P ISSN 2086-3128 | E ISSN 2502-180x

Economic Journal of Emerging Markets

Accredited by Kemenristekdikti No.: 36a/E/KPT/2016

Volume 10 Issue 1, April 2018, Pages: 1-120

Robust approach for efficiency measurement of employee performance under profit sharing system
Umi Mahmudah and Muhamad Safiih Lola

Community empowerment in rural infrastructure development program
Waridin Waridin, Atika Dzulkhijiana, and Izza Mafruhah

Forecasting demand for long-term care based on multistate piecewise constant Markov process
Cui Xiaodong and Zheng Yuhua

The role of tourism toward economic growth in the local economy
Suhel Suhel and Abdul Bashir

Growth of service sector in BRIIC economies
Maisya Farhati and Raquel Ortega-Argilés

Analysis of seaports efficiency in supporting inter-island transportation
Adenanthera L Dewa, Nugroho SBM, Mudjahirin Thohir, and Indah Susilowati

Strategies for increasing tax revenue in tourism sector
Horas Djulius

Cross-asset class portfolio between gold and stocks in Indonesia
Mesakh Prihanto Surya Putra, Apriani Dorkas Rambu Atahau, and Robiyanto Robiyanto

Trade openness and female-male earnings differentials: Evidence from Indonesia
Maryam Jamielaa

Comparison analysis of imported coffee of Malaysia from Indonesia and Vietnam
Eko Atmadji, Esther Sri Astuti S. A., and Yosra Hersegoviva Suhardiman

Inclusive growth and leading sector in Bali
Ni Made Ayu Krisna Cahyadi, Sasongko Sasongko, and Putu Mahardika Adi Saputra

The determinant of equity financing in sharia banking and sharia business units
Jaenal Effendi

Economic Journal of Emerging Markets

http://journal.uii.ac.id/index.php/JEP/

Editorial Office

Faculty of Economics, Universitas Islam Indonesia
Condong Catur, Depok, Sleman, Yogyakarta, Indonesia, 55283
Phone: +6274-881546, 883087, Fax +6274-882589
E-mail: ejem.economicjournal@gmail.com

Economic Journal of Emerging Markets (EJEM) is published by Center for Economic Studies, Faculty of Economics, Universitas Islam Indonesia, in a collaboration with the Indonesia Regional Science Association (IRSA), three times a year. Since 2012, it publishes two issues per year on April and October. EJEM is a forum for scientific works concerning economic studies in emerging markets.

Economic Journal of Emerging Markets

http://journal.uii.ac.id/index.php/JEP

Table of Content Volume 10 Issue 1, April 2018

Robust approach for efficiency measurement of employee performance under profit sharing system _____ 1-7
Umi Mahmudah and Muhamad Safiih Lola
DOI: 10.20885/ejem.vol10.iss1.art1

Community empowerment in rural infrastructure development program _____ 8-14
Waridin Waridin, Atika Dzulkhijiana, and Izza Mafruhah
DOI: 10.20885/ejem.vol10.iss1.art2

Forecasting demand for long-term care based on multistate piecewise constant Markov process _____ 15-31
Cui Xiaodong and Zheng Yuhua
DOI: 10.20885/ejem.vol10.iss1.art3

The role of tourism toward economic growth in the local economy _____ 32-39
Suhel Suhel and Abdul Bashir
DOI: 10.20885/ejem.vol10.iss1.art4

Growth of service sector in BRIIC economies _____ 40-52
Maisya Farhati and Raquel Ortega-Argilés
DOI: 10.20885/ejem.vol10.iss1.art5

Analysis of seaports efficiency in supporting inter-island transportation _____ 53-60
Adenanthera L Dewa, Nugroho SBM, Mudjahirin Thohir, and Indah Susilowati
DOI: 10.20885/ejem.vol10.iss1.art6

Strategies for increasing tax revenue in tourism sector _____ 61-68
Horas Djulius
DOI: 10.20885/ejem.vol10.iss1.art7

Cross–asset class portfolio between gold and stocks in Indonesia _____ 69-81
Mesakh Prihanto Surya Putra, Apriani Dorkas Rambu Atahau, and Robiyanto Robiyanto
DOI: 10.20885/ejem.vol10.iss1.art8

Trade openness and female-male earnings differentials: Evidence from Indonesia _____ 82-92
Maryam Jamielaa
DOI: 10.20885/ejem.vol10.iss1.art9

Comparison analysis of imported coffee of Malaysia from Indonesia and Vietnam _____ 93-98
Eko Atmadji, Esther Sri Astuti S. A., and Yosra Hersegoviva Suhardiman
DOI: 10.20885/ejem.vol10.iss1.art10

Inclusive growth and leading sector in Bali _____ 99-110
Ni Made Ayu Krisna Cahyadi, Sasongko Sasongko, and Putu Mahardika Adi Saputra
DOI: 10.20885/ejem.vol10.iss1.art11

The determinant of equity financing in sharia banking and sharia business units _____ 111-120
Jaenal Effendi
DOI: 10.20885/ejem.vol10.iss1.art12

Economic Journal of Emerging Markets

http://journal.uii.ac.id/index.php/JEP

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

Robust approach for efficiency measurement of employee performance under profit sharing system

Umi Mahmudah*, Muhamad Safiih Lola

Universiti Malaysia Terengganu, Trengganu, Malaysia

Article Info

Article history:
Received : 9 August 2017
Accepted : 20November 2017
Published : 6March 2018

Keywords:
DEA, DMUs, profit sharing, robust, shipping

JEL Classification:
J33, C61, C67

DOI: 10.20885/ejem.vol10.iss1.art1

Abstract

This study estimates the efficiency of employees' performances under profit sharing system using data envelopment analysis (DEA). This method is one of the most common methods used in efficiency measurement analysis. However, a robust approach is used to deal with the complexity of the traditional DEA estimators. Robust Data Envelopment Analysis (RDEA) is very useful when outliers contaminate the data. The sample includes five divisions which cover as many as 102 employees of a shipping company in Malaysia are analyzed by using R program. The results reveal that the initial DEA efficiency is an over-estimate of the true efficiency. RDEA provides better accuracy of the results. Further, the robust approach is appropriate to be used in the measurement of the efficiency of company divisions under profit sharing program.

Introduction

The company and its management keep investing a lot of money to improve employees' productivity to reach the ultimate goal by using the existing sources. Many researchers believe that one of the most effective ways to improve both performances and productivities of the employees isto provide some incentive plans, such as profit sharing. The system is believed to be able to encourage employees' morale and attitudes toward the company in a positive direction so that employees' satisfaction can be maintained. However, employees who are satisfied with the current work environment tend to give the best performances with the expectation of a direct reward of some company profits.

The system has grown rapidly in most of the European Union countries, USA, Canada, Taiwan, Japan, and so on. Estrin, Perotin, Robinson, & Wilson (1997) report profit sharing system show significant progress in industrial countries in the late 1980s and 1990s. However, France and the United Kingdom contribute the highest level of financial participation, especially profit sharing system, which 57 percent of workplaces in France offer the portion of company profits to its employees, while 40 percent of workplaces in UK provide profit sharing scheme. Generally, the growth of profit sharing system in those countries is supported by the government policy who promotes the system through tax concessions. Furthermore, in 1987 to 1991 the amount of profit sharing program has been implemented in the UK is increased from 145 to 2,049 plans. The participation to profit sharing program effects positively (or at least has neutral effect) to productivity (Perotin & Robinson, 2002). The study covers more than 20 countries involving thousands of reputable companies show very encouraging results. Profit sharing system has a positive impression to enhance the efforts of employees which increases their chances of getting a bigger share of the company's profit. Better effort from the employees leads to better productivity(Koskela & König, 2010).Jerger & Michaelis (2007) also analyze individual effort of employees under profit sharing system.

By knowing the efficiency performance of each employee, the company and its management can distribute the profit portion fairly based on their performances to maintain a sense of fairness among the employees. Efficiency measurement is first introduced by Farrell (1957) by using technical efficiency which describes firm ability to maximize the production of outputs with the existing inputs as well as a locative efficiency that reflects a firm to capitalize the available inputs optimally with the determined price levels. This study analyzes the employees' performance efficiency under profit sharing program by using DEA method. This method is very interesting because it allows to compare and rank records (companies, departments, employees, schools, universities, institutions' programs, et cetera) based on their features such as weight, revenue, salary, and size. The main advantage of DEA method relies on there is no need to build any prior

P ISSN 2086-3128|E ISSN 2502-180X
*Corresponding author e-mail: u_mudah@yahoo.com

assumptions. DEA is a nonparametric approach based on linear programming to measure a unit, an organization or a program, which is often called Decision Making Units (DMUs), with similar characteristics.

The method is introduced by Charnes, Cooper, & Rhodes (1978) so it is common to call this as CCR method. Later, the method is extended by Banker, Charnes, & Cooper (1984). There are studies done using DEA approach to assess employees' performances (see Golec & Kahya, 2007; Tao, 2012; Wu & Hou, 2010).Shirouyehzad, Lotfi, Aryanezhad, & Reza (2012) use DEA approach to evaluate employees' efficiency in a pipe company in Iran by using as many as 55 employees as the sample. The results reveal that the main factors that affect employees' efficiency performances are the conditions of physical working and a good commitment by the organization. Further, the result indicates there are ten employees have efficient performances. Whereas the group of employees who have the highest efficiency scores is those aged between 25-35 years, as well as the group of employees who have 5-10 years of work experiences. Evaluation of employees' performance by using DEA method is also used by Zbranek (2013), which uses three inputs and three outputs, while as many as 60 employees in the baking company are used as DMUs. The results indicate that there are 12 employees whoare fully efficient while the remaining employees have inefficient performances that need to improve their efforts to achieve efficient performances.

Although there are studies done on employees' performances using this method by applying profit sharing plans in the parameters of employees is very limited. However, nowadays there are a lot of companies offer its employees to participate in profit sharing plans because of its advantages for both of them. The measurement of employee performance efficiency should be doneto determine which division performs efficiently by using the existing resources. The company division with the best performance, which is identified by the highest efficiency score, can be used as a role model to other divisions to improve their performances. However, a robust approach is appliedto face the complexity as well as multidimensional nature of the traditional DEA estimators. The DEA method relies on the best unit identification which makes it sensitive to the existence of outliers which may reduce the accuracy of the analysis results. Cooper, Huang, Lelas, Li, & Olesen (1998) and Gstach (1998) use stochastic DEA to face these problems, which usually requires specification of statistical distribution. A study conducted by Wilson (1995) proposes a procedure for detecting outliers which are devoted to DEA methods whereas robust optimization is analyzed by Bertsimas & Sim (2003). However, this study implements bias-corrected technical efficiency scores by Simar & Wilson (1998) using robust approach.

This approach is a sampling procedure to produce new samples with replacement, which allows determining the accuracy steps of sample estimates, such as bias, variance, confidence intervals, prediction error, et cetera(Efron & Tibshirani, 1993). Gharakhani, Kazemi, & Haji (2011)measure the relative efficiency of Iranian high schools considering uncertainty on output parameters by using 35 high schools in Tehran as DMUs by applying the robust approach to DEA method. The results reveal that robust DEA approaches are better used for estimating the efficiency performance of Iranian High Schools. Testi, Fareed, Ozcan, & Tanfani (2013)apply a bias-corrected DEA model for assessing the physician performance diabetes using 96 family physicians. The results reveal that 35 practices perform efficiently based on the traditional DEA with the average of VRS scores is 0.86. Meanwhile, in the bias-corrected model, the average is 0.78. Data from shipping company is used to measure the employees' performance. The company engages in the delivery of goods from Malaysia to Indonesia in 2012. Five divisions of the company that cover as many as 102 employees that are received a share of the company profit are used as decision making units. The data is analyzed by using R program.

Research Method

This study applies data envelopment analysis for measuring the efficiency of employees' performances under profit sharing system. This method is very useful for facing the analysis problem with a lot of input and output variables. A DMU has efficient performance when the score of efficiency equal to one, which indicates that its efficiency performance is equal to 100 percent, otherwise when its efficiency score is less than one, then the DMU is declared inefficient. There are two models of DEA method, namely CRS (constant return to scale) model and VRS (variable return to scale) model. The first model is developed by Charnes et al. (1978) so it is also known as CCR model, while the other is introduced by Banker et al. (1984) and is also known as BCC model, which is a development of the first model. CCR model uses the assumption that ratio between the increasing input and output variables is similar. Other than that, this model assumes that each DMU performs at optimal scale. Whereas VRS model assumes that each DMU is not yet operating at optimal scale as well as the increasing of input and output variables is not similar.

This study uses the framework of DEA method where the naïve score is concerned following the structure developed by Charnes et al. (1978) as follows. Let x_n denote the observed of input where $n = 1,2,3, \dots, N$ to produce outputs y_m where $m = 1,2,3, \dots, M$ as $D = \{(x,y): x \geq X\lambda, y \leq Y\lambda, \lambda \geq 0\}$.Coelli, Rao, & Battese (1994) state that input set $P(y)$ contains inputs, which produce a number of outputs under D, so that $P(y) = \{(x): (x,y) \in D\}$. Then the mathematical model form of CRS input-oriented efficiency θ_k for a given DMU_k where $k = 1,2,3, \dots, K$can be written as follow (Charnes et al., 1978):

$$min_{\theta_k,\lambda}\theta_k \quad (1)$$

Subject to

$$-y_{mk} + \sum_{i=1}^{K} \lambda_i y_{mi} \geq 0 \quad (2)$$
$$\theta_k x_{nk} - \sum_{i=1}^{K} \lambda_i x_{ni} \geq 0 \quad (3)$$

and
$\lambda_i \geq 0$

This model assumes that $P(y)$ is strict convexity and strong disposability of input and output variables where the last assumption indicates that if $x \in P(y)$ and if $x' \geq x$ then $x' \in P(y)$. Then to impose CRS model to VRS model requires additional constraints of $\sum_{i=1}^{K} \lambda_i x_{ni} = 1$(Charnes et al., 1978). Due to this method is based on frontiers then data accuracy and preciseness are needed to produce acceptable results. Although the traditional DEA method is considered as one of the most powerful method for measuring efficiency performance, it is required precise and accurate data to provide unbiased efficiency scores for each DMU. However, it is very difficult to obtain real data accurately in the real world problems due to the uncertainty of input and output variables. The bootstrap method is a powerful statistical re-sampling method to approximate the estimator sampling distributions by using the empirical distribution. Basically, the bootstrap methods correct for the bias due to estimated boundary $\hat{P}^{\partial}(y)$ of the input variables may fail to incorporate the most efficient DMU. Then, for each DMU i bias $\theta_i = E(\hat{\theta}_i) - \theta_i = \widehat{\text{bias}}\hat{\theta}_i$ similar to bias $\hat{\theta}_i^* = E(\hat{\theta}_i^*) - \hat{\theta}_i$. The procedure of this method is as follows (Simar and Wilson, 1998):

1) Estimate naive scores of DEA $\hat{\theta}_i = (\hat{\theta}_1, \hat{\theta}_2, \dots, \hat{\theta}_I)$ from the equation (2).
2) Repeat R times to produce K sets of bootstrap estimates $\{\hat{\theta}_{ir}^*\}_{r=1}^{R}$.
3) Calculate $\widehat{\text{bias}}\hat{\theta}_i = \frac{1}{R}\sum_{r=1}^{R} \hat{\theta}_{ir}^* - \hat{\theta}_i$for (x_{ir}^*, y_i)
4) Calculate bias-corrected score $\hat{\hat{\theta}}_i = \hat{\theta}_i - \widehat{\text{bias}}\hat{\theta}_i$

Therefore, according to Simar & Wilson (2007), the algorithm of input-oriented model of bias-corrected bootstrap DEA δ, the reciprocal of θ, is based on the fact that the input variables x_n do not depent on the environmental variables $\boldsymbol{z}_i$, which indicates the input variables that are not directly controlled by producers) are as follows (Simar & Wilson, 1998):

1) Estimate naive distance scores δ_i where $i = 1,2,3, \dots, J$.
2) Assume $\delta_i = \boldsymbol{z}_i\beta + \varepsilon_i \geq 1$, where ε_i are independent and identically distributed and independent from $\boldsymbol{z}_i$ while $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$ with left truncation at $(1 - \boldsymbol{z}_i\beta)$.
3) Calculate $\hat{\beta}$ and $\hat{\sigma}_\varepsilon$ by using observations for which $\delta_i > 1$.
4) Repeat R times to produce K sets of bootstrap estimates $\{\hat{\delta}_{ir}^*\}_{r=1}^{R}$ for (x_{ir}^*, y_i)
5) Calculate $\widehat{\text{bias}}\hat{\delta}_i = \frac{1}{R}\sum_{r=1}^{R} \hat{\delta}_{ir}^* - \hat{\delta}_i$.
6) Calculate bias-corrected score $\hat{\hat{\delta}}_i = \hat{\delta}_i - \widehat{\text{bias}}\hat{\delta}_i$.

To estimate the efficiency scores of each division under profit sharing program by using the existing sources (inputs and outputs), this study is based on the sampling variability of the VRS-DEA efficiency estimator introduced by Simar & Wilson (1998) with input-oriented model to estimate bias-corrected technical efficiency scores. Further, this study provides the confidence intervals around these efficiency scores of the company division under profit sharing program. The confidence intervals are estimated from the empirical sampling distribution, which is constructedform the observed DEA efficiencies.

Results and Discussion

This paper uses data from the shipping company that covers more than 540.000 goods from Malaysia to Indonesia in 2012. The company has as many as 250 employees, both full time and parttime. The data is from the annual data company which includes basic salary, the fraction of profit sharing, number of employees, working hours, the skills and expertise of the employees, as well as the background of the employees in general. After analysis using the selectivity method in the original data, then obtained as many as 102 employees that relevant to be sampled in this study. The average of employees' age is 35 years old with standard deviation is 18 years old, while the average of basic salary is RM 1,349.50 with standard deviation is RM 1,152.54. Monthly income has the average as many as RM 1,977.21 while the average of profit portion is RM 1,195. There are four directors, five managers, 14 head of divisions, and 79 staff who receive some of the company profits. Married employees are about 52 percent compare to single employees as many as 48 percent. Comparison of male employees and female employees is 84.3 percent to 15.7 percent. Further, there are 54.9 percent employees with high school degree get profit share, while the percentage of employees with a bachelor degree is 20.6 percent. Master degree employees have 22.5 percent, and Ph.D. employees have 2 percent.

However, this study uses five divisions in the company as DMUs to describe employee performance, i.e., Administration division, Finance Division, Customer Service division, Marketing division, and processing division. Whereas there are three inputs (basic wage, the number of employees, work experience) and two outputs (total job completed by the employees and total profit sharing earn by the employees) to measure the performance efficiency of these divisions. This study uses biased-corrected data envelopment analysis to estimate bias-correction of technical efficiency scores in input-oriented model based on Simar & Wilson (1998) using robust approach.

The estimations are conducted under a variable return to scale (VRS) model and input-oriented model where DEA minimizes the input variables to the given level of output variables. In other words, an inefficient unit needs to proportionally reduce its inputs proportions to achieve efficient unit while its outputs are held constant. It is used due to the departments have the most control over these input variables. Table 1 represents a descriptive statistics of the input and output variables.

Table 1. Descriptive Statistics

Variables	Min	Max	Mean	Std. Dev
Outputs				
y_1	174,040	210,100	192,294	13,598.265
y_2	84,900	134,100	96,240	21,213.628
Inputs				
x_1	135,000	256,800	169,920	50,036.906
x_2	10	38	20	10.738
x_3	33	74	51	17.813

Where y_1 represents the total job completed by the employees, y_2 represents the total portion of profit sharing earn by the employees, x_1 represents the basic wage, x_2 describes the number of employees, x_3 represents work experience. By using R program, table 2 shows the efficiency scores for both CRS and VRS models of each DMU by using the determined input and output variables.

Table 2. Efficiency Scores of CRS and VRS Models

DMUs	CRS Model	VRS Model
Administration	0.950	1.000
Finance	1.000	1.000
Customer Service	0.885	0.906
Marketing	1.000	1.000
Processing	0.819	1.000

Based on Table 2, the traditional DEA indicates that the averages of efficiency scores are 0.931 and 0.981 for CRS model and VRS model, respectively. It means that the average of CRS model efficiency score is 93.1 percent while VRS model is 98.1 percent. Further, for CRS model, the percentage division that performs efficiently is only 20 percent while the percentage of efficient division on VRS model reaches 80 percent. Moreover, there are two divisions that perform efficiently on both CRS and VRS models, i.e., Finance division

and Marketing division (each division has perfect efficiency score of 100 percent). Whereas administration division and processing division perform efficiently on VRS model but has not efficient performance on CRS model, where the efficiency scores are 95 percent and 81.9 percent in the CRS models, respectively. Further, Customer Service division has inefficient performance on both models where the scores are 88.5 percent on CRS model, and it has efficiency score of 90.6 percent on VRS model.

Following the description of the discrimination phase introduced by Thanassoulis, Dyson, & Foster (1987) then it can be said that administration division should be able to support its activity by using only 95 percent of its sources in the CRS model. Therefore, to accomplish efficient performance, this division requires reducing input variables of 5 percent. Whereas processing division should be able to endorse its activity level by employing the existing input variables of 81.9 percent in the CRS model, which means that this division can reach efficient performance by reducing the input variables as many as 18.1 percent. Furthermore, customer service division should be able to support its activity level by using only 88.5 percent and 90.6 percent in the CRS and VRS models, respectively. This means that this division canperform efficiently by reducing the existing input variables as many as 11.5 percent and 9.4 percent in the CRS and VRS models, respectively.

However, we can safely conclude that VRS model produces better scores of division's efficiency under profit sharing system. Therefore, this study uses this model for estimating bootstrapped DEA efficiencies to deal with the biases in the estimation. Bootstrapping is used to correct the traditional DEA efficiencies for bias and then to estimate confidence intervals for them. Table 3, Table 4 and Table 5 show the results of bias-corrected DEA scores for the input-oriented model by using the number of bootstrap replications B= 500, 1000, 2000 while the size of the confidence interval for the bias-corrected DEA score is 0.01, 0.02 and 0.05.

