An ARDL Analysis on the Internet Usage Rate and the Wealth of Malaysians

Fennee Chong & Venus Khim-Sen Liew

Abstract: - The objective of this study is to examine the relationship between gross national income per capita and the internet usage rate per 100 people of an emerging economy – Malaysia both in the short and long-run. Autoregressive Distributed Lag Modeling Approach (ARDL) was used to analyze the thirteen-year time series collected for these two variables. Empirical findings from the econometrics analysis reported a significant long-run and short-run relationship between these two variables. Hence, this study concludes that, enhancing internet usage among the public and private sectors is a pertinent strategy for Malaysia towards achieving a higher wealth status for its people.

Key-Words*:* - Gross national income per capita, internet usage rate.

I. INTRODUCTION

The internet is an interconnected computer system that allows global communication. It has emerged to become one of the most important ways to support networking of millions of users since its introduction in the 1960s. Nowadays, it has become the fastest and most economical method to facilitate government, private and business activities around the globe. Economic transactions can be executed at the fingertips regardless of business hours and geographical boundary. Consequently, internet usage has become a crucial tool for a country to improve its competitive edge and subsequently, achieving a higher standard of living for its population.

Malaysia is one of the emerging economies striving hard to do well on the world economy platform. Among others, the government has introduced the New Economy Transformation Policy in 2011 aiming to transform the nation into a high income, inclusive and sustainable economy by 2020. As mentioned earlier, to have a higher internet usage rate is one of the main ingredients in this quest. This is because it is important to recognize that future prosperity cannot be achieved without linkages to the world economy. Hence, the government has identified R&D and ICT enhancement as one of the key enablers for the country to move up the global value chain. Internet usage was recognised as a viable ICT infrastructure which allows Malaysia's transition into a high income nation. According to the World Bank, the gross nation income for Malaysia stands at USD 7760 as at 2010. Comparing to the envisaged target of USD 15,000 per capita by 2020, the nation needs to work as least two times harder to accelerate its economic growth.

Economic theory suggested that higher income can only be achieved via greater productivity which in turn required higher level of innovations, technologies and highly skilled workforce (Aghion and Howitt, 1992) [1]. Therefore, Malaysia needs to adopt and transform into the knowledge economy model. Since ICT is the major technology that brings innovations to greater heights especially in a globalized economy, hence, the advancement into "information economy" is inevitable within the knowledge economy context.

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II. PROBLEM FORMULATION

Economic literature contended that microeconomic factors such as oil price, interest rates, foreign exchange rates and money supply are endogenous factors affecting a nation's wealth (Flannery and Protopapadakis, 2002 and Liow et. al., 2005) [2],[3]. In the European Union setting, Kovarnik (2012) [4] posited that European Union Budget has an enormous impact on the creation of knowledge and innovation based economy of its member countries.

On the other hand, the impact of information economy components such as internet usage on the gross national income is rarely examined for developing country such as Malaysia. Furthermore, assessing how internet usage rate influences a nation's wealth is relatively new. Moreover, most of the studies on internet usage are focused on the industry or firm level rather than on the macro level. With the emergence of the information economy, the input or impact of information related technology on the economic well-being of a country should also be evaluated.

A. Internet Usage Background in Malaysia

Intensifying technology usage such as internet usage is crucial as it lowers the barriers in doing business and allowing more innovations involving cutting edge processes and products at the same time. In addition, diffusion of the internet is an ICT innovation that can promote cheaper communication and allows more efficient and faster dissemination of information worldwide.

To keep its pace with the world's economic development, Malaysia's started its commercial internet in 1990 with the launching of Jaring (Joint Advanced Integrated Networking) by the Malaysian Institute of Microelectronic Systems (MIMOS). Nevertheless, Malaysia only gets its satellite link which allows its users gaining access to the global internet in 1992.

The Malaysian government has been an enthusiastic supporter of high tech internet industry since the early nineties. It has employed a wide range of policies to encourage both the private and public sectors to venture on line. Among others, Multimedia Super Corridor was setup to facilitate the research development and exploration of multimedia and communication solutions for both the private and public sectors. More than 900 local and foreign IT and high tech entities were attracted to operate in this mega project.

Due to the high demand on internet usage, a second ISP, TMNet was launched in 1995, and since then, both commercial and residential access has grown steadily. Generally, the main focus of the Malaysian IT industry was on consolidating its domestic network infrastructure and investigating new developments. The local internet market grows steadily with the formation of the Malaysia Internet Exchange (MIX) in 2003. MIX provides a common backbone for all Malaysia ISPs to ensure the robustness of the IT industry in the country.

