COMPARATIVE REVIEW OF ASEAN MEMBER-COUNTRIES' LABOR PRODUCTIVITY IN THE CONTEXT OF INNOVATION

Francis Evan L. Manayan

ABSTRACT

To compare the ASEAN member-countries' labor productivity, this study analyzed the following attributes of geography of innovation constructs, namely: Population's Labor Force, Human Capital, Quality of Math and Science Education, Transparency of Government Policy-Making, Protection of Minority Shareholders, and Institutional Innovation. Using sectoral data from the AEC time period (2007-2014), the multiple regression analysis was used in the investigation of each of the factor affecting labor productivity. Results showed that countries can take advantage of the relative elasticity of labor productivity to changes in the Geography of Innovation constructs namely, Myanmar's labor force; Indonesia, Thailand, and Vietnam's human capital; and Philippines' quality of math and science education, and institutional innovation.

INTRODUCTION

Recent global trends in member countries of Association of Southeast Asian Nations (ASEAN) addresses on challenges relating to job gains and losses, skills and development, labor migration, social protection systems as well as wages and productivity. Some ASEAN member-countries such as the Philippines, Malaysia, and Singapore, have revealed that productivity would depend on use of skilled labor, improved innovative capacity of firms, and reduced regulatory barriers. Singapore, for example, had the highest productivity level per worker, even surpassing that of US. This has made Singapore a yardstick among other member-countries of the ASEAN like the Philippines and Malysia. In the case of the Philippines, the high annual GDP growth for the past five years can be determined by its large labor force of 64.3 million out of 100 million total population (Philippine Statistics Authority, 2014). For Malaysia, in the period of 2007-2011, it recorded a growth of 4.6 percent in congruence with the 5.1 percent GDP (Malaysia Productivity Report, 2011/2012). With this improvement, it can be noted that the freer mobility of labor is an opportunity for countries in ASEAN; however, there is a recognized problem on substantial per capita GDP gaps with the developed economies because of relatively poor labor productivity performance (Nomura, 2010).

The human capital determinants such as education, health, wages and number of hours worked posed a striking difference in labor productivity growth patterns because of the lack of ability to innovate (Scarpetta and Tressel, 2004). According to Program for International Student Assessment's (PISA) worldwide exam last 2015, Singapore was top performing country across all Math and Science subjects. However, Asian countries like Vietnam, Thailand, and Indonesia ranked 22nd, 57th, and 67th for Math Subject, respectively. For Science subject, Vietnam, Thailand, and Indonesia ranked 8th, 57th, and 65th, respectively (OECD, 2015). Naturally, a huge labor force comes with a huge contribution to economic growth. However, a problem arises because some member-countries in the ASEAN, the Philippines, for example, still cannot reach its labor productivity potential. One reason may be on the nature and state of the system of innovation.

Faced with challenges on labor productivity in the context of ASEAN, this study examines the contribution of the population, human capital, quality of education, and innovation factors to the ASEAN member-countries' labor productivity model. Thus, there is a need for the ASEAN member countries to strengthen its coalition by analyzing the uniqueness of each country member characterized by a different level of institutional innovation factors. While a number of studies have been done to measure the relationship between innovation and labor productivity such as Aspergis, Economidou and Filippidis (2008), Bogliacino and Pianta (2009), Janz, Loof and Peters (2003) and Scarpetta and Tressel (2004) among the OECD, very few scholarly work, if any, were undertaken in the ASEAN member-countries' labor productivity in the context of innovation.

METHODS

Research Design

The study used quantitative research design employing the Classical Multiple Regression Model to learn more about the relationship of independent variables (i.e. Population, Human Capital and Institutional Innovation Indices) with the dependent variable (Labor Productivity) in the ASEAN Context. Multiple regression is most effective at identifying relationship between a dependent variables when its underlying assumptions are satisfied: each of the metric variables are normally distributed, the relationships between metric variables are linear, and the relationship between metric and dichotomous variables is homoscedastic (Coelli, 2005).