Table 3. Efficiency Scores of the Biased-Corrected (B=500)

DMUs	alpha=0.01				alpha=0.02				alpha=0.05			
	theta	low	high	bias	theta	low	high	bias	theta	low	high	bias
D1	0.95	0.92	1.02	0.05	0.95	0.92	1.01	0.05	0.95	0.93	1.00	0.05
D2	0.95	0.92	1.06	0.05	0.95	0.91	1.03	0.05	0.95	0.91	1.02	0.05
D3	0.87	0.85	0.92	0.03	0.87	0.85	0.91	0.04	0.87	0.85	0.90	0.04
D4	0.95	0.91	1.02	0.05	0.95	0.91	1.04	0.05	0.95	0.92	1.02	0.05
D5	0.95	0.92	1.05	0.05	0.95	0.91	1.03	0.05	0.95	0.92	1.02	0.05

Table 4. Efficiency Scores of the Biased-Corrected (B=1000)

DMUs	alpha=0.01				alpha=0.02				alpha=0.05			
	theta	low	high	bias	theta	low	high	bias	theta	low	high	bias
D1	0.95	0.92	1.02	0.05	0.95	0.92	1.01	0.05	0.96	0.93	1.00	0.05
D2	0.95	0.91	1.03	0.05	0.95	0.91	1.03	0.05	0.95	0.91	1.01	0.05
D3	0.87	0.85	0.91	0.03	0.87	0.85	0.91	0.04	0.87	0.85	0.90	0.04
D4	0.95	0.91	1.04	0.05	0.95	0.91	1.03	0.05	0.95	0.91	1.01	0.05
D5	0.95	0.91	1.04	0.05	0.95	0.91	1.03	0.05	0.95	0.91	1.02	0.05

Table 5. Efficiency Scores of the Biased-Corrected (B=2000)

DMUs	alpha=0.01				alpha=0.02				alpha=0.05			
	theta	low	high	bias	theta	low	high	bias	theta	low	high	bias
D1	0.95	0.92	1.02	0.05	0.95	0.92	1.01	0.05	0.95	0.92	1.00	0.05
D2	0.95	0.91	1.05	0.05	0.95	0.92	1.03	0.05	0.95	0.91	1.01	0.05
D3	0.87	0.85	0.92	0.04	0.87	0.85	0.91	0.03	0.87	0.85	0.90	0.03
D4	0.95	0.91	1.04	0.05	0.95	0.91	1.03	0.05	0.95	0.91	1.01	0.05
D5	0.95	0.91	1.04	0.05	0.95	0.91	1.03	0.05	0.95	0.91	1.01	0.05

Where D1 represents administration division, D2 is financed division, D3 is customer service division, D4 is a division of marketing and D5 is a division of processing. Further, theta column indicates the vector of bias-corrected DEA score for each division, which is in the range of zero to one, while bias column shows the vector of bias for naive DEA score, and it is non-negative, and both of the low and high columns indicate the vector bounds of lower and upper confidence intervals for bias-corrected score.

From Table 3, by using 500 replications indicates that the confidence intervals of the efficiency scores of all DMUs are smaller when alpha is greater. Unless D4 (a division of marketing) which shows that the width of the confidence interval at alpha=0.02 is greater than at alpha=0.01, all DMUs show consistency interval shrinking. Overall, the results show a fairly narrow confidence interval for all DMUs where the average of its width is 0.112 with the maximum width is 0.147 when alpha is 0.01. Then the average width of the confidence intervals when alpha is 0.02 and 0.05 are 0.104 and 0.09, respectively. While the maximum widths are 0.132 and 0.107 when alpha are 0.02 and 0.05, respectively. The narrow interval indicates that there is a smaller chance of obtaining an observation within that interval, which means that the accuracy of the result is higher. Table 3 also indicates that valid conclusions can be made due to the bias estimates are fairly small.

Table 4 shows the results of bias-corrected scores using 1000 replications. It can be seen that the width of confidence interval decreases as the alpha value increases. The average and the maximum of width interval are 0.106 and 0.129 at alpha=0.01, respectively. While its values are 0.100 and 0.124 at alpha=0.02, respectively. Whereas the average and the maximum of width interval are 0.09 and 0.109 when alpha is 0.05, respectively. The results also indicate that the bias estimates are small enough so that valid conclusions canbe made.

Furthermore, Table 5 shows bias-corrected of efficiency scores by using 2000 replications. The interval widths of all DMUs show the same properties as the bias-corrected scores with replication as much as 1000 times, which go down when the alpha values go up. Further, any valid conclusions can be made due to the bias estimates are quite small. Summing it up, robust DEA scores of employees' efficiency performance under profit sharing program provides the narrow width of confidence intervals, which indicates that there is a smaller chance of obtaining an observation outside the interval. Generally, the narrower the interval tends to decrease the uncertainty of the results. In other words, there is a little risk of the results about missing the true value due to a narrower width of interval provides more precise results. Furthermore, the efficiency scores of robust DEA are always in the range of confidence interval, which the bias-corrected scores continually follow the scores of traditional DEA. Besides the empirical results reveal that the initial DEA score is close to the upper bound of the confidence interval, which indicates that the initial DEA efficiency is an over-estimate of the true efficiency. Overall, the bias estimates are quite small. Therefore, from the explanation above, the results of robust efficiency scores of the company's divisions under profit sharing program statistically significant, which provide more precise as well as more valid results. Because of that, it is possible to conclude that robust approach is appropriate to be used in the measurement of the efficiency of company divisions under profit sharing program.

Conclusion

This study uses data envelopment analysis to investigate the efficiency of employees' performances under profit sharing system. However, a robust approach is applied due to the complexity of the traditional DEA estimators. The results show that bias-corrected efficiency scores under robust approach provide more precise and valid conclusions in measuring employees' efficiency under profit sharing program.

References

Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science*, *3*(9), 1078–1092.

Bertsimas, D., & Sim, M. (2003). Robust discrete optimization and network flow. *Mathematical Programming*, *98*(1), 49–71.

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the inefficiency of decision making units. *European Journal of Operational Research*, *2*(6), 429–444.

Coelli, T., Rao, D., & Battese, G. (1994). *An introduction to efficiency and productivity analysis*. Boston: Kluwer Academic Publishers.

Cooper, W. W., Huang, Z. M., Lelas, V., Li, S. X., & Olesen, O. B. (1998). Chance constrained programming formulations for stochastic characterizations of efficiency and dominance in DEA. *Journal of Productivity Analysis*, *9*(1), 53–79.

Efron, B., & Tibshirani, R. (1993). *An introduction to the Bootstrap.* Boca Raton, Florida: Chapman

&Hall/CRC Press.

Estrin, S., Perotin, V., Robinson, A., & Wilson, N. (1997). Profit sharing in OECD countries: A review and some evidence. *Business Strategy Review*, *8*(4), 27–32.

Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society Series*, *120*(3), 253–290.

Gharakhani, M., Kazemi, I., & Haji, H. A. (2011). A robust DEA model for measuring the relative efficiency of Iranian high schools. *Management Science Letters*, *1*(3), 389–404.

Golec, A., & Kahya, E. (2007). A Fuzzy model for competency-based employee evaluation and selection. *Computers & Industrial Engineering*, *52*(1), 143–161.

Gstach, D. (1998). Another approach to data envelopment analysis in noisy environments: DEA+. *Journal of Productivity Analysis*, *9*(2), 161–176.

Jerger, J., & Michaelis, J. (2007). To share or not to share? Why profit sharing is so hard to implement? *Economic Letters*, *110*(2), 104–106.

Koskela, E., & König, J. (2010). *Can profit sharing lower flexible outsourcing?* (HECER Discussion Paper No. 310).

Perotin, V., & Robinson, A. (2002). *Employee participation in profit and ownership: A review of the issues and evidence* (Paper prepared for the European Parliament).

Shirouyehzad, H., Lotfi, F. H., Aryanezhad, M. B., & Reza, D. (2012). A data envelopment analysis approach for measuring the efficiency of employees: A case study. *South African Journal of Industrial Engineering*, *23*(1), 191–210.

Simar, L., & Wilson, P. W. (1998). Sensitivity analysis of efficiency scores: How to Bootstrap in nonparametric frontier models. *Management Science*, *44*(1), 49–61.

Simar, L., & Wilson, P. W. (2007). Estimation and inference in two-stage, semi-parametric models of production processes. *Journal of Econometrics*, *136*(1), 31–64.

Tao, G. (2012). Multi-department employee performance evaluation based on DEA cross efficiency. *Journal of Emerging Trends in Economics and Management Sciences*, *3*(5), 553–558.

Testi, A., Fareed, N., Ozcan, Y., & Tanfani, E. (2013). Assessment of physician performance diabetes: A bias-corrected data envelopment analysis model. *Quality in Primary Care*, *21*(6), 345–357.

Thanassoulis, E., Dyson, R. G., & Foster, M. J. (1987). Relative efficiency assessments using data envelopment analysis: An application to data on rates departments. *Journal of Operational Research*, *38*(5), 397–412.

Wilson, P. (1995). Detecting influential observations in data envelopment analysis. *Journal of Productivity Analysis*, *6*(1), 27 – 45.

Wu, Y.-J., & Hou, J.-L. (2010). An employee performance estimation model for the logistic industry. *Decision Support Systems*, *48*(4), 568–581.

Zbranek, P. (2013). Data envelopment analysis as a tool for evaluation of employees' performance. *Acta Economica et Informatica*, *26*(1), 12–21.

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

Community empowerment in rural infrastructure development program

Waridin[1], Atika Dzulkhijiana[2], Izza Mafruhah[3]*

[1,2]Faculty of Economics and Business, Diponegoro University, Semarang, Indonesia
[3]Faculty of Economics and Business, Sebelas Maret University, Surakarta, Indonesia

Article Info

Article history:
Received : 20 December 2017
Accepted : 25 January 2018
Published : 6 March 2018

Keywords:
community empowerment, rural infrastructure, willingness to pay, CIPOO

JEL Classification:
L9, R58, O21,

DOI:10.20885/ejem.vol10.iss1.art2

Abstract

This study evaluates the role of stakeholders in the Rural Infrastructure Development Program (RIDP) and analyzes the intensity of community participation in the program implementation with a willingness to pay. Also, it analyzes the factors that influence community empowerment. This research uses sequential mixed method with descriptive statistics, Context Input-Output and Outcome Process (CIPOO), Analytical Hierarchy Process (AHP) and Willingness to Pay (WTP). The results of the analysis show that the main actors in the community empowerment program are the community followed by the local government, academician, and business actors. The community WTP is IDR 5,100, which helps them to maintain sustainability and maintain projects built by the government actively. The empowerment process is the most important factor followed by context and input as the second priority, while output and outcome become the third priority.

Introduction

Development priorities in Indonesia today are stimulating economic growth and delivering development equally for all Indonesians. The welfare gap is marked one of them with differences in urban and rural poverty. The BPS (2017) report states that the number of poor people in March 2016 was 28.01 million people or 10.86 percent of the total population of Indonesia. BPS found gaps between the proportion of poor people in urban and rural areas. In March 2015, the proportion in rural areas reached 17.94% while in urban areas the proportion was lower, 10.65%. The figure declined slightly in March 2016, down to 17.67% and 10.34% respectively (https://www.bps.go.id/). High differences in poverty rates occur due to infrastructure development gaps in urban and rural areas.

Infrastructure is currently a major requirement in rural development. The availability of infrastructure both buildings and roads will provide easy access for local economic development. Infrastructure is important to accelerate economic progress and reduce poverty. Infrastructure is public goods and services that enter into the production process as complementary input to traditional production factors such as capital, labor, and entrepreneurship. They help increase return on investment by reducing production costs and improving transition efficiency. Availability of infrastructure and service efficiency determine the success of other production processes. Investments in infrastructure such as energy, water, transportation, and communication technology promote economic growth, reduce poverty, and improve living conditions in developing countries. Infrastructure and economic growth have a fairly complex relationship. The development of infrastructure is important and necessary for industrial take-off and economic growth, but increasing number and more high-tech infrastructure does not guarantee economic growth(De Haan, Romp, & Sturm, 2007). On the other hand, infrastructure development, especially large-scale infrastructure, has a dilemma because it will have an environmental impact that is a long-term challenge and is feared to affect climate change. The most prominent infrastructure development took place in East Asia, especially China and Vietnam.

Community involvement at the grassroots level from planning to project implementation becomes a necessity. Community-run projects can be managed and maintained better. The community can work with the project developers and handle some aspects of the project and thus develop the capacity of rural communities. The FADAMAis In Nigeria; the term "Fadama" is a Hausa name for irrigable land—usually low-lying plains underlaid by shallow aquifers found along major river systems. The FADAMA is a project initiated by the United Nations and the Government of Nigeria.Is an appropriate step because people are given the authority to select projects that best suit their environment and are supported by various external and internal stake-

P ISSN 2086-3128|E ISSN 2502-180X
*Corresponding author e-mail: Waridin.dr@gmail.com

holders (National Fadama Coordination Office Nigeria, 2015). The government remains the motor to rally and mobilize the community, especially in the early stages to create awareness of how community participation will be addressed and achieved. Procedures and mechanisms of community engagement should be undertaken and adhered to so that the government, the business sector, and the community can work in harmony.

Empowerment is a complex issue and can be seen at an individual, organizational or community level and closely linked. At the community and organizational level, empowerment results depend on the level of empowerment of its members. Community empowerment is defined as a process by which people can take power to act effectively to change their lives and environment. The process of community empowerment encourages participation, solves local problems, increases individual and community control, and improves the quality of life and social justice. So far, there has been no consensus on universally accepted methods or measures to evaluate community empowerment processes (Kasmel & Andersen, 2011). Community empowerment and infrastructure development have a very close relationship, so the Indonesian government applies this pattern in the national development model.

Based on this background, the Government of Indonesia launched the Rural Infrastructure Development Program (RIDP) aimed at creating and improving the quality of community life, both individually and in groups, so that they can solve various problems related to poverty and backwardness in rural areas. RIDPis a community empowerment program based on rural infrastructure development consisting of 1) community empowerment, in which the entire process of activities from preparation, planning, implementation, control, to maintenance involves the active role of the community; 2) alignment to the poor, where the outcomes of both process and utilization activities are endeavored to have a direct impact on the poor; 3) autonomy and decentralization, where local governments and communities are fully responsible for program implementation and infrastructure sustainability; 4) participatory, in which the community is actively involved in every process of activity, and the poor, women and minorities have the opportunity to play an active role; 5) self-reliance; 6) integrated development programs, meaning that programs are integrated with other rural development programs; 7) strengthening of institutional capacity; and 8) gender equality and justice. It is expected that RIDP will accelerate the process of community independence and realize the synergy of various development actors in the context of poverty alleviation in rural areas.

This research was conducted in Semarang Regency, Central Java Province because poverty level in this regency is relatively low (8,13%), much lower compared to provincial average which reaches 13,03%. Semarang regency, with 19 districts and 235 villages, became the fifth lowest poverty in Central Java. Banyubiru subdistrict was selected as a research sample because it is located in rural areas, butthe lifestyle of its people has been influenced by urban lifestyle. The population in Banyubiru sub-district is 41,066 inhabitants with 20,611 males and 20,455 females. The education level of the population aged five years and above is an elementary school with 40.98%, junior high school with 18.6%, and senior high school with 16.0%.

This study aims to evaluate the role of stakeholders in the Rural Infrastructure Development Program (RIDP) in Semarang Regency and to analyze the intensity of community participation in RIDPimplementation with a willingness to pay. The study is also to analyze the factors that influence community empowerment.

Structuring of infrastructure, directly and indirectly, will change the rural environment to make it more organized (Laah, Adefila, & Yusof, 2014). Developing countries have experienced growth in infrastructure development although there are still many deficiencies in the number, quality, and accessibility for the community, especially rural communities. Such shortcomings will affect the competitiveness of slowing performance in the economic, health, and education sectors that would harm the poor in rural areas. Community participation in infrastructure development in the region will create awareness, mobilization, and creative potential including talent, skills, human resources, and finance. The results of research in African countries in 2010 indicate that a sizable infrastructure investment of up to 15% of GDP is often inefficient due to weak public management. The private sector has contributed significantly to increasing efficiency and access but has not been an alternative to public engagement and financing. Another weakness in inefficient infrastructure development is the absence of monitoring of infrastructure spending and conditions (Marianne Fay & Toman, 2010). The needs of the people involved in rural infrastructure development through empowerment demonstrate specific implementation shifts. Policies and strategies are directed primarily at nature control, technology considerations, economic structures, and demographic conditions by considering values, customs, social structures and political participation (Khan, 2005).

Research conducted by Fernández-Moral, Vidueira, Díaz-Puente, & Nicolás (2015) in rural communities in Cuenca, Spain shows that the willingness of community members to become active agents in the empowerment process is an important aspect of community-based development. The Institute of Community

Development of Cuenca (IDC), which collaborated with various groups for 30 years with a focus on empowering rural community organizations, stated that the main tool in this process is the evaluation of empowerment approaches and the role of critical friends when helping groups to achieve goals and strengthen them. Group work is crucial to gaining the capacity, skills, and attitudes that enable them to become truly independent after the facilitator has left. To achieve this, facilitators should be able to provide transfer knowledge of their capacities, skills, and attitudes to individuals and entire groups. At the beginning of this process, the role of the leader is crucial to ensure the development of the group. Then, as the group continues to grow, members must learn to take over the leader's role, and they must make their own decisions. At this time, the facilitator becomes a group guide. Finally, when the facilitator has left, the group must be completely autonomous, and members should be able to apply all the capacities built during this process (Fernández-Moral et al., 2015).

Research Method

Factors affecting the level of community empowerment are analyzed by Context, Input, Process, Output, and Outcome (CIPOO). Context includes aspects of the institution, management systems, organizational performance, and material mastery; input includes internal and external aspects; process consists of approaches to capacity building, new public management, performance, and substantial such as knowledge, attitude, and practice; Output; and Outcome (Mačiulskytė, 2014).This research uses the sequential mixed method with descriptive statistics, Context Input-Output and Outcome Process (CIPOO), Analytical Hierarchy Process (AHP) and Willingness to Pay (WTP) (Saaty, 2008).

Stages in the contingent valuation method (CVM) analysis in this study are a) Creating Hypothetical Market to formulate a reason why people need to pay for an environmental goods or service; b) Respondents receive an offer of WTP value (Obtaining bids) with Bidding Game, Closed-ended Referendum, Payment Card, and Open-ended Question.The technique used in this research is Bidding Game because this research wants to know the degree of public participation in contributing to PPIP success seen from the lowest WTP value.

This study used 125 respondents and ten key informants. Respondents will be interviewed with a structured questionnaire for quantitative analysis. Key informants will be interviewed in depth to obtain inputs in qualitative analysis. Respondents were chosen by an accidental method, while key informants were the main figures in the PPIP implementation.

Results and Discussion

The first objective of this research is to evaluate the role of stakeholders in PPIP activities. Stakeholders consist of four actors: academicians, government, business, and community, while the stages of activities are divided into planning, organization, implementation, and control. Evaluation value ranges from 1 to 10 that are classified as very poor, poor, adequate, good and very good. Respondents were asked to provide an assessment of the performance of each stakeholder. The results show that on average the community earns the highest score of 7.71 for all stages of activity, followed by the government with an average value of 6.30 or adequate. The third role is academicians with a value of 6.10, while the business has the lowest value in the implementation of this PPIP, which is 4.48 or poor. The Table 1 shows that communities have an important role in infrastructure development. In other words, they are willing to contribute with energy and financial resources.

Table 1. Evaluation of Stakeholder Roles In PPIP activities (n=125)

No.	Activities	*Stakeholders Roles*				Average	Classification
		Academician	Government	Business	Community		
1.	Planning	6,50	6,50	5,50	7,89	6,60	Adequate
2.	Organization	6,25	6,45	5,00	7,71	6,35	Adequate
3.	Implementation	6,35	6,25	4,35	7,75	6,18	Adequate
4.	Control	5,30	6,00	4,50	7,50	5,83	Adequate
	Average	6,10	6,30	4,48	7,71		
	Classification	Adequate	Adequate	Poor	Good		

The second objective of this study was to calculate the value of financial resources that the community would be willing and able to pay with a willingness to pay (WTP). The method used to calculate WTP is the contingent valuation method (CVM). Valid WTP estimates will be used to develop an optimal pricing strategy.

CVM also can estimate non-user value (Amirnejad & Aminravan, 2013; Breidert, Hahsler, & Reutterer, 2006). The method used is by involving respondents to determine their willingness to pay for PPIP.

Table2. Distribution of Respondents' WTP values

No.	WTP (Rp)	Respondents (people)	Percentage (%)	WTP x Respondents Willing to Pay
1.	Rp 4.000	64	51	Rp 256.000
2.	Rp 6.000	15	12	Rp90.000
3.	Rp 10.000	28	23	Rp 280.000
4.	Not willing to pay	18	14	0
	Total	125	100	Rp 626.000

The data in table 2 is then calculated using the average value of WTP which is Rp 5.008 rounded to Rp 5,100. The value can be used as a reference of RIDPmaintenance and sustainability pricing in Banyubiru Sub-district of Semarang Regency.

The third purpose of this research is to analyze the factors that influence community empowerment through infrastructure development program. Community empowerment strategies used are community organizing, community-based development, and the provision of community-based services. Macroeconomic and social structure factors may encourage or inhibit grassroots mobilization. This discussion emphasizes the importance of leadership development, strategic planning, and network building (across neighborhoods, cities, and regions) by mobilizing people to solve their common problems. The main obstacle in community organization is the lack of leadership development training and organizational capacity building (Kellly, 2010).

This research uses CIPOO (Context, Input, Process, Output, and Outcome) that will be processed with Analytical Hierarchy Process (AHP).