According to the World Bank (2012) [5], Malaysia's total internet usage rate has grown from 2.3 per 100 people in 1997 to 55 per 100 people in 2010. Figure 1 below shows that the internet population in Malaysia has recorded a drastic grown in the past decade. In 2010, there was only about 3.7 million internet population in the country and this figure has expanded to 16.9 million in 10 years' time.

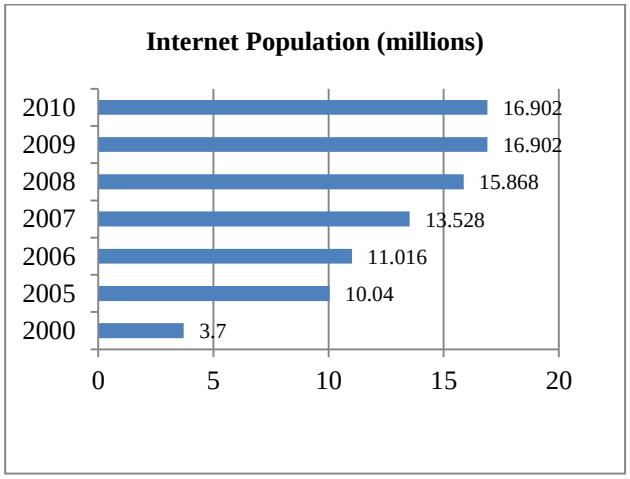

Figure 1: Internet Population in Malaysia 2000 to 2010 (in millions)

Despite its growing trend, the total internet usage is consider as low if compared to the Newly Industrialized Economies and other emerging economies such as South Korea and Taiwan. Figure 2 exhibits the distributions of internet users among major Asia countries.

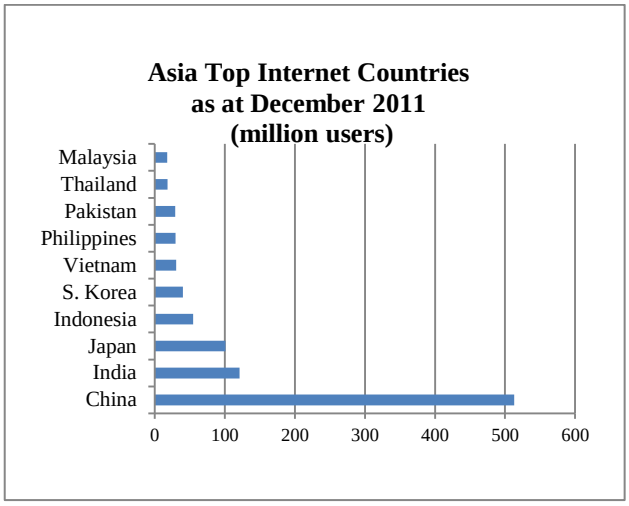

Figure 2: Asia Top Internet Using Countries

According to the Internet World Stats (2012)[6], China has the most internet users in Asia (513 million) followed by India (121.2 million), Japan (101.2 million), Indonesia (55 million) and Malaysia was ranked at number ten with about17.7 million internet users in 2011. Nevertheless, if the indicator used was internet user per 100 people, then, Malaysia is doing much better than countries with huge populations such as China, India as well as Indonesia.

The lower internet user rate in Malaysia compared to Singapore, South Korea and Taiwan at 68, 79 and 74 respectively per 100 people in the country as at 2010 was partially due to the unavailability of ICT infrastructure in the rural area (World Bank Database, 2012)[5]. Furthermore, computer literacy rate is another determining factor which could affect internet usage rate. Generally, population in Malaysia who are residing in the rural areas and the senior citizens are amongst the groups with the highest illiteracy rates and these categories are also the fall backs in the internet era.

Apart from improving internet infrastructure and computer literacy, internet security also need to be taken care of in order to encourage greater usage of internet. Paynter and Lim (2001) [7] studied the drivers and impediments of e-commerce in Malaysia. They documented that respondents who are reluctant to shop online suggested that they would do so if they have more confidence with the security of the web payment systems.

Majority of the respondents expressed their worries about the safety of disclosing their personal information via the internet. The rampant occurrences of credit card frauds have added to the concerns on the internet security for online shopping. Report from CyberSecurity (2012)[8] documented that the internet fraud cases reported was 1491 cases and this represents an increase of 29% in the first quarter of 2012 comparing to the previous quarter. Other cases reported are intrusion related cases (1154), spam (201) and several cases related to cyber harassment and malicious codes.

