. For example, the probability is reduced to less than 0.10 when the number of people earning an income in the household is four as compared to 0.50 when there is only a single income earner in the household.

As the number of people living in the house increases, so does the probability of being poor. The predicted value of remaining poor for a household with only one member is 0.05. The value increases to 0.50 when the household has 9 members. The value for a household is almost 0.99 when the household size increases to 21. Bigsten and Shimeles (2008) and Molnar *et al.* (2006) have recorded similar findings. In addition, the household will continue to be poor if there is no improvement in their level of education. This condition is observed where the probability to be poor is as low as 0.23 when the head of household has at least completed secondary school. In comparison, the probability is 0.3 when he or she is without any school certificate. Lanzi (2007) has noted the importance of education in empowering individuals to improve their capabilities. In their analysis, Molnar *et al.* (2006) have pointed that incidence of poverty among head of household without schooling is 55%. As the level of general education among the respondents of this study improved between the years of 2004 to 2007, fewer of them have remained trapped in poverty by 2007. It is also discovered that the employment status of the head of household plays an important determinant of poverty. The probability of remaining in poor condition decreases when the head of household is either employed or self-employed. The value of being in this category is 0.44 compared to 0.27 if he or she is without any specific employment.

Finally, place of residence has an impact on the probability of being poor. Household located in Peninsular Malaysia has much lesser probability of being poor as compared to those in Sabah or Sarawak. The probability that a household will continue to be in poverty in Sabah and Sarawak is about 0.42. In contrast, households located in other regions have the probability of about 0.2. From spatial perspective, we can relate the reasons to poverty and growth nexus: poverty tends to be higher in poor states. The economic status of Sabah or Sarawak is lower compared to other states in the country. In 2007, the mean monthly household income for each state in East Malaysia has shown various statistical numbers. For example, the mean monthly household income for Sabah reached RM2,866 and RM3,349 for Sarawak. In comparison, states in central region of Peninsular have recorded higher mean income such as RM3,421 for Melaka, RM5,322 for Kuala Lumpur and RM5,580 for Selangor. Both Sabah and Sarawak have lower economic status; thus, provide less employment opportunity.

## CONCLUSION AND POLICY RECOMMENDATIONS

The results of this study provide new insights about poverty study that are

related to dynamic of poverty in Malaysia. After taking the element of time into consideration, we can infer that households in this country are prone to be persistently poor due to the key factors related to household characteristics and location of residence. These factors include the number of income recipients in the household, size of household, educational achievement of the head of household and his or her employment status, ethnicity, and the region of household. These findings are consistent with earlier result from the study by UNDP for Malaysia based on static approach in 2007. Thus, some policy recommendations can be drawn from this study. They do not only address the issues of poverty but also facilitate the government objective to achieve robust inclusive development.

First, we would like to propose that government embarks on evaluating poverty from the perspective of multi-dimensional poverty framework as well as looking at the issues of social exclusion. The multi-dimensional poverty evaluates wellbeing of the population. It is directly based on specific dimensions such as education, health and standard of living that focus on strengthening the capability and functions of households. On the other hand, the social exclusion addresses issues that are related to access to household needs from the public and community that can improve capability of the households. This approach will be more meaningful since the persistent poor will also have a high tendency to be poor or deprived in these dimensions as well as being socially excluded. By doing so, the programs for poverty eradications will be apt to fulfill the government's inclusive development policy.

Second, policy towards achieving regional balance between Peninsular Malaysia and East Malaysia should be given the highest priority since these two states in East Malaysia are in a dire situation with higher occurrence of persistent poverty relative to other states in the country. Parallel to this, more concerted efforts should be directed towards implementing programs and projects that are micro-targeting in nature. Micro-targeting allows the government to look at the distinct features of the socio-economic characteristics of the society in Sabah and Sarawak and how they differ from the rest of the states in Peninsular Malaysia.

Third, with the presence of persistent poverty, we strongly suggest that programs designed to alleviate poverty should be of developmental in nature instead of welfare types of assistance. While the existing programs should be improved and strengthened, new employment generating activities must be created. The launching of the Agropolitan projects in various 'corridor' developments are the strategies into right direction. Related government agencies should undertake these initiatives in delivering a package that includes providing initial capital either direct grant or soft loan, as well as, providing training and support services to the targeted group. The sustainability of these initiatives over a long period of time must be maintained to help the economically disadvantaged groups

secure more stable income overtime; thus, escape out of poverty.

Fourth, there should be specific programmes targeting the young head of household within the age range of 18 to 40 years and with larger number of dependents. This is due to the group's high tendency remaining persistently poor. These programmes should be extended to the members of the household. Provide them with the opportunities to increase the number of income earners in their families.

Finally, among current programmes that need to be improved and further strengthened is skilled training or re-training. Training has huge potential to enable the trained members of poor households to participate effectively in the labor force. In current situation, Malaysia has an influx of cheap foreign labors. These proposed measures are exceptionally crucial and the latest policy revision on the employment of foreign labors in Malaysia must be drawn towards the advantage of domestic labors.

## REFERENCES

Barro, R., & Lee, J. W., (2010). *A new data set of educational attainment in the world, 1950-2010*. NBER Working Paper No.15902. Cambridge, MA.

Betti, G., D'Agostino, A., & Neri, L. (2003). Panel regression models for measuring multidimensional poverty dynamics. *Statistical methods and application*, 11,359-369.

Bewick, V., Cheek, L., & Ball, J. (2005). Statistics review 14: Logistic regression. *Critical care, 9*(1),112-118.

Bigsten, A., & Shimeles, A. (2008). Poverty transition and persistence in Ethiopia:1994–2004. *World development*, *36*(9), 1559–1584.

Cotter, D. A. (2002). Poor people in poor places: Local opportunity structures and household poverty. *Rural Sociology, 67*(4), 534–555.

Deaton, A.(1997). *The analysis of household surveys: A microeconometric approach to development policy*. Baltimore: The Johns Hopkins University Press.

Deininger, K., & Okidi, J. (2003). Growth and poverty reduction in Uganda, 1999-2000: Panel Data Evidence. *Development Policy Review*, *21*(4), 481-509.

Dekkers, G. J. M. (2008). Are you unhappy? Then you are poor! Multi-dimensional poverty in Belgium. *International Journal of Sociology and Social Policy*, *28*, 502-515.

Economic Planning Unit. (2006). N*inth Malaysia Plan 2006-2010*. Putrajaya, Malaysia: Economic Planning Unit.

Economic Planning Unit. (2008). *Mid-term review of the ninth Malaysia Plan 2006-2010*. Putrajaya, Malaysia: Economic Planning Unit.

Economic Planning Unit. (2010). *Tenth Malaysia Plan 2010-2015*. Putrajaya, Malaysia: Economic Planning Unit.

Giang, L. T., & Pfau, W.D. (2009). Vulnerability of Vietnamese elderly to poverty: Determinants and policy implications. *Asian Economic Journal*, *23*(4), 19-437.

Hulme, D., & Shepherd, A. (2003). Conceptualizing chronic poverty. *World Development, 31*, 403-423.

ILO. 2003. *Key indicators of the Labour Market 2003-2004*.(Geneva). Retrieved March 05, 2011, from http://www.ilo.org/kilm Jalan, J., & Ravallion,

M. (1998). Transient poverty in post reform rural China. *Journal of Comparative Economics*, 26, 38-357.

McNabb, R., & Said, R. (2013). Trade Openness and Wage Inequality: Evidence for Malaysia. *The Journal of Development Studies, 49*(8), 1118-1132.

Mendola, D., Busetta, A., & Milito, A. M. (2009). *The Importance of consecutive spells of poverty: A longitudinal poverty index* .IRISS working paper 2009-21, CEPS/INSTEAD, Differdange, Luxembourg.

Mok, T. Y., Gan, C., & Sanyal, A. (2007). The determinants of urban household poverty in Malaysia. *Journal of Social Sciences, 3*(4), 190-196.

Molnar, M., Panduru, F., Vasile, A., & Duma, V.(2006). Multidimensional fuzzy set approach poverty estimates in Romania. In Lemmi, A. and Betti, G.(Ed.), *Fuzzy set approach to multidimensional poverty measurement*, New York, Springer.

Paugam, S. (1995). The spiral of precariousness: A multidimensional approach to the process of social disqualification in France. In G. Groom (Ed.), *Beyond the threshold: The Measurement and Analysis of Social Exclusion,* pp.49–79, Bristol: Policy Press.

Pramanik, A. H., Haneef, M. A., Meera, A. K., & Yusoff, W. W. S. (2008), *Poverty with Many Faces: A Case Study of Malaysia*, International Islamic University Malaysia.

United Nations Development Programme (UNDP). (2007). *Malaysia: measuring and monitoring poverty and inequality*, United Nations Development Programme, Malaysia.

Ragayah, M. Z., & Krongkaew, M. (2008). *Income distribution and sustainable economic development in East Asia: A comparative analysis*, Penerbit Universiti Kebangsaan Malaysia, Bangi.

Salehi-Isfahania, D., & Majbouri, M. (2010). Mobility and the dynamics of poverty in Iran: Evidence from the 1992-1995 panel survey. *The quarterly review of economics and finance*, article in press, doi:10.1016/j.qref.2010.04.001

Shireen, M. H. (1998). *Income Inequality and Poverty in Malaysia,* Rowman and Littlefield Publishers, Lanham, Md.

Stata FAQ.(2010). *How can I check for collinearity in survey regression*, UCLA, Academic Technology Services, Statistical Consulting Group, Retrieved October 13, 2010 from http.www.ats.ucla.edu/stat/stata/faq/stata/svycollin.htm

Szeles, M. R., & Tache, I. (2008). The forms and determinants of social exclusion in the European Union: The case of Luxemburg. *International Advance Economic Research, 14*, 369-380, published online: 5 August 2008.

*Todaro,* M. P., & Smith, S. C. (2009). *Economic Development* (10th ed), Pearson Addison Wesley, Essex, England.

World Bank. (2007). *Poverty manual for poverty analysis course*. World Bank, Washington D.C.

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# Iranian Productivity in Manufacturing Sector: Empirical Evidence Using Panel Estimation Techniques

**Hamid Reza Morad Pour, Suhaila Abdul Jalil* and Siong-Hook Law**

*Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

Rapid changes in demand and supply models, the byproduct of increasing productivity and competition, cause entrants to pay special attention to the conditions of productivity and environment of the competition. Iranian manufacturing sector faces a major problem where its lack of entrants' paying attention to productivity issues. Productivity issues cause a waste of resources and wrong entry decisions. This research employs econometrical models to investigate the determinants of productivity. The three productivity equations are estimated into two categories, that is labour-intensive and capital-intensive sub sectors during the period of 1997-2006. The results indicate that productivity, both in labour, capital and joint labour-capital, in twenty one Iranian industries seem to be highly sensitive to investment sales ratio and minimum efficiency of scale. We review performance indicator roles in manufacturing sector in acquiring results of this study. It increases our knowledge about the Iranian manufacturing structure. The importance of this study stems from a desire to formulate industrial policy based on real empirical knowledge rather than on baseless foundations.

*Keywords:* Productivity, panel data, pooled OLS, manufacturing sector, labour and capital sub sectors

## INTRODUCTION

Productivity and performance are the two most important concepts that have mistakenly been construed as the same in most studies. The producer firm's productivity, an index of performance, can be defined as the ratio of output to input. In fact, the relationship between this two concepts is a single direction: productivity to performance. Productivity depends on other factors. In industrial organization discussions, higher productivity is the synonym of improved competitiveness

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*E-mail addresses*:
suhailaaj@upm.edu.my (Suhaila Abdul Jalil),
lawsh@upm.edu.my (Siong-Hook Law)
* Corresponding author

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that qualify incumbent firms. Incumbents are competitive when their productivity of labour and capital grow consistently. It allows them to reduce the unit costs of their output and upgrade their profits.

Higher productivity allows funding in an organization's expansion plans. In short term, customers gain from available lower prices in the market. While, in medium term, employees benefit from growth in wages in real terms. The country's living standard increases as the result of productivity growth (Safdari *et al*, 2010; Shepherds, 1990). On the other hand, in macro terms, higher productivity creates the potential for more entry of firms via the increase in investments, exports and demand that includes price reduction, salaries increment and creation of jobs (Fig.1).

### *Productivity Structure In Iran*

The labour productivity in Iran has shown a gradual recovery after the eight-year war with Iraq (1988). Several reasons contributing to the increase of productivity include the high prices of oil, trade and financial liberalization, exchange rate unification and expansionary monetary and fiscal (Jbili *et al.*, 2004).

Iran's economic sanctions, the freezing of foreign assets, volatile international oil market and international economic isolation has caused the country's declining on capital formation. As a result, the country's capital productivity is affected. Furthermore, the population pyramid, based on 1996 census covering 50 percent of below 19 years old, has a significant impact on productivity. To a certain extent, the labour productivity is being attributed by the influx of more than three million refugees from Afghanistan and Iraq (Amuzegar, 2000; Karshenas & Pesaran, 1995).

As part of this changes, Fig.2 and Fig.3 show the estimated labour productivity and capital productivity in the Iranian manufacturing during 1997-2007. Increase

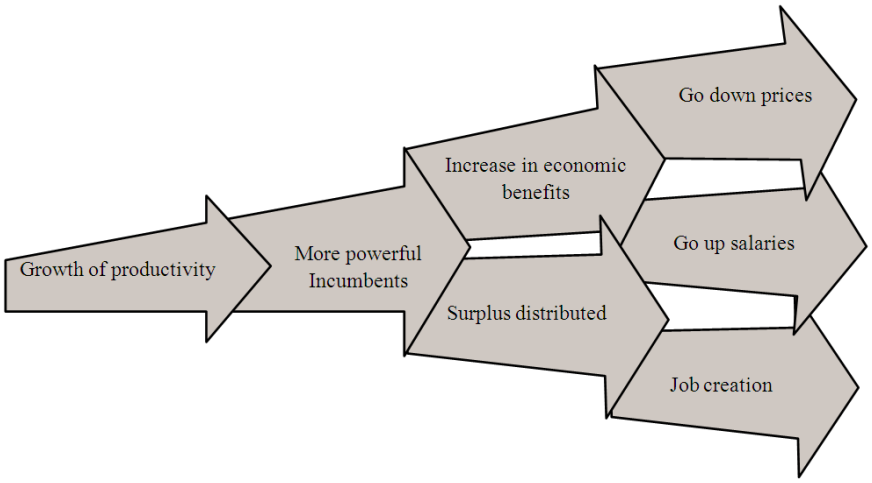


Fig.1: Productivity cycle

in the nominal value added in inflation condition and decreasing growth rate of real wage cause, on average, the labour productivity be somewhat high, while capital productivity is still low. On the other hand, the positive changes are in labour productivity due to rise in the labours' education level. In addition, increasing international sanctions, especially from the USA, in the last three decades causes the scale down of investment in capital. Thus, incapability in renovation of capital decreases capital productivity in manufacturing sector in Iran.

## LITERATURE REVIEW

A large number of empirical studies on productivity have been conducted. In many of the studies, the authors use the Total Factor Productivity (TFP) and Cobb-Douglas production function. Many researchers postulate that TFP is a contribution of technological advancement (Kartz, 1969).

Kartz calculates residual factors to show the contribution of technological progress to output and labour productivity growth in Argentina in the period of 1946-1961. He concluded that capital is the major

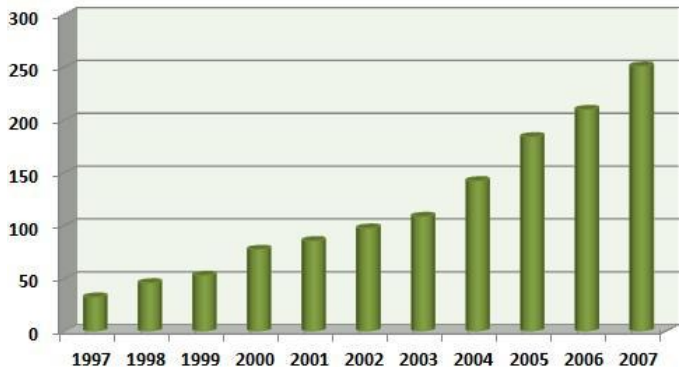


Fig.2: Labour productivity

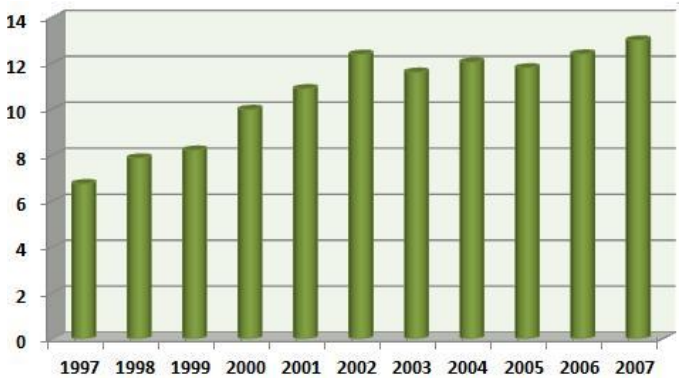


Fig.3: Capital productivity

determinant of labour productivity besides TFP.

Baier *et al*. (2002) examine the relative importance of the growth of physical and human capital and the growth of TFP on 145 countries. They found that TFP growth is an unimportant part of average output growth across all countries. The weighted-average TFP growth is only about 0.13% per year which is about 8% of growth of output per worker. It hardly suggests technological progress. The world average masks interesting variation across countries and regions. TFP growth accounts for about 25% of output growth per worker in Western countries including the United States; 20% in Southern Europe; and 18% in newly industrialized countries.

Mahadevan (2002) uses SFA technique on the South Korean Manufacturing Industry data of 1980-1994 to estimate the TFP growth of four industries, namely food, textile, chemical and fabricated metal. She finds that the output growth of these four industries is increasingly productivity-driven. The export-oriented industry experiences a higher contribution of TFP growth. Furthermore, her study shows that the technical efficiency change is negative in light industries such as food and textile; but was positive in heavy industries such as chemical and fabricated metal.

Huang (2003) studied the growth-output multifactor productivity index using the Törnqvist Index approximation.for the U.S. manufacturing sector. He found that the food manufacturing industry has grown by 0.19% per year between 1975 and 1997. This productivity growth is low compared to the estimation of 1.25% per year for the whole manufacturing sector. Low investment in research and development (R and D) could have been one of the reasons for such low productivity growth. Although productivity has been relatively low, food manufacturing output has grown significantly by 1.88% a year over the 22-year period.

Fu (2005) estimates TFP growth in a panel of Chinese manufacturing industries over the period of 1990-1997. The TFP growth is estimated using the non-parametric methodology, Malmquist Productivity Index which he decomposed it into technological change and technical efficiency change. There is no evidence of significant productivity gains at the industry level resulting from exports in a transition economy. The results suggest that a well-developed domestic market and a neutral, outward-oriented policy are necessary for exports to generate a significant positive effect on TFP growth.

Valadkhani (2005) detected that investments in physical capital and ITT and promoting trade liberalization with the use of Cobb-Douglas production function will improve labour productivity in the long-term. Afrooz *et al.* (2010), in their first study, consider the level of labour, total productivity and technical changes in the Iranian food industry in comparison with total industries over the 1971-2006 periods. They concluded that total factor productivity and labour productivity in food industry, compared to other industries, are lower than average total industries.

In addition, the technical changes is 0.09% in food industry. While, the average for total industries is 0.16% over the period. Afrooz *et al* (2011), as per second study, discuss the effect of human capital on labour productivity in Iranian food industry for the period of 1995-2006. They employed the role of educated workers and skilled workers as a proxy for human capital. The result shows that educated workers and skilled workers have significant and positive effect on labour productivity. In this study, we follow Holtermann's study (1973). Afrooz *et al.* classified labour productivity, capital productivity and expenditure on labour and capital as three productivity indicators that affect industrial performance.

The productivity indicators evaluate different dimensions of productivity. They are not proxies for each other. The performance factors explain inter-industry differences in productivity. Performance variables affect productivity indicators through direct effects on profits. It means that labour productivity, capital productivity and expense on labour and capital change under indirect effects of performance variables. Holtermann (1973), for the first time, uses the market structures in explanation of productivity changes. Unlike other researchers in productivity discussions, his approach is based on Industrial Organization (IO) class.

The key point highlighted in the above mentioned studies is that they focus on macro economics factors of productivity especially TFP and growth. Moreover, the literatures show that most of the researchers are interested in using Cobb-Douglas production function. This study explains the role of micro determinants in three productivity indexes. The authors use the Industrial Organization (IO) approach.

## MATERIALS AND METHODS

This study evaluates industry productivity in the Iranian industries using multiple methods of estimation for the years 1997-2006. Changes in the dimensions of productivity indexes vary in different economic structures. Assessing their boundaries requires an understanding of market competition and environmental factors. It necessitates appropriate matching of technology with the industry which can either be labour intensive or capital intensive in order to accurately determine productivity. For example, labour and capital productivity in developed countries which comprise mostly of capital-intensive industries are different from that of developing countries which constitute basically labour-intensive industries. Hence, in order to have an effective determinants of productivity indices, we divide the industries into labour-intensive and capital intensive before running the models. We compare labour cost and capital cost of each industry on annual basis in order to separate the industries into labour-intensive and capital-intensive group. They are selected based on weight of the capital and labour costs. For example, paper industry has been a capital-intensive industry between 1997 until 2002. However, the industry has become a labour-intensive from 2003 until 2006. The details of separation are explained in Table 8.

Here we estimated three models of productivity that contain same explanatory variables put in two categories, that is labour-intensive and capital-intensive industries. Model 1 evaluates the relationship between labor productivity and performance indicators. The former represents the dependent variable and the latter are the independent variables consist of growth rate of demand, capital output ratio, investment sale ratio, advertising intensity and minimum efficiency scale. Model 2 examines the effect of performance indicators on capital productivity. While model 3 estimates overall productivity using the same explanatory variables as that of models 1 and 2.