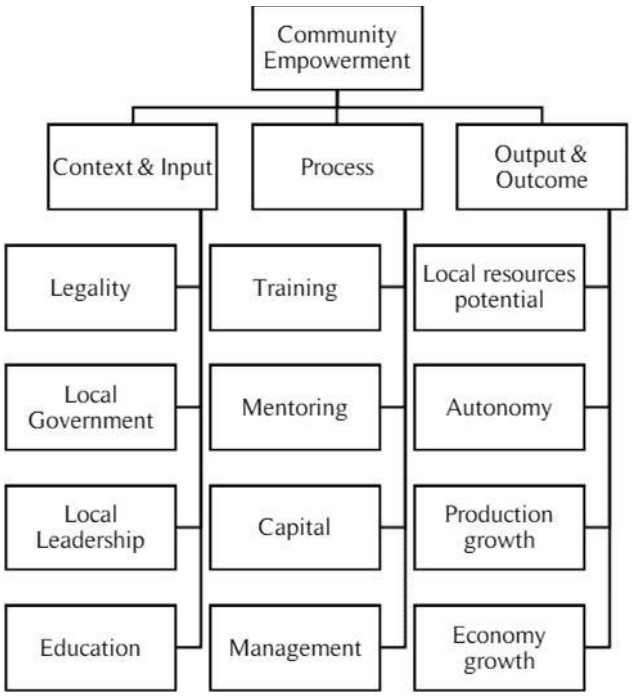


Figure 1. Hierarchy of problems

Figure 1 shows the hierarchy of problems of community empowerment.Empowerment problems are divided into three: context and input, process, and output and outcome. Context and input are divided into four variables: legality, local government, local leadership, and education, while the process is divided into

training, mentoring, capital, and management. Output and outcome consist of local resource potential, autonomy, production and economy growth. Table 3 shows the results of data processing with AHP in the first step.

Table 3. AHP Results

Criteria	Priority Value	Ranking
Context & Input	0.3458	2
Process	0.3797	1
Output & Outcome	0.2744	3

The results show that process has the greatest effect because the process is the steps undertaken by the community. The second and third priorities are context & input and output & outcome.

Table 4. Priority at context and input level

Criteria	Priority Value	Ranking
Legality	0.3545	1
Local Government	0.2368	3
Local Leadership	0.2421	2
Education	0.1664	4

Table 4 showsthat the results of data processing in the second step of context and input have priority showed in table 4. The resultshows that legality is a top priority in the development of community empowerment because legality is a form of legal certainty guarantee. The second priority variable is local leadership, followed by the local government. This suggests that in the process of empowerment, people listen more to local leadership than the government. Cultural aspects and local wisdom influence the level of trust in local leadership. The fourth priority is education because society does not regard education as important social capital.

Table 5. Priority at process level

Criteria	Priority Value	Ranking
Training	0.3005	1
Mentoring	0.2604	2
Capital	0.2268	3
Management	0.2122	4

Table 5 shows that the results of processing at the second level of the process show that training is the priority followed by mentoring. This is because empowerment process requires not only hard skill but also soft skill development followed by structured mentoring. The most prevalent cases in Indonesia show that empowerment programs are not followed by sustainable mentoring, resulting in failure and unsustainable empowerment programs. The third priority is capital because of the understanding in the community that all activities always require capital. The fourth priority is management.

Table 6 lists the results of AHP processing for output and outcome at the second level.

Table 6. Priority at output and outcome level

Criteria	Priority Value	Ranking
Local resource potential	0.2668	2
Autonomy	0.2138	3
Production Growth	0.2132	4
Economy Growth	0.3062	1

Table 6 shows that the desire for economic improvement is the priority in output and outcome followed by the amount and potential of local resources. Meanwhile, the third priority in output and outcome is the realization of community autonomy or self-reliance as the main actors of empowerment, and the fourth priority is the production increase. The three factors included in the CIPOO are the levers variable in community empowerment based on the RIDPimplementation in Semarang regency. The results of research conducted in Riyom Area, Plateau State of Nigeria, show that community participation is limited to receive information and consultation, therefor that community participation is low. Recommendations includeincreasing levels of awareness and enlightenment about communal participation through mass media, and regular meetings with authorities. The involvement of rural communities in the formulation of projects, planning,and implementation should continue to be encouraged. Governments should create an enabling environment where the grass roots will actively participate in decision-making processes that affect their living conditions, which can stimulate relationships between government and rural communities as partners (Laah et al., 2014). The results of research conducted at Rapla Estonia, in the case of health improvement, show that the role of the community through Organizational Domains of Community Empowerment (ODCE) shows a considerable increase. ODCE was initiated by the community in cooperation with the government as a decision maker. The establishment of ODCE enhances community participation in sustainable health development (Kasmel & Andersen, 2011).

Conclusion

The results of the analysis show that the main role in community empowerment process based on PPIP is the community followed by the local government, academicians, and business. Based on this first objective, it is recommended that the government provides greater opportunities for the community to participate in the development, especially RIDP. The second result found that the community WTP is Rp 5,100, meaning that in maintaining the sustainability and maintenance of projects built by the government, the community can actively participate with such WTP value. The third result showed that in empowerment, the process is the most important factor and top priority with training and mentoring as its derived variables. Meanwhile, context & input become a second priority, and output & outcome become a third priority. It is recommended that the government always monitors the implementation or the process of community empowerment so that the community will be empowered and self-reliant. This Research will contribute to scholarship, especially institutional theory and regional economic theory based on community participation.

References

Amirnejad, H., & Aminravan, M. (2013). The application of the contingent valuation method to estimate the recreational value of Sari Forest. *International Journal of Agriculture and Crop Sciences*, *5*(10), 8–11.

Breidert, C., Hahsler, M., & Reutterer, T. (2006). A review of methods for measuring willingness-to-pay. *Innovative Marketing*, 1–32. https://doi.org/10.3111/13696998.2011.644408

De Haan, J., Romp, W., & Sturm, J. (2007). Public capital and economic growth: key issues for Europe. *IMF International Seminar on Strengthening Public Investment and Managing Fiscal Risks from Public-Private Partnerships*.

Fernández-Moral, M. J., Vidueira, P., Díaz-Puente, J. M., & Nicolás, V. L. De. (2015). Empowerment evaluation in Spain: The critical friend role in working with rural communities. *Procedia - Social and Behavioral Sciences*, *191*, 984–989. https://doi.org/10.1016/j.sbspro.2015.04.483

Kasmel, A., & Andersen, P. T. (2011). Measurement of community empowerment in three community programs in Rapla (Estonia). *International Journal of Environmental Research and Public Health*, *8*(3), 799–817. https://doi.org/10.3390/ijerph8030799

Kellly, P. (2010). *Poverty in Scotland: Three challenges for community development. Community Empowerment: Critical Perspectives from Scotland*. Glasgow.

Khan, Z. (2005). *Evaluating the importance of community participation in infrastructure delivery in the Western Cape*.Cape Peninsula University of Technology.

Laah, E. D., Adefila, J., & Yusof, R. (2014). Community participation in sustainable rural infrastructural development in Riyom Area, Plateau State of Nigeria. *Journals of Economics and Sustainable*

Development, *5*(4), 49–57.

Mačiulskytė, S. (2014). *The code of society transformation in social work: Modelling the construction of Lithuanian social work professionalization*. Rovaniemi: Acta Universitatis Lapponiensis.

Marianne Fay, & Toman, M. (2010). *Infrastructure and sustainable development*. *1*. Busan South Korean. https://doi.org/10.1080/15568310601091957

National Fadama Coordination Office Nigeria. (2015). *Project Information Document (PID) Appraisal Stage*. Abuja. Nigeria.

Saaty, T. L. (2008). Decision making with the analytic hierarchy process. *International Journal of Services Sciences*, *1*(1), 83. https://doi.org/10.1504/IJSSCI.2008.017590

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

Forecasting demand for long-term care based on multistate piecewise constant Markov process

Cui Xiaodong*, Zheng Yuhua

Nanjing Xiaozhuang University, Nanjing, China

Article Info

Article history:
Received : 8 September 2017
Accepted : 25 January 2018
Published : 6 March 2018

Keywords:
Markov process, forecast, expectancy, population

JEL Classification:
I0, I1, H5

DOI: 10.20885/ejem.vol10.iss1.art3

Abstract

This paper forecasts demand for long-term care based on multistate piecewise constant Markov process. Two types of data are mainly used in this study. The first type of data came from the Chinese Longitudinal Healthy Longevity Survey (CLHLS), 2008-2011. The second type of data came from the China's Demographic Yearbook of 2016, used as the number of population in the base period. It finds that the changes in health have a significant difference in gender and age. It also finds that under different health states, the distribution of duration of staying in each state in different gender and age groups shows a characteristic similar to the distribution of population size.

Introduction

Long-term care means "*providing care, including medical care, social care, home care, transportation or other support services for people with a chronic disease or dysfunction under disability within a long period*"[1]. Due to illness, disability, function decline or other reasons, the aged population becomes the main group with a demand for long-term care. According to the sixth national census data, the ratio of the elderly aged 60 and above who cannot care for themselves in China is nearly 3% (Bao, 2015). Moreover, with the increase of life expectancy and the decline of fertility level, China's aging population shows a high-speed and advanced-age trend. The aging rate is averagely increased by 0.34 every year from 2010 to 2025, and the ratio of the aged population is increased from 8.9% to 14%, which reflects a serious aging problem (Wei, Shanjun, & Chen, 2014). In the meantime, aging is associated with family miniaturization. According to the sixth national census data, the average number of members in each family is 3.10 in China, and the average number of members in each urban family is only 2.87. However, the number of members in each urban family was 3.50 in 1990 (Hongwei, 2015). Family miniaturization causes the weakening of traditional family-based elderly support function and the aging of population, and the combination of the two brings a severe challenge to China's pension system. As China's current social welfare and social security system are unable to solve the long-term care problem for most elderly people, the establishment of a long-term care security system is an inevitable choice for coping with aging. So far, China's long-term care security system is in the exploration stage. This study is aimed to research the actuarial basis of the long-term care security system, i.e., the evolvement rule and transition probability of health state, and to forecast such issues as the population size required for long-term care, and the long-term care time in China in the future so as to provide experience for exploring China's long-term care security system for the elderly.

The forecasting methods of the demand for long-term care are divided into macro scenario simulation forecasting and micro simulation data forecasting. Macro scenario simulation means constructing scenarios by setting different parameters of key factors, then speculating the demands for long-term care in different scenarios. There is a difference in the factor selection and setting of different documents. Overall, factor selection includes the factors reflecting macro socio-economic state and the factors at the micro individual level. Comas-Herrera et al. (2006) took the lead in applying a simulation method to forecast the demand for long-term care in four European countries, and found that the demand for long-term care is highly sensitive to

[1] From the definition given by the Health Insurance Association of America

P ISSN 2086-3128 | E ISSN 2502-180X
*Corresponding author e-mail: cui_xiaodong@163.com

living standard, health state, nursing cost, as well as the availability of family or friend care; (Costa-Font et al., 2008) used the data provided by the actuarial department to forecast the demand for long-term care from 2005 to 2031 in his research on the UK, and found that the selection of such parameters as marital state, family members' dwelling state and degree of disability has a great influence on the forecasting. Costa-Font et al. (2008) constructed the PSSRU model, and forecasted the population with a demand for long-term care in the future by simulating the number of population under different circumstances and multiplying it by the ratio of the current population under long-term care to the total population; Minglai, (2009) and Yi, Huashuai, & Zhenglian (2012) speculated the number of the elderly needing long-term care based on the same method. Zeng Yi utilized the geometric growth rate of long-term care population on a period-on-period basis (Yi et al., 2012). The key factors of this method in simulation are birth rate and death rate. The results of macro simulation greatly rely on the selection and setting of parameters. Comas-Herrera et al. (2012) used the analytic hierarchy process to verify this conclusion by selecting different factors.

Micro simulation forecasting is based on micro survey data to follow up the evolution track of health state of the elderly. First, the transition probability matrix of different health state is constructed, and then the Markov process is utilized for forecasting. The key of this method is the construction of the transition probability matrix and the application of Markov process. Rickayzen & Walsh (2002) took the lead in applying Markov process to the forecasting of demand for long-term care, and divided the calculation of the transition probability matrix into two parts. First, the ratio of population under each state at the beginning of the period to the total population is used as the base period probability; then the base period probability is adjusted according to the variation trend of health state to obtain the probability of the next year so as to calculate the transition probabilities of the forecast period in sequence. Hare, Alimadad, Dodd, Ferguson, & Rutherford (2009) obtained the transition probability by fitting through the construction of a regression model based on the factors influencing the demand for long-term care in his research on the long-term care of the UK, and his research data came from medical departments and individual surveys. Based on the same regression method, Chahed, Demir, Chaussalet, Millard, & Toffa (2011) used the health state transition data of patients in London from 2008 to 2011, and Peng, Ling, & Qun (2010) utilized the health state survey data of China's aged population to construct the transition probability matrix of corresponding regions, and forecasted the elderly people's demand for long-term care under Markov time invariant hypothesis; In the research by Rong (2009) in China, the transition probability is borrowed from the national long-term care survey & research results of the USA; Feng & Chunjie (2012) and Hongwei (2015) respectively established a mortality probability model and a health state transition model through logit and ordinal logit regression models, and assumed that the health transition probability matrix is unchanged during the forecasting when applying the Markov process method.

In the comparison between the two forecasting methods, as macro scenario simulation is restricted by the selection and hypothesis of numerous key factors, the forecasting model based on micro data is relatively dominant in the case of data available. The "Chinese Longitudinal Healthy Longevity Survey" (CLHLS) program conducted by the Center for Healthy Aging and Development Studies, Peking University, has made some progress for the domestic research based on micro forecasting, but still has some room for improvement in application. First, in the aspect of the construction of the transition probability matrix, the direct borrowing of the overseas transition probability or the simple period-on-period method has low precision, which cannot meet the design requirement of the insurance system. The multiple regression model construction method is a more common method. But the complicated, diversified and multidimensional characteristics of changes in health state add diversity and subjectivity to the selection of explanatory variables in the regression model. Therefore, in the case of data available, only constructing the transition probability based on the tracking data can better capture the dynamic evolution of the health state of the elderly. Second, in the aspect of the time invariant hypothesis of Markov process, the nature of time invariant hypothesis is that the transition intensity is an invariant constant, and the transition probability is only related to time interval, but unrelated to its time point. This hypothesis is convenient for the expression of the transition probability function. However, the changes in health state are related to age. People of different ages have different changes in health, i.e., the transition probability is related to the time point. Thus, the time invariant hypothesis of Markov process is improper. Third, there are only few researches on the forecasting of time required for long-term care, and the expressions in existing literature are unclear, but the time required for long-term care and the population size thereof are also the key to forecasting the cost of long-term care.

In this regard, based on the micro simulation forecasting method, the changes in health state before and after the observation period of samples in the CLHLS survey program are tracked in this paper, and the

actuarial method is adopted to construct the transition probability matrix to avoid the subjectivity of variable selection in regression analysis; the Markov process method with transition intensities as piecewise constants and matrix multiplication by age is adopted to forecast the number of long-term care population, and to overcome the defect of Markov time invariant hypothesis not in conformity with the reality; on this basis, the expected time required for long-term care is forecasted based on the actuarial theory of life insurance. Considering that the micro simulation forecasting loses the reliability of medium and long-term forecast due to model refinement and forecast precision advantages, this paper is focused on forecasting the demand size of ten-year long-term care and the time duration required for long-term care.

Research Method

Data source and concept definition

Two types of data are mainly used in this study. The first type of data came from the CLHLS (2008-2011). This survey was carried out in 22 provinces of China, and related data were collected by means of questionnaire interviews in each household. Hundreds of scholars at home and abroad have registered for free use of CLHLS, the data quality of which is good and has been widely accepted by the academic circles. In this study, the elderly people aged 60 and above in the tracking survey samples were the objects of study. After the observed value lacking key information and the data unavailable for follow-up tracking were removed, the number of effective samples were 15,964, and the male to female ratio was 0.93:1. The CLHLS data were used to calculate the transition probability matrix and reckon the ratio of the population in each health state to the total population in the base period. The second type of data came from the China's Demographic Yearbook of 2016, used as the number of population in the base period.

In this study, the definition of nursing state is subject to the ADLs (activities of daily living) independence criterion widely used in the academic circles. According to the criterion, in case that a person needs help from others in one or more of the six items reflecting the activities of daily living of the elderly (bathing, dressing, indoor mobility, getting to the toilet, self-feeding, urine & feces control), it is defined as self-care disability; if a person has three or more daily activity disorders, such person is deemed to need long-term care. Besides, considering that one of the objectives of this study is providing a basis for the long-term care security system, cognitive impairment is also defined as self-care disability so as to enable the definition of long-term care state to be consistent with the long-term care security system.

In CLHLS, the respondents' health state is investigated from multiple dimensions. In addition to the six items of ADLs, the eight indexes reflecting the instrumental activities of daily living (IADLs) of the elderly are collected as well, including dropping in on neighbors, 5kg weightlifting, bathing, cooking, and so on. If a respondent is unable to complete a daily activity without the sustained help from others, such respondent is deemed to lose the activity of daily living. Moreover, in the survey, the Chinese version of simple cognitive function scale conforming to China's cultural traditions and socio-economic state is used to measure the cognitive function of the elderly. The simple scale includes such aspects as direction positioning ability, reaction ability, attention, calculative ability, recalling ability, as well as language, understanding and self-coordination ability, and covers 24 questions and 30 points in total. The scoring method is used in CLHLS, wherein, the ability to complete an activity or a correct answer will add 1 point for the respondent.

To sum up, health state is divided into four types in this study, respectively, 1 health, 2 health impairment, 3 dysfunction and 4 death, among which, 1, 2 and 3 belong to transition states, i.e., the states are interchangeable; 4 is the absorption state, i.e., 1, 2 and 3 can be transferred to 4, but 4 cannot be transferred to others. The definition of health state is based on three indexes, namely, ADLs, IADLs and cognitive ability. If a person has no disorder in none of the three, such person is deemed to in a health state 1. If a person has three or more than three daily activity disorders, i.e., the ADLs score is larger or equal to 3 points or the cognitive function score is below 16 points (30 points in total), the person is deemed to be in the state of dysfunction 3, namely, the state of needing long-term care. The complementary state is deemed as health impairment state, i.e., a certain disorder exists, but does not reach the state 2 of needing long-term care.

Mechanism analysis of Markov process

With the help of the multi-state model in long-term health insurance actuarial science, a four-state probability transition model is adopted pursuant to the above definition in this paper. Defining random process $\{S(x).x \geq 0\}$: the value of $S(x + t)$ represents the health state when the variable is $x + t$, and the health state space is {1, 2, 3, 4}, wherein, 4 is the absorption state.

Defining transition probability: ${}_t p_x^{ij} = p\{S(x+t) = j \mid S(x) = i\}; j = 1,2,3,4; i = 1,2,3$, it represents that the state is i when at time x ; it is transformed into j probability at time $x + t$; it is deemed as one-step transition probability ${}_1 p_x^{ij}$ when t = 1. The treatment method of the multi-state transition probability model is the Markov process.

Markov process

A Markov process refers to a set of random variables $\{X(t), t \in T\}$ relying on the variable parameter t, the set T of all possible values of the variable parameter t is known as a parameter space, and the value S of $X(t)$ constitutes the state space of a stochastic process. If it is known that the time t system is under a state condition, when the state of the time $\tau(\tau > t)$ is unrelated to the previous state of the time t, this process is a Markov process.

In this paper, the four-state probability transition model can be regarded as a Markov process with T discrete and S discrete. T is a set of ages, and S represents four health states. In other words, the transition probability of health states is only related to the state before transition, which can be expressed as the following mathematical symbol:

$$\begin{aligned} & p\{S(x+t) = h_t \mid S(x+t-1) = h_{t-1}, S(x+t-2) = h_{n-2}, \mathrm{L}\ , S(x+1) = h_1\} \\ & = p\{S(x+t) = h_t \mid S(x+t-1) = h_{t-1}\} \end{aligned} \tag{1}$$

For all $t \in T, h_t \in S$ is satisfied.

Transition probability matrix and transition intensity matrix

States 1, 2 and 3 are transferable states while state 4 is the absorption state. The transition probability meets the Chapman-Kolmogorov equation:

$$\begin{aligned} & {}_2 p_x^{ij} = \sum_k {}_1 p_x^{ik}\ {}_1 p_{x+1}^{kj},\ {}_3 p_x^{ij} = \sum_k {}_2 p_x^{ik}\ {}_1 p_{x+2}^{kj}, \mathrm{L} \\ & {}_t p_x^{ij} = \sum_k {}_{t-1} p_x^{ik}\ {}_1 p_{x+t-1}^{kj} = \sum_k {}_1 p_x^{ik}\ {}_1 p_{x+1}^{ik}\ {}_1 p_{x+2}^{ik} \mathrm{L}\ {}_1 p_{x+t-1}^{kj} \\ & i = 1,2,3; k = 1,2,3; j = 1,2,3,4 \end{aligned} \tag{2}$$

For different x, i.e., different ages in this paper, with different transition probabilities, the transition probabilities of different ages are expressed as matrixes. The one-step transition probability is denoted as matrix $P(1)$; the t-step transition probability matrix is $P(t)$. According to Equation (2),

$$P(t) = P^{(m)}(1).P^{(m+2)}(1)....P^{(m+t-1)}(1). \tag{3}$$

Where, $P^{(m+t-1)}(1)$ represents the one-step transition matrix at time $m + t - 1$.

When the transition probability is only related to the initial state i and the arrival state j, but unrelated to the initial time x, the Marko chain has a stationary transition probability, also known as time-homogeneous transition probability.

Transition intensity represents the instantaneous transition of state, which is denoted as:

$$«^{ij}(t) = \lim_{\Delta t \to 0} \frac{p^{ij}(t+\Delta t) - p^{ij}(t)}{p^{ij}(t) \cdot \Delta t} = \frac{(p^{ij}(t))'}{p^{ij}(t)} \tag{4}$$

From this, the relation between transition intensity and transition probability can be inferred:

$${}_t p_x^{ij} = e^{\int_x^{x+t} «^{ij}(s) ds} \tag{5}$$

When the transition intensity is the constant « : ${}_t p_x^{ij} = e^{«t}$. Under the time invariant hypothesis, transition probability and transition intensity meet Kolmogorov forward differential equation:

$\frac{d}{dt}\,{}_t p_x^{ij} = \sum_{l=1}^{s} {}_t p_x^{ih} u^{hj}(x+t)$, see the appendix for the specific equation.