Until recently, the Malaysian Communications and Multimedia Commission has not legislated any spam policy. However, it would be beneficial if they could look into the email marketing as well as the mobile marketing law. Prevention measures via education and create awareness concerning cyber security could be another solutions to internet security. The Cyber Security Malaysia was established under the purview of the Ministry of Science, Technology and Innovation (MOSTI) in 2007 to provide safety tips and advisory support on digital forensics and wireless security.

In a survey conducted by Paypal (2012)[9], Malaysia's online shopping market has achieved a recorded sales of RM1.8 million in 2010 and this figure is predicted to reach RM5 million in 2014. This survey also reported that 70% of the online shoppers are coming from the middle income and above groups. Majority of the online shoppers are coming from the younger age groups and are of higher education attainment.

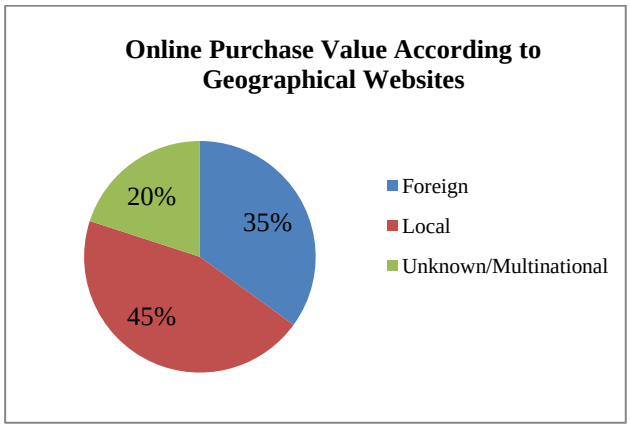

Figure 3: Geographical Distributions of Online Shopping in Malaysia According to Value

In terms of the online shopping websites profile according to value spent, as demonstrated in Figure 3, 45% of the total Malaysian online shopping value went to the local websites while 35% of the online shopping spending was contributed to the foreign websites. Travel ticket purchases top the value of the online shopping via local websites while purchases of books and reading materials dominate the total value spent of online shopping via foreign websites.

Paypal (2012) [9]'s survey also highlighted on the profile of the products and services purchased online by Malaysians. Referring to Figure 4, travel products and services made up of 24% of the total shopping via the internet. This is followed by other e-transactions such as bill payment (18%), entertainment and lifestyle products and services (14%), IT and electronics goods (12%), insurance purchases (11%), fashion and beauty products and services (10%) and finally, gift and collectibles at 4%.

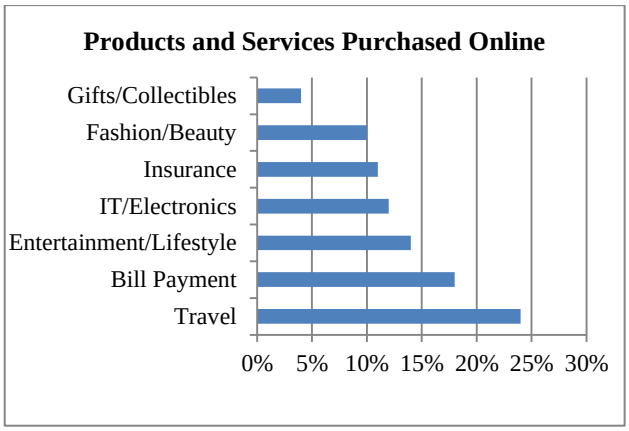

Figure 4: Product and Services Purchased Online by Malaysian

B. Literature Review

Numerous empirical literatures documented positive impact of ICT usage particularly on the productivity and growth at the firm level. Ark et al. (2003) [10] examined labour productivity growth of 51 industries in Europe and United States. He found that U.S. productivity has grown faster than that of Europe due to its more intensive use of ICT. To improve productivity, Horvath and Rudas (2012) [11] proposed the use of ICT in product object modelling to coordinate the engineering intents and knowledge components into product life cycle. This approach allows better coordination and efficiency in managing product life cycle.

This suggestion was supported by Bojandolsak (2012) [12]. He documented that computational intelligence allows better product design process as it improves effectiveness and reliability of the various tasks involved in product designs. Greater usage of ICT and internet resources also facilitates the decision making element in product design engineering. With more innovative products, the firm can remain competitive and thus support the rates of growth and development of the country.