Examining three alternate dependent variables as three independent models is not only intended to expand the scope of analysis. It is also to provide more comprehensive analysis of industry productivity. Finally, the techniques used to estimate each of the models are pooled cross-section (OLS), fixed effects (LSDV) and random effects (GLS). For each regression model, we test four hypothesis in order to choose the best model (Park, 2009)

*Data source*

This study uses data from the census of production collected by the annual survey of industries, published by the Statistical Centre of Iran (SCI). This collection covers data of private and public sectors with 10 or more employees. There are twenty one sectors in the two-digit International Standard Industrial Classification (ISIC), as shown in Table 9. Data of a longer period of time is preferred, but it is difficult to collect. Another challenge is that the latest available data dated 2006. Furthermore, several changes have been made on the data processing before 1995-96. Therefore, any data prior to that year are grouped differently and are not classified in the same category as those of 1996 onwards

*Functional form of models*

The data used in this research is a combination of time series and cross-section which is known as panel data. Panel data approach examines the random and/or fixed effects of groups over time period. The main difference between random and fixed effect models indicates the role of the dummy variables that can help us to control individual heterogenity. It is a random effect model if the dummy variables are considered as an error term. In comparison, the dummy variables play as part of intercept in fixed effect model, (Table 1) (Baltagi, 2008; Gujarati, 2003; Hsiao, 2003, 2005, 2006).

In this study, each specific industry has individual structures that maybe unobservable and unable to measure under particular variables. One of the advantages of panel data is that it allows researchers to control individual structures that each industry employ either fixed or random. The random effects models are considered by generalised least squares (GLS) technique. While, the fixed effects models are estimated by least squares dummy variable (LSDV) technique (Note 1). According to econometric texts (Hasia, 2003; Gujarati,

TABLE 1
Fixed, random and pooled model

| | Fixed effect model | Random effect model | Pooled model |
|---|---|---|---|
| Form | $y_{it} = (a+\mu_t) + X'_{it}\beta + v_{it}$ | $y_{it} = a + X'_{it}\beta + (\mu_t + v_{it})$ | $y_{it} = a + X'_{it}\beta + v_{it})$ |
| Intercepts | Varying across industries and/ or time | Constant | Constant |
| Error variances | Constant | Varying across industries and/ or time | Constant |
| Slopes | Constant | Constant | Constant |
| Estimation | LSDV | GLS | OLS |

2003; Baltagi, 2008), the choice between a fixed and random model depends on the nature of the data. In this paper, we use both LSDV and GLS in order to facilitate the comparison with previous research results. The OLS result is also shown here. Many studies are only based on OLS estimation.

The empirical models used in the study is as shown below. Model 1 evaluates labor productivity. Model 2 examines the effect of performance indicators on capital productivity, while model 3 estimates the overall productivity.

$$\mathrm{LP}_{it} = \alpha_0 + \alpha_1 MES + \alpha_2 GR + \alpha_3 IS + \alpha_4 AD + \alpha_5 KI + \theta_{it} + \varepsilon_{it} \quad (1)$$

$$\mathrm{CP}_{it} = \alpha_0 + \alpha_1 MES + \alpha_2 GR + \alpha_3 IS + \alpha_4 AD + \alpha_5 KI + \theta_{it} + \varepsilon_{it} \quad (2)$$

$$\mathrm{LCP}_{it} = \alpha_0 + \alpha_1 MES + \alpha_2 GR + \alpha_3 IS + \alpha_4 AD + \alpha_5 KI + \theta_{it} + \varepsilon_{it} \quad (3)$$

Where:

LP = Labor productivity
CP = Capital productivity
LCP = Overall productivity (total expenditure productivity)
MES = Minimum efficiency scale
GR = Growth rate of demand
IS = Investment-sales ratio
AD = Advertising intensity
KI = Capital-output ratio
$\theta_{it}$ = The unobservable market factors and $\varepsilon_{it}$ is the error term; Both of them are independently and identically distributed

*Dependent variables*

Labour Productivity (LP) or net output per person employs estimations of value added to the used materials (labours) in the production process.

Capital Productivity (CP) or net output per unit of capital calculates the value added of used capital in the production process as:

$$\mathrm{LP}_{it} = \mathrm{VA}_{it} / \mathrm{L}_{it} \text{ and } \mathrm{CP}_{it} = \mathrm{VA}_{it} / \mathrm{C}_{it}$$

where, VA denotes nominal value added, L labour input and C capital input for industry *i* at time *t*. Total expenditure on both capital and labour (LCP) or value added per $1000 expenditure on capital and labour are instead of evaluating the productivity of each unit separately. Total factor index is a measurement of value added over total expense as:

$$\mathrm{LCP}_{it} = \mathrm{VA}_{it} / (\mathrm{Kr}_{it} + \mathrm{Lw}_{it})$$

where, $r$ is the opportunity cost of capital (interest rate) and w is the average wage rate. The availability of data to clarify opportunity cost of capital (interest rate) is not clear. Therefore, we use expected rates of return on facilities in manufacturing sector as explained by Central Bank of Iran (CBI) (Note 2).

## INDEPENDENT VARIABLES

### *Minimum Efficiency Scale (MES)*

One of the objectives of this study is to test the simple hypothesis where there is a negative relationship between MES as entry barrier and productivity indicators. As we have known, expected profit rate of an entrant depends on changes in productivity such as labor and capital productivity. On the other hand, a decline in entry barriers increases expected profit of entrants. Therefore, we can conclude that a reduction in barriers to entry raises profits leads to improvement in productivity. We can employ the ratio of the average size of the largest incumbents which account for 50% of the industry's employment (output) over total employment (output) in determining efficient size. Here we are faced with two choices in estimating the minimum efficiency scale. It is either we use the employment base or output base. In view of inflation, we prefer using the employment base in measuring MES. We assume that the MES is a barrier to entry and has a negative relationship with productivity indicators (Holtermann, 1973; Schmalensee, 1981).

### *Advertising Intensity (AD)*

Advertising expenditure may create an additional entry barrier if it increases the incumbents' profits. Advertising affects on profit can be seen via two modes. Firstly, expenditure on advertising may establish a barrier for new entrants; thus, incumbents will continue enjoying more profits. Secondly, incumbent firms will expand advertising expenditure in order to increase their market shares through shifts in the demand curve.

We can expect advertising to have a positive effect on the productivity indicators through positive changes in profits, or alternatively having a negative effect as it poses a barrier to entry (McAfee *et al*., 2004). We compute the effects of advertising by advertising intensity as follows:

Advertising Intensity (AD) = Expenditure on Advertising /sales.

### *Growth Rate of demand (GR)*

The MES and AD explain variations in profit. However, other market performances like GR have positive impact on profits. It is easier to make profits in a growing market than a stagnant market. Growth of demand or a moving demand curve to the right causes higher equilibrium price that leads to increases in profits.

It is necessary to increase supply to meet the growing demand which will be covered through expansion of capacity of incumbents firms or entry of new firms. In the absence of the supply, higher profits are made by incumbents firms (Holtermann,

1973). We expect GR to explain changes in productivity indicators that include labour productivity, capital productivity and overall productivity, through increase in profit. We measure GR by the annual changes in sales value as proxy for demand growth between 1996 and 2006.

### *Capital-output ratio (KI)*

The KI is an efficiency measure for firms. It shows how much is invested to gain one unit of output or sales revenue. Each industry employs specific technology which is reflected in different ratios of capital to labour. Industries with low capital-output ratio or with less use of capital compared to labour, are expected to have higher rates of return on capital. These industries are also expected to have lower rates of return on labour and vice versa (Holtermann 1973). Optimization in capital tools causes labour to be more effective. In addition, growing capital directs labour productivity. Overall, capital intensive industries are apt to have higher standards in the long run. We estimate KI as ratio of capital value to output over a specified period of time. It is hypothesized that KI has positive effects on labour productivity and negative effects on capital productivity. Morever, they may cancel each other's effects on overall productivity (Holtermann, 1973).

### *Investment-Sale ratio (IS)*

Investment guarantees growth of production capacity and renovation of old capital. In both cases, we can expect new investment to push up use of new technologies. Therefore, use of new technologies raises profit through lowering costs (Holtermann, 1973). On the other hand, investment in human capital means an increase in labour. It may cause a decline in labour productivity. While, investment in capital means an increase in the number of machinery and equipment. Similarly, it may cause a decline in capital productivity. Hence, growth of investment has an ambiguous effect on productivity indicators. Moreover, we can expect the existence of negative correlation between investment and labour productivity and between investment and capital productivity.

Investment sales ratio is calculated as ratio of investment value to sales over a specified period of time (Holtermann, 1973). Investment value consists of investment on machineries, durable goods, office instruments, transport vehicles, buildings, lands and computer software.

## RESULTS

### *Regression results for LP*

Table 2 and 3 show the results for labour productivity in both labour-intensive and capital intensive groups. In models 1.1 (1.1 for labour-intensive group and 1.1 for capital-intensive group), we employ a pooled method by controlling labour productivity through 1997-2006 period. As a result, we find significant relationships exist between the dependent variable and investment sales ratio, minimum efficiency scale and advertising intensity in the labour-intensive group. However, only minimum efficiency of scale is significant in the capital-intensive group.

TABLE 2
Results for industry labour productivity (labour-intensive group), 1997-2006

| Variable | Model 2.1 OLS | Model 2.2 LSD (2-way)1) | Model 2.3 GLS |
|---|---|---|---|
| KI | -238.4** | 40.23 | -187.6** |
| IS | -449.4** | -226.7** | -400.4** |
| GR | 16.47 | 22.32 | -0.082 |
| MES | -558** | -52.63 | -35.4* |
| AD | 2307* | 216.4 | 2357* |
| R-squared | 0.143 | 0.918 | 0.164 |
| Time effect test | F (9, 11) =30.42 | Prob>F = 0.945 | |
| Wald test | F (29,111) = 36.55 | Prob>F = 0.000 | |
| LM test | chi 2(1) = 49.40 | Prob>chi2 = 0.052 | |
| Hausm an test | chi2 (5) = 2.14 | Prob>chi2 = 0.464 | |

TABLE 3
Results for industry labour productivity (labour-intensive group), 1997-2006

| Variable | Model 2.1 OLS | Model 2.2 LSD (2-way)1) | Model 2.3 GLS |
|---|---|---|---|
| KI | -384.2*** | -240.** | -329 |
| IS | 103.5 | 4.76 | -53.73 |
| GR | 6.32 | 6.70 | -3.66 |
| MES | -870* | -2801 | 193.9 |
| AD | -3969 | -3056 | -27154*** |
| R-squared | 0.455 | 0.884 | 0.397 |
| Time effect test | F (9, 11) = 2.32 | Prob>F = 0.0386 | |
| Wald test | F (29,111) = 4.59 | Prob>F = 0.000 | |
| LM test | chi 2(1) = 22.28 | Prob>chi2 = 0.000 | |
| Hausman test | chi2 (5) = 11.44 | Prob>chi2 = 0.043 | |

The differences in significance of variables in both labour-intensive group and capital-intensive group are due to size of independent variables. It means that the size of advertising costs and capital costs in labour- intensive group is a noticeable value in comparison with capital-intensive group.

Nevertheless, the result of capital output ratio is statistically accepted even though it is not consistent with the theory that capital output ratio has positive effect on labour productivity.

In order to account for the possible existence of unobservable heterogeneity across industries, we estimate model 1.2 (1.2 for labour-intensive group and 1.2 for capital-intensive group) with a LSDV fixed effects model. As a result, we find that there is a significant relationship between dependent variable and investment sales ratio and growth rate in labour-intensive group. However, there is no statistical significant relationship between the independent variable and dependent variables in capital-intensive group.

Finally, models 1.3 (1.3 for labour-intensive group and 1.3 for capital-intensive group) estimate the random effects models as an alternative estimation. The result of these models indicate that the investment sales ratio, minimum efficiency of scale and advertising intensity have statistical significant effect on labour productivity in labour-intensive group. Meanwhile, only advertising intensity has significant effect in capital-intensive group.

The terms of panel and pool data are often used. In this study, the nature of the data for the 21 industries which is a as cross-section data, repeated between 1996-2006. This justificies that the panel model is appropriate. However, we need statistical justification to demonstrate the validity of the model. Greene (2003; Wooldridge, 2006; Park, 2009) have considered some statistical justification tests (Table 10). These tests are Group specific test for time-fixed effects, Breusch and Pagan LM test and Hausman test.

We use F test to consider the necessity of time effect in the first test. The null hypothesis is that the effects of time are zero. In this case, F values for both labor-intensive and capital-intensive groups are significant. We can reject the null hypothesis that is all years' coefficients are jointly equal to zero; therefore, time fixed effects are needed. The second test indicates whether the pooled or fixed-effects model (LSDV) is more appropriate. The test rejects the null hypothesis.

Evidently, we can conclude that two-way LSVD model is better than the pooled OLS model. In the third test, the LM test helps to decide between a random effect model and an OLS model (pooled). The evidence indicates a random effect model. Finally, the Hausman test directs random effect model to the labor-intensive group. However, this test cannot choose random effect model for the capital-intensive group. Henceforth, the random model is preferred to the labour-intensive group and the fixed effect model is preferred to the capital-intensive group.

### *Regression results for CP*

Table 4 and 5 display the results of capital productivity models in two categories. The results indicate that the relationship between investment sales ratio and capital productivity in both categories and all three models (2.1, 2.2 and 2.3) are negative and statistically significant. These results indicate wrong investment or wrong entry into Iranian industries causing a waste of resources. The evidence of wrong investment can be seen in number of entries and exits into the industries (Fig.4). Investors in Iranian manufacturing sector merely use the financial facilities such as loans and subsidie from governmental resources to enter into inappropriate industries. Subsequently, arbitrage opportunities of government's loans in informal markets drive loans to other sectors.

According to statistical justification tests, the random effect model is preferred for both labour-intensive and capital-intensive groups.

### *Regression results for LCP*

Table 6 and 7 show the result of regression on overall productivity in both labour-intensive and capital- intensive groups. In the labor-intensive group, the investment sales ratio, growth rate, advertising intensity and minimum efficiency scale as explanatory variables in LSDV and GLS models have significant effects. The investment sales ratio, growth rate, advertising intensity and minimum efficiency scale have significant effects in the labor-intensive group, similar

TABLE 4
Results for industry capital productivity (labour-intensive group), 1997-2006

| Variable | Model 2.1 OLS | Model 2.2 LSD (2-way)1) | Model 2.3 GLS |
|---|---|---|---|
| KI | 4.81 | -0.926 | 1.80 |
| IS | -211.5*** | -228.6*** | -224.2*** |
| GR | -2.78 | -1.46 | -1.80 |
| MES | 17.5 | -32.11 | -11.71 |
| AD | 206.7 | 179.4 | 208.9 |
| R-squared | 0.437 | 0.597 | 0.487 |
| Time effect test | F (9, 11) = 0.37 | Prob>F = 0.0945 | |
| Wald test | F (29,111) =12.06 | Prob>F = 0.000 | |
| LM test | chi 2(1) = 3.76 | Prob>chi2 = 0.052 | |
| Hausman test | chi2 (5) = 4.62 | Prob>chi2 = 0.464 | |

TABLE 5
Results for industry capital productivity (capital-intensive group), 1997-2006

| Variable | Model 2.1 OLS | Model 2.2 LSD (2-way) | Model 2.3 GLS |
|---|---|---|---|
| KI | -11.36 | -14.31 | -11.79 |
| IS | -33.22*** | -38.82*** | -37.75*** |
| GR | 1.48 | 2.01 | 1.4 |
| MES | -11.86 | -78.22 | -2.6 |
| AD | 10.35 | -155.4 | -79.81 |
| R-squared | 0.411 | 0.735 | 0.492 |
| time effect test | F(9, 32) = 0.99 | Prob>F = 0.467 | |
| Wald test | F(9, 32) = 3.48 | Prob>F = 0.000 | |
| LM test | chi2 (1) =10.77 | Prob>chi2 = 0.001 | |
| Hausman test | chi2 (5) =1.31 | Prob>chi2 = 0.933 | |

TABLE 6
Results for Industry Overall Productivity (labour-intensive group), 1997-2006

| Variable | Model 2.1 OLS | Model 2.2 LSD (2-way) | Model 2.3 GLS |
|---|---|---|---|
| KI | -1.75 | 2.49 | 2.34 |
| IS | -27.29 | -10.20*** | -11.55** |
| GR | 2.11*** | 1.14*** | 1.17**** |
| MES | -7.87 | -17.36*** | -16.84*** |
| AD | 57.74 | -73.46** | -71.56** |
| R-squared | 0.152 | 0.863 | 0.230 |
| Time effect test | F (9,111) = 1.28 | Prob>F = 0.256 | |
| Wald test | F (20,120) = 31.39 | Prob>F = 0.000 | |
| LM test | chi 2(1) = 82.85 | Prob>chi2 = 0.000 | |
| Hausman test | chi2 (5) = 5.46 | Prob>chi2 = 0.362 | |

TABLE 7
Results for industry overal productivity (capital-intensive group), 1997-2006

| Variable | Model 2.1 OLS | Model 2.2 LSD (2-way) | Model 2.3 GLS |
|---|---|---|---|
| KI | -1.23 | 1.68 | 1.05 |
| IS | -19.09** | -22.71*** | -22.40*** |
| GR | 3.57** | 2.81** | 2.81**** |
| MES | -68.10 | -94.06 | -55.30 |
| AD | -335.9* | -196.9 | -233.7 |
| R-squared | 0.427 | 0.862 | 0.4522 |
| Time effect test | F (9, 32) = 1.28 | Prob>F = 0.581 | |
| Wald test | F (17, 41) = 31.39 | Prob>F = 0.000 | |
| LM test | chi 2(1) = 82.85 | Prob>chi2 = 0.000 | |
| Hausman test | chi2 (5) = 5.46 | Prob>chi2 = 0.984 | |

Note: for OLS and LSDV t-statistics in parentheses and for GLS z-statistic in parentheses;
*; significant at 10%; **; significant at 5%; ***; significant1%

to the explanatory variables in LSDV and GLS models. However, only growth rate has significant effect in the pooled OLS model.

In capital-intensive group, the investment sales ratio and growth rate are significant in all three models. In addition, advertising intensity and minimum efficiency scale have significant effects in pooled OLS model. The statistical justification tests indicate the random effect model is appropriate for third models.

## DISCUSSION

Productivity and performance are the two most important concepts that have mistakenly been construed as the same in most studies. The productivity of a producer

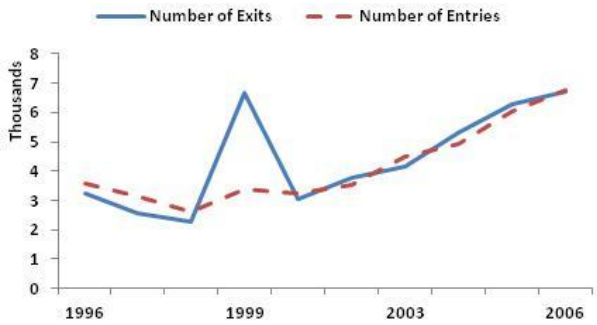


Fig. 4: Number of entry and exit in Iran manufacturing

Table 8
Labour-intensive and capital-intensive separation

| Year<br>ISIC code | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | Capital | Capital | Capital | Capital | Labour | Labour | Capital | Labour | Capital | Labour |
| 17 | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour |
| 18 | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour |
| 19 | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour |
| 20 | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour |
| 21 | Capital | Capital | Capital | Capital | Capital | Capital | Labour | Labour | Labour | Labour |
| 22 | Capital | Capital | Labour | Capital | Labour | Labour | Labour | Labour | Labour | Labour |
| 23 | Capital | Capital | Labour | Labour | Capital | Labour | Capital | Labour | Labour | Labour |
| 24 | Capital | Capital | Capital | Capital | Capital | Labour | Labour | Capital | Capital | Labour |
| 25 | Capital | Capital | Capital | Capital | Labour | Capital | Labour | Labour | Labour | Labour |
| 26 | Capital | Labour | Capital | Capital | Capital | Labour | Labour | Labour | Labour | Labour |
| 27 | Capital | Capital | Capital | Capital | Capital | Capital | Capital | Capital | Capital | Capital |
| 28 | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour |
| 29 | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour |
| 30 | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour |
| 31 | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour |
| 32 | Labour | Capital | Capital | Labour | Labour | Labour | Labour | Labour | Labour | Labour |
| 33 | Capital | Capital | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour |
| 34 | Capital | Capital | Capital | Capital | Capital | Capital | Capital | Capital | Capital | Capital |
| 35 | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Capital | Capital |
| 36 | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour | Labour |

* Capital means capital-intensive and Labour means labour-intensive
* An industry is considered as labour or capital intensive based on comparison between required labour cost and capital cost. The author compares the labour cost and capital cost of each industry in every year. E.g. if the labour cost is more than capital cost the industry is specified as labour intensive industry.

TABLE 9
Manufacturing sectors in Iran based on the 2-digit ISIC Code

| Industry | SIC code | Industry | SIC code |
|---|---|---|---|
| Food products and beverage | 15 | Wearing apparel | 18 |
| Textiles | 17 | Wood products and cork | 20 |
| Tanning and dressing of leather; luggage,… | 19 | Publishing, printing and | 22 |
| Paper products | 21 | Chemicals and chemicals products | 24 |
| Coke, refined petroleum | 23 | Other non- metallic mineral | 26 |
| Rubber and plastic product | 25 | Fabricated metal pro, except machinery | 28 |
| Basic metal | 27 | Office, accounting and computing | 30 |
| Machinery and equipment NEC | 29 | Radio, TV and communication equipment | 32 |
| Electrical machinery and apparatus NEC | 31 | Motor vehicles, trailers and semi trailer | 34 |
| Medical, precision and optical instrument | 33 | Furniture; manufacturing NEC | 36 |
| Other transport equipment | 35 | | |

Source: Statistical centre of IRAN (ISIC is abbreviation for International Standard Industry Classification)

TABLE 10
Summary of statistical test

| **Test** | Time-fixed | Wald | LM | Hausman |
|---|---|---|---|---|
| **Labour productivity** | | | | |
| Labour-intensive | 2-way | LSDV (2-way) | Random | Random |
| Capital-intensive | 2-way | LSDV (2-way) | Random | Fixed |
| **Capital productivity** | | | | |
| Labour-intensive | 1-way | LSDV (1-way) | Random | Random |
| Capital-intensive | 1-way | LSDV (1-way) | Random | Random |
| **Overall productivity** | | | | |
| Labour-intensive | 1-way | LSDV (1-way) | Random | Random |
| Capital-intensive | 1-way | LSDV (1-way) | Random | Random |

*; Summary of statistical test that is used in this study as statistical justification to choose appropriate model

firm can be defined as the ratio of output to input. It is an index of performance. In fact, the relationship between both concepts is a single direction: productivity to performance. Productivity depends on other factors. In industrial organization (IO) discussion, higher productivity is the synonym of improved competitiveness that qualifies incumbent firms. Incumbents are competitive when their productivity of labor and capital grow consistently. Such situation allows them to reduce the unit costs of their output and upgrade their profits that causes entry to raise.