Markov process method with transition intensity as piecewise constant

The nature of the Markov process time invariant hypothesis is that the transition intensity is an invariant constant, i.e., the time interval of state transition is subject to exponential distribution, and the state transition probability is only related to the time interval, but unrelated to the time point. This hypothesis is convenient for the expression of a transition probability function, but is improper in many applications. For example, if we assume that the health state transition probability is time-homogeneous, it means that no matter 60, 70 or 80, as long as the time intervals of transition observed are the same, the health state transition probabilities are the same. In other words, the people aged 60, 70 or 80 have the same changes in health state within the following equal time, which is apparently not in conformity with the reality. Therefore, based on the non-homogeneous characteristic of transition intensity varying with age, the forecasting method with transition intensity as a piecewise constant is adopted so as to maintain the easy controllability of constant transition intensity in this paper. That is to say, a given forecast interval (*s*,*t*) is divided into *m* short intervals. We assume that the transition intensity of each short interval is a constant, but the transition intensities of the *m* short intervals are different. In the process of calculating the transition probabilities of (*s*,*t*) the transition intensity of each short interval is calculated first, then the transition intensity of this short interval, finally the transition probability matrix of the entire interval.

A ten-year transition probability matrix is forecasted in this paper. It is divided into ten intervals on a yearly basis. We assume that the transition intensity every year is a constant[2], but the transition intensities in different years are different. Then according to Equation (3), the future ten-year transition probability matrix can be expressed as:

$$P(0,10) = P^0 P^1 \ldots P^9 \tag{6}$$

It should be noted that unlike the time invariant hypothesis, $P^0, P^1 \ldots$ here, i.e., the transition probabilities of all intervals, are unequal to one another. Theoretically, we might track the health state transition of samples every year to obtain ten section matrixes for multiplication, but it is actually infeasible and unnecessary for short and medium-term forecasting[3]. For the section matrix of health transition of each age group obtained by the utilization of samples, dislocation multiplication is applied during forecasting. For the forecasting of the future 10-year health transition probability of people aged (x), we assume that each year is a short interval, then we can apply the transition probability of age (x) in the section data to the first interval, the transition probability of age $(x+1)$ in the section data to the second interval, the transition probability of age $(x+2)$ in the section data to the third interval. It should be also noted that P^0, P^1 etc. are one-year transition probabilities, and the three-year transition probabilities are obtained according to CLHLS survey data from 2008 to 2011. Therefore, the one-year transition intensities and one-year transition probabilities need to be obtained pursuant to Equation (5), and then substituted into Equation (6).

Expected time of state transition and duration

State duration means the time $T(x)$ of state i transitioning to and remaining in state. The expected time is expressed as $E(T(x))$. For example, if it is forecasted that a person aged 60 is in a health state, then the expected time of the state transitioning to and remaining in disability state from age 60 to 70 is $E(T(60))$. According to the actuarial theory[4], the value can be given by the following equation (for more specific derivation, see the annex):

$$\begin{aligned} E(T(60)) &= \int_0^{10} t \times {}_t p^{ij}{}_{60} \times \ll^{ij}{}_{60+t} dt \\ &= \int_0^{10} {}_t p_{60}{}^{ij} dt = \sum_{x=60}^{69} \int_x^{x+1} {}_t p_{60}{}^{ij} dt \\ &= \sum_{x=60}^{69} \int_x^{x+1} \sum_{h=1}^{k} ({}_{x-60} p_{60}{}^{ih}\, {}_{t-x} p_x{}^{hi}) dt \\ &= \sum_{x=60}^{69} \sum_{h=1}^{k} {}_{x-60} p_{60}^{ih} \int_x^{x+1} {}_{t-x} p_x^{hi} dt \end{aligned} \tag{7}$$

Where, x is a nonnegative integer, $i = 1,2,3; k = 1,2,3; j = 1,2,3,4,$

---

[2] As long-term care often results from chronic and long-term diseases, it is reasonable to set the health transition probability within one year as a constant (the explanation comes from *Health Insurance*, exam book required by the China Association of Actuaries).

[3] In the short to medium-term, the macro-environment has an insignificant impact on health (Zeng Yi).

[4] See *Actuarial Principles*

To simplify the above equation, the aforesaid hypothesis is followed, i.e., the transition intensity or transition probability is a constant within one year, and initial and final states are only considered in state changes within one year, irrespective of the mutual transformation state in the middle period. For instance, if the initial state is 1, the mid-year state is changed to 2 and the year-end state is changed to 3, then we can denote the state changes as 1 to 3[5]. Hence, in the following equation:

$$ {}_{x-60}p_{60}^{ih} = \prod_{t=0}^{x-60-1} {}_{1}p_{60+t}^{ih}, \quad \int_{x}^{x+1} {}_{t-x}p_{x}^{hi}\,dt = {}_{1}p_{x}^{hi} \tag{8} $$

When Equation (8) is substituted into Equation (7), Equation (7) can be simplified to:

$$ T = \int_{60}^{70} {}_{t}P_{60}^{ij}\,dt = \sum_{x=60}^{69} \left(\prod_{t=0}^{x-60} p_{60+t}^{ij}\right) \tag{9} $$

Equation (9) is applicable to the estimation of average time of any age, health state and forecast interval.

Results and Discussion

Three-year health state transition probability matrix

As the sample data are three-year tracking survey data, the three-year health state transition probability matrix is calculated first. Table 1 is the three-year health state transition probability matrix of different ages and genders completed with SPSS software based on the CLHLS survey data from 2008 to 2011. In the process of sorting data, considering that age and gender are important influencing factors of health state, first, the samples are classified by age and gender. Every five years is an age group (if every age is a group, more accurate results will be obtained, but there will be too many data. Moreover, when there is only a small age difference, the transition probability difference will be insignificant). Each individual of each category is classified as different health state according to the definition standard of health state, then, the health states of individuals in different states at the end of the period are tracked in each category so as to calculate the ratio of the number of people in each state at the end of the period to that at the beginning of the period, which can be counted as the corresponding three-year transition probability. As shown in Table 1, the samples are classified into different groups by age and gender, and each group is divided into different state. The data at the intersection represents the corresponding state transition probability. For instance, among the elderly men aged 60-64 who are in State 1 (i.e., health) at the beginning of the period, the ratio of the elderly men remaining in State 1 at the end of the period is 0.7867; the ratio of the elderly men in State 2 is 0.14; the ratio of the elderly men in State 3 is 0.0067; the ratio of the elderly men in State 4 (i.e., death) is 0.0666. Similarly, among the elderly men aged 60-64 who are in State 2 at the beginning of the period, the ratio of the elderly men in State 1 at the end of the period is 0.6444; the ratio of the elderly men in State 2 is 0.3011; the ratio of the elderly men in State 3 is 0.0222; the ratio of the elderly men in State 4 (i.e., death) is 0.0323. The remaining data have the same meaning.

In order to observe the impact of age and gender on health state in a more intuitive way and support the grouping standard in this paper, Fig.1 and Fig.2 are drawn according to the data in Table 1. Seen from the trend of each figure, no matter how the initial state is, disability probability and death probability both progressively increase with age[6]. The decline in people aged above 90 in Fig. 1b and the people aged above 85 in Fig. 1c is due to the sharp increase of the mortality risk in the period. This figure re-illustrates that it is inconsistent with the reality to set the transition probability as a constant in the entire forecast period. Seen from all figures, there is a significant difference in the transition probabilities between men and women. In Fig.1, the disability transition probability of men in the same initial state and the same age group is smaller than that of women, especially the men aged 75-79 in Fig.1b and the men aged 70-84 in Fig.1c, who have a significant health advantage. As shown in Fig.2, the death probability of men is larger than that of women on the whole, especially the people aged 85-89 in Fig. 2b and the people aged 70-79 in Fig. 2c, who have a significant difference. This phenomenon forms a complementary explanation with Fig.1, with a large disability probability and a small death probability; a small disability probability and a large death probability respectively. Certainly, the two are not linearly related or equal to 1. But, no matter in State 2 or 3, the people

[5] From *Health Insurance*, exam book required by the China Association of Actuaries

[6] It can be used to explain why the Markov process does not meet the time invariant hypothesis as abovementioned.

in the age group have a fairly low possibility of transition to health. Thus, it can be concluded: the intensified aging, increased aged population, prolonged life expectancy and increased ratio of aged population in the future will certainly bring an increase of the demand for long-term care; compared to men, women have a high disability probability and a low death rate, resulting in a severer situation of women's demand for long-term care. The future demand size for long-term care is our next content. Due to the restriction on forecasting hypothesis, we only forecast the demand for long-term care in the next 10 years.

Table 1 Three-Year Health State Transition Matrix

Age	State	men				women			
		1	2	3	4	1	2	3	4
[60 64]	1	0.7867	0.1400	0.0067	0.0666	0.7500	0.2065	0.0326	0.0109
	2	0.6444	0.3011	0.0222	0.0323	0.4837	0.4140	0.0943	0.0080
	3	0.3902	0.3698	0.1800	0.0600	0.3710	0.3720	0.2500	0.0070
[65 69]	1	0.6754	0.2403	0.0237	0.0606	0.5333	0.3767	0.0500	0.0400
	2	0.3869	0.4201	0.1003	0.0927	0.3768	0.4589	0.1063	0.0580
	3	0.2010	0.4000	0.2490	0.1500	0.1923	0.4231	0.2692	0.1154
[70 74]	1	0.5279	0.2817	0.0711	0.1193	0.5233	0.2746	0.1451	0.0570
	2	0.3948	0.3542	0.1107	0.1403	0.2073	0.5793	0.1189	0.0945
	3	0.2364	0.2545	0.1455	0.3636	0.1837	0.1429	0.4286	0.2448
[75 79]	1	0.3202	0.3900	0.0969	0.1929	0.3006	0.4247	0.1561	0.1186
	2	0.1968	0.4124	0.1860	0.2049	0.1654	0.3780	0.2703	0.1863
	3	0.0625	0.2813	0.2188	0.4375	0.0645	0.2903	0.3710	0.2742
[80 84]	1	0.3196	0.3144	0.1443	0.2217	0.1900	0.4364	0.2216	0.1520
	2	0.1119	0.3776	0.2005	0.3100	0.0502	0.3480	0.3542	0.2476
	3	0.0518	0.2798	0.2642	0.4042	0.0190	0.2531	0.3742	0.3537
[85 89]	1	0.0755	0.4854	0.1946	0.2445	0.0456	0.4154	0.3051	0.2339
	2	0.0363	0.3189	0.2104	0.4344	0.0297	0.3051	0.3729	0.2923
	3	0.0178	0.1684	0.2579	0.5559	0.0117	0.1202	0.3806	0.4875
[90 94]	1	0.0339	0.3266	0.2358	0.4037	0.0385	0.1923	0.3077	0.4615
	2	0.0149	0.1983	0.2593	0.5275	0.0045	0.2123	0.4234	0.3598
	3	0.0101	0.0911	0.2376	0.6612	0.0058	0.0764	0.3299	0.5880
95+	1	0.0833	0.2500	0.2500	0.4167	0.0156	0.0940	0.4005	0.4899
	2	0.0185	0.1806	0.2454	0.5556	0.0107	0.1584	0.3083	0.5226
	3	0.0033	0.0542	0.1921	0.7504	0.0011	0.0272	0.2484	0.7233

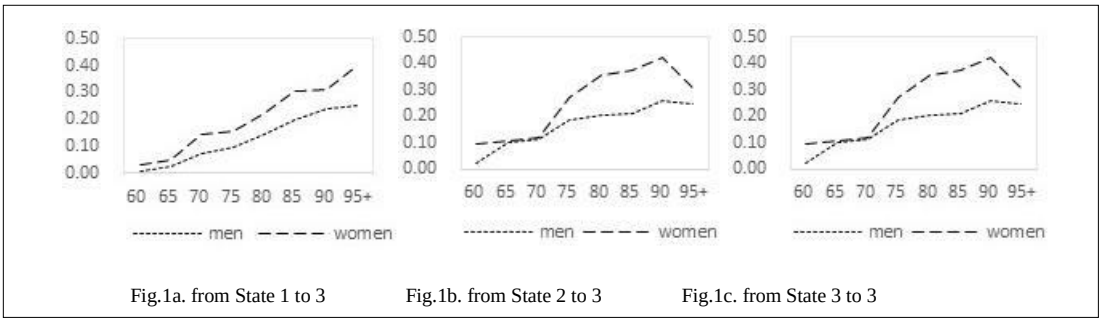


Fig.1a. from State 1 to 3 Fig.1b. from State 2 to 3 Fig.1c. from State 3 to 3

Figure 1. Three-Year Transition Probabilities from Different States to Disability State

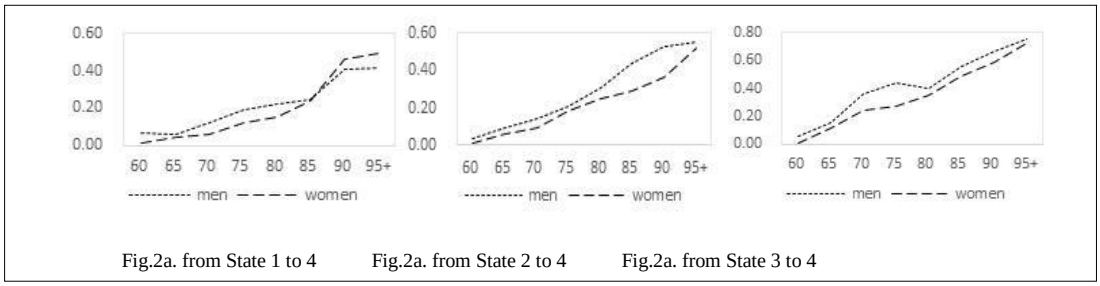


Fig.2a. from State 1 to 4 Fig.2a. from State 2 to 4 Fig.2a. from State 3 to 4

Figure 2. Three-Year Transition Probabilities from Different States to Death State

One-year transition probability matrix

The three-year transition probability matrix $P(3)$ is obtained in Table 1. To calculate one-year transition probabilities, we may conduct a staged time invariant hypothesis, i.e., assuming that the transition probability intensity of each category within the three years is a constant to reversely calculate $P(1)$ according to Equation (3). In this paper, mathematic programming is utilized to calculate the transition intensity, then to calculate the one-year transition probability matrix. Due to limited space, the matrix is not listed in the text. Please refer to Table 1 in the Appendix.

Ten-year transition probability matrix of piecewise constant transition intensities

In accordance with the one-year transition probability matrix, the transition probability in each category and different state after any period can be calculated via Equation (5). However, due to the complexity of health state transition, only ten-year forecasting is carried out in this study, and each five years is still used as an age unit in each category, e.g., the forecasting of probabilities of healthy men (State 1) aged 60-64 in States 1, 2, 3 and 4 ten years later. As each age group is on a five-year basis, with a forecast period of ten years, the forecast period is divided into two parts. The transition probability of the age group in Table 2 is applied in the first 5 years, and the transition probability of the next age group is applied in the last 5 years. For instance, for the forecasting of the ten-year transition probability matrix of people aged 60-64, the transition probability every year in the first five years is the one-year transition probability of the age group of 60-64; then 5 years later, the people aged 60-64 enter the age group of 65-69, so, the one-year transition probability matrix of the age group of 65-69 is adopted in the last 5 years[7]. In the meantime, it is assumed that the transition probability matrix every year in the five years meets time homogeneity. $P_{60\sim64}(1)$ represents the one-year transition probability of the age group of 60-64; $P_{65\sim69}(1)$ represents the one-year transition probability of the age group of 65-69. Then, the ten-year transition probability of the age group of 60-64 is $P_{60\sim64}(10) = (P_{60\sim64}(1))^5 . (P_{65\sim69}(1))^5$. The calculation methods of the remaining groups are the same. The people aged 95+ have a fairly low survival rate, so it is assumed that they are in State 4. In this way, the ten-year transition probability matrix of each group is obtained by means of programming calculation, as shown in Table 2. Seem from the table, the ratio of healthy men in the age group of [60 64] who remain healthy ten years later is 0.4980; the ratio of health impairment is 0.2514; the probability of dysfunction is 0.0441; the death probability is 0.2065. The remaining groups have the same meaning.

Table 2. Ten-Year Health State Transition Probability Matrix

Age	State	men				women			
		1	2	3	4	1	2	3	4
[60 64]	1	0.4980	0.2514	0.0441	0.2065	0.4262	0.3925	0.0830	0.0983
	2	0.5096	0.2656	0.0488	0.1761	0.4166	0.3950	0.0883	0.1000
	3	0.4729	0.2667	0.0551	0.2054	0.4077	0.3958	0.0930	0.1036
[65 69]	1	0.3710	0.2475	0.0745	0.3070	0.2935	0.3382	0.1546	0.2137
	2	0.3428	0.2338	0.0718	0.3516	0.2777	0.3295	0.1533	0.2395
	3	0.3049	0.2124	0.0666	0.4161	0.2434	0.2995	0.1483	0.3088
[70 74]	1	0.1484	0.2588	0.1072	0.4856	0.1388	0.2882	0.2064	0.3666
	2	0.1405	0.2476	0.1038	0.5082	0.1253	0.2691	0.2003	0.4053
	3	0.0995	0.1772	0.0751	0.6482	0.0911	0.2039	0.1598	0.5452
[75 79]	1	0.0806	0.1816	0.1096	0.6282	0.0361	0.2072	0.2221	0.5347
	2	0.0730	0.1717	0.1051	0.6503	0.0300	0.1818	0.1995	0.5887
	3	0.0463	0.1148	0.0714	0.7675	0.0239	0.1537	0.1729	0.6495
[80 84]	1	0.0151	0.1274	0.1004	0.7570	0.0109	0.1104	0.1965	0.6822
	2	0.0119	0.1015	0.0832	0.8033	0.0086	0.0878	0.1633	0.7402
	3	0.0096	0.0821	0.0690	0.8393	0.0071	0.0722	0.1366	0.7842
[85 89]	1	0.0039	0.0431	0.0734	0.8796	0.0022	0.0436	0.1321	0.8221
	2	0.0027	0.0305	0.0525	0.9142	0.0019	0.0377	0.1156	0.8448
	3	0.0020	0.0219	0.0384	0.9377	0.0013	0.0242	0.0759	0.8986
[90 94]	1	0.0019	0.0177	0.0359	0.9444	0.0006	0.0095	0.0445	0.9455
	2	0.0014	0.0128	0.0264	0.9595	0.0006	0.0106	0.0507	0.9381
	3	0.0009	0.0084	0.0176	0.9731	0.0004	0.0060	0.0301	0.9636

[7]If 1 age unit is a group, this hypothesis will not exist.

According to Table 3, we can conclude that compared to women, men still have a health advantage; regardless of the initial state, men's probability of transitioning to health ten years later is larger than women's probability; however, after the age 70, men's health advantage is gradually weakened, and there is no significant difference between men and women after age 80 (Fig.3). As it is ten-year forecasting, the people at the age of 70 now will be at the age of 80 ten years later, and the men at the age of 80 above have no significant health advantage compared to women, which conforms to the previous results. Next, we will focus on the probability of transition to disability state in a ten-year period. Fig.4 provides a comparison among the ten-year transition probabilities from different states to disability state. According to the figure, we can see that under three states, women's probability of transition to disability 3 (any age group) is larger than men's probability. In the age group of 70-74, the difference reaches the maximum value. In other words, the ratio of women aged from 75 to 79 needing long-term care is significantly larger than that of men. The inverted u-shaped difference is because that men blow the age of 70-74 has a health advantage (as shown in Fig.3), and the death rate of men above the age of 75 is higher than that of women, as shown in Fig. 4.

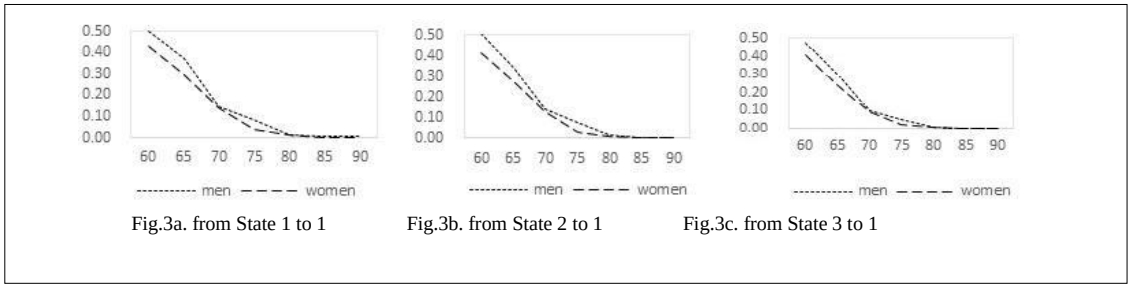


Fig.3a. from State 1 to 1 Fig.3b. from State 2 to 1 Fig.3c. from State 3 to 1

Figure 3. Ten-Year Transition Probability from Different States to Health State

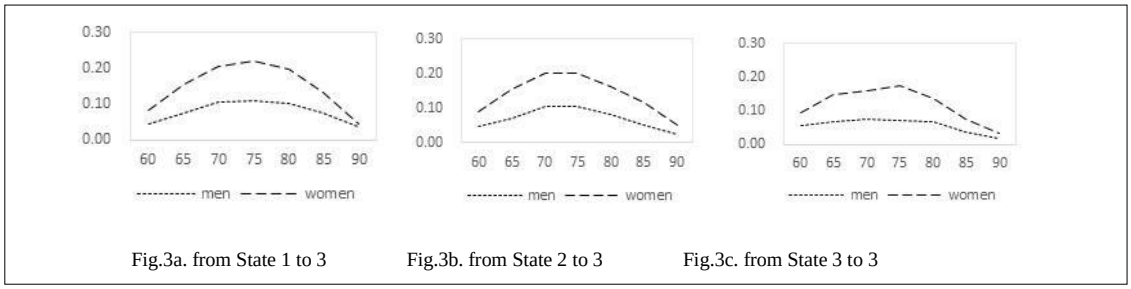


Fig.3a. from State 1 to 3 Fig.3b. from State 2 to 3 Fig.3c. from State 3 to 3

Figure 4. Ten-Year Transition Probability from Different States to Disability State

Forecasting of population size with a demand for long-term care

1. Forecasting of population size in the same health state

Based on the demographic structure data of China's Demographic Yearbook of 2016, the ratio of people in each age group and each health state is calculated according to the CLHLS survey data from 2008 to 2011. The number of population in the base period multiplied by corresponding ratio vector is the heath state population vector of different age groups in the base period. The ratio of men at the age of 60-64 to healthy people in samples multiplied by the total number of men at the age of 60-64 is the number of men aged 60-64 in the health state (i.e., State 1) in the base period. The rest are similar. According to the definitions of health state and standard in this paper, the ratio (6.6%) of disabled population at and above the age of 60 is calculated[8]. Due to limited space, the number of population of each group in the base period is shown in Table 2 of the Appendix.