In a related study, Panian (2012) [13] claimed that knowledge discovery in business and enterprise systems development and design relied heavily on ICT usage. Business intelligence which involves methods to improve business decision making that utilises facts and knowledge-based system is crucial to improve the competitive edge of the firms in this globalised era. Internet usage can provides useful inputs in accelerating the data mining process which forms one of the important tasks under business intelligence. Business intelligence is powerful as it allows the conversion of data into intelligence which business can use in predicting future market trend and consumer behaviour. Specifically, ICT and particularly internet usage allows perspective data mining which involves activities such as exploiting detailed data, creating and analysing the data collected, testing the model and finally integrates the outcomes obtained into business opportunities. With the advances

in ICT, mobile and location-based intelligence are made available to enable timely and accurate business decisions and innovations.

Apart from improving product designs and facilitating better business decision making, internet usage also allows firms to internationalize their operations. Dunning (1981 and 1988) [14] and [15] contended that firms can be benefited from three sources of advantage in adopting internalisation. Firstly, firms can extend their proprietary assets abroad. Secondly, firms can exploit the advantage of integrating activities across regions with different factor costs, and finally, firms can leverage on the scale and scope by merging activities that would otherwise be spread across firms. Mithas and Whitaker (2007) [16] on the other hand stated that internet allows innovative business practices across broader at ease. In fact, internet usage has transformed the marketing as well as the supply chain operations. Furthermore, the capacity of the firms in terms of coordination and human resource management are accelerated and enhanced.

In a related study, Mathews et al. (2012) [17] posited that internet usage opening up many new international market opportunities for the firm. They examined the internet's impact on internationalisation-process of the firms in Australia. Particularly, the relationship between information availability, information usage and interactive communication with internet are assessed in their study. Based on the results obtained, they concluded that there is a positive mediating impact of internet on information availability and usage with the growth of a firm in the international market. Generally, other than improved efficiency and profitability, firm's internet adoption also benefited from cost savings. In addition, the mushrooming of internet services related providers and businesses also helps in the job creation in the country.

On the macro level, Gius and Ceccucci (2010) [18] documented that nation which impede economic activity, discourage human development and retard entrepreneurial endeavour generally have less internet usage. Tiwari (2008) [19] reported that ICT usage has a significant positive impact on the economic development and poverty diminution especially in poorer countries. This finding was supported by a later research conducted by Dimelis and Papaioannou (2010) [20] which reported a highly positive and significant ICT usage effect in developing countries.

In terms of usage rate, Mathews et al, (2012) [17] found that in spite of the different characteristics that emerging economy possess, the internet usage frequency for marketing and supply chain management of the emerging economies are at par with that of their highly developed and internationalised counterparts. Moreover, emerging economy tends to use more internet business practices to expand or enter into new markets than the developed economies. Lastly, they found that emerging economy with high internationalisation reports relatively higher sales and customer service impacts from internet business practices than the high internationalised firms in developed countries. However, promoting a higher and more efficient internet usage does not only involving investments in internet infrastructure, but also heavily dependent upon the commitment of the end users. Therefore, a successful internet or e-implementation cannot be completed without proper e-training.

Ramayah et al. (2011) [21] investigated the e-training effectiveness in multinational companies in Malaysia. They found that motivation to learn, management support and organization support are among the factors affecting user satisfaction. Hence, commitment from the top management after the implementation stage is crucial to the success of internet business practices.

C. Methodology

This study utilised the annual data covers a period of 13 years from 1997 to 2010. Data on gross national income per capita (*GNI*), and internet user per 100 people (*INT*) are obtained from World Bank database. All data are logarithmic transformed before applied for further analysis. The time series plots of variables under study showed an increasing trend for LGNI and LINT over the sample period of study.

In order the determine if there exist any relationship between LGNI and LINT, the autoregressive distributed lag (ARDL) bounds testing framework pioneered by Pesaran and Shin (1995, 1999) [22][23] is adopted in this study. This approach does not only suitable for studies with small sample size like this one, but also could be adopted for variables with mixed integration orders of I(0) and I(1).