Matching of technologies with industries and being either capital-intensive or labor-intensive plays an important role in the structure of industries. For example, the labor and capital productivity are different in developed countries from developing countries. The former are almost capital-intensive, while the latter are almost labor-intensive. Increase in productivity leads to improvement of the Iranian manufacturing structure.

## CONCLUSION

The objective of this study is to analyse the relationship between productivity measures and performance indicators (capital output ratio, investment sales ratio, advertising intensity, growth of demand and MES). This paper illustrates in detailed the general picture of the productivity patterns in the

Iranian manufacturing sector. A unique firm-level data supports the main part of the industry sector of Iran during the period of 1997-2006 that are used in the empirical analysis. The results indicate that productivity indices seem to be highly sensitive to the investment sales ratio. Increasing investment in labour and capital do not follow growth in productivity. Therefore, wrong investments or wrong entries take place in Iranian manufacturing sector. The evidence of wrong investment is seen in a number of entries and exits into the industries. This indicates that there is lack of stable financial rules in the government sector.

The performance indicators used in this research are based on previous empirical finding (e.g. Holtermann 1973). Besides, the research makes an empirical and methodological contribution by employing panel data methods applied to the unique dataset.

## POLICY IMPLICATION

The results of this paper have implications to policy makers. The policy makers intend to guide owners of industrial firms in expanding their businesses. Knowledge of the variables that influence the productivity measures is valuable to policy makers in planning growth strategies for the manufacturing sector in Iran. The significance of the mentioned variables indicates that investors and incumbents must pay attention to optimizing the use of capital tools. It is due to the evidence that growing capital intensifies direct labour productivity. Furthermore, the significance of MES in labour-intensive groups of models of 1 and 3 states that the MES as entry barrier causes increases in profit. Hence, improvements in productivity.

**Note 1**: There are two kinds of fixed model. It is called one way fixed model if the unobservable variables are dependent only on the cross-section to which the observation belongs. It is called two-way fixed effect model when panel approach allows the unobservable variables vary across both cross sections and time period.

**Note 2**: Money and Credit Council determines the regulations pertaining to determining lending rates or the expected rate of return on the banking facilities, and the provisional deposit rates as a result of law implementation on usury free banking and introduction of contracts with fixed return and transaction contracts. The expected lending rates are related to the facilities extended by public banks.

## REFERENCES

Afrooz, A., Khalid, A. R., Zaleha, M. N., & Chin, L. (2010). Human capital and labour productivity in food Industries of Iran. *International Journal of Economics and Finance, 2*(4), 47-51.

Afrooz, A., Khalid, A.R., Zaleha, M.N., & Chin, L. (2011). Total Factor Productivity in Food Industries of Iran. *International Journal of Economics and Finance, 3*(1), 84-91.

Amuzegar, J. (2000). *A perspective on Iran's post-revolution political economy*. A lecture delivered at the Foundation for Iranian Studies, March 24, Bethesda. Retrieved from http://www.fis-iran.org/amuzegar.htm.

Baier, S. L., Dwyer, G. P., & Tamura, R. (2002). *How Important are Capital and Total Factor Productivity for Economic Growth?* Working paper, Federal Reserve Bank of Atlanta,

Baltagi, B. H. (2008). *Econometric. 4th Edn*. Verlag Berlin Heidelberg, Springer, pp. 295-320.

Safdari, M., Shahiki, M., & Sheidaee, Z. (2010). How Does Human Capital Affect on Growth in Different Economies?. *Journal of Social Sciences, 6*(3), 416-423. DOI:10.3844/jssp.2010.416.423.

Carlton., & Perloff. (2005). *Modern Industrial Organization. 4th Edn*. Pearson, Addison Wesley,

Fu, X. (2005). Exports, technical progress and productivity growth in a transition economy: A nonparametric approach for China. *Applied Econ., 37*, 725-39.

Greene, W. (2003). *Econometric Analysis, (5th ed)*. New Jersey: Prentice Hall.

Gujarati, D. (2003). *Basic Econometrics (4th ed.)*. New York: McGraw Hill. pp. 636-655.

Holtermann, S. E. (1973). Market structure and economic performance in U.K manufacturing industry. *Jounal of Industrial Economics*, *22*, 119-139.

Hsiao, C. (2003). *Analysis of Panel Data (2nd ed.)*. Cambridge: Cambridge University Press

Hsiao, C. (2005). Why Panel Data? *IEPR Working paper, 05-33*. Institute of Economic Policy Research University of Southern California.

Hsiao, C. (2006). Panel data analysis-advantages and challenges. *IEPR Working paper 06-49*. Institute of Economic Policy Research University of Southern California.

Karshenas, M., & Pesaran, H. (1995). Economic reform and the reconstruction of the Iranian economy. *Middle East Journal, 49*, 89-111.

Kartz, J. M. (1969). *Production functions, foreign investment and growth: A paper based on the manufacturing sector 1946-1961*. Amsterdam: North Holland Publishing Company.

Huang, K. S. (2003). *Food Manufacturing Productivity and Its Economic Implications*.United sates Department, Technical Bulletin (No 1905). Retrieved from http://ageconsearch.umn.edu/handle/33557

Jbili, A., Kramarenko, V., & Bailén, J. (2004). Islamic Republic of Iran.Selected Issues, International Monetary Fund, *IMF Country Report No. 04/308,* (Washington DC: the IMF).

Mahadevan, R. (2002). *Is output growth of korean manufacturing firms productivity driven?* Proceedings of the 8th Convention of the East Asian Economic Association, 4-5 Kuala Lumpur.

McAfee, R. P., Mialon, H. M., Williams, M. A. (2004). What is a barrier to entry? *The American Economic Review, 94 Ministry of Industries and Mines*. Retrieved from http://www.mim.org.ir

Park, H. M. ( 2009). *Linear Regression Models for Panel Data Using SAS, Stata, LIMDEP and SPSS. Working paper.* The University Information Technology Services (UITS). Center for Statistical and Mathematical Computing, Indiana University. Retrieved from http://www.indiana.edu/~statmath/stat/all/panel

Schmalensee, R. (1981). Economies of scale and barriers to entry. *Journal Political Economy, 89*, 1228-1238.

Statistical Centre of Iran, (1996; 1997…, 2006). *Iran statistical year book*. Tehran: SCI. Statistical Centre of Iran. Retrieved from http://www.sci.org.ir

Shepherds, W. G. (1990). *The Economics of Industrial Organization*. Prentice-Hall.

Valadkhani, A. (2005). Sources of Iranian Labour Productivity. *Review of Middle East Economics and Finance*, *3*, 203-18.

Wooldridge, J. M. (2006). *Introductory Econometrics. 3rd ed.)*., Mason, OH: South-Western, pp.408-460.

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# International Evidence on the Link between Foreign Direct Investment and Economic Freedom

**W. N. W. Azman-Saini*, Yin-Li Tun and Saifuzzaman Ibrahim**

*Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

Foreign direct investment (FDI) by multinational enterprises (MNEs) is considered as one of the key ingredients that drives the development process in many countries . However, the distribution of FDI across countries has not been uniform as only few countries have the ability to attract the bulk of FDI. In an effort to further understand the evolution in MNEs' locational decision and their changing need, this paper examines whether economic freedom plays an important role in attracting FDI inflows. Hypothesis was tested based on the data gathered from 75 countries over the period 1981 to 2005 — using a system generalised method of moment (GMM) panel estimator. The result of this study shows the importance of economic freedom in attracting FDI inflows is undisputable. Furthermore an improvement in the freedom of economic provides a more enabling business environment.

*JEL Classification codes:* F21, N20

*Keywords:* Foreign direct investment, economic freedom, Generalised Method of Moment

## INTRODUCTION

It is well known that foreign direct investment (FDI) by multinational enterprises (MNEs) is regarded as one of the important components for development strategies especially in developing countries. FDI plays an important role in enabling host countries to access new technologies available at the world's frontier because MNEs make huge investment in research and development (R&D) activities (Azman-Saini *et al.*, 2101b). Similarly, MNEs mainly hire large number of professional and technical employees (Markusen, 1995). In addition, they undertake substantial efforts in improving the quality of their workforce through extensive trainings (Fosfuri *et al.,* 2001). In short, MNEs have always been

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*E-mail addresses*:
wazman@upm.edu.my (W. N. W. Azman-Saini),
saifuzzaman@upm.edu.my (Saifuzzaman Ibrahim)
* Corresponding author

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associated with superior technologies, patents, trade secrets, brand names, management techniques and marketing strategies (Dunning, 1993). Once MNEs have invested in host countries, they may not be able to internalize all of its advantages and thus spill over to domestic firms which would eventually expand their business activities[1]. Therefore, FDI is viewed not only as a source of finance and employment but also a channel for host countries to widen the access of new technologies that are available at the world's frontier[2].

Since MNEs are expected to bring numerous benefits to host countries, many countries have removed laws and regulations that hinder free flow of capital. According to the *World Investment Report* by UNCTAD (2009), a yearly average of 175 changes in FDI laws was recorded in the period of 2000 – 2008 and most of these changes (i.e. 88 per cent) were favourable to FDI. In response to these efforts, MNEs has increased their investments significantly over the past few decades. Global FDI inflows increased from $57 billion in 1982 to $1271 billion in 2000 and reached its peak of $2099 billion in 2007 (UNCTAD, 2001, 2009). In fact, the growth rate of world FDI has surpassed the growth rates of both international trade and gross domestic product (GDP) over the past few decades. Although total FDI have increased significantly, its distribution has not been uniform across countries and few countries have, however been able to attract more FDI.

Given this scenario, it is natural to ask whether it is possible to identify a set of policies that might enhance the attractiveness of host countries as destinations for MNEs. Therefore, it is important for policymakers to know the evolution in MNEs locational decision and understand their changing need as part of their global integration strategies. In line with this development, this paper investigates the importance of freedom of economic activity as an attribute to attract FDI. It is well known that higher level of economic freedom (hereafter, EF) provides free and competitive markets which allow greater business opportunities for entrepreneurs. There are at least three reasons to believe why the level of EF in the host countries is an important determinant of MNEs locational decisions. Firstly, the extent of regulations in a host country is a crucial determinant of transaction or production cost. Conventional wisdom suggests that a highly regulated country (i.e. less freedom) will not bean economically attractive location for MNEs due to high cost of doing business. Secondly, as investment involves a large amount of money, investors become very sensitive to stability and insecurity. Therefore, information about the quality of investment environment is vital because incomplete information is risky. Lastly, high level of EF provides better legal

[1]Recently, several studies show that the growth-effect of FDI exists only under certain circumstances. See for example, Azman-Saini *et al.*, 2010a,b; Alfaro *et al.,* 2004; Borenzstein *et al.,* 1998; among others.

[2]FDI is a more useful source of capital to finance current account deficits than other types of capital like portfolio investment because it is less volatile.

protection of assets, and thus reduces the chance of expropriation of a firm's assets, hence make investment more likely.

The findings in this study are related to the findings from previous studies Bengoa and Sanchez-Robles (2003) and Quazi (2007) which assess the impact of promoting economic freedom on FDI inflows. Bengoa and Sanchez-Robles (2003) employ fixed and random effect estimators and document that FDI inflows are positively associated with EF in ten Latin American countries. Meanwhile, using random effects and generalized least square estimators, Quazi (2007) shows that EF positively affects FDI inflows into East Asian countries. This study differs from the above-mentioned studies in three important aspects . Firstly, this paper utilizes a larger sample of 75 countries covering both developed and developing countries across all regions. The inclusion of developed countries in the analysis of FDI is very important because most of FDI inflows are between developed countries. Secondly, this paper uses a recent panel technique which is able to address some of the limitations associated with previous studies. Specifically, this paper uses generalized method of moments (GMM) which is not only able to accommodate heterogeneity in country-specific effects but also problems associated with and simultaneity bias. Thirdly, this study assesses the impact of outliers on the estimation results to ensure that the relationship between FDI and EF is robust. The importance of addressing outliers was emphasized in Azman-Saini *et al.* (2010b) who show that the failure to formally address outliers in the analysis of FDI may lead to incorrect conclusions.

Literature has also highlighted several other important determinants of FDI inflows. This includes human capital (Glass and Saggi, 2002, Noorbakhsh *et al.,* 2001), market size (Ramirez, 2006; Quazi, 2007), quality infrastructure (Asiedu, 2002), and also the past value of FDI (Noorbakhsh *et al.,* 2001)[3]. The quality of human capital is important for FDI inflows because high-tech MNEs' productions require skilled labour (Borensztein *et al.*, 1998). MNEs are known to be among the most technologically advanced firms as they are responsible for a large part of the world's R&D expenditures. Therefore, they require high skilled labours with the ability to adapt new technologies easily. In addition, market size in the sense of a larger population implies more potential consumption and thus more opportunity for business. Therefore, countries with larger consumer market should receive more FDI than that of smaller ones (Desmet & Parente, 2010; Wadhwa & Reddy, 2001). The availability of good quality physical infrastructure may improve the investment climate for MNEs by subsidizing their cost of total investment and thus raising the rate of return. The importance of infrastructure availability in influencing MNEs' locational decision was corroborated by Asiedu (2002) and Ang (2008), among many other researchers. The existing level of FDI is an important attracting factor for MNEs. This is because past FDI embodies information on operating conditions in the host country (Noorbakhsh *et al.,* 2001). This information

[3]Refer Blonigen (2005) for a survey of the literature on FDI determinants.

shapes perception about a country and may influence potential investor to view a particular location favourably. Also, an investment by MNEs requires time to adjust to desired levels as MNEs normally stagger their investments in a new market. By and large, it should be noted that the impact of the above-mentioned factors on FDI inflows are still inconclusive as some studies in this literature have found no such evidence (Singh *et al.*, 2008; Cheng and Kwan, 2000; Na and Lightfoot, 2006).

The remainder of this paper is structured as follows. Section of Model Specification outlines the model specification followed by research methodology. Subsequent section highlights the data. Section of Empirical Results reports the empirical results and their interpretation and concluding remarks are provided in the last section.

## MODEL SPECIFICATION

The objective of this study is to test whether EF plays a significant role in influencing FDI inflows. To this end, this study utilize a specification which is widely used in the literature (e.g. Bengoa and Sanchez-Robles, 2003; Quazi, 2007)[4] FDI is expressed as a function of EF and other factors as follows:

$$\mathrm{FDI}_{i,t} = \alpha \mathrm{FDI}_{i,t-1} + \alpha_1 \mathrm{EF}_{i,t} + \alpha_2 \mathrm{X}_{i,t} + \eta_i + \varepsilon_{i,t} \quad (1)$$

where *i and t* are respectively country and time index. The main variables in this study are FDI and EF. FDI is expressed as net FDI inflows over GDP while EF is represented by the index of economic freedom. *X* is a set of other conditional variables which are usually included in the analysis of FDI determinant, $\eta_i$ is time invariant unobserved country—specific effect term, and $\varepsilon_{i,t}$ is the usual disturbance term. The selection of other determinants is guided by past literature on FDI[5]. It consists of variables that are robustly related to FDI inflows which includes population size (i.e. proxy for market size), telephone line (i.e. proxy for infrastructure development), and life expectancy (i.e. proxy for human capital). All of these determinants are expected to carry positive signs. Within this specification, if the estimated coefficient on EF is found to be positive and significant, this would indicate that EF is an important attracting factor for MNEs locational decisions. This would suggest that efforts to promote freedom of economic activity will translate into more FDI inflows.

## METHODOLOGY

To test the hypothesis outlined in the previous section, this study uses a system GMM panel estimator as proposed by Holtz-Eakin *et al.* (1988) and improved by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). This estimator is chosen as it has several advantages over other estimation techniques. In the present context, this estimator can alleviate bias introduced by the presence of unobserved country-specific

[4]Both Bengoa and Sanchez-Robles (2003) and Quazi (2007) focus on economic freedom as the core determinant for FDI inflows in Latin Americas and Asian countries, respectively.

[5]See for example, Bengoa and Sanchez-Robles (2003); Quazi (2007); Kok and Ersoy (2009); Asiedu (2002).

effects. Moreover, the GMM estimator can control simultaneity bias induced by the possibility that some of the explanatory variables are endogenous. For instance, FDI and EF may be simultaneously determined because MNEs may ask for improvement in the protection of property right (which is an important element of economic freedom).

In the literature, there are two variants of GMM estimator which are widely used namely, difference-GMM (D-GMM) and system GMM (S-GMM). The D-GMM estimator uses a first-difference transformation of Equation (1) to eliminate bias triggered by the presence of country-specific effects. The model can be expressed as follows:

$$\begin{aligned}\mathrm{FDI}_{i,t} - \mathrm{FDI}_{i,t-1} &= \alpha(\mathrm{FDI}_{i,t-1} - \mathrm{FDI}_{i,t-2}) \\ &+ \beta_1(\mathrm{EF}_{i,t} - \mathrm{EF}_{i,t-1}) + \beta_2(\mathrm{X}_{i,t} - \mathrm{X}_{i,t-1}) \\ &+ (\varepsilon_{i,t} - \varepsilon_{i,t-1})\end{aligned} \tag{2}$$

Within this specification, there are two issues that need to be addressed. First is the endogeneity of explanatory variables. Second issue is the correlation between $(\mathrm{FDI}_{i,t-1} - \mathrm{FDI}_{i,t-2})$ and $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$. In order to address these issues, Arellano and Bond (1991) suggest using higher-order lags of explanatory variables as instruments. This estimation strategy however requires two important assumptions. First, the error terms in Equation (2) must not serially correlated and secondly, the instruments used (i.e. the lag of explanatory variables) must be weakly exogenous. Following the suggestion in Arellano and Bond (1991), the following moment conditions are employed:

$$\begin{aligned}&\mathrm{E}[\mathrm{FDI}_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] \\ &\quad = 0 \text{ for } s \geq 2; t = 3, \ldots, \mathrm{T}\end{aligned} \tag{3}$$

$$\begin{aligned}&\mathrm{E}[\mathrm{EF}_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] \\ &\quad = 0 \text{ for } s \geq 2; t = 3, \ldots, \mathrm{T}\end{aligned} \tag{4}$$

$$\begin{aligned}&\mathrm{E}[\mathrm{X}_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] \\ &\quad = 0 \text{ for } s \geq 2; t = 3, \ldots, \mathrm{T}\end{aligned} \tag{5}$$

Although this strategy could handle problems caused by the presence of country-specific effects and the possibility that the explanatory variables are endogenous, it poses one limitation. As discussed in Alonso-Borrego and Arellano (1999), and Blundell and Bond (1998), instruments are weak if the explanatory variables show some level of persistency (i.e. they move slowly over time). This is particularly relevant for EF index as the quality of institution is a deep factor and moves slowly over time. The authors show that weak instruments could result in biased parameter estimates and inflated variances. As a solution, Arellano and Bover (1995) propose an alternative estimator known as S-GMM estimator which combines both Equations (1) and (2) in one system. Blundell and Bond (1998) show that this alternative estimator performs well in reducing biases and imprecision linked to the D-GMM estimator. This estimation strategy requires additional moment conditions as below:

$$\begin{aligned}&[\mathrm{FDI}_{i,t-s} - \mathrm{FDI}_{i,t-s-1} \cdot (\eta_i + \varepsilon_{i,t})] \\ &\quad = 0 \, for \; s = 1; t = 3, \ldots \mathrm{T}\end{aligned} \tag{6}$$

$$\begin{aligned}&[\mathrm{EF}_{i,t-s} - \mathrm{EF}_{i,t-s-1} \cdot (\eta_i + \varepsilon_{i,t})] \\ &\quad = 0 \, for \; s = 1; t = 3, \ldots \mathrm{T}\end{aligned} \tag{7}$$

$$[X_{i,t-s} - X_{i,t-s-1} \cdot (\eta_i + \varepsilon_{i,t})] = 0 \; for \; s = 1; t = 3, \ldots T \quad (8)$$

The consistency of outputs obtained from S-GMM estimations depends on the validity of assumption made regarding error term in Equation (2) and instruments. Thus, two specification tests are used. The first test assesses the null of no second-order serial correlation in Equation (2) (Arellano & Bond, 1991). The second test is Hansen's over-identifying restrictions test used to evaluate whether the instruments used are valid. If we fail to reject both nulls this would imply that our estimated model is correctly specified and the instruments used are valid.

Both of the D-GMM and S-GMM estimators can be applied in one- and two-step approaches (Arellano & Bond, 1991). Theoretically, the two-step estimator was shown to be more efficient than its one-step counterpart because it utilizes optimal weighting matrices. Nevertheless, the use of two-step estimator in a small sample may lead to several problems such as biased standard errors and estimated parameters (Windmeijer, 2005). Moreover, Bowsher (2002) reveals that this may result in weakened over identification test. Recently, Roodman (2009) shows that these problems are triggered by the proliferation of instruments and the author further suggests reducing the dimensionality of the instrumental variable matrix as a solution.

In this paper, the moment conditions presented in Equations (3)–(8) and the two step estimator are used.[6] The number of instruments is also reduced, using the approach suggested by Roodman (2009).