The health state population vector of each age group in the base period multiplied by the corresponding ten-year transition probability matrix is the number of population in each state ten years later, as shown in the table below. The datum 302672 in the table shows that among the men at the age of 60-64,

[8] The ratio is higher than the result 6.25% forecasted by the Research Team of the China Research Center on Aging (2011). It may be because of different definitions of the disability state. The definition of disability state in this paper includes the cognitive impairment with a score below 18.

the number of healthy population is 302,672 ten years later; the number of population with health impairment is 154,248; the number of population with a dysfunction (with a demand for long-term care) is 27,471; the number of deaths is 120,534. The rest are similar. The original age group of 95+ enters the age group of 105+ ten years later. It is presumed that they are all in the death state, so they are not included in the table.

Table 3. Number of Population in Different Health State after the Ten-Year Period (one thousand people)

Age	men				women			
	1	2	3	4	1	2	3	4
[60 64]	302672	154248	27471	120534	255950	238704	51749	60118
[65 69]	153640	103189	31241	136966	121572	141976	65526	96963
[70 74]	39185	68672	28616	139877	36383	77365	56975	116042
[75 79]	14666	33875	20616	126460	6628	39805	43519	125691
[80 84]	1357	11512	9377	89480	1186	12059	22368	105921
[85 89]	118	1309	2259	41160	107	2082	6431	58291
90+	14	128	266	11431	10	164	804	20959

The data in the table show that the number of healthy old men is more than that of women in the same age group. Moreover, the number of female deaths is more than that of male deaths before the age of 80-84, because the population size of old men in the later period is reduced, which indicates that men have a heath advantage and a survival disadvantage. Seen from the age distribution of disabled population size, the number of old men and women shows a phenomenon of increasing first and decreasing later, and the number of the disabled elderly in the age group of 65-69 is the largest.

2. Comparison of disabled population size before and after the ten-year period

Fig.5 and Fig.6 respectively provide the population size comparison diagram of disabled men before and after the ten-year period, as well as the population size comparison diagram of disabled women before and after the ten-year period. The two figures show the changes in the number of disabled population within ten years. A comparison of the same age before and after a ten-year period is made, e.g., the comparison between the number of disabled population at the age of 70-74 at present and that at the age of 70-74 ten years later. In the process of data processing, as the first age group of samples is 60-64, corresponding to 70-74 ten years later, the forecasted number of disabled population in the age group of 70-74 is compared with the current number of disabled population in the age group of 70-74. The rest can be compared in a similar fashion. The three age groups of 85-89, 90-94 and 95+ will enter the 95+ age group ten years later, so the sum of the three group data is compared with the data of the 95+ age group.

Seen from the figures, compared to the number of disabled population in the base period, the number of both men and women in all age groups is increased to different extent, wherein, the number of disabled population in the age group of 75-80 is increased significantly; the number of male disabled population is 1.5 times the number in the base period; the number of female disabled population is 1.57 times the number in the base period; the total number of disabled population is 1.53 times the number in the base period[9]. Seen from the age characteristics of the disabled population changes, the disabled population from the age group of 70-75 to the age group of 75-80 shows a progressive increase, reaches the maximum change in the age group of 80-85, and begins showing a downtrend at the age of 85+. Fig.7 depicts a gender contrast of the number of disabled population. Seen from the figure, the number of disabled old women in all age groups is more than that of disabled old men, and the total number of disabled women is 2.06 times that of disabled men.

[9] According to Huang Feng's research results, if it is assumed that the growth rate is unchanged, the number of disabled women is 2.0 times the number in the base period after the ten-year period (i.e., 2026 in this study); the number of disabled men is basically stable, and the total number of disabled population is 1.57 times the number in the base period. Lin Bao measured and calculated that the disabled population shows an annual growth rate of 3% before 2032, so the estimated number of disabled population in 2026 is 1.35 times the current number according to the ratio.

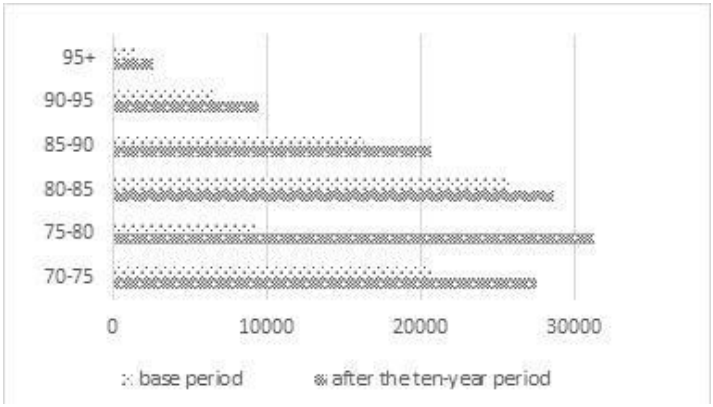


Figure 5. Comparison of the Number of Disabled Men

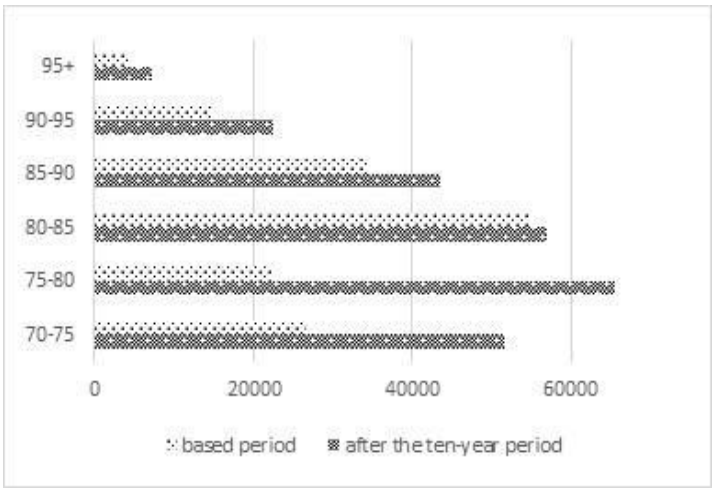


Figure 6. Comparison of the Number of Disabled Women

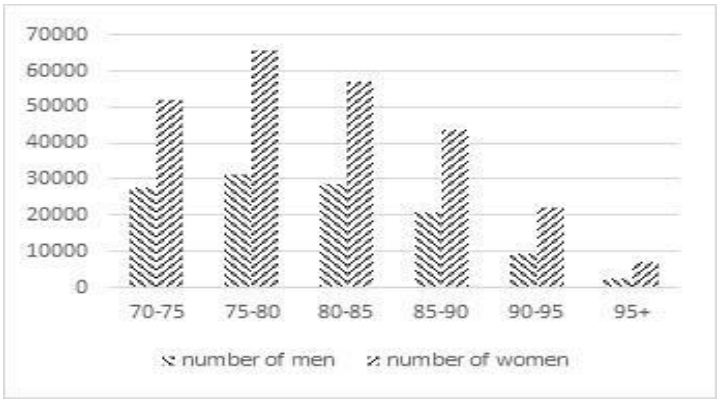


Figure 7. Comparison of Number of Disabled Men and Women

Estimation of Expected Time Required for Long-Term Care

For the study of long-term care, in addition to estimating the probability and population size of disability, we also need to estimate the duration of disability (if any). Thus, the average time of each group transferred to and remaining in the target state in the future ten years is forecasted. Likewise, as the original 95+ age group enters the 105+ age group ten years later, it is presumed that they are all in the death state. The data of the group are not included in the table. Based on Equation 8, the duration of each state is obtained as shown in

Table 4. Seen from the data in the table, the duration of healthy (State 1) men in the age group of 60-65 who remain healthy (State 1) in the future ten years is 6.8257 years; the average duration of staying in State 2 is 1.8225 years; the average duration of staying in State 3 is 0.1960 year; the average duration of staying in State 4 is 1.1558 years. The rest are similar.

Table 4. Duration of Staying in Each State in Future Ten Years (Unit: Year)

Age	State	men				women			
		1	2	3	4	1	2	3	4
[60 64]	1	6.8257	1.8225	0.1960	1.1558	6.2592	2.8542	0.5066	0.3800
	2	5.7986	3.0656	0.3017	0.8341	4.5081	4.2656	0.8573	0.3691
	3	4.3174	3.0740	1.5048	1.1038	3.8873	3.6994	2.0363	0.3770
[65 69]	1	5.6410	2.4418	0.4785	1.4386	4.5385	3.5616	0.9217	0.9782
	2	3.6918	3.6316	0.8567	1.8199	3.3108	4.2868	1.2131	1.1893
	3	2.5648	3.0706	1.9361	2.4285	2.1845	3.6246	2.3854	1.8055
[70 74]	1	3.8653	2.7964	0.8400	2.4984	3.7555	2.9287	1.6737	1.6421
	2	2.7980	3.4355	1.0514	2.7153	1.7653	4.6372	1.5769	2.0205
	3	1.7430	2.2485	1.4236	4.5850	1.4081	1.8199	3.2668	3.5052
[75 79]	1	2.4220	2.9842	1.0441	3.5499	2.0782	3.3512	1.8755	2.6931
	2	1.4296	3.3319	1.5254	3.7143	1.0476	3.2266	2.4058	3.3200
	3	0.5530	2.0893	1.8167	5.5422	0.4658	2.3416	3.1019	4.0906
[80 84]	1	2.0208	2.4834	1.2837	4.2121	1.3483	2.9682	2.1660	3.5175
	2	0.6277	2.9304	1.4972	4.9448	0.3069	2.6244	2.7452	4.3235
	3	0.3161	1.9507	2.0890	5.6442	0.1347	1.7321	3.0144	5.1188
[85 89]	1	0.6765	2.9163	1.3918	5.0156	0.4396	2.6495	2.2327	4.6784
	2	0.2078	2.1454	1.4318	6.2150	0.1734	2.1109	2.6287	5.0870
	3	0.0991	0.9970	1.9195	6.9844	0.0652	0.7607	2.7597	6.4146
90+	1	0.4374	2.0371	1.2344	6.2911	0.5094	1.1069	1.8160	6.5678
	2	0.0891	1.4207	1.5058	6.9844	0.0259	1.4991	2.5009	5.9743
	3	0.0600	0.5104	1.6733	7.7563	0.0332	0.4249	2.2359	7.3070

Note: Due to rounding, the sum of duration is not fully equal to 10.

According to the data in the table, the distribution of old men remaining healthy in the same age group and the same state in the future is completely different from that of women. In each age group and each initial state, the duration of old men in health state 1 is longer than that of women, which shows that men have a health advantage; besides, the duration of men in the death state is longer than that of women (except the women aged 90 above whose initial health state is State 1), which shows that women have a survival advantage. For further observation, the duration of staying in the disability state of different ages, different genders and different states is shown in Fig.8.

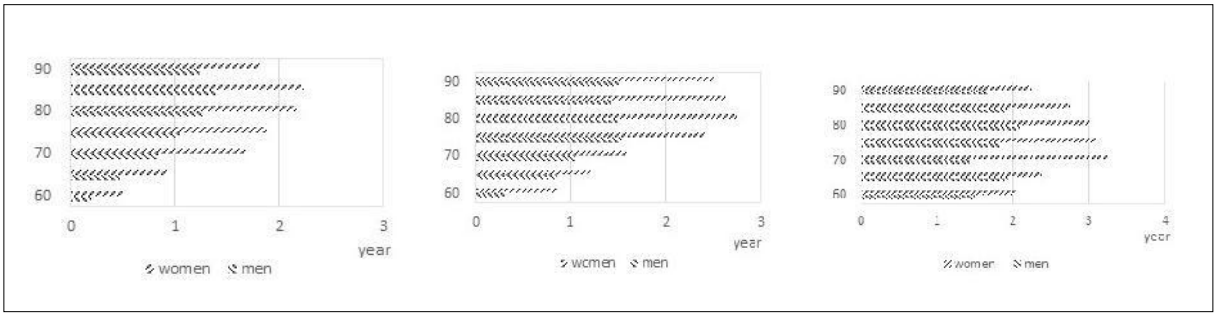


Figure 8. Duration of Disability from Different States in the Future

Fig.8 shows that regardless of the initial state and genders, the duration of disability has no linear correlation with age. On the whole, it shows an increase first and a slow decrease later. In the age group of 70-85, the average time required for long-term care is relatively longer. In a comparison among Fig. 8a, Fig. 8b and Fig. 8c, Fig. 8c shows the longest duration of disability at the same age, and Fig.8a shows a smaller duration, so the elderly who are in poor health initially have an urgent demand for long-term care; for the comparison of duration of disability between different genders, the average time of old women needing long-

term care is longer than that of old men, regardless of their states and age groups, and the difference is significant in the age groups of 70-75 above, until the age group of 90-95 as shown in Fig. 8b. Therefore, on the whole, the women around the ages of 70-85 who are in poor health initially constitute the major group with a demand for long-term care in the future.

Conclusion

In this paper, the survey data of CLHLS from 2008 to 2011 are utilized to investigate the dynamic evolution process of the health state of the elderly. According to the activities of daily living, instrumental activities of daily living and cognitive ability of the elderly, the health state of the elderly is divided into three types, namely, health, health impairment and dysfunction, and the people with a dysfunction are the major group needing long-term care as defined in this paper. Based on the Markov theory, tracking survey data are used to construct probability transition matrixes in this paper. Considering the age characteristics of changes in health states, the piecewise constant Markov process method is adopted to forecast the population size of different states in the future, and the time of transitioning to and remaining in each state is forecasted as well based on the actuarial method. According to the research results: (1) the changes in health have a significant difference in gender and age. Compared to men, old women have a significant survival advantage; compared to women, old men have a health advantage. The superposition of the two enables the number of disabled women of different ages to be around 2 times the number of disabled men in 2026, and the difference reaches the maximum value in the age group of 70-80. The mortality risk and the health risk are increased with the growth of age and the worsening of the initial health state. As a result, the people who are in poor health initially have a bigger possibility of needing long-term care. (2) Under different health states, the distribution of duration of staying in each state in different gender and age groups shows a characteristic similar to the distribution of population size. In the event that other conditions are the same, the duration of men staying healthy is longer than that of women, with a significant health advantage; the duration of men in the death state is longer than that women, which shows women have a survival advantage; the duration of men staying in disability is shorter than that of women; disability duration shows a nonlinear change with age. On the whole, it shows a trend of increasing first and progressively decreasing later. The duration of disability in the age groups of 70-85 is relatively long. As the disability duration is related to the initial health state, the people who are in poor health initially have a longer duration of disability.

Population aging is a global yet irreversible phenomenon. As China has the largest number of aged population in the world, accompanied by miniaturized and hollow family size, the long-term care for the aged population not only adds a financial burden to families, but also forms a huge recessive aging debt of a country in the future. Boosting the long-term security system for the elderly is not only the huge progress in aging and social security undertakings made by a country, but also an inevitable strategic choice for a country to cope with population aging. This study contributes to the understanding and recognition of the natural law of body function changes of the elderly, helps policymakers to plan and prepare medical and nursing services required by the elderly, and is beneficial to the accumulation of basic information for the construction of China's long-term care security system for the elderly, thereby, providing a decision basis for the government to develop an aging strategy.

References

Bao, L. (2015). An analysis on the status and trend of old population without self-care ability in China. *Population & Economics*, *4*, 77–84.

Chahed, S., Demir, E., Chaussalet, T. J., Millard, P. H., & Toffa, S. (2011). Measuring and modelling occupancy time in NHS continuing healthcare. *BMC Health Services Research*, *11*, 163–178. https://doi.org/10.1186/1472-6963-11-155

Comas-Herrera, A., Northey, S., Wittenberg, R., Knapp, M., Bhattacharyya, S., & Burns, A. (2012). Future costs of dementia-related long-term care: Exploring future scenarios. *Int Psychogeriatric*, *23*(1), 20–30. https://doi.org/10.1017/S1041610210000025

Comas-Herrera, A., Wittenberg, R., Costa--Font, J., Gori, C., Di Maio, A., Patxo, C., & Rothgang, H. (2006). Future long-term care expenditure in Germany, Spain, Italy and the United Kingdom. *Ageing & Society*, *26*(2), 285–302. https://doi.org/10.1017/S0144686X05004289

Costa-Font, J., Wittenberg, Raphael Patxot, Concepció Comas-Herrera, A., Gori, C., Di Maio, A., Pickard, L., Pozzi, A., & Rothgang, H. (2008). Projecting long-term care expenditure in four European Union member states: The influence of demographic scenarios. *Social Indicators Research*, *86*(2), 303–321. https://doi.org/10.1007/s11205-007-9140-4

Feng, H., & Chunjie, W. (2012). A study of long-term-care demand of the elderly in China: Based on multistatus transition model. *Economic Research Journal*, *2*, 119–130.

Hare, W., Alimadad, A., Dodd, H., Ferguson, R., & Rutherford, A. (2009). A deterministic model of home and community care client counts in British Columbia. *Health Care Manag Sci*, *12*(1), 80–98.

Hongwei, H. (2015). Estimation and prediction of demand of Chinese elderly long-term care service. *Chinese Journal of Population Science*, *3*, 79–89.

Minglai, Z. (2009). The Analysis of Demand for Long-term Care and its Insurance System Constructing in China. *Chinese Journal of Health Policy*, *2*(7), 32–38.

Peng, R., Ling, L., & Qun, H. (2010). Self-rated health status transition and long-term care need of the oldest Chinese. *Health Policy*, *97*(2), 259–266.

Rickayzen, B., & Walsh, D. (2002). A multi-state model of disability for the UK: implications for need for long term care for the elderly. *Br Actuar J*, *8*(2), 341–393.

Rong, P. (2009). Analysis of senior population nursing needs based on Markov model. *Statistics & Information Forum*, *3*, 77–79.

Wei, Z., Shanjun, L., & Chen, K. (2014). Characteristics and trend of population aging in China and its potential impact on economic growth. *The Journal of Quantitative & Technical Economics*, (8), 3–38.

Yi, Z., Huashuai, C., & Zhenglian, W. (2012). Analysis on trends of future home-based care needs and costs for elderly in China. *Economic Research Journal*, *10*, 134–149.

Appendix

1. Transition Probability and Transition Intensity.

Transition probability: ${}_t p_x^{ij} = p\{S(x+t) = j \mid S(x) = i\}; j = 1,2,3,4; i = 1,2,3$, it represents that the state is i when at time x; it is transformed into j probability at time $x+t$; States 1, 2 and 3 are transferable states while 4 is the absorption state.

Transition intensity represents the instantaneous transition of state, which is denoted as: $«^{ij}(t) = \lim_{\Delta t \to 0} \frac{p^{ij}(t+\Delta t) - p^{ij}(t)}{\Delta t}$

Under the time invariant hypothesis, transition probability and transition intensity meet Kolmogorov forward differential equations:

$$\frac{d}{dt}({}_t p_x^{11}) = -{}_t p_x^{11}(«_{x+t}^{12} + «_{x+t}^{13} + «_{x+t}^{14}) + {}_t p_x^{12}«_{x+t}^{21} + {}_t p_x^{13}«_{x+t}^{31}$$

$$\frac{d}{dt}({}_t p_x^{12}) = -{}_t p_x^{12}(«_{x+t}^{21} + «_{x+t}^{23} + «_{x+t}^{24}) + {}_t p_x^{11}«_{x+t}^{12} + {}_t p_x^{13}«_{x+t}^{32}$$

$$\frac{d}{dt}({}_t p_x^{13}) = -{}_t p_x^{13}(«_{x+t}^{31} + «_{x+t}^{32} + «_{x+t}^{34}) + {}_t p_x^{11}«_{x+t}^{13} + {}_t p_x^{12}«_{x+t}^{23}$$

$$\frac{d}{dt}({}_t p_x^{14}) = {}_t p_x^{11}«_{x+t}^{14} + {}_t p_x^{12}«_{x+t}^{24} + {}_t p_x^{13}«_{x+t}^{34}$$

$$\frac{d}{dt}({}_t p_x^{21}) = -{}_t p_x^{21}(«_{x+t}^{12} + «_{x+t}^{13} + «_{x+t}^{14}) + {}_t p_x^{22}«_{x+t}^{21} + {}_t p_x^{23}«_{x+t}^{31}$$

$$\frac{d}{dt}({}_t p_x^{22}) = -{}_t p_x^{22}(«_{x+t}^{21} + «_{x+t}^{23} + «_{x+t}^{24}) + {}_t p_x^{21}«_{x+t}^{12} + {}_t p_x^{23}«_{x+t}^{32}$$

$$\frac{d}{dt}({}_t p_x^{23}) = -{}_t p_x^{23}(«_{x+t}^{31} + «_{x+t}^{32} + «_{x+t}^{34}) + {}_t p_x^{21}«_{x+t}^{13} + {}_t p_x^{22}«_{x+t}^{23}$$

$$\frac{d}{dt}({}_t p_x^{24}) = {}_t p_x^{21}«_{x+t}^{14} + {}_t p_x^{22}«_{x+t}^{24} + {}_t p_x^{23}«_{x+t}^{34}$$

$$\frac{d}{dt}({}_t p_x^{31}) = -{}_t p_x^{31}(«_{x+t}^{12} + «_{x+t}^{13} + «_{x+t}^{14}) + {}_t p_x^{32}«_{x+t}^{21} + {}_t p_x^{33}«_{x+t}^{31}$$

$$\frac{d}{dt}({}_t p_x^{32}) = -{}_t p_x^{32}(«_{x+t}^{21} + «_{x+t}^{23} + «_{x+t}^{24}) + {}_t p_x^{31}«_{x+t}^{12} + {}_t p_x^{33}«_{x+t}^{32}$$

$$\frac{d}{dt}({}_t p_x^{33}) = -{}_t p_x^{33}(«_{x+t}^{31} + «_{x+t}^{32} + «_{x+t}^{34}) + {}_t p_x^{31}«_{x+t}^{13} + {}_t p_x^{32}«_{x+t}^{23}$$

$$\frac{d}{dt}({}_t p_x^{34}) = {}_t p_x^{31}«_{x+t}^{14} + {}_t p_x^{32}«_{x+t}^{24} + {}_t p_x^{33}«_{x+t}^{34}$$

If the transition intensity is a constant, the above equations are a set of correlative differential equations which are available to a simultaneous solution. If it is not a constant, nonlinear differential equations should be used for a solution.