Based on this approach, the regression equations in the ARDL (*m*, *n*) framework to be estimated in this study are presented as in (1) below:

$$\Delta lgni_t = \sum_{i=-1}^{m} \beta_i \, \alpha_1 lgni_{t-1} + \alpha_2 lint_{t-1} + \sum_{i=-1}^{m} \beta_i \, \Delta lgni_{t-i} + \sum_{i=0}^{n} \gamma_i \, \Delta lint_{t-i} + c + \varepsilon_t \quad (1)$$

Where Δ is the first difference operator, $lgni$ and $lint$ represent logarithmic forms of gross national income per capita and internet user per 100 people respectively. To start with the analysis, the optimal lag order *m* and *n* needs to be predetermined by objective criteria while ε is a series of random errors. The parameters to be estimated here include α's, β's and γ's. Furthermore, the intercept, *c* is included in the estimation. Nonetheless, the parameters of interest are α's.

The null and alternative hypotheses for regression (1) are,

H_0: $\alpha_1 = \alpha_2 = 0$ (There is no long-run relationship between GNI and INT),
and
H_1: $\alpha_1 \neq \alpha_2 \neq 0$ (There exists a long-run relationship between GNI and INT).

The null hypothesis could be rejected in favour of the alternative hypothesis if the computed *F*-statistics exceed its upper bound critical values. Since the *F*-statistics in the ARDL framework does not follow standard distribution and therefore need to be simulated. These critical values are available for references in Pesaran *et al* (2001) [24].

III. ANALYSIS AND FINDINGS

A. *Descriptive Statistics*

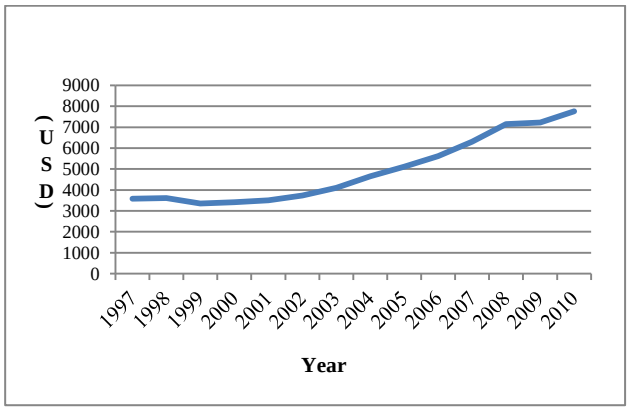

Figure 5: Gross National Income Per Capita of Malaysia (in USD) from 1997 to 2010.

From Figure 5, we can see that the gross national income per capita of Malaysia was on an upward trend during the period of study. In 1997, the GNI per capital was USD4500 and it remains below USD5000 until 2005. Despite its rather mild growth, there is an improvement from year to year within the study period.

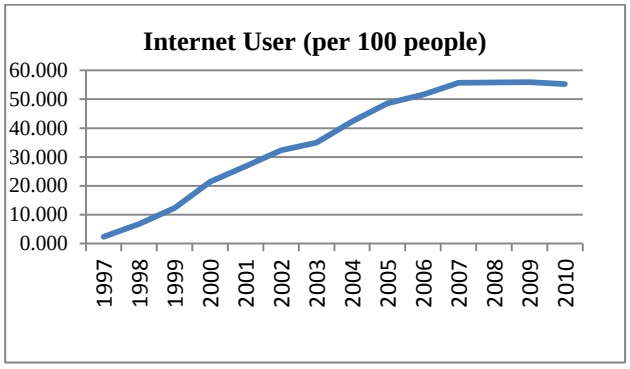

Figure 6: Internet User in Malaysia (per 100 people)

In terms of internet usage rate, Figure 6 shows that the internet usage rate was merely at 2.3 per 100 people in 1997. However, it picked up rather fast in the following years and reached its peak at around 55 per 100 people in 2007 and then, recorded a slight increase from there. This stagnant state after 2007 could be related to the lack of infrastructure especially broadband facility in the rural area.

B. *ARDL Analysis and Findings*

As one of the requirements under ARDL bound testing approach is that all the variables in the model should be I (0) or I (1) variable, unit root test is applied to ensure that the LGNI and LINT variables are not integrated of higher order. To achieve this objective, the conventional ADF test is performed and the results are reported in Table 1. From Table 1, it can be seen that LGNI is stationary after first differencing, while LINT is already stationary in its level form. Thus, we can conclude that LGNI and LINT are integrated of order 1 and 0 respectively. In other words, LGNI is an I(1) variable while LINT is an I(0) variable. As such, ARDL approach is suitable to be used for further analysis in this study.