## DESCRIPTION OF DATA

This study employs panel observations of 75 countries (which includes both developed and developing nations) for the period of 1981–2005[7]. The countries were selected based on the availability of reliable data over the sample period. FDI data is obtained from the *World Development Indicators* database (WDI) and measured in term of FDI inflows over GDP (i.e. FDI/GDP). The data set for EF index is taken from the Fraser Institute due to its greater coverage than other alternative sources. This index measures EF in five areas, namely; 1) size of government in terms of expenditures, taxes, and enterprises, 2) legal structure and security of property rights, 3) access to sound money, 4) freedom to trade internationally, and 5) regulation of credit, labour and business. This index is scaled from 0–10 with 10 representing the greatest level of freedom. Other control variables used are life expectancy, infrastructure, population, and the lag value of FDI. Life expectancy and telephone line (measured as per 100 people) are respectively used to measure the quality of human capital and infrastructure development. Both data were taken from the WDI database whereaspopulation was taken from the PWT database. Several other

[6]All estimations were implemented using the **xtabond2** routine developed by Roodman (2009).

[7]Refer to Appendix A for country list.

studies on FDI determinants have included other macroeconomic variables such as trade openness, government size, and inflation. However, this study does not include these variables because they are already included in the computation of the EF index. Also, the inclusion of these variables together with the EF index may introduce multicollinearity problem in the model.

This study employs panel dataset for 75 countries. However, the use of time series dimension shows at a glance, that FDI data are highly volatile and observations for few years are missing. This problem of large fluctuations in FDI series may distort the true effects of EF and other determinants on FDI inflows. In order to address this issues, we use data based on five-year averages (1981–1985, 1986–1990, …, 2001–2005). Moreover, this strategy is able to reduce some of the business cycle effect (Azman-Saini *et al*., 2010a; Alguacil *et al.,* 2011).

## EMPIRICAL RESULTS

The purpose of this paper is to test whether EF has any influence in attracting FDI inflows. The first step of the analysis is visual inspection of the data. All data are plotted against FDI inflows and displayed in Fig.1. The figure shows that life expectancy, telephone line and EF are positively associated with FDI inflows. However, population is negatively related to FDI inflows. It is worth noting that in all cases the correlation coefficients are low which range from 0.065 (life expectancy) to -0.240 (population).

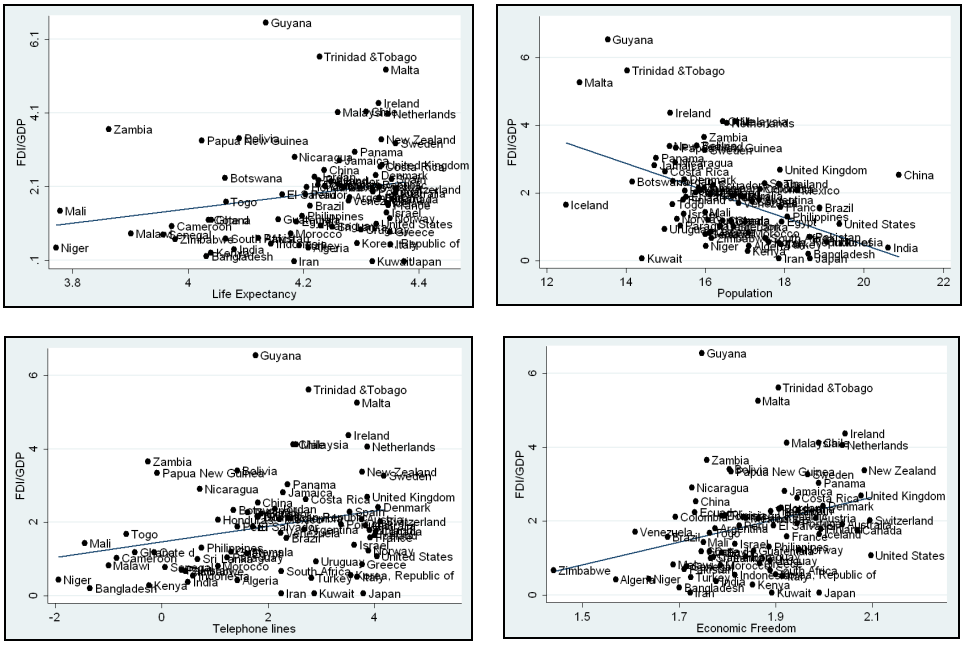


Fig.1: Scatter plot of FDI versus its determinants

The next step of the analysis is to evaluate the central issue in this study which is to test the importance of EF in attracting FDI inflows. Utilizing the EF index obtained from the Fraser Institute, Equation (1) is estimated using the two-step S-GMM estimator and results are reported in Table 1. The results presented shows that EF appears to be important FDI determinants at the 10% significant level. This indicates that an improvement in freedom of economic activity will attract more FDI inflows. This is in line with the argument that MNEs are much more likely to invest in countries which provide stimulating environment for business and investment activities because promotion of freedom improves productivity prospects and reduces the cost of doing business and cost of uncertainty. In the case of other FDI determinants, only the coefficient on lagged value of FDI is found to be positive and statistically significant. This suggests that the past value of FDI provides an important signal for future investment by MNEs. This outcome is consistent with the argument that MNEs are much more likely to choose countries that already have accumulated sizable amount of FDI. The success of MNEs in the host countries is a strong attracting factor for new investments by foreign firms. The finding for population is consistent with Ali *et al*. (2010) who also found that market size is not an important attracting factor for MNEs locational decisions. One possible reason for this outcome is that most of the FDI are export-oriented in nature and rely more on foreign markets than domestic markets. Finally, the coefficients on life expectancy and telephone line are also insignificant. Since the *p*-values of testing for Hansen over identification test (0.133) and *AR*(2) (0.115) are high, the null of both tests cannot be rejected. Hence this provides support for

TABLE 1
FDI Determinants (Dependent Variable = FDI/GDP)

| Regressor | Coeff. | S.e. | *p*-value |
|---|---|---|---|
| $(FDI/GDP)_{t-1}$ | 0.620*** | 0.137 | 0.000 |
| Life Expectancy (log) | -3.330 | 3.007 | 0.268 |
| Population (log) | -0.103 | 0.397 | 0.794 |
| Telephone Line (log) | -0.122 | 0.262 | 0.640 |
| Economic Freedom (log) | 5.714* | 3.033 | 0.060 |
| Constant | 6.125 | 11.374 | 0.590 |
| *AR*(2) test (*p*-value) | | 0.115 | |
| *J*-test (*p*-value) | | 0.133 | |
| Number of Observation | | 294 | |
| Number of Countries | | 75 | |

Note: *, ** , and *** denote the 10%, 5%, and 1% level of significance respectively. Relevant *p*- values are in parenthesis. *AR(2)* is a test of second-order residual serial correlation. *J*-test is the Hansen over identification test. Time dummies are included to capture period-specific effect but are not reported. Lag 2 and earlier are used as instruments for the equation in first-differences, while lag 1 in first-differences are used as instrument for the equation in levels. Moreover, collapsing instrument approach is adopted in the estimation.

the validity and reliability of the estimation results.

It should be highlighted that it is critically important to evaluate the impact of outliers in the analysis of FDI. It could be that the finding of a strong positive impact of EF on FDI inflows as presented in Table 1 may be driven by outlier observations. In a recent study, Azman-Saini *et al.* (2010b) show that the inclusion of China (i.e. an outlier) in their FDI-growth analysis appears to distort estimation results. In ensuring that the link between EF and FDI is robust and not affected by outlier observations, we formally identify outlier observations using the DFITS statistic proposed by Belsley *et al.* (1980). The test is computed as $DFITS_j = r_j\sqrt{h_j/(1-h_j)}$, where $r_j$ is studentized residual given by $r_j = e_j/(s_{(j)}\sqrt{1-h_j})$ where $s_{(j)}$ is the root mean squared error ($s$) of the regression equation with $j^{th}$ observation removed, and $h$ is the leverage statistic. Following the suggestion by Belsley *et al*. (1980), outliers are considered as observation with the absolute value of the DFITS statistic greater than $2\sqrt{k/n}$, where $k$ is the number of independent variables and $n$ is the number of countries. The results of the DFITS test show that Ireland, Austria and Iceland are true outliers. Fig.2 shows the scatterplot of leverage point versus residual for all countries in the sample. The figure clearly shows that Ireland, Austria and Iceland fall relatively way above other observations as they have high combinations of residual and leverage.

Based on the results of the outlier test, we re-estimate Equation (1) by excluding Ireland, Austria and Iceland. The results reported in Table 2 show that the importance of EF as an attractor for FDI remains intact as the $p$-value for the coefficient on EF is less than the 10% level. More importantly, both of the Hansen and AR(2) tests indicate that the model is adequately specified and

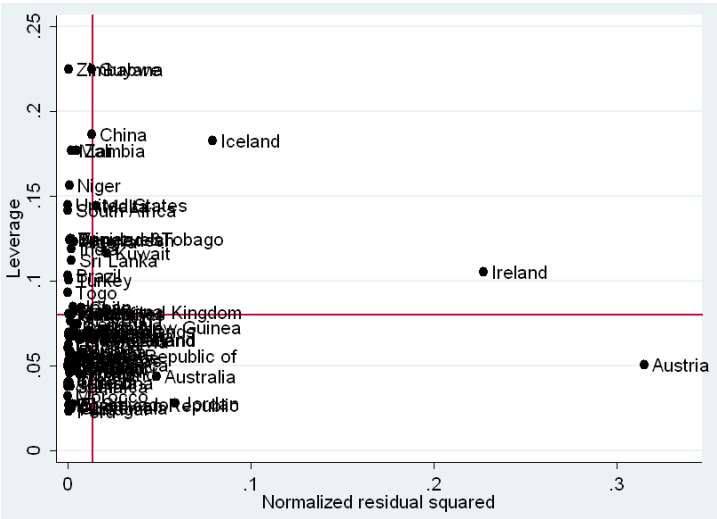


Fig.2: Residual Versus Leverage

TABLE 2
Robustness Check (Dependent Variable = FDI/GDP)

| Regressor | Coeff. | S.e. | *p*-value |
|---|---|---|---|
| $(FDI/GDP)_{t-1}$ | 0.559*** | 0.142 | 0.000 |
| Life Expectancy (log) | –3.377 | 2.567 | 0.188 |
| Population (log) | –0.184 | 0.407 | 0.651 |
| Telephone Line (log) | –0.074 | 0.228 | 0.746 |
| Economic Freedom (log) | 5.386** | 2.513 | 0.032 |
| Constant | 8.307 | 9.100 | 0.361 |
| *AR*(2) test (*p*-value) | | 0.141 | |
| *J*-test (*p*-value) | | 0.171 | |
| Number of Observation | | 282 | |
| Number of Countries | | 72 | |

Note: *, **, and *** denote the 10%, 5%, and 1% level of significance respectively. Relevant *p*- values are in parenthesis. *AR(2)* is a test of second-order residual serial correlation. *J*-test is the Hansen over identification test. Time dummies are included to capture period-specific effect but are not reported. Lag 2 and earlier are used as instrument for the equation in first-differences, while lag 1 in first-differences are used as instrument for the equation in levels. Moreover, collapsing instrument approach is adopted in the estimation.

the result is not affected by simultaneity bias. Therefore, our previous interpretation on the importance of promoting economic freedom in an effort to attract more FDI inflows remains unchanged. The link between EF and FDI is robust and not affected by outlier observations. The finding is in accordance with Bengoa and Sanchez-Robles (2003) and Quazi (2007) who find that improvements in the quality of EF is an important pre-condition for FDI inflows for Latin American and Asian countries, respectively.

## CONCLUSION

FDI has been viewed as an effective channel to transfer new technologies across countries. Accordingly, many countries, especially developing ones, compete against each other in order to attract more FDI. In an effort to further understand the nature of MNEs locational decisions, this paper draws from recent literature that emphasises on the importance of institutional quality in the development process. This paper argues that improvement in economic freedom has an important influence in attracting FDI because economic freedom creates more conducive environments for investors in terms of lower cost of doing business, lower uncertainty and better prospect for productivity improvement. To test the hypothesis, this study employs a Generalized Method of Moment panel estimator and data obtained from 75 countries over the period of 1981– 2005. Consistent with our argument, the results reveal that improvement in EF is an important pre-condition for host countries to have more FDI. Importantly, this finding is robust and not driven by biases due to endogeneity, weak instrument, or outliers' presence.

The findings of this paper clearly suggest that the policies formulated towards attracting FDI should emphasize more on promoting EF as higher level of EF which is likely to foster a healthy economic environment that is ready to attract more FDI inflow. EF can be further improved by promoting personal choice, voluntary exchange coordinated by markets, freedom to enter and compete in global markets, and protection of persons and their property from aggression by others. However, these efforts may be politically unpopular but the experiences of countries that have already achieved high level of EF indicate that this strategy produces tremendous long-term economic growth.

## REFERENCES


Ali, F. A., Fiess, N., & MacDonald, R. (2010). Do institutions matter for foreign direct investment? *Open Economies Review, 21*(2), 201–219.

Alguacil, M., Cuadros, A., & Orts, V. (2011). The role of macroeconomic and institutional environment. *Journal of Policy Modelling*, *33*(3), 481–496.

Alonso-Borrego, C., & Arellano, M. (1999). Symmetrically normalized instrument-variable estimation using panel data. *Journal of Business and Economic Statistic, 17*(1), 36–49.

Ang, J. B. (2008). Determinants of foreign direct investment in Malaysia. *Journal of Policy Modelling, 30*(1), 185–189.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence with an application for employment equation. *Review of Economic Studies, 58*(2), 277–297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental-variable estimation of error-components models. *Journal of Econometrics, 68*(1), 29–52.

Asiedu, E. (2002). On the determinants of foreign direct investment to developing countries: Is Africa different? *World Development, 30*(1), 107–119.

Azman-Saini, W. N. W., Baharumshah, A. Z., & Law, S. H., (2010a). Foreign direct investment, economic freedom and economic growth: International evidence. *Economic Modelling*, *27*(5), 1079–1089.

Azman-Saini, W. N. W., Law, S. H., & Ahmad, A.H. (2010b). FDI and economic growth: New evidence on the role of financial market. *Economics Letters*, *107*(2), 211–213.

Belsley, D., Kuh, E., & Welsh, R. (1980). *Regression diagnostics: Identifying influential data and sources of collinearity.* New York: Wiley.

Bengoa, M., & Sanchez-Robles, B. (2003). Foreign direct investment, economic freedom and growth: New evidence from Latin America. *European Journal of Political Economy, 19*(3), 529–545.

Blonigen, B. A. (2005). A review of the empirical literature on FDI determinants. *Atlantic Economic Journal*, *33*(4), 383–403.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), 115–143.

Borensztein, E., Gregorio, J., & Lee, J. (1998). How does foreign direct investment affect economic growth? *Journal of International Economics, 45*(1), 115–135.

Buckley, P. J., Clegg, L. J., Cross, A. R., Liu, X., Voss, H., & Zheng, P. (2007). The determinants

of Chinese outward foreign direct investment. *Journal of International Business Studies, 38*( 4), 499–518.

Cheng, L. K., & Kwan, Y. K. (2000). What are the determinants of the location of foreign direct investment? The China experience. *Journal of International Economics*, *51*(2), 379–400.

Desmet, K., & Parente, S. L. (2010). Bigger is better: Market size, demand elasticity and innovation. *International Economic Review, 51*(2), 319–333.

Dunning, J. (1993). *Multinational enterprises and the global economy*. Wokingham: Addison-Wesley Publishing Company.

Durham, J. (2004). Absorptive capacity and the effects of foreign direct investment and equity foreign portfolio investment on economic growth. *European Economic Review, 48*(2), 285–306.

Fedderke, J. W., & Romm, A. T. (2006). Growth impact and determinants of foreign direct investment into South Africa, 1956–2003. *Economic Modelling, 23*(5), 738–760.

Fosfuri, A., Motta, M., & Ronde, T. (2001). Foreign direct investment and spillovers through workers' mobility. *Journal of International Economics*, *53*(1), 205–222.

Glass, A., & Saggi, K. (2002). Multinational firms and technology transfer. *Scandinavian Journal of Economics*, *104*(4), 495–513.

Holtz-Eakin, D., Newey, W., & Rosen, H. S. (1988). Estimating vector autoregressions with Panel Data. *Econometrica, 56*(6), 1371–1395.

Kok, R., & Ersoy, B. A. (2009). Analyses of FDI determinants in developing countries. *International Journal of Social Economic*, *36*(1), 105–123.

Markusen, J. (1995). The boundaries of multinational enterprises and the theory international trade. *Journal of Economic Perspectives, 9*(2), 169–189.

Na, Lv., & Lightfoot, W. S. (2006). Determinants of foreign direct investment at the regional level in China. *Journal of Technology Management in China, 1*(3), 262–278.

Noorbakhsh, F., Paloni, A., & Youssef, A. (2001). Human capital and FDI inflows to developing Countries: New empirical evidence. *World Development, 29*(9), 1593–1610.

Quazi, R. (2007). Economic freedom and foreign direct investment in East-Asia. *Journal of the Asia Pacific Economy, 12*(3), 329–344.

Ramirez, M. D. (2006). Economic and institutional determinants of foreign direct investment in Chile: A time series analysis 1960–2001. *Contemporary Economic Policy, 24*(3), 459–471.

Roodman, D. (2009). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, *71*(1), 135–158.

Singh, R., McDavid, H., Birch, A., & Wright, A. (2008). The determinants of FDI in small developing nation states: An exploratory study. *Social and Economic Studies. 57*(3&4), 79–104.

UNCTAD (2001). World investment report: Promoting linkages. United Nations :

UNCTAD (2009). World investment report: Transnational corporations, agricultural production and development. United Nations

Wadhawa, K., & Reddy, S. S. (2011). Foreign direct investment into developing Asian countries: The role of market seeking, resource seeking and efficiency seeking factors. *International Journal of Business and Management, 6*(11), 219–226.

## APPENDIX A

## LIST OF COUNTRIES

| Country | Country | Country | Country |
|---|---|---|---|
| Algeria | El Salvador | Korea, Rep. | Senegal |
| Argentina | Finland | Malawi | Singapore |
| Australia | France | Malaysia | South Africa |
| Austria | Ghana | Mali | Spain |
| Bangladesh | Greece | Malta | Sri Lanka |
| Bolivia | Guatemala | Mexico | Sweden |
| Botswana | Guyana | Morocco | Switzerland |
| Brazil | Honduras | Netherlands | Thailand |
| Cameroon | Iceland | New Zealand | Togo |
| Canada | India | Nicaragua | Trinidad &Tobago |
| Chile | Indonesia | Niger | Tunisia |
| China | Iran, Islamic Rep. | Norway | Turkey |
| Colombia | Ireland | Pakistan | United Kingdom |
| Costa Rica | Israel | Panama | United States |
| Cote d`Ivoire | Italy | Papua New Guinea | Uruguay |
| Denmark | Jamaica | Paraguay | Venezuela |
| Dominican Rep. | Japan | Peru | Zambia |
| Ecuador | Jordan | Philippines | Zimbabwe |
| Egypt | Kenya | Portugal | |

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# The Importance of the Agricultural Sector to the Malaysian Economy: Analyses of Inter-Industry Linkages

**M. Yusof Saari[1]*, Emmy Farha Alias[2] and Norlaila Abdullah Chik[2]**

[1]*Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

[2]*Agricultural and Food Policy Studies Institute, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

This paper assesses the importance of the agricultural sector to the economic growth in Malaysia. A hypothetical extraction method was used to quantify the relative strength of backward and forward linkages of the agricultural sector. For empirical analyses, we ran an extended input-output table that takes into account detailed agricultural sub-sectors. Findings suggested that the agricultural sector contributes mainly through forward linkages, implying that the output of this sector is demanded larger by other sectors, in particular the manufacturing sector as their input. Large-scale oil palm (estate and smallholdings) should be highlighted for growth policies due to strong pull effects on the rest of the economic sector.

*JEL classification:* C67, O13, Q18

*Keywords:* Agriculture, linkages, input-output

## INTRODUCTION

How does the agricultural sector contribute to economic growth? There are reasons to be pessimistic about the role of the agricultural sector as an engine of growth in developing economies. Recent trends indicate that the agricultural sector represents a small share of gross domestic product (GDP) – on the average between 5% and 15% (see, for example, Valdés & Foster, 2010). Although the share of the agricultural sector in overall GDP is decreasing, it still plays an important role: growth in the agricultural sector contributes proportionally more to poverty reduction than growth in any other sector (see, for example, Diao *et al*., 2010; World Bank, 2002 ). In Malaysia, for instance, most poor people are trapped in the

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*E-mail address*:
mysaari@gmail.com (M. Yusof Saari)
* Corresponding author

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agricultural sector (34% of the total number of poor) and it might seem obvious that this is the 'key' sector for poverty reduction in the economy. However, agriculture's principal role in poverty reduction can only be taken up when its inter-industrial linkages with other production sectors are sufficiently strong and well developed.

Improving the agricultural sector itself, with the assumption that spillover effects to other production sectors of the economy will be generated automatically, is the common policy in developing economies. This has often not happened, leading to pessimism about the role of agricultural sector in economic development. Recently Valdés and Foster (2010) have shown that the main contribution of the agricultural sector to growth is through forward linkages rather than backward linkages, indicating that output from agricultural sector is demanded much higher than what it demands from other sectors. This implies that stimulating growth in the output of the agricultural sector would mostly benefit the sector itself, with minimal spillover effects to other sectors.

This paper is principally concerned with the question: to what extent is the magnitude of the multipliers associated with inter-industrial linkages between the agricultural and non-agricultural sectors relevant to the development of the Malaysian economy. To answer this empirical question, we measured the linkages between the agricultural sector and the rest of the economy by calculating the two commonly used methods of backward and forward linkages. Understanding the extent to which the agricultural sector is integrated with other sectors allowed us to estimate the potential for agriculture to have positive spillover effects on the growth of other sectors.

The linkages of agriculture sector were analysed within the framework of input-output analysis. The potential of input-output analysis for studying linkages among the sectors of an economy is widely recognised. This method allowed us to study the importance of the agricultural sector as a whole in the economic system, as well as to analyse the role played by each sub-sector and their relationships with other production sectors. For more meaningful analysis, we further extended the existing input-output table, accounting for detailed agricultural activities in the economy.