Data Collection

The study relied on data collected from the World Bank Databank (Development Indicators), Asian Development Bank of the Philippines' Data Bank and World Economic Forum websites. The study made use of cross-sectional panel data. This type of data pertain to the data on labor force, number of graduates and labor productivity in a specific period from 2007 to 2014 and classified according to economic sectors per country. Because of increasing availability of panel data in social sciences, panel data regression models are being increasingly used by researchers in many fields. Global innovation indices reports from 2007 – 2014 provided data for institutional innovation index, transparency of government policy making and protection of minority shareholder index.

Statistical Tools

The application of Classical Linear Regression is appropriate because of the type of data (cross-sectional panel data) wherein the observations are based across space and across time. The data include the type of economic sectors (agricultural, industry and service) with corresponding figures on the labor force, the number of graduates and institutional innovation indices per member country of the ASEAN. Also, the concept of elasticity was used to measure the responsiveness to labor productivity to one of its variables. It presents quantitative observation about the impact or contribution of changes in attributes of the geography of innovation namely, Population (number of Labor Force), HCapital (Number of graduates), QMathSci (Quality of Math and Science Education), and Insti (Institutional Innovation) on Labor Productivity.

In the preliminary analysis of models, the data have been found to have violated some of the assumptions under Classical Linear Regression Model, specifically autocorrelation and heteroscedasticity. In this case, the method of transforming the data into functional forms was done. The Ordinary Least Squares (OLS) method of regression was used to obtain the values of each parameter/measure in the model. The E-views software was used to run the regression models, which has the Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors (Newey-West standard errors) feature.

The HAC was used to cure the presence of certain violations of the assumptions in the Classical Linear Regression Model, namely, autocorrelation (error/disturbance terms affecting the data) and heteroscedasticity or the unequal spread of variances in the residuals (Gujarati, 2003). Also, to test for multicollinearity (data show a relationship between the independent variables), Pairwise correlation matrix was used, wherein if the values are less than .5, it is ought to be not multicollinear (Gujarati, 2003).

To test for autocorrelation, the Durbin-Watson test was applied. Results showed (see Table 1) that regression models for Cambodia, Indonesia, Laos, Philippines, and Thailand do not possess

autocorrelation between members of series of observations. For Heteroscedasticity, the Park test was employed and test revealed that regression models for Brunei, Indonesia, Malaysia, Philippines and Thailand possessed an unequal spread of variances in the residuals of data Labor Force (LForce).

The Model transformation (Double-Log Form) was employed in the susty. The choice of functional form for an equation in this study was necessary to come up with the correct natural log form in specifying an equation. In this study, the double-log form was used based on three reasons: First, the double-log form was found to be the closest to the underlying theory of the study; second, it is so popular that some researchers use it as a default functional form instead of the linear form. It is often used because it has specified the assumption that the elasticities of the model are constant and the slopes are not; and third, using the double-log model, the researcher made sure that there were no negative or zero observations in the data set. Since the log of a non-positive number is undefined, a regression could not be run.

The most recent data available for labor productivity, labor force, the number of graduates, quality of math and science education, transparency of government policy-making index, protection of minority shareholders index and institutional innovation indices for this study were from 2007 up to 2014 only. This study assumed the following 2 models:

Model 1 is for Brunei, Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam's per sector data for Labor productivity

$$lnLP = C + \beta_1 ln(LForce) + \beta_2 ln(HCapital) + \beta_3 ln(QMathSci) + \beta_4 ln(Insti) + \mu$$

Model 2 is for Laos and Myanmar's Labor Productivity per sector:

$$lnLP = C + \beta_1 ln(LForce) + \beta_2 ln(HCapital) + \beta_3 ln(QMathSci) + \beta_4 ln(TransGovPol) + \beta_5 ln(Protec) + \mu$$

Where:
- LP-The Labor Productivity, per sector from 2007-2014, (in USD)
- C-Constant/Intercept (model 1); Base variable/Service Sector
- LForce – Labor force (2007-2014), per sector, per country
- HCapital-Number of graduates from (2007-2014), per country
- Insti – Institutional Innovation (2007-2014)
- Transgovpol; Protec – Transparency of Government and Policy Making Index and Protection of Minority Shareholders Index (For Laos and Myanmar's Institutional Innovation Indices.)
- µ- error/disturbance term

RESULTS AND DISCUSSION

ASEAN's Population - Labor Force

For ASEAN's Labor Force (population), despite the positive average growth of Labor productivity among ASEAN member-countries, the labor force generation did not grow at a faster pace. According to the Philippine Development Plan (2017-2022), the sluggish economic growth of both the global and Asian emerging markets for the period 2003 – 2015 is suspected to be directly correlated with the ASEAN's annual average growth for the labor force.