Table 1: Unit Root Test for Order of Integration

Variable	Unit Root Test	
	Level	First-difference
LGNI	-2.394 [0.362]	-5.137 [0.002]
LINT	-18.093 [0.000]	/

Notes: The optimal lag of the ADF test is selected based on AIC, with a maximum lag of 2. The regression equation for the level of LGNI is estimated with a trend and intercept, while for LINT, only intercept is included in the estimation. The value included in the square brackets next to the reported *t*-statistic is the *p*-value of the statistic.

For the estimation of the ARDL procedure, the choice of optimal lag is important. Pesaran and Shin (1999) [23] show that out of the two commonly used minimum information criteria, namely Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC), the latter perform better in the ARDL setting. Furthermore, for annual data like those used in the current study, Pesaran and Shin (1999) [23] suggest to choose the optimal lag from a maximum lag of 2. Consequently, following Pesaran and Shin (1999) [23], SBC was adopted and the optimal lag chosen was a maximum of 2 lags.

The results are reported in Table 2. It is obvious from Table 2 that based on SBC (note that AIC consistently has chosen the same), ARDL (2, 1) is the appropriate specification, and the *F*-statistic obtained is larger than the 1% its upper bound critical value. Hence, it can be concluded that there is a long-run relationship between the LGNI and LINT.

Table 2: Bounds Test for Long-run Relationship

Order of ARDL(*m*, *n*)	*F*-statistic	*AIC*	*SBC*
(2, 1)	8.398***	-4.411	-4.158
(2, 2)	6.663**	-4.370	-4.080

Notes: The 10, 5 and 1% critical values I(0) are 4.04, 4.94 and 6.84 respectively for with unrestricted intercept with no trend , while the critical values for I(1) are, in that order, 4.78, 5.73 and 7. 84 These values are reproduced from Table CI.iii (with an

unrestricted intercept and no trend; with one regressor) in Pesaran *et al*., 2001). Asterisks ** and *** denotes rejection of null hypothesis at 5 and 1% significant level respectively.

Having established the long-run relationship, the ARDL (*m*,*n*) dynamic model is estimated for the derivation of long-run elasticity. The resulting optimal model based on SBC and a battery of diagnostic tests is reported in Table 3.

Table 3: Estimated ARDL Dynamic Model for Long-run Elasticity

$$\widehat{LGNI}_t = 0.870 + 0.857LGNI_{t-1} + 0.115LINT_{t-1} \quad (2)$$

s.e.	(0.292)	(0.036)	(0.010)
p-value	[0.014]	[0.000]	[0.000]

Goodness-of-fit

R-squared = 0.992
F-statistic = 646.364
AIC = -3.978
SBC = -3.847

Diagnostic test

Test	Test Statistic	*p*-value
Breusch-Pagan-Godfrey Heteroscedasticity Test	1.202	0.341
Jarque-Bera Normality Test	0.532	0.766
Breusch-Godfrey Serial Correlation LM Test	2.042	0.192
Ramsey RESET Test	0.884	0.399

Referring to Table 3, this model has passed through a battery of diagnostic tests, implying the estimated model is valid for interpretation. From (2) as reported in Table 3, it can be seen that the first lagged values of LGNI and LINT have significant positive impact on the current values of LGNI.

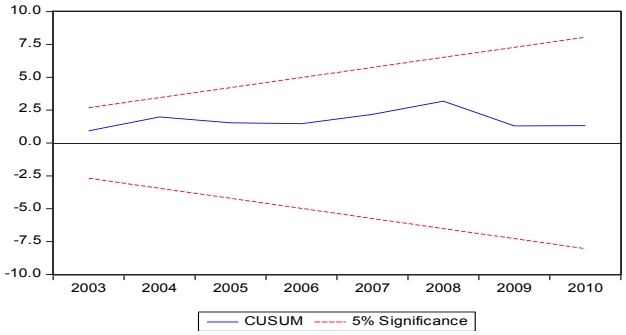

Figure 7: CUSUM Plot for Stability Test

The plot of CUSUM statistic as shown in Figure 7 was reported well within the 5% critical bounds, implying the estimated coefficients in (2) are stable.

The long-run elasticity can be calculated from (2) and the resulting long-run model is[1]:

$$\widehat{LGNI}_t = 6.804 + 0.804LINT_t. \quad (3)$$

Equation (3) reveals that internet usage rate and Malaysia's gross national income per capita are positively related, whereby a 10% change in internet usage rate can be associated to a 8% change in gross national income per capita in the same direction.