The rest of this paper is organised as follows. The next section explains the input-output model and its application to the analysis of agricultural linkages. Section of Data briefly discusses the data sources that have been used to run our analyses. The structure of the existing input-output table and how it has been extended to account for detailed agricultural sub-sectors is elaborated in some length. Results and Discussion presents the results of linkage analyses. Finally, Conclusions section summarises the main conclusions drawn from this paper.

## INPUT-OUTPUT MODEL

### *The hypothetical extraction method*

The study of sectoral relations and dependence has a long tradition within

the field of input-output analysis. In the input-output framework, two kinds of interdependence measures are developed. First, if a particular sector, say sector *j*, increases its output, this means there will be increased demands from sector *j* (as a purchaser) on the sectors whose goods are used as inputs to the production of *j*. This kind of interconnection is termed as backward linkage. On the other hand, increased output in sector *j* also means that additional amounts of product *j* are available to be used as inputs to other sectors for their own production, that is, there will be increased supplies from sector *j* (as a seller) for the sectors that used goods from *j* in their production. The term forward linkage is used to indicate this kind of interconnection.

Several studies have analysed the inter-industrial linkages of the agricultural sector in Malaysia (see, for example, Bekhet & Abdullah, 2010; Puasa & Rahman, 2008; Saari et al., 2008). All these studies have applied Rasmussen's (1956) traditional linkage measure; however, there have also been numerous suggestions for refinements of linkages (see Miller & Blair, 2009 for a detailed discussion). For our purpose, we applied the hypothetical extraction method instead of other traditional measures (see, for example, Chenery & Watanabe, 1958; Hirschman, 1958; Rasmussen, 1956). The hypothetical extraction method was proposed by Strassert (1968) and further formalised by Dietzenbacher et al. (1993) and Dietzenbacher and van der Linden (1997). The unique thing about this approach is that we were able to quantify explicitly the degree of the interdependency between the agricultural sector and other production sectors.

According to this approach, sectoral inputs should be hypothetically eliminated in order to measure the backward linkage. Leaving the technical production process invariant, it is thus assumed that the inputs required for production are no longer delivered by the sectors within the system, but have their origin outside the system. In our case, whenever the agricultural sector was considered, it was assumed that the required inputs were from non-agricultural sectors. The backward linkage was then obtained by comparing the actual production with the production in the hypothetical situation where the sector under consideration did not depend on any sector within the system. Similarly, the forward linkage of a sector was obtained by considering the hypothetical situation where this sector provided no intermediate deliveries. Therefore, this method allowed us to calculate explicitly output reduction for the rest of the production sectors as a result of extraction for a particular sector.

Let us start with an ordinary input-output table. with $n$ sectors and $z_{ij}$ denoting the intermediate deliveries from sector $i$ to sector $j$, the independencies among production activities can be shown based on the following material balance equation[1]:

[1]For clarity, matrices are indicated by bold, upright capital letters; vectors by bold, upright lower case letters, and scalar by italicized lower case letters. Vectors are columns by definition, so that row vectors are obtained by transposition, indicated by a prime (e.g. $\mathbf{x}'$). A diagonal matrix with the elements of vector x on its main

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{f} \quad (1)$$

where $\mathbf{x}$ is the vector for gross output $\mathbf{A}(\mathbf{A} = \mathbf{Z}\hat{\mathbf{x}}^{-1})$ is known as the technical coefficient and $\mathbf{f}$ is the vector for final demand. In the standard input-output model, (1) can be transformed and solved in matrix notation as follows:

$$\mathbf{x} = (\mathbf{I}-\mathbf{A})^{-1}\mathbf{f} = \mathbf{L}\mathbf{f} \quad (2)$$

where $\mathbf{I}$ is the identity matrix, and $(\mathbf{I}-\mathbf{A})^{-1}$ is known as the Leontief inverse matrix.

For the backward linkage, it was assumed that sector $j$ buys no intermediate inputs from any productions sector. Operationally, this was done by replacing column $j$ in $\mathbf{A}$ with zero entries. Let us denote this new matrix as $\bar{\mathbf{A}}_{(cj)}$ (subscript $c$ indicates that column $j$ only is gone). Then, the new output level as a result of extraction was given by

$$\bar{\mathbf{x}}_{(cj)} = (\mathbf{I} - \bar{\mathbf{A}}_{(cj)})^{-1}\mathbf{f} \quad (3)$$

in which the backward linkage for sector $j$ was directly obtained as

$$Bj = \mathbf{i}'\mathbf{x} - \mathbf{i}'\bar{\mathbf{x}}_{(cj)} \quad (4)$$

The backward linkage was based on the input coefficients matrix $\mathbf{A} = \mathbf{Z}\hat{\mathbf{x}}^{-1}$. Its element $a_{ij}$ measured the delivery $z_{ij}$ of sector $i$ to sector $j$ per unit of the buyer's output $x_j$.

The forward linkage was based on the output coefficients matrix $(\mathbf{B} = \hat{\mathbf{x}}^{-1}\mathbf{Z})$. Its element $b_{ij}$ measured the delivery $z_{ij}$ of sector $i$ to sector $j$ per unit of the seller's output $x_i$. For the forward linkage, we used the following accounting equations and identities.

$$\mathbf{x}' = \mathbf{x}'\mathbf{B} + \mathbf{v}' = \mathbf{v}'(\mathbf{I} - \mathbf{B})^{-1} \quad (5)$$

where $\mathbf{v}'$ is the (row) vector of primary inputs (i.e. value added and imports).

It is important to note here that Saari *et al*. (2008) and Puasa and Rahman (2008) relied on the coefficient in matrix $\mathbf{A}$ to calculate both the backward and forward linkages. This is inappropriate and both have been viewed with scepticism, because they are generated by a peculiar stimulus.

In contrast to the backward linkage, the forward linkage of sector $j$ is hypothetical, extracted through elimination of the sector's intermediate sale in the matrix $\mathbf{B}$ (i.e. sector $j$ does not sell intermediate deliveries to sector $i$). That is, we replaced row $j$ of the matrix $\mathbf{B}$ with a row of zeros and we defined this new matrix as $\bar{\mathbf{B}}_{(rj)}$. It follows directly that the new output level as a result of extraction was given by

$$\bar{\mathbf{x}}'_{(rj)} = \mathbf{v}'(\mathbf{I} - \bar{\mathbf{B}}_{(rj)})^{-1} \quad (6)$$

in which the forward linkage for sector $j$ was directly obtained as

$$F_j = \mathbf{x}'\mathbf{i} - \bar{\mathbf{x}}'_{(rj)}\mathbf{i} \quad (7)$$

Normalisations for (4) and (7) are possible and often used. Division of (4) and (7) by $\sum_{j=1}^{n} x_j$ would give the percentage decrease in total output. That is,

$$\bar{B}_j = 100[(\mathbf{i}'\mathbf{x} - \mathbf{i}'\bar{\mathbf{x}}_{(cj)}) / \mathbf{i}'\mathbf{x}] \quad (8a)$$

$$\bar{F}_j = 100[(\mathbf{i}'\mathbf{x} - \mathbf{i}'\bar{\mathbf{x}}_{(rj)}) / \mathbf{x}'\mathbf{i}] \quad (8b)$$

diagonal and all other entries equal to zero are indicated by a circumflex (e.g. $\hat{\mathbf{x}}$). A summation vector is represented by $\mathbf{i}$.

Similarly, the index relative to the average were obtained as follows:

$$\tilde{B}j = n\bar{B}j / \mathbf{i}'\bar{B}j \tag{9a}$$

$$\tilde{F}j = n\bar{F}j / \mathbf{i}'\bar{F}j \tag{9b}$$

*The Agricultural sub-system*

Results of linkages that we obtained in this study (see Agricultural linkages) indicate that agricultural sub-sectors have been associated with lower backward and forward linkages. Of all 26 agricultural sub-sectors, 25 activities have linkage indices below the average of all sectors in the economy. In turn, it seems that the agricultural sub-sectors only have strong interdependence within their own economic system and less spillover effects on the rest of the economic sectors. This leads to the question: should we consider the agricultural sector in Malaysia as a single sub-system delinked from the rest of the systems? To quantify this, we extended our analysis by treating the agricultural sector as a sub-system generating a single output. Our approach here was based on previous methodology developed by Heimler (1991) and, later, by Alcántara and Padilla (2009) for the decomposition of an input-output matrix into sub-systems. We started our methodological approach by partitioning (1) in the following way:

$$\begin{pmatrix} \mathbf{x}_A \\ \mathbf{x}_R \end{pmatrix} = \begin{pmatrix} \mathbf{A}_{AA} & \mathbf{A}_{AR} \\ \mathbf{A}_{RA} & \mathbf{A}_{RR} \end{pmatrix} \begin{pmatrix} \mathbf{x}_A \\ \mathbf{x}_R \end{pmatrix} + \begin{pmatrix} \mathbf{f}_A \\ \mathbf{f}_R \end{pmatrix} \tag{10}$$

where subscripts $A$ and $R$ denote production sectors that belong to the agricultural sector and production sectors that do not belong to the agricultural sector, respectively. It follows directly that (2) can be partitioned in a similar way

$$\begin{pmatrix} \mathbf{x}_A \\ \mathbf{x}_R \end{pmatrix} = \begin{pmatrix} \mathbf{L}_{AA} & \mathbf{L}_{AR} \\ \mathbf{L}_{RA} & \mathbf{L}_{RR} \end{pmatrix} \begin{pmatrix} \mathbf{f}_A \\ \mathbf{f}_R \end{pmatrix} \tag{11}$$

or

$$\mathbf{x}_A = \mathbf{L}_{AA}\mathbf{f}_A + \mathbf{L}_{AR}\mathbf{f}_R \tag{12a}$$

$$\mathbf{x}_R = \mathbf{L}_{RA}\mathbf{f}_A + \mathbf{L}_{RR}\mathbf{f}_R \tag{12b}$$

The way the input-output is partitioned basically decomposes the input-output model into sector groups. This kind of analysis allowed us to examine the specific productive structure of each of the $n$ sectors of the economic system.

Assuming the final demand of the agricultural sector $\mathbf{f}_A$ only is a variable, the total output effects were divided into two components. The first expression on the right-hand side of (12a) represents the requirements for own inputs that each activity in the agricultural sub-system needs to satisfy its new final demand. We termed this the own-component effect. The second expression on the right-hand side of (12b) shows the production inputs required by each agricultural sub-sector from other sub-systems. This was considered as the spillover effect. The spillover effect was of greater interest because lower spillover effect implies weak integration with other

sub-systems. Therefore, the agricultural sector is totally independent.

## DATA

Analyses were run by using the latest input-output table for 2005 published by the Department of Statistics Malaysia (DOSM, 2010). The input-output table consisted of 120 sectors and was classified according to the Malaysia Standard Industrial Classification (MSIC, see DOSM, 2000). There are 12 agriculture sub-sectors distinguished in the table (for details, see Appendix 1). This sectoral disaggregation, however, may have limitations in offering a complete analysis of the role of the agricultural sector in the Malaysian economy. A more meaningful analysis should be carried out with a finer sectoral disaggregation. For this purpose, we extended the standard input-output table by further detailing the sectors of food crops, fruits, rubber, oil palm, other livestock, forestry and logging, and fishing into their specific individual activity (the full lists of the disaggregation are available in Appendix 1). Unfortunately, a more detailed sectoral breakdown was not possible for the paddy, vegetables, flower plants and poultry farming sectors due to data limitations. As a result of this extension, the sectoral breakdown of the agricultural sub-sectors increased from 12 to 26 sectors. Therefore, taken together, the total sectoral breakdown in our extended input-output table is 134 sectors.

The extended input-output for the agricultural sub-sectors was constructed in two steps. The first step was to assemble a supplementary matrix (supplied by the DOSM) that contains intermediate deliveries (intermediate inputs and demands) and primary inputs of the 26 agricultural sub-sectors into the standard input-output table. However, the flows of intermediate inputs and demands for the rest of the production sectors (i.e. sector 27 to sector 134) were provided in an aggregated form (i.e., only one row for the intermediate inputs and one column for the intermediate demands). Thus, the main task remaining was to disaggregate these flows. For this purpose, a proportionality assumption based on production structures in the standard input-output table was used to distribute the intermediate inputs and demands. For example, the fruits sector (sector 4 in the standard input-output table) was disaggregated into growing pineapples and growing other fruits (sector 8 and sector 9 in the extended input-output table). Then, a similar structure of intermediate inputs and demands of the fruits sector was applied to growing pineapples and growing other fruits. Results from our analyses were not sensitive to this procedure as long as the primary concern were agricultural sub-sectors and their connection with other sectors in the economy was analysed at aggregated sector.

In addition, the supplementary matrix that was provided by the DOSM did not distinguish final demand's detailed components. In our extended input-output table, we broke down final demand into two categories: domestic demand and export. Export data for each of the 26 agricultural sectors was obtained from external trade statistics (DOSM, various years) which

was classified according to the standard international trade classification (SITC). The fact that the economic activities in the input-output table were classified according to the MSIC means the export data must be re-classified. For this purpose, DOSM provided a concordance to re-classify SITC into MSIC. We estimated domestic demand using a residual approach, i.e. taking the difference between the total final demand and export.

Assembling the supplementary matrix and application of proportionality assumption would lead to an unbalanced matrix, i.e. equality of the total output and total input for each sector would not be satisfied. Thus, the next step was to balance the whole input-output table. We used the RAS method for balancing a matrix, given that the row and column sums were known (for an overview of RAS, see Miller & Blair, 2009). In our case, we took the row and column sums from the standard input-output table and the supplementary matrix.

## RESULTS AND DISCUSSION

Results are presented in two analyses. The first analysis discusses the degree of connectedness of the agriculture sub-sectors through backward and forward linkages. The second analysis simulates how growth in the agriculture sub-sectors could have significant implication on the whole economy.

### *Agricultural linkages*

The hypothetical extraction method, as sketched above, was applied to the 134 sectors of the Malaysian extended input-output table. Results for the total backward and forward linkages are given in Table 1 and Table 2, respectively. The first three rows of Table 1 show the results in aggregated sectors. For backward linkages, for example, if the agricultural sector is hypothetically removed or disappears from the system, the total output in the economy would fall by 1.8% or 30 billion MR (Malaysian *Ringgit*) from its actual level. Of this, 32% is explained by the loss of its own sector, 32.4% by the manufacturing sector and another 35.6% by the services sector. The forward linkages can be interpreted in a similar fashion. The total output falls by 5.6% or 90 billion MR due to the fact that the output of the agricultural sector is no longer used for further production processes. Of this, there will be a 50% decrease in the output of other sectors (37.1% for the manufacturing sector and 13% for the services sector) due to the fact that no output is supplied from the agricultural sector.

In the aggregated sector, the production structures of the agricultural sector exhibited a large difference compared to other sectors. This sector had the weakest linkages in the economic system. Extraction of this sector reduced total output by 1.8%, which was the smallest reduction seen. This was in contrast to the manufacturing sector, extraction of which led to a 30.6% reduction in total output. Results for the forward linkages were more or less the same as was the case for the backward linkages. However, the agricultural connectedness for the forward linkages was even larger than for the backward linkages (for forward linkages,

TABLE 1
Hypothetical extraction results for backward linkages (% reduction of output)

| | Total economy | Own sector | Agri. sector | Manuf. sector[1] | Serv. sector[2] |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Manufacturing* | 30.67 | | 6.78 | 52.66 | 40.55 |
| Services** | 20.88 | | 3.01 | 28.93 | 68.06 |
| Agriculture | 1.83 | | 32.00 | 32.37 | 35.63 |
| Paddy | 0.02 | 8.81 | 1.04 | 36.56 | 53.59 |
| Growing of sugar cane & tapioca | 0.00 | 38.33 | 1.08 | 29.55 | 31.03 |
| Growing of cocoa | 0.01 | 38.49 | 3.16 | 28.45 | 29.90 |
| Growing of tea & coffee | 0.00 | 35.77 | 39.31 | 11.46 | 13.45 |
| Growing of pepper | 0.01 | 38.33 | 1.08 | 29.55 | 31.03 |
| Growing of coconuts | 0.03 | 38.34 | 1.07 | 29.55 | 31.03 |
| Vegetables | 0.01 | 43.68 | 4.63 | 25.17 | 26.52 |
| Growing of pineapples | 0.01 | 43.22 | 17.87 | 18.30 | 20.61 |
| Other fruits (banana, durian & other fruits) | 0.03 | 40.72 | 6.96 | 24.84 | 27.48 |
| Rubber estate | 0.01 | 0.49 | 6.27 | 31.32 | 61.92 |
| Rubber smallholdings | 0.13 | 0.29 | 2.51 | 32.65 | 64.55 |
| Oil palm estate | 0.62 | 16.20 | 14.72 | 28.13 | 40.95 |
| Oil Palm Smallholdings | 0.26 | 46.15 | 17.47 | 14.99 | 21.39 |
| Flower plants | 0.08 | 40.78 | 1.15 | 25.73 | 32.35 |
| Other agriculture | 0.03 | 72.95 | 20.60 | 4.27 | 2.19 |
| Poultry farming | 0.09 | 69.35 | 1.52 | 20.29 | 8.84 |
| Cattle farming | 0.08 | 4.03 | 4.89 | 61.14 | 29.94 |
| Pig farming | 0.37 | 24.09 | 3.73 | 48.45 | 23.73 |
| Other livestock farming | 0.11 | 1.98 | 83.18 | 10.30 | 4.54 |
| Logging (except rubber wood logging) | 0.10 | 0.16 | 1.36 | 59.06 | 39.42 |
| Collection of rattan and other jungle produce | 0.03 | 0.05 | 1.47 | 59.07 | 39.42 |
| Bird's nest collection | - | - | - | - | - |
| Rubber wood logging & forest services | 0.06 | 0.02 | 1.49 | 59.07 | 39.42 |
| Ocean and coastal fishing | 0.13 | 38.26 | 9.26 | 32.72 | 19.75 |
| Inland fishing & fishing | 0.04 | 15.61 | 3.42 | 50.49 | 30.48 |
| Aquaculture | 0.09 | 14.94 | 19.95 | 40.60 | 24.50 |

Notes: (*) including mining and quarrying and (**) including construction sector

TABLE 2
Hypothetical extraction results for forward linkages (% reduction of output)

| | Total economy | Own sector | Agri. sector | Manuf. sector[1] | Serv. sector[2] |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Manufacturing* | 40.39 | | 0.69 | 86.54 | 12.77 |
| Services** | 43.04 | | 0.79 | 22.63 | 76.58 |
| Agriculture | 5.59 | | 49.78 | 37.15 | 13.07 |
| Paddy | 0.10 | 2.10 | 0.88 | 83.87 | 13.15 |
| Growing of sugar cane & tapioca | 0.01 | 12.61 | 0.67 | 71.03 | 15.69 |
| Growing of cocoa | 0.02 | 12.40 | 0.67 | 71.20 | 15.73 |
| Growing of tea & coffee | 0.00 | 9.92 | 0.69 | 73.22 | 16.17 |
| Growing of pepper | 0.01 | 12.61 | 0.67 | 71.03 | 15.69 |
| Growing of coconuts | 0.04 | 12.61 | 0.67 | 71.03 | 15.69 |
| Vegetables | 0.01 | 53.63 | 3.54 | 19.55 | 23.27 |
| Growing of pineapples | 0.01 | 50.76 | 0.33 | 33.85 | 15.07 |
| Other fruits (banana, durian & other fruits) | 0.02 | 53.89 | 0.30 | 31.70 | 14.11 |
| Rubber estate | 0.01 | 0.65 | 0.48 | 76.53 | 22.35 |
| Rubber smallholdings | 0.10 | 0.39 | 0.74 | 76.53 | 22.35 |
| Oil palm estate | 2.12 | 4.76 | 0.61 | 76.43 | 18.20 |
| Oil Palm Smallholdings | 0.32 | 0.15 | 0.81 | 79.99 | 19.05 |
| Flower plants | 0.14 | 15.14 | 25.16 | 48.15 | 11.55 |
| Other agriculture | 0.12 | 21.07 | 32.08 | 37.81 | 9.04 |
| Poultry farming | 0.21 | 31.15 | 30.43 | 27.02 | 11.39 |
| Cattle farming | 0.03 | 11.82 | 0.62 | 61.12 | 26.45 |
| Pig farming | 0.26 | 5.35 | 0.93 | 65.43 | 28.30 |
| Other livestock farming | 0.25 | 0.84 | 0.80 | 68.67 | 29.69 |
| Logging (except rubber wood logging) | 0.47 | 0.03 | 0.30 | 77.09 | 22.58 |
| Collection of rattan and other jungle produce | 0.14 | 0.01 | 0.32 | 77.09 | 22.58 |
| Bird's nest collection | - | - | - | - | - |
| Rubber wood logging & forest services | 0.07 | 0.00 | 0.33 | 77.09 | 22.58 |
| Ocean and coastal fishing | 0.09 | 52.11 | 0.62 | 34.79 | 12.48 |
| Inland fishing & fishing | 0.05 | 11.51 | 38.34 | 36.92 | 13.24 |
| Aquaculture | 0.04 | 36.34 | 0.70 | 46.34 | 16.62 |

Notes: (*) including mining and quarrying and (**) including construction sector

extraction of this sector reduced total output by 5.6%). These results are consistent with a recent study by Valdés and Foster (2010) indicating that the main contribution of the agricultural sector comes through forward, not backward, linkages. This implies that output from agricultural sector is demanded much higher than what it demands from other sectors.

Besides calculating the linkages of the entire agricultural sector (and other sectors) as a whole, we further detailed the results for each of the 26 agricultural activities. Linkages for the edible bird nest collection activity requires further explanation. Extraction of this activity did not have any impact on backward and forward linkages. This was not surprising, because this sector did not purchase any intermediate input from other sectors and all output was destined for final demand. Thus, this agricultural activity was totally independent from the entire economic system.