2. Expected Time of State Continuance

(x) represents the people at the age of x. First, the remaining life of (x) is derived, i.e., the time of maintaining a survival state, which is denoted as $T(x)$. $T(x)$ represents a continuous random variable, and its distribution function $G(t)$ is: $G(t) = P(T(x) \le t), t \ge 0$,

In fact, $G(t)$ is a conditional probability, i.e., the probability of people at the age of x who will be dead in the next *t* years, which is expressed as symbol ${}_t q_x$. Besides, $s(x)$ represents a survival function, then:

$${}_t q_x = \frac{s(x)-s(x+t)}{s(x)},$$

$g(t)$ represents the probability density of $T(x)$, then:

$$\begin{aligned} g(t) = G'(t) &= \frac{d}{dt}\,{}_t q_x \\ &= \frac{d}{dt}\left(\frac{s(x)-s(x+t)}{s(x)}\right) \\ &= -\frac{1}{s(x)} \times s'(x+t) \\ &= \frac{s(x+t)}{s(x)} \times \left(-\frac{s'(x+t)}{s(x+t)}\right) \\ &= {}_t p_x \times «_{x+t} \end{aligned}$$

Where, ${}_t p_x$ represents the survival probability of people from the age x to the age $x+t$, ${}_t p_x = 1 - {}_t q_x$, and $«_{x+t}$ represents the intensity at time $x+t$.

On this basis, the expected value of $T(x)$ can be derived:

$$E(T(x)) = \int_0^\infty t \times {}_t p_x \times «_{x+t} dt = \int_0^\infty {}_t p_x dt$$

The above indicates the calculation of the expected time of staying in the survival state. In case of calculating the expected time of staying in any other state, we just need to change the probability to the corresponding transition probability, and use the same calculation form.

3. One-Year Health Transition Matrix.

Table 1. One-Year Health State Transition Matrix

Age	State	men				women			
		1	2	3	4	1	2	3	4
[60 64]	1	0.8949	0.0788	0.0022	0.0241	0.8799	0.1066	0.0097	0.0038
	2	0.3650	0.6109	0.0196	0.0045	0.2458	0.6816	0.0702	0.0024
	3	0.0828	0.3393	0.5516	0.0262	0.1347	0.2686	0.5947	0.0020
[65 69]	1	0.8473	0.1331	0.0008	0.0188	0.7434	0.2367	0.0084	0.0115
	2	0.2111	0.6766	0.0798	0.0325	0.2374	0.6638	0.0794	0.0194
	3	0.0388	0.3105	0.5874	0.0633	0.0279	0.3182	0.6039	0.0500
[70 74]	1	0.7465	0.1867	0.0301	0.0366	0.7792	0.1373	0.0726	0.0109
	2	0.2606	0.5988	0.1043	0.0363	0.1011	0.8127	0.0556	0.0306
	3	0.0234	0.2368	0.5435	0.1963	0.0265	0.0611	0.8093	0.1031
[75 79]	1	0.6086	0.3178	0.0008	0.0728	0.5877	0.3775	0.0054	0.0294
	2	0.1639	0.6175	0.1728	0.0458	0.1473	0.5739	0.2183	0.0605
	3	0.0041	0.2687	0.5044	0.2228	0.0014	0.2348	0.6500	0.1137
[80 84]	1	0.6558	0.2146	0.0662	0.0634	0.5384	0.4217	0.0033	0.0366
	2	0.0809	0.6482	0.1606	0.1103	0.0481	0.5870	0.2930	0.0720
	3	0.0148	0.2313	0.5786	0.1763	0.0012	0.2088	0.6383	0.1518
[85 89]	1	0.3321	0.5722	0.0154	0.0803	0.2321	0.6830	0.0115	0.0734
	2	0.0447	0.6097	0.1831	0.1625	0.0432	0.5992	0.2851	0.0725
	3	0.0117	0.1370	0.5953	0.2560	0.0081	0.0856	0.6913	0.2149
[90 94]	1	0.2660	0.6301	0.0005	0.1034	0.3295	0.2795	0.1867	0.2042
	2	0.0193	0.5228	0.2727	0.1852	0.0003	0.5518	0.3776	0.0702
	3	0.0132	0.0839	0.5816	0.3213	0.0074	0.0653	0.6549	0.2724
95+	1	0.4128	0.3466	0.1530	0.0875	0.2244	0.1611	0.5791	0.0354
	2	0.0264	0.5202	0.2713	0.1821	0.0235	0.5189	0.2957	0.1619
	3	0.0012	0.0607	0.5483	0.3898	0.0004	0.0277	0.6157	0.3563

Note: Due to rounding, the sum of duration is not fully equal to 10

For the advanced age groups of [90 94] and 95+, as there are only a few individual sample data, probability transition has certain instability. However, it has little influence on the ten-year forecasting, because ten years later, people in the two age groups are all above the age of 100. It is presumed that they are in the death state.

4. Ratio and Number of Population in Different Health State in the Base Period.

Table 2. Ratio and Number of Population in Different Health State in the Base Period

Age	Item	men			women		
		1	2	3	1	2	3
[60 64]	Ratio (%)	0.7462	0.2386	0.0152	0.3460	0.0474	0.7462
	Number of population (one thousand people)	451402	144357	9166	367930	209835	28745
[65 69]	Ratio (%)	0.7114	0.2516	0.0370	0.3677	0.0448	0.7114
	Number of population (one thousand people)	302356	106938	15742	249903	156428	19077
[70 74]	Ratio (%)	0.5539	0.3709	0.0752	0.5535	0.0933	0.5539
	Number of population (one thousand people)	153056	102499	20777	101289	158729	26747
[75 79]	Ratio (%)	0.4218	0.5310	0.0471	0.6728	0.1035	0.4218
	Number of population (one thousand people)	82510	103865	9222	48249	145075	22319
[80 84]	Ratio (%)	0.2313	0.5384	0.2303	0.4604	0.3869	0.2313
	Number of population (one thousand people)	25846	60151	25729	21612	65161	54761
[85 89]	Ratio (%)	0.1434	0.4931	0.3635	0.4303	0.5141	0.1434
	Number of population (one thousand people)	6433	22113	16301	3723	28789	34398
[90 94]	Ratio (%)	0.0802	0.3831	0.5367	0.3024	0.6754	0.0802
	Number of population (one thousand people)	949	4535	6353	487	6634	14814
95+	Ratio (%)	0.0307	0.2467	0.7225	0.1346	0.8605	0.0307
	Number of population (one thousand people)	60	480	1407	24	666	4257

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

The role of tourism toward economic growth in the local economy

Suhel*, Abdul Bashir

Department of Development Economics, Universitas Sriwijaya, Indonesia

Article Info

Article history:
Received : 1 April 2017
Accepted : 25 February 2018
Published : 6 March 2018

Keywords:
tourists, investment of tourism, government spending of tourism, and economic growth.

JEL Classification:
H76, L83, O40, R53

DOI: 10.20885/ejem.vol10.iss1.art4

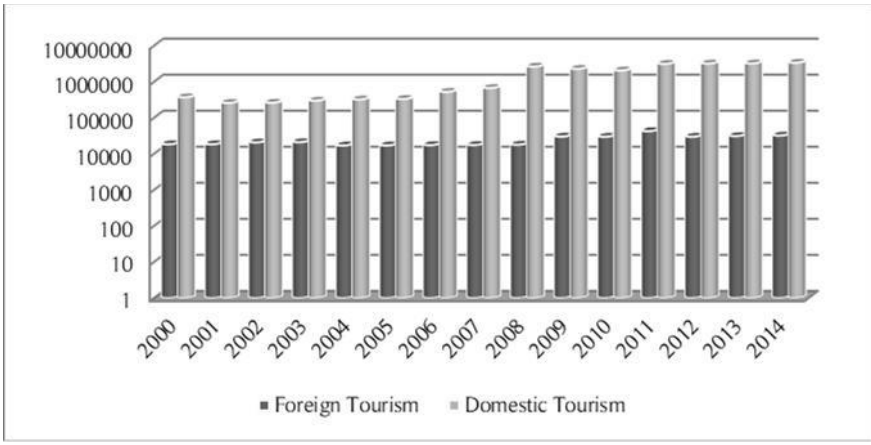
Abstract

This study analyzes the relationship between the number of tourists, tourism investment, government tourism spending, and economic growth in South Sumatra. It uses Granger causality model and simultaneous equation model to estimate the empirical model. The findings show that the number of tourists, the added value of the tourism sector, and the tourism spending of the tourism sector affect economic growth, while tourism investment does not affect the economic growth. In the second model, this study found that economic growth, tourism added value, tourism, and government tourism spending affect the number of tourists. This study implies that government policy has an important role in encouraging the tourism sector development which is indicated the contribution this sector on economic growth.

Introduction

Indonesia's economy is still dominated by primary sector that utilizes natural resources, such as agriculture, forestry, fisheries, and mining (Chakravarty, Ghosh, Suresh, Dey, & Shukla, 2012; Hilmawan, Yudaruddin, & Wahyuni, 2016). Natural resources owned by Indonesia are potential in creating economic activity that can provide significant added value. However, Indonesia also has a sizeable population of the fourth-largest in the world. Moreover, Indonesia has abundant natural resources and diverse culture, so it has a great potential to be an attraction for the tourism sector (Lewis, Simons, & Fennig, 2015). Potential of tourism has future hopes to become one of the sectors that can contribute to economic growth.

The tourism sector can involve all layers of the population indicating that all of the community can participate in the realization of the tourism development (Basiago, 1999; Yunis, 2009). Therefore, the government needs to provide more intensive attention in supporting this sector (Curristine, Lonti, & Joumard, 2007). Currently, tourism in Indonesia ranks fourth regarding acceptance of foreign exchange after oil and natural gas and palm oil. Based on the data from 2014, the number of international tourists who come to Indonesia by 9.4 million, or grew by 7.05% compared to the previous year.



Source: South Sumatera in figures 2016

Figure1. The number of foreign and domestic tourists visits to South Sumatera

P ISSN 2086-3128 | E ISSN 2502-180X
*Corresponding author e-mail: suhel_feunsri@yahoo.co.id

Eleven provinces that are most frequently visited by the tourists are Bali with approximately more than 3.7 million tourists, followed by Jakarta, Yogyakarta, East Java, West Java, North Sumatera, Lampung, South Sulawesi, South Sumatera, Banten, and West Sumatera (Lewis et al., 2015). Sumatera island became one of the tourist destinations to see the natural beauty and diversity of cultures. The island of Sumatera has a variety of national parks, which can be a natural tourist destination in Indonesia (Lewis et al., 2015).

The number of tourist arrivals is very beneficial for both the government and private sectors related directly or indirectly to tourism. Accommodation establishments and tourist services such as hotels, restaurants, travel agencies and travel, recreation, amusement parks, business results of the industry, and even the historic sites of South Sumatera province will benefit from the tourist visits. In general, an increase in the number of tourists coming to South Sumatera Province will add jobs to the community and improve the economy of South Sumatera Province.

The average growth of tourist arrivals in the period 2000-2014 shows a positive figure. The average growth of foreign tourist visits is 6.25% while for domestic tourists is amounted to 29.37%. That the increase in the number of tourists coming into South Sumatera showing that it is increasingly in demand as a tourist destination for both overseas and domestic tourists. The development of the tourism sector is a strategy used to promote and improve the condition of tourism and tourist attractions as well as to give benefits to the community around the attraction and government (Csapo, 2012). Economically, the number of tourist arrivals is very beneficial will absorb jobs to the community and improve the economy (Chang, Khamkaev, & McAleer, 2010; Dritsakis, 2009). Furthermore, the tourism sector is an important sector in the world economy, as millions of tourists travel to different areas, domestic and international tourist arrivals affect the country's income level (Li, Mahmood, Abdullah, & Chuan, 2013).

This study wants to determine and investigate the relationship between the variables of tourism and economic growth in South Sumatera. The contribution of this research, first, the model in this study into an empirical study of economic growth models driven by the development of tourism potential; Second, the development of the theoretical study of fiscal and investment policy in Indonesia. The tourism has a positive impact on economic growth that comes from research on the case of one country and studies based on a large number of countries. Other studies such as Brida, London, & Rojas (2013); Brida, Risso, Lanzilotta, & Lionetti (2010); Caglayan, ak, Karymshakov, Çaglayan, & Sak (2012); Cortes-Jimenez, Pulina, Prunera, & Artis (2009); Li et al. (2013); Phiri (2016) mention the same results.

The next section presents the research method and model specifications of this study. The third section gives the estimation results for all models and explores of the result and present empirical estimates of the implications of this research. The last section concludes.

Research Methods

The research data was using secondary data published by the Central Bureau of Statistics (BPS) of South Sumatera Province. The data includes GDRP, the number of tourists (NT), investment of tourism (INV), and government spending on tourism (ETS). Research data period of 2000-2015. The data are in log form with % as the number and rupiah.

Research methods use Granger causality test and simultaneous equation model. The Granger causality test refers to Granger (1988); White & Pettenuzzo (2010). Meanwhile, the simultaneous equation model use of the two-stage least square method (2SLS) requires some classical assumptions that must be met by error components in the model produced. Some assumption is among others that error must meet the assumption of multicollinearity, homogeneity, and does not contain any autocorrelation (Myers, 1990). The model Granger causality can be seen as follows:

$$NT_i = \sum_{j=1}^{m} aj\ NT_{i-j} + \sum_{j=1}^{m} bj\ GDRP_{i-j} + \varepsilon_i \quad (1)$$

$$GDRP_i = \sum_{j=1}^{m} cj\ GDRP_{i-j} + \sum_{j=1}^{m} dj\ NT_{i-j} + \partial_i \quad (2)$$

$$INV_i = \sum_{j=1}^{m} ej\ INV_{i-j} + \sum_{j=1}^{m} fj\ GDRP_{i-j} + \mu_i \quad (3)$$

$$GDRP_i = \sum_{j=1}^{m} gj\ GDRP_{i-j} + \sum_{j=1}^{m} hj\ INV_{i-j} + \varepsilon_i \quad (4)$$

$$ETS_i = \sum_{j=1}^{m} ij\ ETS_{i-j} + \sum_{j=1}^{m} kj\ GDRP_{i-j} + \epsilon_i \quad (5)$$

$$GDRP_i = \sum_{j=1}^{m} lj\ GDRP_{i-j} + \sum_{j=1}^{m} mj\ ETS_{i-j} + \pi_i \quad (6)$$

The simultaneous equation model can be seen as follows:

$$LNGDRP_i=\alpha_{10}+\alpha_{11}LNNT_i+\alpha_{12}LNVAT_i+\alpha_{13}LNINV_i+\alpha_{14}LNETS_i+\varepsilon_{1i} \quad (7)$$

$$LNNT_i=\gamma_{20}+\gamma_{21}LNGDRP+\gamma_{22}LNVAT_i+\gamma_{23}LNINV_i+\gamma_{24}LNETS_i+\varepsilon_{2i} \quad (8)$$

where: NT is the number of tourists; INV is investment tourism sector, and GDRP is the gross domestic, regional product; VAT is value-added of tourism; ETS is the government spending of the tourism sector in South Sumatera province.

Results and Discussion

In the contribution of tourism to economic growth, the tourism sector has increased significantly each year. It can be seen from the contribution of trade, hotels, and restaurants in the year 2000-2015 with an average of 13.64%. That shows that this sector can be one of the leading sectors that can contribute significantly to the economy. In 2015, the contribution of this sector was quite substantial, at 45.85%. The increase is also accompanied by a growing number of five-star hotels. With the rise in this sector, it will also affect other sectors and can increase the average employment rate by 3.8%, to reduce the unemployment rate in South Sumatra.

Table 1. The contribution of tourism to GDRP in South Sumatera, 2000-2015 (%)

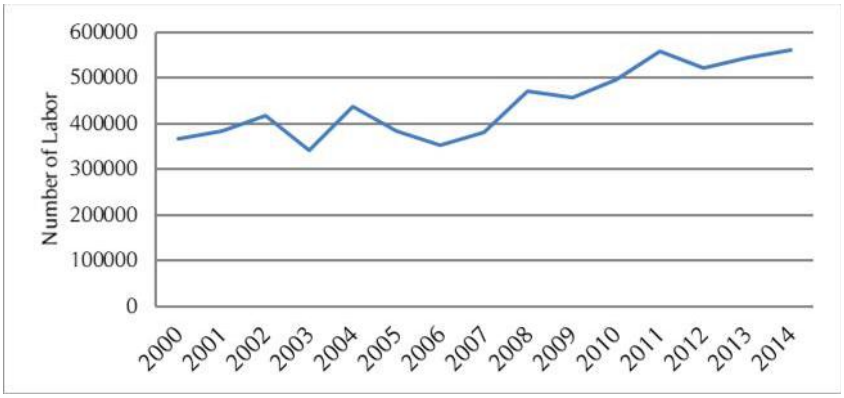
year	Contribution Tourism Sector to GDRP	Contribution of Investment to GDRP	Contribution of Expenditure to GDRP
2000	11,66	0,79	1,12
2001	11,94	1,25	1,13
2002	12,22	2,08	2,23
2003	12,42	2,54	1,69
2004	12,61	3,30	2,08
2005	12,95	3,97	2,18
2006	13,29	5,01	2,62
2007	13,69	6,27	3,82
2008	13,93	8,11	5,60
2009	13,80	9,49	5,63
2010	13,99	12,89	4,97
2011	14,16	17,29	4,45
2012	14,62	23,34	5,35
2013	15,26	31,41	5,40
2014	15,33	42,88	6,09
2015	16,43	45,85	6,84
Average	13,64	13,53	3,83

Source: South Sumatera in figures 2016

If the terms of the creative economy are an opportunity for the utilization of South Sumatra's cultural wealth, then many aspects of the tourism sector can be developed into businesses to gain profit and increase employment for South Sumatera residents, such as restaurants, inns, souvenirs, transportation and more. The average of employment growth in this sector is 3.8%.

The development and utilization of resources, as well as the tourism potential of the region, is expected to contribute to the economic development (Saner, Yiu, & Filadoro, 2015). Tourism is seen as an activity that has multiple dimensions of the circuit a development process, in which the development of the tourism sector concerns many aspects, such as, social, cultural, economic and political (Chou, 2013).

The first step in this analysis is to check stationary test results conducted by Augmented Dickey-Fuller (ADF). If the ADF test results indicate that the data is not stationary at the level, then modifications are made to obtain stationary data. One way that commonly used is a method of differentiation, i.e., reducing the value in a period with the value of the previous period data. If still not stationary then made a distinction again.



Source: South Sumatera in figures 2016

Figure 2. Trend of labor in the tourism sector in South Sumatera

ADF test results than compared with the critical value of McKinnon. If the value of t-statistic ADF is smaller than the critical value McKinnon, then the data is said to be stationary, and vice versa if the value of ADF t-statistic is greater than the McKinnon critical value, then the data is supposed to be stationary. In table 2, the resulting test of unit root using ADF test shows that NT, INV, ETS, and PDRB variables are not stationary. Therefore, testing should be performed on the first-order differentiation process.

Unit root test on the first difference results shows that all the variables in this study are stationary at a significance level of 5% (Table 2). It means that all variables in this study can be used for the analysis of time series and equations model that have been previously specified further can be estimated using a model of Granger Causality.

Table 2. Result of unit root test: first differences

Variables	t-statistics ADF	ADF McKinnon Critical Value	Unit Root Test
D(LNGDRP)	-3.965197	-4.121990 -3.144920 -2.713751	*stationary
D(LNNT)	-3.904796	-4.057910 -3.119910 -2.701103	*stationary
D(LNVAT)	-5.657879	-4.297073 -3.212696 -2.747676	*stationary
D(LNINV)	-2.993583	-4.057910 -3.119910 -2.701103	*stationary
D(LNETS)	-3.562420	-4.121990 -3.144920 -2.713751	*stationary

Note: * is stationary at 5% level. Maximum lag = 2

In determining the lag period, optimal lag determination uses variable response lengths to the past and other endogenous variables. Determination of lag in this research using Likelihood Ratio (LR) approach, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn (HQ). The full-length lag determination can be seen in table 3.

Table 3. Determination of optimal lag length

lag	LogL	LR	FPE	AIC	SC	HQ
0	-969.6200	NA	1.33e + 60	149.7877	149.9615	149.7520
1	-876.1065	115.0936	1.04e + 55	137.8625	138.7317	137.6839
2	-759.6393	71.67210*	6.12e + 48*	122.4060*	123.9705*	122.0845*

* Indicates number of lag optimum

Table 3 explains the optimal lag according to the criteria of LR, FPE, and AIC, the smallest and most designated the lag two is indicated with an asterisk (*), therefore, subsequent analysis phase through the Granger Causality Test will use the lag 2.

Granger causality test results show the first model among the variables of the number of tourists and economic growth has no two-way relationship (table 4). However, the first model of the null hypothesis is rejected, meaning the hypothesis can be expressed as a tourism-led growth hypothesis (TLGH). The research findings show that the rate of change in the number of tourists will cause changes in economic growth. The conclusion of the tourism sector as a driver of economic growth is in line with the results of Brida et al. (2013), (2010); Caglayan et al. (2012); Li et al. (2013); Phiri (2016). Therefore, the development of tourism sector policy to encourage economic growth is very appropriate for cases in South Sumatra.