The estimated optimal error correction representation of ARDL model based on SBC and a battery of diagnostic tests is reported in Table 4. It can be observed from Table 4 that LINT has significant short-run positive impact on LGNI. Moreover, the error correction term (EC) is negative and significant at 5% level, implying that LGNI is responsive to short-run disequilibrium, in order to restore long-run equilibrium.

Table 4: Error Correction Representations of ARDL Model

$$\Delta\widehat{LGNI}_t = -0.009 + 0.885\Delta LGNI_{t-1} + 0.214\Delta LINT_t - 1.392EC_t \quad (4)$$

s.e.	(0.028)	(0.214)
	(0.108)	(0.459)
p-value	[0.763]	[0.003]
	[0.084]	[0.016]

Goodness-of-fit

R-squared = 0.833
F-statistic = 13.346
AIC = -4.025
SBC = -3.863

Diagnostic test

Test	Test Statistic	*p*-value
Breusch-Pagan-Godfrey Heteroscedasticity Test	1.408	0.315
Jarque-Bera Normality Test	0.660	0.719
Breusch-Godfrey Serial Correlation LM Test	1.408	0.315
Ramsey RESET Test	0.746	0.480

[1] The slope coefficient is given by 0.870/ (1-0.857) =6.840, whereas the slope coefficient is given by 0.115/ (1-0.857) =0.804, see Obben and Nugroho (2006) [25].

Note: EC is the first lagged values of the residuals of Equation (2).

Moreover, the CUSUM statistic plot as shown in Figure 8 was reported well within the 5% critical bounds. Hence, it can be concluded that the estimated coefficients in this model are stable.

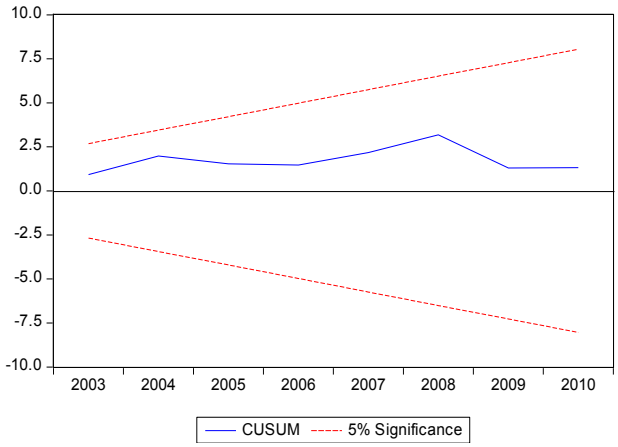

Figure 8: CUSUM Plot for Stability Test

IV. CONCLUSION

Using time series data of internet users per 100 people and gross national income per capita of Malaysia, an ARDL analysis was carried out to investigate whether internet usage is beneficial in driving the country's gross national income per capita towards achieving its target of USD15000 in 2020. The empirical findings provided by this study suggested that there is a significant long-run and short-run relationship between gross national income per capita and the internet usage rate in Malaysia. Particularly, it was found that a 10% change in internet usage rate is associated to a 8% change in gross national income per capita in the same direction.

Therefore, this study concludes that investing in ICT infrastructure and in particular, promoting a higher internet usage is beneficial to improve the gross nation income per capita of Malaysia. With that, the New Economy Transformation Model committee has made a right move by incorporating ICT development as one of the key enablers towards achieving the vision of a high income nation in 2020. Future research should also examine the internet user's profile and the role of the internet usage in business internationalisation.

References:

[1] Aghion, P. and Howitt, P., A Model of Growth through Creative Destruction, *Econometrica*, vol. 60, 1992, pp. 323-351.

[2] Flannery, M, J., and Protopapadakis, A.A., Macroeconomic Factors Do Influence Aggregate Stock Returns, *Review of Financial Studies, Oxford University Press for Society for Financial Studies*, 2002, Vol. 15, no.3, pp751-782.

[3] Liow, K. H., Ibrahim, M. F, and Huang, Q., Macroeconomic Risk Influences On The Property Stock Market. *Journal of Property Investment and Finance*, 2006, vol.24, no.4, pp 295-323.

[4] Kovarnik, J., The Analysis of Net Position Development And The Comparison With GDP Development For Selected Countries Of European Union. *Proceedings of the 4th WSEAS World Multiconference on Applied Economics, Business and Development (AEBD'12)*, Porto, Portugal July 1-3, 2012, pp. 223-228.

[5] World Bank Database. Available Online: http://data.wordbank.org/indicator. 2012.