Results for the backward linkages show that most of the agricultural activities are weakly linked to the rest of the sectors in the economy. Only three agricultural activities show considerable linkages with other sectors: oil palm estate, pig farming and oil palm smallholdings. These three economic activities demand a considerably higher share of intermediate inputs from the rest of the sectors. Extraction of these economic activities leads to lower reduction of output in their own sectors compared to the extraction of other agricultural activities. Results show that the manufacturing sector is the major input supplier to the pig farming (accounting for 48.5%), while the services sector is the main input supplier for the oil palm estate and oil palm smallholdings (account for 41% and 21.4%, respectively).

Results of individual activity are similar to those of the aggregated sector, i.e., the agricultural connectedness for the forward linkages is larger than for the backward linkages. For example, the forward linkages for the oil palm estate are more than triple those of the backward linkages. Among the agricultural sub-sectors, oil palm estate, logging and oil palm smallholdings are the sectors that show considerable integration with other sectors. It can be seen that the manufacturing sector is the major consumer of the products of these sub-sectors. For example, extraction of oil palm estate reduced the total output of the manufacturing sector by 76.4%. The fact that the manufacturing sector shows higher backward and forward linkages therefore discriminates against oil palm in general and oil palm estate in particular, and is likely to hinder economic growth.

Next, we constructed linkage indices to access the relative linkage strength of agricultural sub-sectors and those of other sectors. For this purpose, we normalised the backward and forward linkages by the average of the linkages for all 134 sectors in the economy [see equations (9a) and (9b)]. Individual agricultural activity with backward and forward linkage indices greater than 1 is considered to have strong linkages. For example, backward linkages that are greater than 1 mean that a unitary

increase in final demand for a particular sector generates an above-average increase in activity in the economy.

Fig.1 shows the distribution of the 134 sectors according to the normalised backward and forward indices. The distribution shows that 96% of the agricultural activities (25 out of 26 activities) have below-average linkages for both backward and forward indices. Results suggest that almost all agricultural sub-sectors are weak-linkage sectors. Only oil palm estate has strong backward and forward linkages. This provides an indication that oil palm estate uses a significant amount of input from other sectors, and considerable amounts of its output are sold to other sectors for their inputs.

Comparison of the strengths of backward and forward linkages for the sectors in a single economy provides one mechanism for identifying 'key' or 'leading' sectors in that economy (those sectors that are most connected and therefore, in some sense, most 'important'). Determination of a key sector is important for a developing country, given the scarcity of resources, and so the necessity for investment to be selective. In linkage analyses, a key sector is defined as the sector associated with above average backward and forward indices (i.e. greater than 1). Fig.1 clearly shows that oil palm estate is the key (and most important) sector in the Malaysian economy. Investment in this key sector would then initiate economic development due to interaction with other sectors. Thus, development of oil palm estate could potentially have large impacts on the rest of the economy.

The linkage analyses in this sub-section

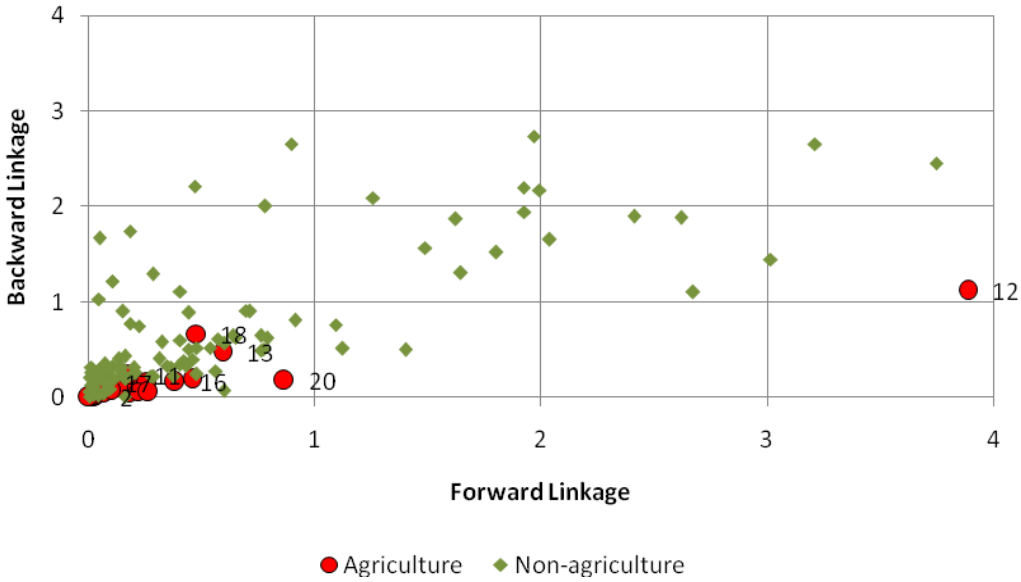


Fig.1: Classification of backward and forward indices for 134 sectors

suggested that the agricultural sector as a whole has a lower degree of economic integration with the rest of the economy. It appears that the output of the agricultural sector is demanded by other sectors more than what it demands from other sectors. The implication is policies designed for higher economic growth may be targeted to the other sectors (e.g. manufacturing and services sectors) than the agricultural sector. Stimulating growth of the agricultural sector would not benefit the whole economy (lower backward linkages) given the fact that it depends more on the growth of other sectors (higher forward linkages).

However, relying heavily on linkages to quantify the importance of the agricultural sector may not provide a complete overview. It is then important to note here that linkage analyses reflect the size effect of the production sector, that is, linkages tend to be lower in the smaller sectors such as paddy and growing sugar cane and tapioca (because smaller sectors use less intermediate input and so are less integrated). Thus, in the next sub-section, we measured explicitly the extent to which growth in the agricultural sector affects the growth of the rest of the economy. In our analyses, we 'removed' the size effect by simulating a fixed increase in final demand for each agricultural sub-sector.

*Simulating growth impacts*

In this sub-section, the total impacts were simulated by assuming a fixed increase in the final demand of agricultural activities. For instance, results were computed for the case of a one-billion MR (BMR) increase in final demand for the products of a single agricultural sector $j$ (=1….. 26), while the final demand levels in other sectors remain unchanged. Results are given in Table 3. For example, one BMR extra final demand of paddy led to an increase of 1.4 BMR of total output in the economy (see column (1) of Table 3). The last three columns decompose the increase in the total output into two components: own-component effect (column 2) and spillover effect (columns (3) and (4)). Recall that own-component represents the output effect of its own sector and the spillover effect demonstrates the pull effects of the different sectors. For the paddy sector, of the total increase in output, 74% is explained by own-component and another 26% is contributed by the output of other sectors (0.3% for other agriculture sub-sectors and 26% for other sectors).

Fixing the amount by which the final demand level is changed (i.e. one BMR in our case) allowed for a comparison of the output responses across sectors. As an alternative, one might have chosen to increase the final demand level of a sector by a fixed percentage. Both calculations have their pros and cons. The advantage of using a fixed size for the change is that a comparison across sectors is not 'blurred' by the size of the sectors. A disadvantage of using a fixed size (of one BMR) for the change is that the effects are also calculated in cases where any final demand increase is unrealistic. For example, a one-BMR increase in final demand equals a 22% increase for rubber smallholdings, whereas

TABLE 3
Change in output arising from a 1 billion MR increase in final demand

| | Total economy (MR mil) | Decomposition of total effects (%) | | |
|---|---|---|---|---|
| | | Own component | Other agri. | Other sectors |
| | (1) | (2) | (3) | (4) |
| Paddy | 1,399 | 74.00 | 0.30 | 25.70 |
| Growing of sugar cane & tapioca | 1,171 | 90.98 | 0.16 | 8.86 |
| Growing of cocoa | 1,689 | 74.92 | 1.29 | 23.79 |
| Growing of tea & coffee | 1,327 | 84.16 | 9.70 | 6.15 |
| Growing of pepper | 1,757 | 73.43 | 0.46 | 26.10 |
| Growing of coconuts | 1,939 | 70.14 | 0.52 | 29.34 |
| Vegetables | 1,370 | 84.78 | 1.25 | 13.97 |
| Growing of pineapples | 1,976 | 71.96 | 8.83 | 19.21 |
| Other fruits (banana, durian & other fruits) | 1,594 | 77.90 | 2.59 | 19.51 |
| Rubber estate | 1,412 | 70.98 | 1.83 | 27.19 |
| Rubber smallholdings | 1,417 | 70.65 | 0.74 | 28.62 |
| Oil palm estate | 1,544 | 70.48 | 5.19 | 24.34 |
| Oil Palm Smallholdings | 1,876 | 74.85 | 8.16 | 16.99 |
| Flower plants | 1,947 | 71.19 | 0.56 | 28.25 |
| Other agriculture | 1,647 | 89.38 | 8.09 | 2.53 |
| Poultry farming | 1,900 | 85.48 | 0.72 | 13.80 |
| Cattle farming | 1,884 | 54.97 | 2.29 | 42.74 |
| Pig farming | 2,514 | 54.28 | 2.25 | 43.47 |
| Other livestock farming | 1,609 | 62.91 | 31.48 | 5.62 |
| Logging (except rubber wood logging) | 1,233 | 81.13 | 0.26 | 18.62 |
| Collection of rattan and other jungle produce | 1,323 | 75.61 | 0.36 | 24.03 |
| Bird's nest collection | 1,000 | 100.00 | - | - |
| Rubber wood logging & forest services | 1,801 | 55.53 | 0.66 | 43.81 |
| Ocean and coastal fishing | 1,705 | 74.47 | 3.83 | 21.70 |
| Inland fishing & fishing | 1,953 | 58.82 | 1.67 | 39.51 |
| Aquaculture | 1,613 | 67.68 | 7.58 | 24.74 |

growing sugar cane and tapioca has very little final demand and an increase of one BMR equates to almost 379% of its current final demand. This implies that the results should be interpreted with care, particularly in connection to issues of policy making.

Results for the spillover effect are of the greatest interest, because they quantify the importance of the agricultural sector in pulling other sectors. This effect is no more than the result of the backward linkages. Results show that not all of the agricultural sub-sectors are of the same importance. Cattle farming, pig farming and rubber wood logging and forest services sectors have made a significant impact on the rest of the economy, being responsible for more than 40% of the spillover effect to other

sectors. More importantly, the spillover effect of these sectors was larger for other sectors than within other agricultural sub-sectors itself, implying that the integration of these sectors with the manufacturing and services sectors is considerable.

The weakest spillover effect sectors (and so less important sectors) were growing sugar cane and tapioca, growing tea and coffee, other agriculture and edible bird nest collection. For these sub-sectors, growth in final demand mainly benefitted their own sector, with benefits ranging from 84% for growing tea and coffee to 100% for edible bird nest collection. Since these four sub-sectors demonstrated weak integration with other sectors, they can be formed as a sub-system that is totally (or to a large extent) independent from the rest of the sub-systems. Other agricultural sub-sectors have likewise made considerable impact on other sectors. All in all, results in this sub-section suggest that the agricultural sector cannot be treated as a single sub-system (i.e. delinking it from the rest of the system) given its positive and fairly strong integration with other sectors.

## CONCLUSION

In this paper, we analysed the inter-industrial linkages of the agricultural sector and the Malaysian economy within the framework of input-output analysis. For this purpose, we constructed an extended version of an input-output table, accounting for detailed agricultural sub-sectors in the economy. Using this extended input-output table, backward and forward linkages were calculated by applying the hypothetical extraction method. These analyses allowed us to quantify the importance of the agricultural sector to economic growth and its relationship with other production sectors.

The linkage analyses show that the agricultural sector in general has a lower degree of economic integration with the rest of the economy. Backward and forward indices for the agricultural sector are lower than the average of the economy; however, this does not imply lower importance of the agricultural sector to Malaysian economic growth. The lower linkages are mainly determined by its size – that is, the agricultural sector has a far smaller share of national output. Due to its lower production of output, the agricultural sector demands a lower share of intermediate inputs from the rest of the economy, and as a consequence it has a lower degree of integration compared to other large sectors. Thus, our results tend to suggest that the agricultural sector's contribution to Malaysian economic growth is fairly important. The main contribution of the agricultural sector is through forward linkages, in which output of this sector is in high demand from other sectors, in particular manufacturing.

It is fair to mention here our main limitations. This study only examines the inter-industrial linkages of output growth for the agricultural sector. We do not measure the relative contribution of the agricultural sector from other perspectives, such as on GDP or poverty. Growth in domestic-driven sectors like the agricultural sector may

contribute relatively more to national GDP than growth in the manufacturing sector (a sector that is commonly associated with higher leakages because it relies heavily on imported input). Similarly, it is well documented that the agricultural sector has a greater relative impact on poverty eradication than its observed share in the economy. Modelling for GDP and poverty, however, would require massive amounts of additional data, and we consider such analyses beyond the scope of this study .

## REFERENCES


Alcántara, V., & Padilla, E. (2009). Input-output subsystems and pollution: An application to the service sector and $CO_2$ emissions in Spain. *Ecological Economics*, *68*, 905-14.

Bekhet, H. A., & Abdullah, A. (2010). Energy use in agriculture sector. *International Business Research*, *3*, 111-21.

Chenery, H. B., & Watanabe, T. (1958). International comparisons of the structure of production. *Econometrica*, 26, 487-521.

Department of Statistics Malaysia. (2010). *Malaysia input-output tables 2005*. Putrajaya: Department of Statistics Malaysia.

Department of Statistics Malaysia. (various years). *External trade statistics*. Putrajaya: Department of Statistics Malaysia.

Diao, X., Hazell, P., & Thurlow, J. (2010). The role of agriculture in African development. *World Development*, *38*, 1375-83.

Dietzenbacher, E., & van der Linden, J. A. (1997). Sectoral and spatial linkages in the EC production structure. *Journal of Regional Science*, *37*, 235-57.

Dietzenbacher, E., van der Linden, J. A., & Steenge, A. E. (1993). The regional extraction method: Applications to the European community. *Economic System Research*, *5*, 185-206.

Heimler, A. (1991). Linkages and vertical integration in the Chinese economy. *Review of Economics and Statistics*, *73*, 261-67.

Hirschman, A. O. (1958). *The strategy of economic development*. New Haven: Yale University Press.

Miller, R. E., & Blair, P. D. (2009). *Input-output analysis: Foundations and extensions*. Cambridge: Cambridge University Press.

Puasa, A. F., & Rahman, R. A. (2008). Key sectors in the Malaysian economy to accelerate economic growth. In A. Radam, & M. R. Yacob, (Eds.), *The Malaysian agricultural sector*. Serdang: Universiti Putra Malaysia Press.

Rasmussen, P. N. (1956). *Studies in intersectoral relations*. Amsterdam: North-Holland.

Saari, M. Y., Radam, A., & Abdullah, A. M. (2008). The role of agricultural sector in the Malaysian economy. In A. Radam, & M. R. Yacob, (Eds.), *The Malaysian agricultural sector*. Serdang: Universiti Putra Malaysia Press.

Strassert, G. (1968). Zur bestimmung strategischer sektoren mit hilfe von input-output modellen. *Jahrbücher für NationalÖkonomie und Statistik*, *182*, 211-15.

Valdes, A., & Foster, W. (2010). Reflections on the role of agriculture in pro-poor growth. *World Development*, *38*, 1362-74.

World Bank. (2002). *Reaching the rural poor: A renewed strategy for rural development*. Washington, DC: World Bank.

## APPENDIX 1

Agricultural sectoral breakdown

| MSIC | Input-output table (120 sectors) | Input-output table (134 sectors) |
|---|---|---|
| 01111 | Paddy | Paddy |
| 01113, 01114 | Food crops | Growing of sugar cane & tapioca |
| 01131 | | Growing of cocoa |
| 01132, 01133 | | Growing of tea & coffee |
| 01136 | | Growing of pepper |
| 01137 | | Growing of coconuts |
| 01121 | Vegetables | Vegetables |
| 01134 | Fruits | Growing of pineapples |
| 01135, 01138, 01139 | | Other Fruits (Banana, Durian & other fruits) |
| 01115 | Rubber | Rubber Estate |
| 01116 | | Rubber Smallholdings |
| 01117 | Oil palm | Oil Palm Estate |
| 01118 | | Oil Palm Smallholdings |
| 01129 | Flower plants | Flower plants |
| 01112, 01119, 01400, 01300 | Other agriculture | Other agriculture |
| 01212 | Poultry farming | Poultry farming |
| 01211 | Livestock | Cattle farming |
| 01213 | | Pig farming |
| 01219 | | Other livestock farming |
| 02001 | Forestry and logging | Logging (except rubber wood logging) . |
| 02002, 02003, 02004 | | Collection of rattan and other jungle produce |
| 02005 | | Bird's nest collection |
| 02006, 02009 | | Rubber wood logging & Forest services n.e.c. |
| 05001 | Fishing | Ocean and coastal fishing. |
| 05002, 05009 | | Inland fishing & Fishing n.e.c. |
| 05003 | | Aquaculture. |

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# Human Capital Inequality and Income Inequality: Developing Countries

**Suraya Mahmood[1] and Zaleha M. N.[2]***

[1]*School of Economics, Finance and Banking, College of Business, University Utara Malaysia, 06010 UUM Sintok, Kedah, Malaysia*
[2]*Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

This paper examines the effect of human capital inequality on income inequality in Developing Countries. Gini coefficient is used as a consistent measurement for both inequalities. This paper also adds a few control variables: Globalization Index, GDP per capita and total population.It uses dynamic panel data two-Step System Generalized Method of Moment (GMM) for 52 countries over the period of 1970-2010. The empirical results show that human capital inequality has a significance positive effect on income inequality. This result is similar with the theoretical framework,where the human capital inequality and income inequality are positively correlated. However, other control variables such as Global and total population are insignificant with income inequality except for GDP per capita at 5 and 10 percent level. Thus, in order to reduce income inequality and to give citizens equal opportunities, governments of developing countries and policymakers need to minimise human capital inequality.

*Keywords:* Human capital inequality, income inequality, Generalized Method of Moment (GMM), developing countries

## INTRODUCTION

The persistently increasing income inequalities in most developing countries have been producing negative effects on the economies since 1980s until now. Some of these effects are political, social and economic in nature; such as, political instability, unhappy society, pressure for higher wealth redistribution, increasing crime rate, and low rate of growth[1]. The role

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*E-mail addresses*:
ayarus81@yahoo.com (Suraya Mahmood),
lehnoor@upm.edu.my (Zaleha M. N.)
* Corresponding author

[1](Barro, 2000; Persson & Guido, 1994; Thorbecke & Charumilind, 2002; Kelly (2000); Brush, 2007)

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of human capital is measured by the average years of education in order to reduce income inequality and its effects. It is one of the most important variables especially in 21st century as reported by World Bank (2009). However, the economic performance of a country should not solely depend on its average level of human capital in view of the fact that human capital is not freely traded in a market. The equal distribution of human capital all over the country is also vital in analyzing the country's economic performance as well as reducing income inequality. It is due to human capital functions as one of the determinants in influencing income inequality.

Theoretically, the human capital inequality and income inequality are positively correlated (Fields, 1980; Chakraborty & Das, 2005). If human capital inequality is high, income inequality can be expected to be high. However, previous studies have been using different measurements to estimate the effects of inequality in distribution of human capital on income inequality. They have shown contradictory or inconclusive results between these two variables. For example, Ram (1990) Park (1996) and Gregorio and Lee (2002) use a standard deviation of education as a measurement for human capital inequality and income share for income inequality in support of cross country data. They find that the existence of higher human capital inequality leads to higher income inequality. On the contrary, Ram (1984, 1989) and Digdowiseiso (2009) find that human capital inequality has no significant effects on income inequality when using standard deviation for human capital inequality. In another study, Pose and Tselios (2009) discover that higher human capital inequality has led to higher income inequality in European Union (EU), the region where Theil Index is used to investigate these relationships. The studies reviewed earlier show inconclusive relationship between income inequality and human capital inequality. Hence it is difficult to clearly determine the direction of relationship. This problem might be attributed to the usage of inappropriate measurement for human capital inequality. Therefore, it is important to examine and use appropriate measurement to estimate both types of inequalities.

The objective of this paper is to examine the effects of human capital inequality on income inequality in developing countries. This paper applies the concept of Gini Coefficient as a consistent measurement for both inequalities: human capital Gini to measure human capital inequality; and Income Gini to measure income inequality. The human capital Gini seems to be an appropriate measurement. It is consistent, robust and a good measurement for the distribution of education compared to other measurements (Thomas *et al.* 2000**,** Castello & Domenech, 2002). Several studies have examined these relationships in cross country research. However, none has used Gini coefficient as a consistent measurement in developing countries. Hence this study specifically examines the relationship of both inequalities

covering data set for the years 1970 to 2010. The relationship between human capital inequality and income inequality is important for government of developing countries and policy makers. For instance, policy makers are keen to know the effects of human capital inequality on income distribution and how this relationship affects economic growth. Understanding this relationship will allow policy makers to assess whether human capital inequality will reduce income inequality.

The main contribution of this paper over previous empirical literature is in a number of important aspects. First, this study computes and extends data set of human capital inequality for two periods (2005-2010) using Human capital Gini for developing countries based on the latest data set from Barro and Lee (updated in 2010). Recently, Castello and Domenech (2002) computes the human capital Gini for the period of 1960 – 2000 by using Thomas *et al* model (2000) and Barro and Lee data set (2000). Thus, this paper produces the study results from larger sample and longer periods. Second, this paper considers the importance of human capital inequality in reducing income inequality. It is with a clear cut picture on the sign, direction and extent of the association between income inequality and human capital inequality for periods of 1970 to 2010 in developing countries. Both categories of inequalities use a consistent measurement. Finally, this paper employs the Generalized Method of Moments (GMM) using GMM two-step system as proposed by Arrelano and Bond (1991) for broad panel data in developing countries. It differs from previous studies that have used OLS estimator, SUR Technique and other methods.

The rest of the paper is organized as follows: A Brief Theoritical and Empirical Review reviews the related literatures; Model, Econometric Method and Data explains the empirical model, method estimation and data used in the analysis; Empirical Result reports and discusses the econometric results; and the final section concludes and synthesizes the whole study.