Table 4. Estimation result of Granger causality test

Null Hypothesis:	F-Statistic	Prob.
LNNT does not Granger Cause LNGDRP	0.81977	0.4744
LNGDRP does not Granger Cause LNNT	3.21396	0.0945 *
LNINV does not Granger Cause LNGDRP	3.98683	0.0629 *
LNGDRP does not Granger Cause LNINV	15.0254	0.0020 **
LNETS does not Granger Cause LNGDRP	3.23549	0.0934 *
LNGDRP does not Granger Cause LNETS	3.96593	0.0636 *

Note: ** and * indicate rejection the null hypothesis at 5% and 10% level

The second model also shows a one-way relationship, on the causality models that support the development of the tourism sector, which is the investment in tourism sector. Statistically, economic growth can also lead to increased investment in the tourism sector at 10% significance level, and even the tourism sector investment variable can cause or encourage economic growth at the 5% significance level. By causality investments more dominant tourism sector in promoting economic growth. It is more supportive Investment-led growth hypothesis (ILGH) (Dreger & Herzer, 2011).

Investments to support the tourism sector is not only an increase in the amount of accommodation but an increasing number of other service sectors such as transportation services, serving culinary specialties, as well as other services. In other words, the increase in the tourism sector investment will also provide multiplier effects and add value to other sectors. In economic theory explains that the investment is a component of aggregate demand will have an impact on increasing the output of the economy, it is in line with the contribution of the tourism sector investment to economic output (GDRP) who each year experience growth (Ekanayake & Long, 2012).

Also, the study also looked at the relationship of economic growth of government expenditure in the tourism sector. Estimation results from three models of Granger causality show that the relationship between economic growth in government spending in two-way tourism sector at the level of 10% significance. Statistically, the results also indicate that economic growth may cause government spending in the tourism sector to increase, while the increase in government spending in the tourism sector has also led to economic growth. But a statistically significant government spending more dominant tourism sector in promoting economic growth (Chou, 2013). That means that government policy in increasing spending in the tourism sector is correct, especially in improving the tourism promotion and improvement of infrastructure in the tourism sector (Chou, 2013).

In economic theory, the increase in output will boost economic growth and will directly impact on improving reception area. Further increase in regional income will encourage increased government spending. Government spending is a policy instrument to influence the course of the economy Fayissa, Nsiah, & Tadasse (2008); Lee & Chang (2008). That means that in this study the number of tourists, investment and government expenditure in the tourism sector in the region become factors that are driving the economic growth, which in turn will impact on the development of the tourism sector in South Sumatera.

The simultaneous equation model finds that the number of tourists, the added value of the tourism sector, investment, and government spending of the tourism sector have significantly affected economic growth (table 5). This finding is in line with the results of the study Akan, Arslan, & Cem (2007); Brida et al. (2010); Caglayan et al. (2012); Li et al. (2013); Phiri (2016). Furthermore, in part, the number of tourists, the added value of the tourism sector, and government spending affects economic growth in the tourism sector.

Table 5. Estimation result of simultaneous equation model

Variable	Model 1	Model 2
C (constants)	62.4985** (15.57497)	12.6752** (3.70724)
LNNT (number of tourist)	0.07259** (0.02868)	
LNGDRP (economic growth)		0.24772** (0.08211)
LNVAT (value-added of tourism)	0.18763** (0.08444)	0.32805** (0.12177)
LNINV (investment)	0.03841 (0.05246)	0.19885 (0.12609)
LNETS (government spending)	0.09076** (0.03589)	0.15247** (0.00440)
R^2	0.99357	0.93567
F-test	35.0102	33.8564

Note: ** and * indicate significant 5% and 10% level.

While the investments of tourism sector do not significantly affect the economic growth, this condition is estimated that investment in the tourism sector by the private sector is still low; it is expected as investors look at the availability of infrastructure in South Sumatra is still incomplete. However, other variables, such as the added value of the tourism sector, and government spending tourism sector showed a positive correlation to economic growth. This condition is expected to increase the growth of these variables, and then the economic growth will also increase.

In Table 5, the second model estimation results provide information that, simultaneously, economic growth, the value-added of the tourism sector, investment, and government spending of tourism sector has significantly affect the number of tourists visiting South Sumatera. Furthermore, partially, variable that is significant at 5% level in influencing the number of tourists visiting South Sumatra, are the economic growth, the added value of the tourism sector, investment, and government expenditure of tourism sector. We found that the variable investment to give effect to the increasing number of tourists visiting. Evidently, the investment is having the significant impact on the number of tourists visiting (Ekanayake & Long, 2012; Lee & Chang, 2008). This condition is estimated investment of tourism sector is concentrated in the city, and in the form of sports venues center, hotels, and restaurants. Besides that, although the infrastructure is still incomplete, the area frequently holds international events and national as sports games prestigious start of the SEA Games which was held in 2011 and which will take place in 2018 will come in the Asian Games, as well as other national events.

Conclusion

In this article, we studied the relationship between tourism and economic growth in South Sumatera, Indonesia. In this study, we have found that there is a one-way relationship between the number of tourists and economic growth, while investment tourism has a two-way relation to economic growth. On the other side, we also found that tourism spending has a two-way relationship to economic growth.

Furthermore, the study also found that, partially, the number of tourists, value-added of the tourism sector, and government spending of tourism sector have the significant effect on the economic growth, while, the investments of tourism sector not significant in affecting economic growth in South Sumatera. In the second model, we found the economic growth, value-added of the tourism sector, investment, and government spending of tourism sector has the significant effect on the number of tourists. All variables showed a positive relationship. The positive impact demonstrates the need for public policies that support the initiative of potential development sites in the country and strengthens demand for domestic and international travelers. Indonesia has the opportunity to learn from the experience of the whole world, both positive and negative, to correct the mistakes made because they pay less attention to the tourism sector and the need for initiatives to improve tourism promotion (Chou, 2013). As well as creating a policy to minimize the negative impacts of tourism on the development of natural resources and socio-cultural (Leitao & Hahbaz, 2016).

Acknowledgement

This research is a part of the grand project "Hibah Penelitian Unggulan Kompetitif." We thank Universitas Sriwijaya for financial support of this research through "Hibah Penelitian Unggulan Kompetitif 2016, contract Number: 592/UN9.3.1/LT/2016."

References

Akan, Y., Arslan, I., & Cem, I. (2007). The impact of tourism on economic growth: The case of Turkey. *Journal of Tourism*, *9*(1), 1–24.

Basiago, A. D. (1999). Economic, social, and environmental sustainability in development theory and urban planning practice. *The Environmentalist*, *19*, 145–161.

Brida, J. G., London, S., & Rojas, M. (2013). A dynamic model of tourism and economic growth: The role of physical and human capital. *Economics Bulletin*, *33*(2), 1361–1373.

Brida, J. G., Risso, W. A., Lanzilotta, B., & Lionetti, S. (2010). The tourism-led-growth hypothesis for Uruguay. *Tourism Economics*, *16*(3), 765–771.

Caglayan, E., ak, N., Karymshakov, K., Çaglayan, E., & Sak, N. (2012). Relationship between tourism and economic growth: A panel Granger Causality Approach. *Asian Economic and Financial Review*, *2*(5), 591–602.

Chakravarty, S., Ghosh, S. K., Suresh, C. P., Dey, A. N., & Shukla, G. (2012). Deforestation: Causes, effects, and control strategies. In *Global Perspectives on Sustainable Forest Management* (pp. 3–28).

Chang, C., Khamkaev, T., & McAleer, M. (2010). *Estimation of a panel threshold model of tourism specialization and economic development* (Kyoto Institute of Economic Research Discussion Paper No. 708).

Chou, M. C. (2013). Does tourism development promote economic growth in transition countries? A panel data analysis. *Economic Modelling*, *33*, 226–232.

Cortes-Jimenez, I., Pulina, M., Prunera, C. M., & Artis, M. (2009). *Tourism and exports as a means of growth* (Research Institute of Applied Economics: Working Papers) (Vol. 10).

Csapo, J. (2012). The role and importance of cultural tourism in modern tourism industry. In *Strategies for Tourism Industry-Micro and Macro Perspectives* (pp. 201–232).

Curristine, T., Lonti, Z., & Joumard, I. (2007). Improving public sector efficiency: Challenges and opportunities. *OECD Journal on Budgeting*, *7*(1), 1–41.

Dreger, C., & Herzer, D. (2011). *A further examination of the export-led growth hypothesis* (Discussion Papers of DIW Berlin No. 1149).

Dritsakis, N. (2009). *Tourism development and economic growth in seven Mediterranean countries: A panel data approach.* Retrieved from http://users.uom.gr/~drits/publications/TOURISM_DEVELOPMENT.pdf

Ekanayake, E. M., & Long, A. E. (2012). Tourism development and economic growth in developing countries. *International Journal of Business and Finance Research*, *6*(1), 51–63.

Fayissa, B., Nsiah, C., & Tadasse, B. (2008). Impact of tourism on economic growth and development in Africa. *Tourism Economics*, *14*(4), 1–12.

Granger, C. W. J. (1988). Some recent developments in a concept of causality. *Journal of Econometrics*, *39*(1–2), 199–211.

Hilmawan, R., Yudaruddin, R., & Wahyuni, Y. S. (2016). Coal mining operations and its impact on sectoral and regional area: Evidence of East Kalimantan, Indonesia. *Journal of Indonesian Applied Economics*, *6*(1), 22–42.

Lee, C., & Chang, C. P. (2008). Tourism development and economic growth: A closer look at panels. *Tourism Management*, *29*(1), 180–192.

Leitao, N. C., & Hahbaz, M. (2016). Economic growth, tourism arrivals, and climate change. *Bulletin of Energy Economics*, *4*(1), 35–43.

Lewis, M. P., Simons, G. F., & Fennig, C. D. (2015). *Ethnologue : Languages of Honduras Eighteenth edition data* (Eighteenth).

Li, C. C., Mahmood, R., Abdullah, H., & Chuan, O. S. (2013). Economic growth, tourism, and selected macroeconomic variables: A triangular causal relationship in Malaysia. *Journal of Applied Economic Research*, *7*(2), 185–206.

Myers, R. H. (1990). *Classical and modern regression with applications*. PWS-Kent Publishing Company.

Phiri, A. (2016). Tourism and Economic growth in South Africa: Evidence from linear and nonlinear cointegration frameworks. *Managing Global Transitions: International Research Journal*, *14*(1), 31–53.

Saner, R., Yiu, L., & Filadoro, M. (2015). Tourism development in the least developed countries: Challenges and opportunities. In *Research on Global Hospitality and Tourism Management* (pp. 234–261).

White, H., & Pettenuzzo, D. (2010). Granger causality, exogeneity, cointegration, and economic policy analysis. *Journal of Econometrics*, *178*(2), 316–330.

Yunis, E. (2009). Tourism and employment: An overview by UNWTO. In *Fifth UNWTO International Conference on Tourism Statistics* (pp. 1–13).

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

Growth of service sector in BRIIC economies

Maisya Farhati[1]*,Raquel Ortega-Argilés[2]

[1] Universitas Islam Indonesia, Yogyakarta, Indonesia
[2]University of Birmingham, Birmingham, United Kingdom

Article Info

Article history:
Received :8 November 2017
Accepted :23 February 2018
Published :6 March 2018

Keywords:
input-output, structural decomposition analysis, service sector, BRIIC.

JEL Classification:
F14, L80, O14

DOI: 10.20885/ejem.vol10.iss1.art5

Abstract

In recent years, there has been growing attention to service sector in the world economies. This study analyses service sector in Brazil, Russia, India, Indonesia and China (BRIIC), which are five of the largest economies in today's developing world. We examine how the services links with overall economic activities and what drives its growth in the period 2000-2010. This research finds that in BRIIC economies, final demand in other sectors has not enhanced services output. Furthermore, using structural decomposition analysis, this study investigates various aspects which contribute to the growth of services output, which are final domestic demand, export, and changes in technology. The result suggests that in BRIIC economies, final domestic demand has been the main driver of the growth of services that exceeded more than 70% of overall effect in all economies. Domestic final demand for services contributed higher than the non-services one.

Introduction

In the past, the service sector has been considered as the residual activities of the economy after classifying agriculture and manufacturing (Commission of the European Communities, 2003). In term of policy maker's perspective, the contrast between services and manufacturing could be found especially in developing economies where manufacturing is viewed as the leading edge of modernization and skilled job creation, as well as a fundamental source of various positive spillovers (Tybout, 2000).

Nevertheless, there is the ever-growing importance of services in the knowledge-based economy[1] (Tijaja, 2013, Damuri, 2012). While manufacturing sector still becomes the major contribution in many developing economies in the last decades, there has been a gradual increase in the importance of service sector for economic development. In response to this trend, policymakers in developing economies, which are previously preoccupied with tangible sectors, take consideration to the rise of intangibles (Goswami, Mattoo, & Saez, 2012).

The service sector should be considered not only as it is but also as a pivotal part to boost the national competitiveness through its strong (forward) linkages with the rest of economy. The concept of forwarding linkages measures the inter-relationship of a given industry with the rest of the economy through the demand side. It would show the impact to a given industry if the final demand of every other industry were to increase by one unit (OECD, 2007).

The strong linkage of the service sector is in line with two great unbundling's that marked globalization (Baldwin, 2006). The first unbundling is the breakdown of production and consumption, meaning that the locations of production and consumption are no longer required to be close to each other. This phase, which was driven by declining transportation cost, allowed spatial separation of factory and consumer. The second unbundling is the breakdown of various tasks of production. It was driven by the decline of communication and information cost. There became an opportunity to offshore some routine tasks which are easily codifiable and do not need face-to-face contact. This unbundling process has led to what known today as global value chains (GVC).

[1] Knowledge-based economies are economies which are directly based on the production, distribution and use of knowledge and information (OECD, 1996).

P ISSN 2086-3128 | E ISSN 2502-180X
*Corresponding author e-mail: maisya.farhati@uii.ac.id

According to (Tijaja, 2013), the service sector plays two key roles in GVC: (1) by connecting each point along the global value chains; and (2) by constituting their global value chains. In a similar view, Damuri (2012) addresses the importance of services as production sector and input. As production sector, services generate value added, creates employment and acts as exports commodity 0. As inputs, services act as intermediate inputs to other sectors as well as provides basic socio-economic needs to the population such as education and health.

In general, services products cannot be separated from most of the products from other sectors as the services products are embodied in them. Transportation and logistics services, for example, play a crucial role in distributing manufacture products both for the domestic and international market. Poor quality of service sector leads to inefficiency and high-cost economy. Hence it means a higher price of goods sold to consumers (Damuri, 2012). Also, information and communication technology is also pivotal as it plays a critical role in information flexibility, product quality and fast response which are important in the overall business process (Roy, Das, & Chakraborty, 2002).

It becomes interesting to investigate the increasing role of the service sector in developing economies and how it links with other sectors. This study examines the service sector in Brazil, Russia, India, Indonesia and China (BRIIC): how it links with the overall economic activities and what drives its growth. OECD (2008) classifies Brazil, Russia, India, Indonesia, China and South Africa (BRIICS)as a significant group of emerging economies in today's world. For the past two decades, the countries' shares in world trade have been growing significantly. More specifically, the countries have been more integrated with the world in term of intermediate inputs, final goods, and services markets. However, due to data limitation of South Africa, this country is not included in this paper.

Using structural decomposition analysis, this study investigates various aspects which contribute to the growth of services output, which are final domestic demand, export, and changes in technology. In term of export in services, it is known that developing economies still need to struggle to compete with more developed ones. Besides the fact that barriers to trade in services are more complex than barriers to trade in goods (i.e., domestic restriction and regulation), recent studies confirm that service sector performance critically depends on human capital, the quality of the telecommunication network and the quality of institutions, which are likely to be better in developed economies (Amin & Mattoo, 2006; Goswami et al., 2012; and Eichengreen & Gupta, 2009). Thus, this study will provide new findings on services through developing economies' perspective which has different institutional settings with the developed ones.

Some existing studies have discussed the linkage of services with other economic activities. Jean emphasize that the quality and competence of core logistics service providers is one of the important aspects of overall country performance. The study shows that better logistic services strongly correlate with trade outcomes in goods sectors. Also, Arnold, Javorcik, Lipscomb, & Mattoo (2012) discuss the role of the service sector in a broader scope. The authors find that improvements in regulation on services in India have been a crucial source of productivity gains in manufacturing. The services covered in the study include banking, telecommunications, insurance, and transport.

Duggan, Rahardja, & Varela (2013) examine the extent to which policy restrictions on FDI in the Indonesian service sector affected the performance of manufacturers over the period 1997–2009. This study finds that relaxing policies toward FDI in the service sector was not only associated with improvements in the perceived performance of the service sector itself but also of the manufacturing industry. It is shown by 8 percent increase in manufacturers' total factor productivity over the period.

Some studies that emphasize the linkage of the service sector to overall economy have led some researchers to investigate whether or not the contribution of the service sector has really increased in an economy. Roy and Toh & Thangavelu (2013) focus on information and communication technology (ICT), which is part of growing service sector. ICT sector is considered as one of the key drivers of the 'knowledge economy'. According to Powell & Snellman (2004), in the knowledge economy, production and services are based on knowledge-intensive activities. These activities lead to the more advanced pace of technical and scientific development. The main characteristic that distinguishes knowledge economy to the conventional one is its greater reliance on intellectual capabilities than on physical and natural resources.

Roy et al. (2002) study the extent of *informatization* in the Indian economy during the period 1983- 84 to 1989- 90 and identify the information-intensive sectors. During the period, there was increased linkage between the information sector and other non-information sectors in India. This growth has been mainly driven by domestic demand expansion. Although export expansion and technological coefficient changes also have a role, the effects are not too significant. Later on, the same investigation was done by Toh & Thangavelu (2013)

on Singapore ICT sector. The results indicate that the ICT sector provided the key linkages for the expansion of high-value-added manufacturing activities and electronics export for the Singapore economy.

The existing literature has shown the growing importance of service sector in the economic development. There is the multiplicative positive effect of supporting policies on services towards other sectors due to the pivotal role of services in the economy.

Research Methods

Input-output framework allows us to understand the impact of one particular sector in an integrated framework regarding its linkages to the overall economy, including its sector and other sectors (Toh & Thangavelu, 2013). For that purpose, this study uses National Input-Output Table (NIOT) of each of BRIIC countries for the year 2000, 2005 and 2010, obtained from the World Input-Output Database (WIOD)3F[2]. The observation in this study will be divided into two sub-periods, which are 2000-2005 and 2005-2010. It will allow us to observe and compare the change of output between the two sub-periods.

The WIOD provides data of 40 countries (all 27 EU countries and 13 major other countries) and estimates for the rest of the world. All data in WIOD are obtained from official national statistics and are consistent with the National Accounts. Because it is presented in current prices, the data is converted to constant 2005 prices using CPI deflators.

The NIOT consists of 59 products which are produced and used by each of 35 sectors. Along with the aim to observe the contribution of the service sector to the economy, it is necessary to classify which sectors from the NIOT are categorised as services. Services discussed in this study are based on services classification of Statistical Classification of Economic Activities (NACE) revision one but limited to education and commercial services 4F[3]. Hence it does not include public and other community, social and personal services 5F[4]. It results in 15 out of 35 industries in NIOT to be classified as service sector as presented in Table 1.1 of Appendix 1. These sectors will then be merged as one sector in the NIOT.

Input coefficient of service sector

This section attempts to measure the services intensity of various sectors and their changes over two sub-periods. Thus, it will confirm whether the diffusion of the service sector has occurred and continued to expand in other sectors of BRIIC economies.

Referring to Roy et al. (2002) and Toh & Thangavelu (2013), the intensity measure used in this study is the ratio of services intermediates used per unit of output or also known as input coefficient of the service sector. Denoting this ratio for sector*i* by h_i, we can proceed to obtain a second measure (h^*_i), that accounts for both direct and indirect services required to produce one unit of goods by each sector, as follows.

$$\mathbf{h}^{*\prime} = \mathbf{h}'(\mathbf{I} - \mathbf{A})^{-1} \quad (1)$$

Where$h^{*\prime}$is the row vector with element h^*_i; $\mathbf{h}'$ is the row vector with element h_i, and $(\mathbf{I} - \mathbf{A})^{-1}$ is the standard Leontief inverse matrix.F

Structural decomposition analysis

To calculate the changes or growth of services output, this study uses structural decomposition analysis (SDA). It is a well-known methodology to assess the relative importance of effects that together constitute the actual change in a certain variable of interest. In other words, the SDA quantifies the contributions of determinants of change to total change in a variable over time. For example, the total change in gross outputs between two periods could be broken down into: (1) the part associated with changes in technology (as reflected, initially, in the changes in the Leontief inverse for the economy over the period); and (2) the part related to changes in final

[2] WIOD consist of World Input-Output Table (WIOT). The construction of WIOD and WIOT is described in detail in Timmer (2012) and Dietzenbacher, et al (2013).WIOD can be accessed on http://www.wiod.org/. All data are available for free.

[3] Based on NACE rev. 1, services comprise economic activities covered by wholesale and retail trade (sector G) to real estate, renting and business activities (sector K) and education (sector M) to other community, social and personal service activities (sector O) (OECD, 2013). The classification of commercial services refers to Goswami et al. (2012). The exclusion of personal services from the classification is also because this study tries to focus on the second wave of service sector growth and the so-called 'modern economy' as discussed in Eichengreen & Gupta (2009).