In this study, the labor force from 2007-2014 has an annual average growth rate of 2.04 percent. Though Indonesia is obviously registered the highest number in terms of labor force, Singapore has been consistent in having a strong labor force as it topped the countries in terms of annual average growth rate of 3.81 percent. Singapore had the highest growth in 2008 at 6.5 percent. Philippines followed Singapore at an annual average growth rate of 2.81 percent and had its highest point in 2010 at 3.7 percent. Moreover, from 2007-2014, the overall variability of annual average growth of labor force among ASEAN member-countries revealed a close variation.

The change in labor productivity is synchronized with labor force participation. According to a study by International Labor Organization (2014), the trend of quality of labor force for ASEAN community remained low for some developing countries. The second quarter of 2014, for example, Vietnam has accounted a 47.98 percent for skilled workers while workers who have high qualifications and training remained low at 18.25 percent. In contrast to other countries such as, Thailand, Malaysia, Philippines and Indonesia, they have registered highly qualified and trained workers at 51. 4 percent, 36 percent, 28.2 percent and 27 percent, respectively.

Meanwhile, Singapore strongly emphasizes on education and skill enhancement among its labour force. These characteristics ensure a better alignment with the changing requirements of firms and also to accelerate the creation of new markets for innovative products and services (Malaysia Productivity Report, 2011-12). The population and labor force growth patterns in ASEAN member-countries support the concept of diversity in labor dimensions. The trend implied that as ASEAN member-countries integrate, the labor force may be equipped with the latest skills to support the needs of the industry. This thrust may sustain and make Industry sub-sectors competitive with future demands.

ASEAN's Human Capital - Number of Graduates

The annual number of graduates among ASEAN member-countries had an annual average growth of 7.52 percent. Indonesia continuously increased its number of graduates for the past three years (2012-2014). However, in terms of annual average growth, Cambodia registered the highest rating at 19 percent, followed respectively by Brunei (11.21%), Vietnam (10.29%), and Laos (9.47%). Singapore, Philippines, and Malaysia were among the bottom five with annual average growth rates at 5.7, 5.1 and 1.75 percent, respectively. Thailand, on the other hand, posed a negative annual average growth rates at -0.16 percent. This condition is supported by the values that have close variations under the coefficient of variations across time (2007-2014). However, in terms of variability relative to the total average number

of graduates across ASEAN countries, the values under the coefficient of variations revealed that the countries have almost the same performance.

Among the ASEAN member-countries, it is staggering to note that Thailand had a negative annual average growth rate in terms of the number of graduates. According to OECD (2013), the structural policy challenges for Thailand include challenges on improving its education systems while addressing the accumulated environmental damage from its rapid growth. Thailand has made impressive progress in providing education to the most of the population. However, significant disparities in access remain, especially for poorer households and between rural and urban areas that need to be addressed. Moreover, in the World Education News and Reviews (2014), the gross enrollment ratio in 2010 at the tertiary level was relatively high at 48 percent; however, the gross graduation ratio of 29 percent is suggestive of high drop-out rates.

The experience of Brunei, Vietnam, and Cambodia in terms of huge average growth of the number of graduates may be supported with the countries' Structural Policy Country Notes (OECD, 2013). Brunei has the policy focus on improving tertiary education. Country's education system has been reformed steadily in recent years because the government has provided generous education services to all. The literacy rate, for instance, is over 95 percent, and the gross enrolment rates both primary and secondary levels are over 100 percent (OECD, 2013).

In Vietnam, an improvement to access to education involved successful economic reform during the period 1990-2012 resulting to an impressive human capital development performance. Despite having the lowest human development index (HDI) in ASEAN-5 (Indonesia, Malaysia, Thailand and Vietnam), the number of years spent in schooling by people aged 25 and older lengthened by 1.5 years (OECD, 2013).