## A BRIEF THEORETICAL AND EMPIRICAL REVIEW

Theoretically, several literatures have explained the channel of effect of human capital inequality on income inequality. The first channel is through the rate of return on investment of human capital based on the ability and the distribution of earning theory. According to Becker (1962), the distribution of earning must be equal to the distribution of ability if everyone invests the same amount of effort in human capital. In view of 'abler' person tends to invest in human capital more than others, the earning leads to inequality. The other channel is based on the study by Shultz (1963). It states that the change of investment in human capital is the basic factor that reduces inequality in the personal distribution of income. However, the increase in human capital investment can be unequally distributed. It leads to greater income inequality. Moreover, Fields (1980) demonstrates a partial positive relationship between mean schooling level and earnings

inequality. That corroborates the positive relationship between human capital inequality and income inequality. This theory is further supported by Galor (2011) who emphasizes that income distribution has a significant impact on human capital formation and the development process.

Numerous empirical studies have examined the effect of human capital inequality on income inequality with mixed results. The studies use different measurements such as standard deviations of average years of education, Gini coefficient and Theil Index which measures educational inequality. For example, Becker and Chiswick (1966), Chiswick (1971), Tinbergen (1972), Pchachapoulous (1977), Lam and Levison (1990), Checci (2011), Gregoria and Lee (2002) and Mayer (2010) use standard deviations of average years of education to measure educational inequality. They conclude that there is a positive correlation between educational inequality and income inequality. On the contrary, Ram (1984), Park (1996) and Digdowiseiso(2009) find no significant effect of human capital inequality on the income distribution for cross-section data when they use the standard deviation of schooling as a measurement of human capital inequality. Study by Pose and Tselios (2009) use Theil index to measure income inequality and educational inequality in examining the effect of human capital inequality on income inequality for the regions of European Union. The result shows that higher human capital inequality leads to greater income inequality. Lin (2007), Jun, Y. *et al* (2009) and Hisham (2012) examine the effect of human capital inequality on income inequality by using the Gini Coefficient for these variables. In their findings, they conclude that a lower education inequality causes a lower income inequality.

## MODEL, ECONOMETRIC METHOD AND DATA

### *Empirical model for the effect of human capital inequality on income inequality*

The theoretical research on how human capital influences income distribution originated from Schultz (1963), Becker and Chiswick (1966), Psacharopoulos (1977) and later trailed by Gregorio and Lee (2002). This paper adheres to Gregorio and Lee (2002) to estimate the relationship between human capital inequality and income inequality in developing countries However, it uses Gini coefficient of education to measure human capital inequality by reapplying standard deviation of education. The empirical model specification is illustrated below:

$$\begin{aligned} &\ln GiNi_{j,t} \\ &= \beta_1 \ln GiNi_{j,t-1} + \beta_2 \ln G^h_{j,t} + \beta_3 \ln AYS_{j,t} \\ &\quad + \beta_4 \ln GDP_{j,t} + \beta_5 \ln GLOBAL_{j,t} \\ &\quad + \beta_6 \ln POP_{j,t} + \varepsilon_{j,t} \end{aligned} \tag{1}$$

where GINI is Gini coefficient for income inequality; $G^h$ is human capital inequality using Gini coefficient (human capital Gini); AYS is average years of education for the population aged 25 and above; control variables such as Globalization Index, population and GDP per capita; and ε is

Error term and *j,i* represents index countries and periods.

*Methods of Estimation*

This paper uses dynamic panel data procedure Generalized Method of Moments (GMM) to estimate the model specification for relationship between income inequality and human capital inequality in 52 developing countries with T=11,. The reasons of using GMM: to allow the identification of country-specific effects; to control the unobserved effects by first-different data; to control the potential endogeneity of all the explanatory variables; and to control the simultaneity bias caused by the possibility that some of the explanatory variables may be endogenous. Some authors have found that Human capital Gini ($G^H$), Human capital (average years of education), Global and POP are assumed to be endogenous.

Arellano and Bond (1991) propose transforming Equation (1) into first differences to eliminate country-specific effects as follows:

$$\begin{aligned} &Gini_{j,t} - Gini_{j,t-1} \\ &= \beta_1(\ln Gini_{j,t-1} - \ln Gini_{j,t-2}) \\ &+ \beta_2 (\ln G^h_{j,t} - \ln G^h_{j,t-1}) \\ &+ \beta_3(\ln AYS_{j,t} - \ln AYS_{j,t-1}) \\ &+ \beta_4 (\ln GDP_{j,t} - \ln GDP_{j,t-1}) \\ &+ \beta_5 (\ln GLOBAL_{j,t} - \ln GLOBAL_{j,t-1}) \\ &+ \beta_6(\ln POP_{j,t} - \ln POP_{j,t-1}) \\ &+ (\varepsilon_{j,t} + \varepsilon_{j,t-1}) \end{aligned} \tag{2}$$

Arellano and Bond (1991) propose the lagged levels of the regressors to be used as instruments to address the possible simultaneity bias of explanatory variables and the correlation between ($\ln Gini_{j,t-1} - \ln Gini_{j,t-2}$) and ($\varepsilon_{j,t} + \varepsilon_{j,t-1}$). It is valid under the assumptions such as the error term is not serially correlated and the lag of the explanatory variables are weakly exogenous. This step is known as difference GMM estimation and the moment conditions are illustrated below:

$$E\,[\ln Gini_{j,t-s}(\varepsilon_{j,t} + \varepsilon_{j,t-1})] = 0 \text{ for } s \geq 2;\ t = 3;\ldots;\ T \tag{3}$$

$$E\,[\ln G^H_{j,t-s}(\varepsilon_{j,t} + \varepsilon_{j,t-1})] = 0 \text{ for } s \geq 2;\ t = 3;\ldots;\ T \tag{4}$$

$$E\,[\ln AYS_{j,t-s}(\varepsilon_{j,t} + \varepsilon_{j,t-1})] = 0 \text{ for } s \geq 2;\ t = 3;\ldots;\ T \tag{5}$$

$$E\,[\ln GDP_{j,t-s}(\varepsilon_{j,t} + \varepsilon_{j,t-1})] = 0 \text{ for } s \geq 2;\ t = 3;\ldots;\ T \tag{6}$$

$$E\,[\ln GLOBALi_{j,t-s}(\varepsilon_{j,t} + \varepsilon_{j,t-1})] = 0 \text{ for } s \geq 2;\ t = 3;\ldots;\ T \tag{7}$$

$$E\,[\ln POP_{j,t-s}(\varepsilon_{j,t} + \varepsilon_{j,t-1})] = 0 \text{ for } s \geq 2;\ t = 3;\ldots;\ T \tag{8}$$

It is known that the difference estimator is able to control country-specific effects and simultaneity bias. However, the difference estimator leads to biased parameter estimates in small samples and larger variance. This problem occurs when the explanatory variables are persistent and the lagged levels of the variables become weak instruments as reported by Alonso-Borrego and Arellano (1999) and Blundell and Bond (1998). To solve this problem, Arellano and Bover (1995) propose an alternative system; GMM combines the difference Equation (2) and the level Equation (1) with additional moment conditions for the second part of the system as illustrated below:

$$E\,[\ln Gini_{j,t-s} - \ln Gini_{j,t-s-1})\ (\eta i + \varepsilon_{j,t}) = 0 \text{ for } s = 1 \quad (9)$$

$$E\,[\ln G^{h}_{j,t-s} - \ln G^{h}_{j,t-s-1})\ (\eta i + \varepsilon_{j,t}) = 0 \text{ for } s = 1 \quad (10)$$

$$E\,[\ln AYSgini_{j,t-s} - \ln AYS\ gini_{j,t-s-1})\ (\eta i + \varepsilon_{j,t}) = 0 \text{ for } s = 1 \quad (11)$$

$$E\,[\ln GDP_{j,t-s} - \ln GDP_{j,t-s-1})\ (\eta i + \varepsilon_{j,t}) = 0 \text{ for } s = 1 \quad (12)$$

$$E\,[\ln Global_{j,t-s} - \ln Global_{j,t-s-1})\ (\eta i + \varepsilon_{j,t}) = 0 \text{ for } s = 1 \quad (13)$$

$$E\,[\ln POP_{j,t-s} - \ln POP_{j,t-s-1})\ (\eta i + \varepsilon_{j,t}) = 0 \text{ for } s = 1 \quad (14)$$

Basically, the GMM estimators are applied in one and two-step variants (Arellano and Bond, 1991). The one-step estimator is based on weighted matrices that are independent of estimated parameters. Whereas, the two-step GMM estimator uses the so-called optimal weighting matrices in which the moment conditions are weighted by a consistent estimate of their covariance matrix. Bowsher (2002) and Windmeijer (2005) find that the two-step GMM estimation with numerous instruments can lead to biased standard errors, parameter estimates and the numerous instruments may lead to a weakened identification test. This makes the two step system estimator asymptotically more efficient than the one-step estimator. Thus, the moment conditions presented in equation (3) to(14) are used and the two-step System GMM based on recommendation of Roodman (2009b) are employed.

To ensure the consistency of the GMM estimator, the validity of the moment conditions is ~~are~~ tested using the conventional test of over identifying restrictions proposed by Sargan (1958) and Hansen (1982) and testing the null hypothesis that the error term is not second order serially correlated of the difference in equation (2). Besides that, AR (1) and AR (2) are tested to evaluate the validity of appropriate instrumentation (Arellano and Bond, 1991; Blundell and Bond, 1998). The purpose of testing AR is to determine the error term serial correlation, as far as the assumption of non-existence serial correlation of $\varepsilon_{j,t}$. The consistency of the estimators is important. If $\varepsilon_{j,t}$ is not serially correlated, there should exist negative series correlation (AR (1)) for the first stage and there is no proof of serial correlation in the second stage (AR (2)).

*Data description and sources*

This paper uses several main variables and control variables to reduce the problem of omitted variables. The main variable used is Gini coefficient as a dependent variable. It is a most commonly used variable to measure income inequality. It is partly due to its conceptual clarity and easy calculation. Data for Gini Coefficient index is taken from Deininger and Squire World Income Inequality Data Set (2009) of consumption instead of combining income and consumption indices. Another main variable is human capital inequality. This paper uses human capital Gini from two sources to measure human capital inequality. We use Castello and Domenech data set (2002) for periods 1960 to 2000.

However, we extend and compute human capital Gini based on average years of education of the population aged between 25-64 years for periods 2005 and 2010. The average years of education is taken from Barro and Lee data set updated in 2010 and the model suggested by Thomas *et al*. (2001) is used. The Barro and Lee data set provides information on the average schooling years and educational attainment levels with four levels of education such as no education, primary, secondary and higher education. The human capital Gini ($G^h$) can be computed as follows:

$$G^h = \frac{1}{2\overline{H}} \sum_{i=0}^{3} \sum_{j=0}^{3} \left| \hat{x}_i - \hat{x}_j \right| n_i n_j \tag{15}$$

where $H$ is the average schooling years of the population aged 25 years and above; $i$ and $j$ stand for the different levels of education; $n_i$ and $n_j$ are the shares of population with a given level of education; and $x$ $\hat{x}_i$ and $\hat{x}_j$ are the cumulative average schooling years of each educational level such as follows:

$$\begin{aligned} \boldsymbol{x_0} &= x_0 = {}_0\boldsymbol{x_1} = x_1\boldsymbol{x_2} \\ &= x_1 + x_2\boldsymbol{x_3} = x_1 + x_2 + x_3 \end{aligned} \tag{16}$$

From equation (15) and (16) the human capital Gini coefficient can be rewritten as follows:

$$G^h = n_0 \frac{n_1 x_2 (n_2 + n_3) + n_3 x_3 (n_1 + n_2)}{n_1 x_1 + n_2 (x_1 + x_2) + n_3 (x_1 + x_2 + x_3)} \tag{18}$$

where $x_0 = 0$, $x_1$ is the average years of primary schooling of the total population divided by the percentage of the population with at least primary education; $x_2$ is the average years of secondary schooling of the total population divided by the percentage of the population with at least secondary education, $x_3$ is average years of higher schooling of the total population divided by the percentage of the population with at least higher schooling; $n_0$ is the percentage of population with no education; $n_1$ is the percentage of the population with primary education; $n_2$ measures the percentage of the population with secondary education; and $n_3$ is the percentage of the population with higher education. As control variables, this paper includes a few variables for the econometric estimation such as Globalization Index, GDP per capita and total population to reduce omitted bias. The first control variable, Globalization Index is based on empirical evidence. It has a significant impact on income inequality (Jaumotte, *et al.,* 2008: Krugman, & Vanables, 1995; Ruffin, 2009). The Globalization Index used is extracted from Dreher (2007). It is comprised of three main dimensions of globalization: economics, social and political. Another control variable used in the analysis is Gross Domestic Production (GDP) per capita. Studies have shown that GDP per capita has positive and significant effect on income inequality and human capital inequality (Gregorio and Lee, 2002; Lin, 2007; Pose & Vassilis Tselios, 2009). The Gross Domestic Production per capita data is obtained from World Development Indicator (2009). The GDP covers 9 periods starting from 1970 to 2010. The final control variable used is the total population as a share of GDP. It also has

positive and significant effect on income inequality. The total population data is taken from Barro and Lee data set, updated in 2010, covering over 9 periods starting year from 1970 to 2010.

## EMPIRICAL RESULT

STATA 11.0 software is used to estimate the effect of human capital inequality on income inequality in developing countries for the period 1970-2010 using system Generalized Method of Moment (GMM) with two-steps. From the estimation coefficients, the income Gini with lagged one year (Incomegini (-1)) is positive and has significant effect on income inequality in developing countries. This implies that the income inequality in each developing country is very important in influencing the current income inequality. As expected, human capital inequality ($G^h$) is significant with positive effect on income inequality at 5 percent level. The result is parallel with the theoretical prediction; human capital inequality and income inequality are positively correlated (Fields, 1980; Chakraborty and Das, 2005). In other words, reducing human capital inequality can lead to reduction in income inequality in developing countries. Furthermore, the average years of education (AYRS) also has a significant impact on income inequality with negative sign at 5 percent level. This finding is comparable with previous studies by Knight and Sabot (1983), Park (1996), Checchi (2001). The studies find that average years of education has a strong negative effect on income inequality. In addition, GDP per capita is also negatively influencing income inequality at 5 percent significant level. It indicates that greater economic growth reduces income inequality, and vice versa.

However, the effect of globalization on income inequality as a control variable is not significant at 5 percent and 10 percent level. Similarly, Duncan (2000), reports that globalization should not be the contributing factor in reducing income inequality for developing countries except in the case of external shocks which occur as a result of greater openness in trade and investment. The insignificance of globalization found in this study is not reversing its positive impact. In fact, it raises the issue of how to manage risks as a result of greater openness in trade and investment. Moreover, the variable total population is also insignificant with income inequality at 5 percent and 10 percent level. Such results may be attributed to the measurement used. This problem can be mitigated by using data on population growth instead of total population.

Finally, based on the AR (2), the result finds no error term serial correlation in the second stage. While, Hansen Test proves that the instrument used in this model is a valid instrument. Both tests AR (2) and Hansen Test do not reject the null hypothesis.

## CONCLUSION

In this paper, we examine the role of human capital inequality and income inequality using Gini coefficient as a consistent measurement for both inequalities. It has not been precisely discussed altogether in previous research of 52 developing countries

TABLE 1
The effect of human capital inequality on income inequality in Developing countries (1970-2010) based on Two Step System Generalized Method of Moment (GMM)

| Dependent variable: Income inequality (incomegini) | | |
|---|---|---|
| Explanatory Variable | Coefficient | t-value (p-value) |
| Incomegini(-1) | 0.6855 | 8.24(0.000)* |
| Human capital inequality ($G^h$) | 0.4224 | 2.62(0.012)** |
| Average year of education (AYRS) | -0.0794 | -2.01(0.043)** |
| GDP per capita (GDPC) | -0.05619 | -1.78(0.032)** |
| Total of population (POP) | 0.0117 | 1.06(0.295) |
| Global | -0.0524 | -0.78(0.439) |
| Constant | 1.7353 | 3.58(0.001)** |
| AR(1) | 0.004** | |
| AR(2) | 0.438 | |
| Hansen Test | 0.999 | |
| Number of Observation | 416 | |

*Significant p <0.01 **Significant p< 0.05AR(2) test and Hansen Test: Significant p> 0.05

for periods 1970 to 2010. Importantly, this study confirms that higher equally distributed human capital opportunities can alleviate income inequality. Thus, this is a valid indication to the governments of developing countries, policy makers and politicians to pay attention to investment in human capital and distribution of human capital by accelerating the average years of education as it has a commanding potential in reducing income inequality. In the past, most policy decision makers have not considered education as a powerful tool of human capital and neglected in giving it the top priority. In addition, the government in many developing countries have allowed private sector to provide education in order to mitigate the problem of inequality in human capital. The privatization of education has indeed brought an increase in the share of private financing at the basic level but more commonly at the post basic education level. Nowadays, the numbers of private schools and private universities have increased. This trend emerges largely owing to the incapability of the states in fulfilling the increasing demand at all levels. Thus, the policy makers should also pay more attention to distribution of private schools. Private schools are capable of delivering higher contributions: more resources for the education sector; more efficient use of these resources; and more flexibility in education deliverables. It is parallel with the Millennium Development Goal (MDG) in achieving the target education for all primary schools and generating equal distribution in human capital as well as reducing income inequality for all countries.

## REFERENCES

Abdelbaki, H. H. (2012). An Analysis of Income Inequality and Education Inequality in Bahrain. *Modern Economy, 3*(5), 675-685.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 288-297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. Journal of Econometrics, *68*(1), 29-51.

Barro, R. J. (2001). Human capital and growth. *The American Economic Review, 91*(2), 12-17.

Barro, R. J., & Lee, J. W. (2000). *International data on educational attainment updates and National implications Bureau of Economic Research Cambridge, Mass., USA*. Bureau of Economic Research Cambridge, Mass., USA.

Becker, G. S. (1962). Investment in human capital: A theoretical analysis. *The journal of political economy, 70*(5), 9-49

Becker, G. S., & Chiswick, B.R.(1966). Education and the distribution of earnings. *American Economic Review. 56, 358-369.*

Bergheim, S. (2005). Human capital is the key to growth:Success stories and policies for 2020. *Current Issues. Global Growth Centers*. Deutshe Bank Research.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), 115-143.

Bond, S. R., Hoetler,A., & Temple, J. (2001). GMM Estimates of empirical Growth Models. Centre for economic policy Research. *Discuss Paper* No.3048.

Bowsher, C. G. (2002). On testing overidentifying restrictions in dynamic panel data models. *Economics letters, 77*(2), 211-220.

Brush, J. (2007). Does income inequality lead to more crime? A comparison of cross- and sectional time-series analyses of United States counties. *Economics Letters, 96*(2), 264-268.

Castelló, A., & Doménech, R. (2002). Human capital inequality and economic growth: some new evidence. *The Economic Journal, 112*(478), C187-C200.

Chakraborty, S., & Das. M. (2005). Mortality, human capital and persistent inequality. *Journal of Economic Growth, 10*(2), 159–192.

Checchi, D. (2003). Inequality in Incomes and Access to Education: A Cross country Analysis (1960–95). *Labour, 17*(2), 153-201.

Checchi, D. (2001). *Education, inequality and income inequality*: Distributional Analyses Research Programme Papers 52. Suntory and Toyata International Centres for Economics.

Chiswick, B. R. (1971). Earnings inequality and economic development. *The Quarterly Journal of Economics, 85*(1), 21-39.

Chiswick, B. R. (1974). *Income Inequality: Regional analyses within a human capital framework: National bureau of economics*. National bureau of economics.

Chiswick, B. R., & Mincer, J. (1972). Time-series changes in personal income inequality in the United States from 1939, with projections to 1985. *The Journal of Political Economy, 80*(3), 34-66.

De Gregorio, J., & Lee, J. W. (2002). Education and income inequality: New evidence from cross-country data. *Review of Income and wealth, 48*(3), 395-416.

Digdowiseiso, K. (2009). Education inequality, economic growth, and income inequality: Evidencefrom Indonesia, 1996-2005. *MPRA Paper*.

Dreher, A. (2007). Does Globalization Affect Growth? Evidence from a new Index of Globalization, *Applied Economics, 38*(10), 1091-1110.

Fields. G. S. (1980). *Education and Income Distribution in Developing Countries: A Review of the Literature. In Education and Income*. World Bank Staff Working Paper No. 402. Washington. DC.

Galor, O. (2011). I*nequality, human capital formation and the process of development*. National Bureau of Economic Research.

Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica: Journal of the Econometric Society*, 1029-1054.

Jun.Y., Xiao, H., & Xiaoyu, L. (2009). Educational inequality and income inequality.An empirical study on China. Frontiar Education China, *4*(3), 413-434.

Kelly, M. (2000). Inequality and crime. *Review of Economics and Statistics, 82*(4), 530-539.

Lin, C. H. A. (2007). Education Expansion, Educational Inequality, and Income Inequality: Evidencefrom Taiwan, 1976–2003. *Social indicators research, 80*(3), 601-615.

Park, K.H (1996). Educational expansion and educational inequality on income distributions. *Economicsof Education Review, 15*(1), 51-58.

Pose &Vassilis Tselios. (2009).Education and Income Inequality In the regions of the European Union. *Journal of Regional Science. 49*(3), 411–437.

Persson, T., & Guido, T. (1994). Is inequality harmful for growth?.*American Economic Review*, *84*(3), 600–62.

Psacharopoulos, G. (1977). Unequal access to education and income distribution. *De Economist, 125*(3), 383-392.

Ram, R. (1984). Population increase, economic growth, educational inequality, and income distribution: Some recent evidence. *Journal of Development Economics, 14*(3), 419-428.

Ram, R. (1989). Can educational expansion reduce income inequality in less-developed countries? *Economics of Education Review, 8*(2), 185-195.

Ram, R. (1990). Educational expansion and schooling inequality: International evidence and some implications. *The Review of Economics and Statistics, 72*(2), 266-274.

Roodman, D. (2006). How to do xtabond2: An introduction to" difference" and" system" GMM in Stata. *Center for global development*.

Roodman, D. (2009). A note on the theme of too many instruments*. *Oxford Bulletin of Economics and Statistics, 71*(1), 135-158.

Ruffin,R.J. (2009). Globalization and income inequality. *Trade and Development Review, 2*(2),56-59.