[6] Internet World Stats. Asia Top Internet Countries. Available Online: http: // www. internetworldstats. com. 2012.

[7] Paynter, J. and Lim, J. The Drivers and Impediments of E-commerce in Malaysia. *Journal of Library Malaysian and Information Science*. 2001, vol. 6, no. 2, pp.1-19.

[8] Cyber Security, *Cyber Security Bulletin*. Vol. 30, quarter one, 2012. Available online: cyber security.com.my.

[9] Paypal, *Online and Mobile Shopping Insights*, Available Online: http: paypal.com.my, 2012.

[10] Ark, B. V., Inklaar, R. And McGuckin, R. H. ICT Productivity in Europe and The United States: Where Do The Differences Come From? *CFSifo Economic Studies*. 2003, Vol. 49, no.3, pp. 295-319.

[11] Horvath, L. and Rudas, J.I., New Method of Knowledge Representation and Communication for Product Object Modelling. *Proceedings of the 12th WSEAS International Conference on Applied Computer Science (ACS'12). The 1st International Conference on Computing, Information System and Communications (CISCO'12) and the 1st International Conference on Digital Services, Internet and Applications (DSIA'12), Singapore City, Singapore*, May11-13, 2012.pp. 75-80.

[12] Bojandolsak, Intelligent Decision Support in Product Design. *Proceedings of the 14th WSEAS International Conference of Mathematical Methods, Computational Techniques and Intelligent Systems (MAMECTIS'12), Porto, Portugal.* July 1-3, 2012. pp.97-102.

[13] Panion, Z., The Evolution of Business Intelligence: From Historical Data Mining to Mobile and Location-Based Intelligence, *Proceedings of the 4th WSEAS World Multiconference on Applied Economics, Business and Development (AEBD'12), Porto, Portugal*, July 1-3, 2012, pp. 118-127.

[14] Dunning, J.H. *International Production and the Multinational Enterprise*, Glasgow, Scotland: HarperCollins Publishers Ltd.

[15] Dunning, J.H., The Eclectic Paradigm of International Production: A Restatement and Some

Possible Extensions, *Journal of International Business Studies* 1988, vol. 19, no.1, pp. 1–31.

[16] Mithas, S. and Whitaker, J. Is the World Flat or Spiky? Information Intensity, Skills, and Global Service Disaggregation, *Information Systems Research*, 2007, vol. 18, no.3, pp. 237–259.

[17] Mathews, S., Healy, M. and Wickramasekera, R. The Internationalisation of Information, Knowledge and Interaction Components of the Firm's Internationalisation Process. *Journal of Marketing Management.* 2012. Vol. 28 no. 5&6. pp. 733-754.

[18] Gius, M., and Ceccucci, W., Economic Freedom and Internet Use: A Cross-Country Comparison. *Journal of Business & Economic Studies*, 2010, vol. 16, no 2, pp.49-79.

[19] Tiwari, M., ICTs and Poverty Reduction: Users Perspective Study of Rural Madhya Pradesh, India. *The European Journal of Development Research*, 2008, vol. 20, no 3, pp. 448-461.

[20] Dimelis, S.P. and Papaioannou, S.K., FDI and ICT Effects on Productivity Growth: A Comparative Analysis of Developing and Developed Countries. *European Journal of Development Research*. vol. 22, no 1, pp.79-96.

[21] Ramayah, T., Ahmad, N. H., & Hong, T. S. An Assessment of E-training Effectiveness in Multinational Companies in Malaysia. *Educational Technology & Society*, 2012, vol. 15, no. 2, pp.125–137.

[22] Pesaran, M. H., and Shin, Y. Autoregressive Distributed Lag Modeling Approach to Cointegration Analysis, DAE Working Paper Series No. 9514, Department of Economics, University of Cambridge. 1995.

[23] Pesaran, M.H., and Shin, Y., An Autoregressive Distributed Lag Modeling Approach to Cointegration Analysis, in Storm, S., ed, Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium, Cambridge University Press, Combridge, Chapter 11. 1999.

[24] Pesaran, M. H., Shin, Y., and Smith, R. J. Bounds Testing Approaches to The Analysis of Level Relationships, *Journal of Applied Econometrics*, 2001,vol. 16, pp. 289-326.

[25] Obben, J. and Nugroho, A. E., Determinants of the Funding Volatility of Indonesian Banks: A Dynamic Model, *The Journal of Developing Areas*. 2006, vol.39 no. 2, pp.41-61.

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