In the case of Cambodia, despite the huge quantity of graduates from 2007-2014, the poor education has been noted as one of the main barriers to development. There has been an expanding workforce and a shortage of skilled labor due to country's inefficient education system. The challenges of Cambodia's education system are of two kinds: demand side and supply side. On the demand side is the unwillingness or inability to attend school, while on the supply side lies the inefficiency of the Cambodian government and education system to deliver quality educational resources (OECD, 2013).

ASEAN's Quality of Math and Science Education Rating

Although the ASEAN member-countries has been producing enough graduates at a positive annual average growth of .36 percent, it is suspected that there is still a low supply of qualified talents that may be attributed to the low quality of education in the fields of math and science education in the case of Malaysia, Philippines, and Indonesia. These countries registered the lowest spot among member countries with the mean of 3.94, 3.41, and 3.16, respectively.

Data revealed that in the ASEAN, quality of math and science education's overall annual average growth rate is at -1.57 percent. It is suspected that in other ASEAN-member countries, the growth of number of graduates is inversely related to the quality of math and science education, as revealed in the cases of Brunei (-13.11%), Cambodia (-2.02%), Malaysia (-5.5%), Singapore (-0.05%) and Thailand (-2.4%). This condition has been translated in the case of Brunei that had the lowest annual average growth of -

1.11 percent in terms of the quality of math and science education while having the most sustained growth in terms of the number of graduates in 2007-2014.

Only Philippines (3.29%), Indonesia (2.7%) and Laos (1.14) and Vietnam (.38%) have registered a positive annual average growth. In terms of the variability with the total average growth of quality of math and science education among ASEAN member-countries, the lowest variation was in 2012 (.17%) and the highest was in 2007 (.25%). On the lighter side, the highest annual average growth of quality of math and science rating in the Philippines form 2007 to 2014 may be translated into an improvement from its slow reform on educational system registered in World Economic Forum's rating in 2010. With the negative annual average growth of quality of math and science education among ASEAN member-countries, there is an implication of prospective demand for more qualified teachers as this affect number of issues especially in students' enrolment, performance and graduate output in the discipline of science and mathematics (Pia, 2015).

ASEAN's Institutional Innovation Index

Innovation has been considered a major driver of an exponential economic growth as it is a major support to all economic sectors especially institution. The increase in institutional innovation is likely to have a significant impact on ASEAN member- countries' economy and different sectors.

Data revealed that Singapore had the highest institutional innovation index at an average of 6.06 points and has been consistent for the years 2007-2014. Singapore's consistent performance has been revealed in terms of minimal variation relative to its total average index across time at a coefficient of variation of .014 percent. It is observed that Singapore may be a benchmark for other ASEAN member-countries knowing that its ranking by World Bank as among the world's most competitive countries. Also, Singapore has been consistently ranked second overall for four consecutive years across all criterions of Global Competitiveness Index Global Competitiveness Report (2015) of World Economic Forum.

In spite of the ASEAN member-countries' positive growth in labor productivity, pushing most of the member-countries institutional innovation may be considered as another challenge. The negative average growth of Thailand (-2.52%) and Vietnam (-0.27%) may hinder growth on industries' readiness to participate in the ASEAN integration which involves capacity to comply with local and international standards, SME's access to technology infrastructure development, and research and development adoption. Furthermore, OECD's Innovation Strategy (2015) mentioned that a contribution linked to increased multi-factor productivity growth, reflecting increased efficiency in the use of labor and capital, a substantial part of which can be attributed to innovation. For these reasons, many countries are increasingly emphasizing innovation-led productivity as the main source of future growth (Braconier, et al, 2014).

ASEAN's Transparency of Government Policy Making Rating

In connection with the institutional aspect, the following three environments are present: Political, Regulatory and Business. Basically, the ability of ASEAN member countries to achieve sustained high growth in terms of GDP per capita, for example, transparency of government policy making is crucial. This institutional factor resembles the ability of the businesses to obtain information about changes in government policies and regulations that affect the industry.