Sargan, J. D. (1958). The estimation of economic relationships using instrumental variables. *Econometrica: Journal of the Econometric Society*, 393-415.

Schultz, T. W., & William, T. (1963). *The economic value of education*: Columbia University Press.

Thomas, V., Wang, Y., & Fan, X. (2001). *Measuring education inequality: Gini coefficients of education*. Policy Research Working Paper No.2525, Washington, DC: The World Bank.

Thomas, V., Wang, Y., & Fan, X. (2003). Measuring education inequality: Gini coefficients of education for 140 countries, 1960-2000. *Journal of Education Planning and Administration, 17*(1), 5-33.

Thorbecke, E., & Charumilind. C. (2002). Economic Inequality and Its SocioeconomicImpact. *World Development*, *30*( 9), 1477–1495.

Tinbergen, J. (1972). The impact of education on income distribution. *Review of Income and wealth, 18*(3), 255-265.

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of econometrics, 126*(1), 25-51.

World Bank, (2009). *World Development Report.* Washington, D.C.: World Bank.

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# Regional Development Programmes and Poverty Reduction in East Coast States of Malaysia

**Zaleha M. N.* and Noor Azian Asfari**

*Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

## ABSTRACT

Regional disparities can be found in Malaysia. The Central Region can be considered as a developedregion; while Sabah and the statesin the Eastern Region,the least developed. Such disparities exist not only in the form of income, but also in terms of social welfare. It is then important to highlightthe problems related to poverty in the poorer states of Malaysia. Many regional programs which involve a lot of resources have been carried out in every Malaysian plan. One of its aims is to eradicate poverty among the poor. In the same vein, the objective of this paper is to analyze the implication of regional development programs in reducing poverty. This paper made use of the Household Income Survey (HIS) for 1999 and 2004 data to calculate the relevant indexes to trace the changes in poverty incidence, extent and severity. These indexes include the head-count index, poverty gap and income-gap ratio, Sen's index of poverty, as well as the Foster, Greer and Thorbecke (FGT) index. Results revealed that the regional programs conducted between the two periods improved poverty situations in the region; thus, such programs should be continued to increase the economic performance of the so-called poor states of Kelantan, Trengganu and Pahang and reduce their poverty situation.

*Keywords:* Foster, Greer and Thorbecke (FGT) index, head-count index, Regional disparity, Sen's index of poverty, poverty gap and income-gap ratio

## INTRODUCTION

The problems of regional disparities in the level of economic development are almost universal, but theirextent may differ among countries (Dubey, 1964). This phenomenon has been happeningin Malaysia. Based on the Development Composite Index (DCI), the Central Region, comprised byMelaka, Negeri Sembilan, Selangor and Wilayah PersekutuanKuala Lumpur, was the most developed region in 2005.On the other

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*E-mail address*:
lehnoor@upm.edu.my (Zaleha M. N.)
* Corresponding author

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hand,Sabah and the statesin the Eastern Regionconsisting of Kelantan, Pahang and Terengganu, werethe least developed regions.

Besides DCI, the development gaps between regions and states were identifiedin terms of the level of gross domestic product (GDP), GDP percapita, and its growth. The per capita GDP by state is shown in Table 1. Based on the said Table, all states recorded an increase in GDP percapita; however,most developed states had higher per capita GDP as compared to the least developed ones. Nevertheless, in 2006, Pahang recorded an increase in its GDP percapita and performed better than Johor, a developed state. This may have been due to the government's many development programmes aimed at improving the economic performance of less developed states.

The existence of regional disparities can be illustrated through the economic structure of the states. For example, the richer states such as Selangor, Penang and the Federal Territory of Kuala Lumpur tend to have a higher percentage of GDP in the secondary sector and a lower percentage in the primary sector.Such rapid expansion of industrial and service activities contribute to higher per capita growth in these states. The least developed states have a greater share in primary activities, with the exception

TABLE 1
Gross Domestic Percapita by State,Malaysia in 1995 – 2010

| States | RM million | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1995 | 2000 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| Northen Region | | | | | | | | |
| Kedah | 6,391 | 8,918 | 12,132 | 10,525 | 11,901 | 13,225 | 12,630 | 13,294 |
| Perak | 9,290 | 13,183 | 18,616 | 12,521 | 14,010 | 15,599 | 14,769 | 16,088 |
| Perlis | 7,634 | 10,802 | 15,166 | 14,125 | 13,561 | 14,510 | 14,457 | 15,296 |
| Pulau Pinang | 15,054 | 21,469 | 28,581 | 29,748 | 31,039 | 33,257 | 29,569 | 33,456 |
| Central Region | | | | | | | | |
| Melaka | 11,305 | 15,723 | 21,410 | 20,472 | 22,174 | 24,619 | 22,761 | 24,697 |
| Negeri Sembilan | 9,034 | 12,791 | 17,555 | 22,757 | 23,704 | 26,803 | 23,600 | 27,485 |
| Selangor | 14,168 | 17,363 | 21,286 | 23,377 | 25,481 | 28,544 | 27,609 | 31,363 |
| W/P Kuala Lumpur | 22,799 | 30,727 | 39,283 | 40,868 | 44,801 | 49,996 | 51,197 | 55,951 |
| Southern Region | | | | | | | | |
| Johor | 10,007 | 13,954 | 18,773 | 16,181 | 18,726 | 19,930 | 18,458 | 20,911 |
| Eastern Region | | | | | | | | |
| Kelantan | 4,484 | 6,241 | 8,638 | 5,919 | 6,943 | 7,662 | 7,585 | 8,273 |
| Pahang | 7,548 | 10,370 | 14,549 | 17,319 | 18,930 | 21,793 | 19,974 | 22,743 |
| Terengganu | 16,553 | 22,994 | 29,516 | 15,241 | 17,284 | 19,194 | 16,994 | 19,255 |
| Sabah | 7,206 | 9,123 | 11,323 | 10,645 | 13,067 | 16,843 | 14,830 | 17,424 |
| Sarawak | 9,287 | 12,755 | 16,861 | 26,984 | 29,562 | 34,855 | 30,318 | 33,307 |
| Malaysia | 10,756 | 14,584 | 19,189 | 21,411 | 23,617 | 26,902 | 24,366 | 27,113 |

Source: Department of Statistics Malaysia, Eighth Malaysia Plan

of Terengganu, due to the discovery of off-shore oil. Services form the highest component of GDP for all states and this truly reflects the overall economy of the state. Another interesting structure is the share of urban population in richer states being higher than in its poorer counterparts. Moreover, the depth of such disparities exists not only in the form of income but also in social welfare.

Aside from all these disparities, another important point to be highlighted is the difference in the level of poverty between the states. It has been shown that the situation of poverty in the states of Kelantan, Terengganu, Kedah and Perlis has been higher than in the richer states (e.g. Selangor, Penang and the Federal Territory of Kuala Lumpur) as shown in Table 2.

The development of any country will not be sustainable if the growth process does not contribute to the poverty reduction. For instance, when one of the countries achieves higher growth rate in Gross Domestic Product (GDP) and, at the same time,the poverty incidence is also high, the growth of development for that country is considered as unsustainable.

In Malaysia, the incidence of absolute poverty has traditionally been determined withreference to a threshold poverty line income (PLI), (Cheng *et al.*, 1976). This

TABLE 2
Incidence of Poverty by State,Malaysia,1995 - 2009

| State | Incidence of Poverty (%) | | | |
|---|---|---|---|---|
| | 1995 | 1999 | 2004 | 2009 |
| Malaysia | 8.7 | 8.5 | 5.7 | 3.8 |
| Johor | 4.2 | 3.1 | 2.0 | 1.3 |
| Kedah | 12.2 | 14.2 | 7.0 | 5.3 |
| Kelantan | 22.9 | 25.2 | 10.6 | 4.8 |
| Melaka | 5.3 | 2.9 | 1.8 | 0.5 |
| N.Sembilan | 4.9 | 4.1 | 1.4 | 0.7 |
| Pahang | 6.8 | 9.8 | 4.0 | 2.1 |
| Perak | 9.1 | 6.8 | 4.9 | 3.5 |
| Perlis | 11.8 | 13.6 | 6.3 | 6.0 |
| Pulau Pinang | 4.0 | 0.7 | 0.3 | 1.2 |
| Sabah | 22.4 | 23.4 | 24.2 | 19.7 |
| Sarawak | 10.0 | 10.9 | 7.5 | 5.3 |
| Selangor | 2.2 | 1.9 | 1.0 | 0.7 |
| Terengganu | 23.4 | 22.7 | 15.4 | 4.0 |
| WP Kuala Lumpur | 0.5 | 0.4 | 1.5 | 0.7 |
| WP Labuan | | | 2.7 | 4.3 |

Source: Department of Statistics Malaysia
Eighth Malaysia Plan
Ninth Malaysia Plan

PLI is based on what is considered to be the minimum consumption requirements of a household for food, clothing, and other non-food items, such as rent, fuel, and power. Whilst, the concept of hardcore poverty was first used by the Malaysian government in 1989 to help identify and target poor households whose income is less than half of the PLI.

To ensure higher economic growth among states, measures have beenundertaken to focus development efforts in growth centers of respective states as well as in trans-border areas involving two or more states. One of the trans-border areas is the Northern Terengganu-Southern Kelantan-Western Pahang Zone,which has been identified as a new focus area of development for the Eastern Corridor Region.

For the eastern region states, a total of RM22.3 billion or 11.2 %has been allocated for development in the Ninth Plan compared with RM14.3 billion in the Eighth Plan. Infrastructure projects have been the focus of the development for the region. Among the projects is the SimpangPulai-GuaMusang-Kuala Terengganu Road, which hasprovided the third trunk road link to the Eastern Corridor, and the East Coast Highway Phase 2 in Terengganu. In addition, the Kuala Terengganu airport has been upgraded to handle wide-bodied aircrafts that will boost tourism and industrial development.

To further spur the development in northern Terengganu, as well as provide more educational opportunities, the main campus of a new university will be located in Besut. In addition, a new university will be established in Kelantan during the Plan period. For Pahang, development projects will include permanent food production parks, a palm oilindustrial cluster and an integrated halal hub.

The analysis of the poverty situation is meant to ensure the success of this regional development plan in eradicating poverty problems in the targeted areas (Damery, et al., 1991). Therefore, it is the objective of this study to analyze the implication of regional development programmes in reducing poverty in terms of its incidence, extent and severity.

There are several techniques used to identify the situation in term of incidence, extent and the severity of poverty. Therefore, this analysis is aimed tocapture the real situation of poverty in each state and to likewisehelp the government in giving more attention to the reallocationofsources for development programmes.

## LITERATURE REVIEW

Poverty has absolute and relative contexts. Worldwide, people living in absolute poverty are those who do not have adequate nutrition, housing and access to basic health and education. As standards of living rises and absolute poverty recedes, social concerns focus on those living in what is recognized as poverty relative to a country's average standards of living.

In 1977, Anand explored the extent and nature of poverty in Malaysia, so that policy measures for its alleviation might be considered. For this purpose, he examined data generated by the 1970 Post Enumeration Survey (PES). He adopted

various types of poverty measures, which include poverty incidence (head count ratio), average poverty gap, the Sen's Index of Poverty ($P$), modified Sen's Index ($M$) and index $F$ (after Fishlow). He found that the percentage of the population in poverty was calculated as 40.2%, and the average poverty gap was RM9.05 per month. The poverty gap, as a fraction of the total income needed to support everyone in the population at the poverty level, is 14.5%. The index M for the country was estimated at 0.073, which implies that the poverty gap in Malaysia stands at7.3% of the total personal income. If poverty were to be eliminated by a transfer of income from the non-poor to the poor (index $_F$), the non-poor would need to sacrifice 8.3% of their income(or 12.7 percent of their income in excess of the poverty line income). These indices for expressing the poverty gap have also been computed separately for each ethnic group.

Ginneken (1980) adopted three types of poverty measures for his study, which are poverty incidence, poverty gaps, and Sen's Index that will be applied to Household Expenditure data from the 1975-1976 survey carried out by the Statistical Center of Iran. The data estimatedthe extent of poverty for households of different sizes in Iran. Ginneken appraised the number of poor based on poverty lines for households of different sizes. In his findings, hecame upwith a poverty map of Iran, which categorizedseven different characteristics of the head of households, namely by area, region, sector of employment, occupation, employment position, level of education and, finally, by age.

## METHODOLOGY

The study analyzedthe regional development programmesthat have been successful in reducing poverty in the East Coast Region or not. As mentioned earlier, there werethree important aspects examined in relation to poverty. These include poverty incidence, poverty extend and severity of poverty. Comparisonswere made between these measurements in 1999 and 2004.

There are three steps neededfor measuring poverty (Foster *et al.*, 1984), these are:

1. Defining an indicator of welfare;
2. Establishing a minimum acceptable standard of that indicator to separate the poor from the non-poor, and;
3. Generating a summary statistic to aggregate the information from the distribution of this welfare indicator relative to the poverty line.

The population was relabeled as a vector of household incomes in increasing order so that $y_1 \leq y_2 \leq ... \leq y_n$ and it could be supposed that z > 0 is the predetermined poverty line. Following Sen (1976), this study chose the rank-order weighting scheme, in which the weight on the income gap of a poor household wassimply ranked in the income ordering below the poverty line. This weighting scheme was expected to yield the Gini coefficient of the income distribution of the poor,

$$G_p = \frac{q+1}{q} - \frac{2}{q^2 m}\sum_{i=1}^{q}(q+1-i)y_i \quad (1)$$

To answer the first question of how many are poor, the head-count index ($_H$) wasused. This ratio is called the *head-count (household-count) ratio,* $_H$

$$H = \frac{q}{n} \quad (2)$$

Where q = number of household those below poverty line income, n = total population size.

The extent or depth of poverty wasmeasured by using the poverty gap and income-gap ratio. The poverty gap is

$$P_1 = \sum_{i=1}^{q} g_i \quad (3)$$

where $g_i = z - y_i$ is the income gap of household *i*. Therefore, the average poverty gap is $(z - m)$.

The income-gap ratio,

$$I = \sum_{i=\in S(z)} g_i / qz \quad (4)$$

was a per-person percentage gap, based on the poverty deficit of the poor from the poverty line. However, both the poverty gap and the income-gap ratio ignoredthe distribution of income among the poor. The severity of poverty, which includes the income distribution in the society, was measured by Sen's index of poverty ($P_2$) and the Foster, Greer and Thorbecke index known as FGT index FGT index ($P_3$). Sen's index is a complete poverty measure, which incorporates the information on the number of poor ($_H$), the extent of poverty, measured by income gap (*I*), and the Gini coefficient (*G*), as an indicator of income distribution among the poor. Sen's poverty index is expressed as

$$P_2 = H\lfloor I + (1-I)G_p \rfloor \quad (5)$$

where;

$G_p$ = Gini coefficient of the poor.

The measure is made up of the head-count ratio $_H$ multiplied by the income gap ratio $_I$ increased by the Gini coefficient *G* of the distribution of income among the poor weighted by $[(1-I)]$, i.e. weighted by the ratio of the mean income of the poor to the poverty-line income level. The value of $P_2$ lies in the closed interval [0,1], with $P_2$ =0 if everyone has income greater than $_z$, and $P_2$=1 if everyone has zero income. G will be equal to zero ($_{G=0}$), when all the poor share the same income.

The FGT index ($P_3$), is a poverty gap-based measure. This measure is additively decomposable in the sense that total poverty is a weighted average of the subgroup poverty levels. The subgroup population can be defined either along ethnic, geographical, or other lines. $P_3$ was defined by:

$$P_3(y:z) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{g_i}{z}\right)^{\alpha} \quad (6)$$

where; $g_i = z - y_i$, is the income short-fall of the $i^{th}$ poor, $z$ : poverty line, $q$ : number of people whose income is below thepoverty line.

"α" is a parameter which takes on a value greater than or equal to zero (α ≥ 0). The parameter α can be viewed as a measure of poverty aversion. As α gets larger, the

measure becomes more sensitive to the income circumstances of the "poorest poor". The measure $P_3$wasobtained by setting $\alpha = 2$.

The data for this study wasgathered from published and unpublished materials, with the main sourcecoming fromthe unpublished Household Income Survey (HIS) for 1999 and 2004.These surveys were conducted and processed by the Malaysian Department of Statistics (DOS). For this study, we were provided with the data of income, where the income included earnings from paid employment, income from self-employment, rental income, property income,transfer payments. Apart from that, data on poverty in Malaysia from previous Malaysia Plans, the Malaysia Outline Perspective Plans, and other relevant publications werealso explored.

The estimation of poverty indices was done using the Microsoft Excel program as well as the STATA program.

## RESULTS AND ANALYSIS

The overall results showed significant improvements in poverty incidence, poverty extent and also poverty severity in the area being studied. Nevertheless, the improvements changed the ranking of the states involved. For example, in 1999 Kelantan was the poorest states among the three states; nevertheless in 2004, Terengganu occupied the lowest position in terms of poverty incidence, extent, as well as severity (Table 3). Pahang showed the best position among the three states.

### *Poverty Incidence (H)*

The overall poverty incidence in East Coast has reduced significantly from 33 percent in 1999 to 13 percent in 2004.This trend is shown in Table 3. In 1999, poverty incidence in Kelantan was the highest, followed by Terengganu and Pahang. However, their positions changed in 2004, when Terengganu obtained a 17% poverty incidence while Kelantan got 15%. Pahang's position was still considered best among these three states as poverty incidence was reduced from 15% to only 4% in 2004.

The extent or depth of poverty was measured using the average poverty gap ($P_1$) and income-gap ratio, ($I$). For the year 2004, the extent of poverty in East Coast was reduced. The average poverty gap became

TABLE 3
East Coast Poverty Measures by States, 1999 and 2004

| States | 1999 | | | | | 2004 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | H | $P_1$ (RM) | I | $P_2$ | $P_3$ | H | $P_1$ (RM) | I | $P_2$ | $P_3$ |
| Kelantan | 0.43 | 2732 | 0.45 | 0.12 | 0.11 | 0.15 | 2008 | 0.25 | 0.02 | 0.02 |
| Terengganu | 0.38 | 2711 | 0.44 | 0.11 | 0.10 | 0.17 | 2465 | 0.31 | 0.03 | 0.02 |
| Pahang | 0.15 | 1965 | 0.32 | 0.03 | 0.02 | 0.04 | 1627 | 0.21 | 0.004 | 0.00 |
| East Coast | 0.33 | 2605 | 0.43 | 0.09 | 0.08 | 0.13 | 2163 | 0.27 | 0.02 | 0.01 |

Note: H: Household-count ratio (poverty incidence)
$P_1$: Average poverty gap
I : Income gap
$P_2$: Sen's Index of poverty
$P_3$:FGT index of poverty

smaller, from RM 2605 in 1999 to RM 2163 in 2004. Income gap ratio also declined from 0.43 to 0.27.

*The Extent of Poverty*

At the state level, the extent of poverty has improved for every state. For the year 1999, the level of poverty was highest in Kelantan with an average poverty gap of RM 2732 and 0.45 income gap ratio. However, in 2004, the extent of poverty in Kelantan was reduced. This implies that, in 2004, the improvement in economic condition reduced the poverty gap of the poor Kelantan, increased their income and brought them closer to the poverty line.

On the other hand, the depth of poverty is now highest in Terengganu, with RM 2465 average poverty gap and 0.31 income gap ratio. Pahang showed improvements with the reduction of the poverty gap and the income gap ratio.

*The Severity of Poverty*

Table 3 shows that the severity of poverty in East Coast was reduced between 1999 and 2004. Both the Sen's Index and the FGT's index showed an improvement in the severity of poverty for the said periods. There was an improvement in the Sen's index from 0.09 to 0.02. The FGT index also recorded an improvement from 0.08 at 1999, to 0.01 in 2004.

This study found out that poverty was more severe in the Kelantan as compared to Terengganu in 1999. Results showed that the severity of poverty in Kelantan improved with 0.02 of Sen's index and 0.02 of FGT in 2004. Terengganu experienced about the same effect in 2004 with 0.03 in Sen's index and0.02 FGT index. As in the case of poverty incidence and poverty extent, Pahang showed the largest improvement in poverty severity among the three states. This proves that the improvement in economic conditions helped to reduce the severe effects of poverty.

## SUMMARY AND CONCLUSIONS

We analyzed five major poverty indices, namely the Household-count ratio (H), povertygap ($P_1$), income gap (*I*), Sen's Index ($P_2$) and FGT index ($P_3$) to tackle three major issues: how many are poor, the extent or depth of poverty, and the severity of poverty.

Results showed that poverty incidence in East Coast reduced significantly from 33 percent to 13 percent.The average poverty gap becamesmaller, from RM2605 in 1999 to RM2163 in 2004. Income gap ratio also declined from 0.43 to 0.27.Furthermore, this study found that the severity of poverty in the East Coast reduced in 2004. We can then conclude that the regional development programmescontributed to the increase in household income, reductionin poverty incidence, decrease indepth of poverty,as well asdiminishedseverity of poverty in the areas studied.Government regional development programmes such as the East Coast Economic Region must then be continued to further develop the three states (Kelantan, Ternggnu and Pahang) to catch up with the other developed states in the country.

## REFERENCES

Anand, S. (1977). Aspects of poverty in Malaysia. *Review of Income and Wealth*, *23*(1), 1-16.

Cheong, K. C., & Fredericks, L. J. (1976). *Theory and measurement of poverty: Tentative views on an amorphous topic*. Kuala Lumpur: Universiti Malaya.

Demery, L., & Demery, D. (1991). Poverty and macroeconomic policy in Malaysia, 1979-1987. *World Development*, *19*(11), 1615-1632.

Dubey, V. (1964). The definition of regional economics. *Journal of Regional Science*, *5*, 25-29.

Foster, J., Greer, J., & Thorbecke, E. (1984). Notes and comments: A class of decomposable poverty measures. *Econometrica*, *53*(3), 761-766.

*Malaysia: Eighth Malaysia Plan 2001-2005* . (2001). Kuala Lumpur: Government Printers.

*Malaysia: Ninth Malaysia Plan 2006-2010*. (2006). Kuala Lumpur: Government Printers

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