The annual average growth of transparency of government policy making index (2007-2014) is at -.84 percent. Singapore had the highest average score of 6.20 points and then followed by Myanmar at

5.03 points. Also, Malaysia had the highest variability of growth rate from 2007 to 2014 at a coefficient of variation of 0.19 percent. The goal of transparency of government policy making is to simplify business rules and regulations to reduce the cost of doing business which can be pursued by encouraging different government units to undertake policy and procedural reforms, for example, processing the requirements of investors.

Thus, the negative average growth of transparency on government policy making index may affect the ability of the ASEAN member-countries to continually promote an investor-friendly environment and to ensure compliance of industries to standards. This unsatisfactory performance may be supported with the study of Imperial (2004) on Philippine labor policies wherein it highlighted three major issues: First, they are based on the standards of highly developed markets, which is not congruent with the country's level of development. Two, labor policies are highly regulatory and protective of workers' rights, which is not suitable for a country with a huge labor surplus. Three, labor policies tend to be pro-employed rather than employment-oriented, therefore aggravating the unemployment problem. Apart from Philippines, countries that registered a negative annual average growth such as Thailand (-3.08%) and Vietnam (-0.93%) revealed a direct relationship between transparency of government policy making and institutional innovation at an average growth of -2.52 percent and -0.27 percent, respectively.

ASEAN's Protection of Minority Shareholders

For the private sector, the protection of minority shareholders shall lead the economic growth through labor productivity. For entrepreneurs that seek to develop or expand a business, stronger institutional protection increases the confidence of the investors in the market.Businesses, entrepreneurial activities and other foreign direct investments are seen as potential drivers of development. It is believed that investors' willingness to provide entrepreneurs with equity capital is a significant factor in the development of financial markets, which in turn results in economic development. However, data revealed that the overall performance across ASEAN member countries posted a negative annual growth rate at -0.01 percent. Singapore had the highest annual average of 5.55 points at -.2 percent average growth rate. Malaysia followed with a slight difference at an annual average of 5.25 points. This is supported in the Malaysia Productivity Report (2011-2012) wherein it was placed in the second among Southeast Asia countries behind Singapore. It was found out that 70 percent of employees in Malaysia love their work and had high moral.

On the other hand, given this overall unfavorable trend that registered an overall annual average growth of -0.01 percent, ASEAN's main challenge is to balance efficiency and equity. Since, greater shareholder protection is associated with factors namely, larger capital markets, lower cost of capital and higher cash flows, financial institutions may consider promoting greater access to finance for entrepreneurs by encouraging regulation conducive to investment.

According to World Economic Forum's Human Capital Outlook for ASEAN (2016), it is suspected that there is an increase in efficiency and accelerated returns if businesses collaborate with each other and with governments. Moreover, if this poor performance on protecting shareholders interest is not addressed by improved corporate governance standards, promoting positive outcomes at the country and firm level would be difficult.

ASEAN's Labor Productivity

Despite the sustained average growth of labor force and the number of graduates from 2007-2014, ASEAN member-countries' overall labor productivity did not grow at a faster pace. To effectively address this sluggish growth, the current trend in labor productivity should be looked into from a macro scale down to country specific scale.

Data revealed that the average growth rate of labor productivity of ASEAN member countries was at 1.66 percent. Over the seven-year period, average labor productivity growth among the ASEAN member countries increased gradually from 1.8 percent growth in 2007 to 3.4 percent growth in 2013. Brunei had the highest labor productivity at an annual average of 100,282.29 (USD) from 2007-2014 and then followed by Singapore (94,652.71 USD) and Malaysia (33,549.00 USD). However, in terms of average growth, Brunei had a negative annual average growth rate at − 0.53% from 2007-2013, compared to Singapore at 1.47%. On Singapore's high average increase in labor productivity, it was revealed that it even surpassed US' labor productivity level by per-worker GDP (2012). This massive increase is observed to be correlated with its institutional innovation's average points at 6.066 from 2007-2014 which was almost 2 times higher than the rest of the ASEAN member countries (Global Competitiveness Report, 2015).

Further, Indonesia, Laos, Myanmar and Vietnam had sustained the increase of labor productivity from 2007-2013. Even though Laos belonged to the bottom three with Cambodia and Myanmar in terms of average labor productivity, it has the highest average growth for labor productivity at 3.35 percent which was almost 3 times higher than Singapore.

The strong inconsistency on levels of labor productivity relative to the mean of USD 27,581.59 among ASEAN member-countries implies an incongruence of the level of preparedness of labor force in some other countries' labor productivity like Laos, Cambodia, and Myanmar. Also, based on the average growth of labor force of these countries, it contradicts with the results of the studies conducted by Boserup (1981), Simon (1992), and Kremmer (1993) that greater population growth has a direct relationship with greater productivity.

Moreover, using Singapore as a benchmark, factors governing institutional innovation may be taken into consideration to promote investment and economic growth. Institutional innovation is crucial to be able to maximize labor productivity and participate globally. The experience of Singapore in terms of sustained labor productivity revealed that as the population grows, major innovation cycles must be generated at a continually accelerating rate to sustain growth. This is supported by Singapore's remarkable performance in terms of institutional innovation index from 2007-2014 (Global Competitiveness Report, 2015).

Contribution of Geography of innovation constructs to Labor Productivity

The analysis per country is presented in the following format − F-Statistics results, Model Summary, and Coefficients' Interpretation.To reiterate, although T-test is invaluable for hypotheses about individual regression coefficients, it cannot be used to test hypotheses about more than one coefficient at a time (Studenmund, 2001). Hence, other than T-test, the F-test is used in this section to determine whether the overall fit of an equation per country is significantly reduced by constraining the equation to conform to the null hypothesis.

Looking at the overall significance of each of the model in table 1, the F-statistics for 10 models are all less than the absolute value of two (2), except for Myanmar and Singapore. These values for Myanmar and Singapore mean that although regression coefficients are individually significant, the totality of the model is not statistically significant. Thus, these models do not represent the full picture of Myanmar and Singapore's labor productivity other than the other variables used in this study.

Table 1
Summary of ASEAN Member-Countries' Statistical Results

	BRN	KHM	IDN	LAO	MYS	MMR	PHL	SGP	THAI	VNM
Constant /Intercept	16.600	8.977	7.3058	21.72	22.93	949.77	27.42*	16.31	99.02	13.55*
HCapital	− .0781	.09102*	1.52*	.6058	.0141	-.473	-.1879	.1478*	-4.45	1.07*
QMathSci	- 2.0889	2.0315	.1181	-.3676	-.2852	-.1395	2.5587*	-.8490	.2734	.1426
LForce	- .1604	- .4075	-.664*	-.9513*	-8610	-52.74	-.5999	.0258	-.747	-.7943*
Insti	.284244	.1729	.564		.1282		-4.10	-2.561	-5.504	-.5979
Transgovpol				-1.069		-2.44				
Protec				-.9105		-23.45				
F-Stat	.31	18.37**	30.05**	88.36**	40.63**	1.02	11.11**	3.14**	44.36**	51.98**
R^2	.01	.49	.56	.88*	.70*	.07	.37	.15	.70*	.69*
Durbin- Watson	1.34	2.38**	2.24**	3.08**	1.71	1.91	2.30**	1.51	2.24**	1.86

Legend: * Sig at .10 α ; ** Sig at 2T Rule

Elasticity of Labor Productivity among ASEAN Member-Countries

Based on the ASEAN member-countries' Labor Productivity model (LOG-LOG), the elasticity is generated as the variables' (negative or positive) relationship to Labor Productivity for every 1 percent increase in the unit of variables. If the coefficient's value is less than one, the Labor Productivity is said to be inelastic. However, if the coefficient's value is more than one, the Labor Productivity is said to be elastic. For values equal to 1, the Labor Productivity's response is unitary. Table 2 presents the summary of the responsiveness of ASEAN member countries' labor productivity to the variables namely, human capital, quality of math and science education, labor force and institutional innovation.

Human Capital (Number of Graduates) - The responsiveness of Indonesia and Thailand's Labor Productivity are observed to be elastic at 1.52 and 4.45, respectively. Similarly, Vietnam's responsiveness in terms of Labor Productivity revealed a unitary value at 1.07. On the other hand, other seven countries have an inelastic response of Labor Productivity at values less than one.

Quality of Math and Science Education - Only Brunei, Cambodia and Philippines registered elastic values of 2.08, 2.03 and 2.55 for Labor Productivity's responsiveness, respectively. These countries' performance under Quality of Math & Science Education may be further studied as a benchmark for other countries.

Labor Force - Among other countries, only Myanmar registered a value of 52.7 which resembles an elastic response for its Labor Productivity. Other countries have less than 1 results with an average of

.54. This prevalent relationship of inelasticity may be further investigated to maximize labor force effects to labor productivity.

Institutional Innovation - Only Philippines and Thailand registered an elastic response for countries' labor productivity at 4.10 and 5.50, respectively. Indonesia has a close value to 1 at .56 while others did not reach values more than 1 which resembles elasticity. Further, for countries like Philippines and Thailand institutional innovations like an improvement of labor market governance mechanisms may contribute significant growth to labor productivity.

Table 2
Summary of Variables Based on Labor Productivity's Elasticity in changes
of one of the variables

Country	Variables using LOG-LOG Model			
	HCapital	QMathSci	LForce	Insti
BRN	.07	2.08*	.160	.28
KHM	.09	2.03*	.16	.28
IDN	1.52*	.11	.66	.56
LAO	.60	.36	.95	N/A
MYS	.014	.28	.86	.12
MMR	.47	.13	52.7*	N/A
PHL	.18	2.55*	.59	4.10*
SGP	.00018	.46	.00000018	.111
THA	4.45*	.27	.74	5.50*
VNM	1.07**	.14	.79	.59

Legend: * Elastic; ** Unitary (<1 inelastic; >1 elastic; =1 unitary)

CONCLUSIONS

In totality, the human capital, and labor force, per country are those factors which significantly affect ASEAN member countries' labor productivity. These variables can be considered as endowments for productivity. Also, it can be observed that for all countries, it is revealed that the HCAPITAL (No. of Graduates) variable contributes positively to labor productivity. The countries Cambodia, Indonesia, Singapore, and Vietnam exhibited positive relationship of variables with Labor productivity. On the other hand, the LFORCE (No. of labor force) also negatively contribute to labor productivity for countries namely, Cambodia, Indonesia, Philippines, Vietnam, and Laos.

It is believed that promoting a culture of innovation produces availability and acceptability of work in terms of employment opportunities, as exhibited by Singapore. Moreover, proactive programs on Industry sectors shall be taken into consideration to address the growth of labor productivity. Furthermore, it may be concluded that these variables can increase the bargaining power of ASEAN member- countries. Since the common significant variables HCAPITAL and LFORCE contribute to each country's labor productivity, this study then concludes that it would be beneficial to all member-countries to further study and explore from Singapore's institutional innovation performance and service-sector supportive programs.

For ASEAN's competitiveness, results show that countries could improve labor productivity by focusing on the country's labor force, and human capital. Similarly, countries like Indonesia, Thailand, and Vietnam may focus their efforts in augmenting the growth of human capital as this significantly affect their labor productivity. The quality of math and science education for Brunei, Cambodia, and Philippines offer an opportunity to improve, knowing that this variable poses an elastic effect to Labor productivity. Myanmar, despite its negative average growth rate for private sector index, may align effective labor governance mechanism to increasing labor force because it has an elastic effect to Labor productivity. Philippines and Thailand may take into consideration Singapore's performance in terms of institutional innovation which can be used as a barometer in improving public and private sectors as these have an elastic effect to labor productivity.

In terms of limitations of the study, the data for Institutional Index (2007-2014) for Laos and Myanmar were not available. Thus, other institutional-related indices from the Global Competitiveness Indicators were used. For Public and Private Sector index, the Transparency of Government Policy Making Index and Protection of Minority Shareholders Index were used, respectively. A set of cross-sectional panel data was used in this study. However, according to Gujarati (2003), cross-sectional panel data have their own problems in terms of heterogeneity.

Finally, as this study only covers the AEC time period of 2007-2014, future studies may explore on the effects of other innovation constructs on ASEAN's labor productivity using a longer or a future time period. Other studies may also consider exploring the significance of other non-human resource related variables with regards to the relationship with labor productivity. These variables may include Technological Readiness, Financial Market and FDI (Foreign Direct Investments), to widen the analysis on ASEAN member countries' labor productivity.

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