[4] However in the NIOT, health sector is presented in the same section with social work under 'Health and Social Work' industry. This of course becomes a data limitation.

demand over the period (both domestic final demand and export). At the next level, both Leontief inverse and final demand can be disaggregated into parts of interest (Miller & Blair, 2009).
The basic equation is as follows7:

$$\begin{aligned} \boldsymbol{x}_1 - \boldsymbol{x}_0 &= (\boldsymbol{I} - \boldsymbol{A}_1)^{-1}\boldsymbol{f}_1 - (\boldsymbol{I} - \boldsymbol{A}_0)^{-1}\boldsymbol{f}_0 \\ &= \boldsymbol{M}_1\boldsymbol{f}_1 - \boldsymbol{M}_0\boldsymbol{f}_0 \qquad (2) \\ &= (\boldsymbol{M}_1 - \boldsymbol{M}_0)\boldsymbol{f}_1 + \boldsymbol{M}_0(\boldsymbol{f}_1 - \boldsymbol{f}_0) \qquad (3) \\ &= (\boldsymbol{M}_1 - \boldsymbol{M}_0)\boldsymbol{f}_0 + \boldsymbol{M}_1(\boldsymbol{f}_1 - \boldsymbol{f}_0) \qquad (4) \end{aligned}$$

x = *n*-element (column) vector of gross output (or production value) in each sector, *in which each element x_i in* **x** *matrix indicates gross output in sector i*

A = *n× n* matrix of intermediates, *in which each element a_{ij} in* **A** *matrix indicates the deliveries of good i (which is produced in sector i) that are sold to sector j (as an intermediate input in the production of sector j)*

M = $(\boldsymbol{I} - \boldsymbol{A}_1)^{-1}$ = multiplier matrix or also known as the Leontief inverse

f = *n x k* matrix of final demand categories, *in which each element f_{ij} in* **f** *matrix indicates the goods and services produced by sector i that are bought by category j (e.g. private consumption by the households).*

In addition to equation (3) and (4), there are some other alternatives of decomposition (Miller & Blair, 2009). However, among many researchers, Dietzenbacher & Los (1998)examine a wide variety of possible decompositions and conclude that using an average of results from (3) and (4) is often an acceptable approach.

As this study aims to see the role of services, the overall sector will be classifiedas service sector (S) and non-service sector (N). Furthermore, to see the different role of change in domestic final demand and export to the total output, final demand f will be decomposed into domestic final demand **d** and export which is represented by e. Thus, the equation (3) is decomposed as follows:

$$\begin{aligned} &\lambda(\boldsymbol{x}_1 - \boldsymbol{x}_0) = \lambda(\boldsymbol{M}_1 - \boldsymbol{M}_1^N)\boldsymbol{f}_1 && \text{(changes in services input)} \\ &+ \lambda(\boldsymbol{M}_1^N - \boldsymbol{M}_0)\boldsymbol{f}_1 && \text{(changes in non-services input)} \\ &+ \lambda\boldsymbol{M}_0(\boldsymbol{d}_1^S - \boldsymbol{d}_0) && \text{(changes in domestic final demand for services sectors)} \\ &+ \lambda\boldsymbol{M}_0(\boldsymbol{d}_1^N - \boldsymbol{d}_0) && \text{(changes in domestic final demand for non-services sectors)} \\ &+ \lambda\boldsymbol{M}_0(\boldsymbol{e}_1^S - \boldsymbol{e}_0) && \text{(changes in export of services sectors)} \\ &+ \lambda\boldsymbol{M}_0(\boldsymbol{e}_1^N - \boldsymbol{e}_0) && \text{(changes in export of non- services sectors)} \qquad (5) \end{aligned}$$

Similarly, equation (4) is decomposed as follows:

$$\begin{aligned} &\lambda(\boldsymbol{x}_1 - \boldsymbol{x}_0) = \lambda(\boldsymbol{M}_1 - \boldsymbol{M}_1^N)\boldsymbol{f}_0 && \text{(changes in services input)} \\ &+ \lambda(\boldsymbol{M}_1^N - \boldsymbol{M}_0)\boldsymbol{f}_0 && \text{(changes in non-services input)} \\ &+ \lambda\boldsymbol{M}_1(\boldsymbol{d}_1^S - \boldsymbol{d}_0) && \text{(changes in domestic final demand for services sectors)} \\ &+ \lambda\boldsymbol{M}_1(\boldsymbol{d}_1^N - \boldsymbol{d}_0) && \text{(changes in domestic final demand for non-services sectors)} \\ &+ \lambda\boldsymbol{M}_1(\boldsymbol{e}_1^S - \boldsymbol{e}_0) && \text{(changes in export of services sectors)} \\ &+ \lambda\boldsymbol{M}_1(\boldsymbol{e}_1^N - \boldsymbol{e}_0) && \text{(changes in export of non- services sectors)} \qquad (6) \end{aligned}$$

Whereλ is a diagonal matrix composed of one and zeros. The one appears in the location that corresponds to service sectors and all the other elements of the matrix are zero. In other words, λ in the equation will generate only element of service sector.

Results and Discussion

Services intensity of BRIIC economies

As discussed in the theoretical framework section, services coefficient or input coefficient of the service sector is the ratio of services intermediates used per unit of output in all sectors. The services coefficients of various sectors in each of BRIIC economies are presented in Table 2.1 to 2.5 in Appendix2 with a highlight on the top five services intensive sector in each year. The tables present more detailed information of services intensity for each sector. During 2000-2010, it varied from 16.5% (agriculture) to 41.5% (mining and quarrying) in Brazil, from 18.5% (agriculture) to 45.3% (electricity, gas and water supply) in Russia, from 10.5% (agriculture) to 48% (rubber and plastic) in India, from 1.5% (coke, refined petroleum and nuclear fuel) to 35.2% (electrical

and optical equipment) in Indonesia, and 14.2 (agriculture) to 47.4% (public admin and defense; compulsory social security) in China.

Table 1: Average of service intensity between 2000-2005 and 2005-2010

Country	Average of Change		Trend
	2000-2005	2005-2010	
Brazil	-0.0010	0.0131	Increasing
Russia	0.0301	0.0608	Increasing
India	0.0143	0.0230	Increasing
Indonesia	0.0175	0.0198	Increasing
China	-0.0497	0.0394	Increasing

Table 1 shows the trend of average value of services intensity in BRIIC between two sub-periods. Although there is heterogeneity across economies and sectors, the results suggest that in all BRIIC economies, the average of the change of services coefficient increased in the second sub-period. It means that on average there is increasing use of services input per unit of output in the second period compared to the first sub-period. Therefore, there has been an increase in services intensity in BRIIC economies in the period 2005 – 2010 compared to that in 2000 – 2005.

Sources of growth of service sector in BRIIC economies

Structural decomposition analysis (SDA) model is usedto identify the sources of growth of service sector in each of BRIIC economies. Referring to Dietzenbacher & Los (1998), the result of the analysis is derived from the average of (2.3) and (2.4). Table 3.1 until Table 3.5 in Appendix 3 provide information on the contributors to the services growth, which are divided into domestic final demand effect, export effect and technical coefficient effect (effect of the change in services input). Furthermore, each of them is similarly decomposed into the effect of services and non-services.

All BRIIC economies, except Brazil, show positive growth of services output in both sub-period 2000-2005 and 2005-2010. Moreover, when compared between two sub-periods, all economies experience an increase in growth of services except India which has modest decline from US$ 265,356.68 million to US$ 245,482.11 million. As for Brazil, although the growth of output is negative over first sub-period, it catches up over second sub-period with the increase from US$ -114,368.95 to US$ 660,774.08.

In all of the economies, domestic final demand effect has been the main factor in the growth of services output. All things being equal, the contribution of this effect exceeded more than 70% of overall effect in all economies, where final domestic demand for services contributed higher than the non-services one. The result implies that domestic services activities have mainly driven the growth of services output in BRIIC. Nevertheless, Brazil, India, and Indonesia show an increasing contribution of non-services domestic final demand in the second sub-period.

Another contributor to the growth of services output is export, includes both services and non-services. Its contribution varied across economies. The most striking feature can be seen in the case of Indonesia wherein output growth was dampened by the negative export effect in the first sub-period. Nevertheless, the export effect increased from -10.41% to 2.69% in the second sub-period. On the contrary, India and China show deteriorating effect of export between two sub-periods. In the case of India, the effect declined from 19.03% in the first sub-periods to 10.29% in the second sub-period. The decline was even dramatic in China which dropped from 25.10% in the first sub-periods to 9.10% in the second sub-period.

The decline of export contribution in the growth of services output in both economies during second sub-period might be affected by the re-shoring phenomenon which recently arises. Financial crises in 2008 have led to economic recession in developed economies including US and EU countries. This simultaneously occurred in the period when the real wage in developing economies strikingly increased. In China, for instance, the aggregate of the salaries and benefits of an average worker increased between 2000 and 2005 by 10% per year and have accelerated between 2005 and 2010 to 19% a year. Moreover, the Chinese government has set the target to increase the minimum wage by 13% per year until 2015. In India, wage rate has also grown by 10-20 % annually in the last decade (Margulescu & Margulescu, 2014).

Even though most of there-shored activities are manufacturing, it affects both services and non-services output because services activities are embedded in manufacturing as well, such as transportation, finance and renting and other business activities. Moreover, Heinemann Jr. (2013) addresses that nowadays closely

interrelating, even co-locating, research and development, design and marketing, manufacturing and assembly close to the markets become important again. It is recognized by companies as a strategy too much faster response to market shifts and much faster innovation. Therefore, the movement of manufacturing will give consequences on services, too.

The relatively low contribution of export effect in the growth of services output in BRIIC economies might relate to the challenging services export itself. Goswami et al. (2012) acknowledge that barriers to trade in services are more complex than barriers to trade in goods. The study mentions some examples of the types of barriers exporters face for the four modes of supply, which are cross-border trade, consumption abroad, commercial presence and movement of natural persons. The barriers for foreign services providers include not only explicit restrictions on entry but also on policy and regulation of domestic services. Domestic regulation is established either purely because countries differs in the choice and strictness (such as qualification or licensing requirements) or because of the purpose of merely protecting domestic providers.

Besides the effect from demand side (domestic final demand and export), the other effect which contributes to growth in services output is a technical coefficient effect. Except for the first sub-period in Brazil, the result suggests that production technology changes have positively contributed to the growth of services output associated with final demand shifts. In the second sub-period for instance, as shown in Appendix 3, the adoption of production technology has contributed to 2.4%, 19.12%, 6.87%, 4,98% and 6.74% increase in the output of services in Brazil, Russia, India, Indonesia and China respectively.

Moreover, the contribution of services technology has higher portion compared to non-services technology. It indicates that there has been an escalation of the role of services technology in services growth. This fact is somewhat anticipated since many services activities utilize and even rely on services input. For instance, financial and logistics industry much rely on information and telecommunication technology (ICT). The rise of ICT, in turn, enhances services output growth. This phenomenon has been identified much earlier in developed countries. Roach (1988) finds that in the United States, a much larger proportion of the services sector's capital budgets is spent on information technology relative to goods-producing industries. The result pinpoints a high dependence of services on service technology itself as a factor of production. Also, one of the findings of Guerrieri and Meliciani (2005) study suggest that in selected advances countries, the same service producers are also intensive users of these producer services, namely Financial, Communication, and Business services. BRIIC as emerging economies, in this case, seems to follow the path of services in advanced economies.

Conclusion

According to the analysis of services intensity, it is found that there has been an increase in the average of services intensity in the period 2005–2010 compared to that in 2000 – 2005.Furthermore, by developing basic structural decomposition analysis of Miller, this study has been able to explain various factors which affect the growth of service sector in BRIIC economies namely domestic final demand, export and changes in technology. Each of the factors is decomposed into services and non-services.

Except for the case of Brazil during sub-period 2000–2005, all BRIIC economies show increasing services output. In general, the result suggests that in BRIIC economies, final domestic demand has been the main driver of the growth of services. Nevertheless, there is heterogeneity across economies regarding the contribution of other effects. In most of the economies, the role of technology is still relatively small in acquiring increasing contribution, where the contribution of technology effect in services is higher than that in non-services. While there is variation in the export effect, the empirical findings show that India and China experienced the deteriorating effect of export between two sub-periods. The decline might be affected by the re-shoring phenomenon which recently arises.

Some existing literature (i.e., Jorgenson & Timmer, 2011; Noland, Park, & Estrada, 2012; OECD, 2005) have shown the rise and importance of service sector, particularly regarding its strong linkage in the economy. This study contributes to the services literature in explaining the factors affecting growth in services using the case of BRIIC as the largest emerging economies in today's world. Nonetheless, this study is not without limitation. Because it uses the data of aggregate level of services (comprises education and commercial services), it does not capture in detail each category of services (i.e., distribution, finance and business services and personal services, as discussed in Jorgenson & Timmer (2011). Moreover, aside from being five of the largest developing economies, BRIIC economies are quite heterogeneous in term of economic, social and political characteristics. Hence it is challenging to draw a specific conclusion which can represent the whole group.

Future research may focus on one particular economy and analyze and categorize some particular services instead of overall services. Furthermore, the opportunity to study service sector is still wide open and can be focused on different specific variables. Different objects of studies, such as developed and developing economies, might also lead to different result.

References

Amin, M., & Mattoo, A. (2006). *Do institutions matter more for services?* (World Bank Policy Research Working Paper No. 4032).

Arnold, J., Javorcik, B., Lipscomb, M., & Mattoo, A. (2012). Services reform and manufacturing performance: Evidence from India. Retrieved from http://siteresources.worldbank.org/INTTRADERESEARCH/Resources/544824-1296163684646/7695355-1337112639003/Arnold_Javorcik_Lipscomb_Mattoo_ppt.pdf

Arvis, J.-F., Mustra, M. A., Ojala, L., Shepherd, B., & Saslavsky, D. (2010). *The logistics performance index and its indicators*. Washing-ton, D.C. Retrieved from http://siteresources.worldbank.org/INTLAC/Resources/ConnectingtoCompete.pdf

Baldwin, R. (2006). *Globalisation: The great unbundling(s).* Finland. Retrieved from http://graduateinstitute.ch/files/live/sites/iheid/files/sites/ctei/shared/CTEI/Baldwin/Publications/Chapters/Globalization/Baldwin_06-09-20.pdf

Commission of the European Communities. (2003). *The competitiveness of business-related services and their contribution to the performance of European enterprise*. Brussels.

Damuri, Y. R. (2012). *Roles of services sector in economic activities. Indonesia Services Dialogue*. Jakarta.

Dietzenbacher, E., & Los, B. (1998). Structural decomposition techniques: Sense and sensitivity. *Economic Systems Research*, *10*(4), 307–324. https://doi.org/10.1080/09535319800000023

Dietzenbacher, E., Los, B., Stehrer, R., Timmer, M., & de Vries, G. (2013). The construction of world input–output tables in the WIOD project. *Economic Systems Research*, *25*(1), 71–98. https://doi.org/10.1080/09535314.2012.761180

Duggan, V., Rahardja, S., & Varela, G. (2013). *Service sector reform and manufacturing productivity: Evidence from Indonesia* (Policy Research working paper No. 6349).

Eichengreen, B., & Gupta, P. (2009). *The two waves of service sector growth* (NBER Working Paper No. 14968). Cambridge, MA. https://doi.org/10.3386/w14968

Goswami, A. G., Mattoo, A., & Saez, S. (2012). *Exporting services: A developing country perspective*. The World Bank. https://doi.org/10.1596/978-0-8213-8816-7

Guerrieri, Paolo and Valentina Meliciani. (2005). Technology and international competitiveness: The interdependence between manufacturing and producer services. *Structural Change and Economic Dynamics, Volume 16, Issue 4, 489-502*.https://doi.org/10.1016/j.strueco.2005.02.002

Heinemann Jr., B. W. (2013, March). Why we can all stop worrying about offshoring and outsourcing - The Atlantic. *The Atlantic*.

Jorgenson, D. W., & Timmer, M. P. (2011). Structural change in advanced nations: A new set of stylised facts. *Scandinavian Journal of Economics*, *113*(1), 1–29. https://doi.org/10.1111/j.1467-9442.2010.01637.x

Margulescu, S., & Margulescu, E. (2014). Reshoring in manufacturing and services. *Global Economic Observer*, *2*(1), 90–95.

Miller, R. E., & Blair, P. D. (2009). *Input-output analysis: Foundations and extensions*. Cambridge University Press.

Noland, M., Park, D., & Estrada, G. B. (2012). *Developing the service sector as engine of growth for Asia: An overview* (ADB Economics Working Paper Series No. 320).

OECD. (1996). *The knowledge-based economy*. Paris.

OECD. (2005). *Growth in services: Fostering employment, productivity, and innovation.*

OECD. (2007). *Globalisation and structural adjustment: Summary report of the study on globalisation and innovation in the business services sector.*

OECD. (2008).*Globalisation and Emerging Economies: Brazil, Russia, India, Indonesia, China and South Africa.*

Powell, W. W., & Snellman, K. (2004). The Knowledge Economy. *Annual Review of Sociology*, *30*(1), 199–220. https://doi.org/10.1146/annurev.soc.29.010202.100037

Roy, S., Das, T., & Chakraborty, D. (2002). A study on the Indian information sector: An experiment with input-output techniques. *Economic Systems Research*, *14*(2), 107–129. https://doi.org/10.1080/09535310220140924

Roach, Stephen S. (1988) Technology and the services sector: The hidden competitive challenge. *Technological Forecasting and Social Change, Volume 34, 387-403.* https://doi.org/10.1016/0040-1625(88)90006-6.

Tijaja, J. (2013). *The proliferation of global value chains: Trade policy considerations for Indonesia.*

Timmer, M. (ed). (2012). *The world input-output database (WIOD): Contents, sources and methods.*

Toh, M. H., & Thangavelu, S. M. (2013). An input–output study of the Singapore information sector. *Economic Systems Research*, *25*(2), 233–244. https://doi.org/10.1080/09535314.2012.740616

Tybout, J. R. (2000). Manufacturing firms in developing countries: How well do they do, and why? *Journal of Economic Literature*, *XXXVIII*, 11–44.

Appendix 1: Data and Methodology

Table 1.1 List of Service Sector

NIOT code	Service Sector
50	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel
51	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles
52	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods
F	Construction
H	Hotels and Restaurants
60	Inland Transport
61	Water Transport
62	Air Transport
63	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies
64	Post and Telecommunications
J	Financial Intermediation
70	Real Estate Activities
71t74	Renting of M&Eq and Other Business Activities
M	Education
N	Health and Social Work

Source: National Input Output Table

Table 1.2. Basic Outline of NIOT

		Industry			Final use/demand		Total output
		1	2	3	Domestic	Export	
Industry	1	Z_{11}	Z_{12}	Z_{13}	D_1	E_1	X_1
	2	Z_{21}	Z_{22}	Z_{23}	D_2	E_2	X_2
	3	Z_{31}	Z_{32}	Z_{33}	D_3	E_3	X_3
		Imports					
		Value added					
		Total output					

Note: the yellow-shaded area shows inter-industry linkages or the use of intermediate inputs in production stages.

Appendix 2: Services Intensity

Table 2.1 Services coefficients of various sectors in Brazil for 2000, 2005 and 2010

	Industry	Total Services Used				
		2000	2005	2010	Change 2000-2005	Change 2005-2010
1	Agriculture, Hunting, Forestry and Fishing	0.1653	0.1899	0.1897	0.0246	-0.0002
2	Mining and Quarrying	0.3446*	0.3623*	0.4150*	0.0177	0.0527
3	Food, Beverages and Tobacco	0.3265	0.3349*	0.3842*	0.0084	0.0494
4	Textiles and Textile Products	0.2428	0.2586	0.2789	0.0158	0.0203
5	Leather, Leather and Footwear	0.3495*	0.3292*	0.3265	-0.0203	-0.0028
6	Wood and Products of Wood and Cork	0.2079	0.2394	0.2330	0.0314	-0.0064
7	Pulp, Paper, Paper , Printing and Publishing	0.2752	0.2727	0.2869	-0.0025	0.0142
8	Coke, Refined Petroleum and Nuclear Fuel	0.3311	0.2990	0.2913	-0.0321	-0.0078
9	Chemicals and Chemical Products	0.3568*	0.3426*	0.3715*	-0.0142	0.0290
10	Rubber and Plastics	0.3361*	0.3138	0.3273	-0.0222	0.0135
11	Other Non-Metallic Mineral	0.3136	0.2938	0.3213	-0.0198	0.0276
12	Basic Metals and Fabricated Metal	0.2823	0.2807	0.2947	-0.0016	0.0140
13	Machinery, Nec	0.3025	0.3142	0.3284*	0.0117	0.0142
14	Electrical and Optical Equipment	0.3139	0.3150	0.3265	0.0011	0.0115
15	Transport Equipment	0.3559*	0.3653*	0.3792*	0.0094	0.0139
16	Manufacturing, Nec; Recycling	0.2444	0.2421	0.2528	-0.0023	0.0107
17	Electricity, Gas and Water Supply	0.1745	0.1679	0.1853	-0.0066	0.0174
18	Public Admin and Defence; Compulsory Social Security	0.3023	0.3184	0.3008	0.0161	-0.0176
19	Other Community, Social and Personal Services	0.2853	0.2642	0.2714	-0.0211	0.0071
20	Private Households with Employed Persons	0.0000	0.0000	0.0000	0.0000	0.0000
21	Services	0.2583	0.2431	0.2567	-0.0151	0.0136
				Average	-0.0010	0.0131

*five highest services coefficients

Table 2.2. Services coefficients of various sectors in Russia for 2000, 2005 and 2010

	Industry	Total Information Used				
		2000	2005	2010	Change 2000-2005	Change 2005-2010
1	Agriculture, Hunting, Forestry and Fishing	0.1850	0.2111	0.2791	0.0261	0.0680
2	Mining and Quarrying	0.2892	0.2020	0.2131	-0.0872	0.0112
3	Food, Beverages and Tobacco	0.2766	0.3366	0.4390*	0.0599	0.1025
4	Textiles and Textile Products	0.2533	0.3417*	0.3350	0.0884	-0.0067
5	Leather, Leather and Footwear	0.4037*	0.4249*	0.4338*	0.0212	0.0090
6	Wood and Products of Wood and Cork	0.2512	0.3021	0.3711	0.0509	0.0690
7	Pulp, Paper, Paper, Printing and Publishing	0.2613	0.3165	0.3855	0.0552	0.0689
8	Coke, Refined Petroleum and Nuclear Fuel	0.2700	0.3259	0.4062*	0.0559	0.0803
9	Chemicals and Chemical Products	0.2773*	0.3333	0.3839	0.0560	0.0506
10	Rubber and Plastics	0.2583	0.3427*	0.4251*	0.0844	0.0824
11	Other Non-Metallic Mineral	0.3043*	0.3134	0.3800	0.0091	0.0667
12	Basic Metals and Fabricated Metal	0.2908	0.3093	0.3867	0.0185	0.0774
13	Machinery, Nec	0.2539	0.2673	0.3596	0.0134	0.0923
14	Electrical and Optical Equipment	0.2376	0.2559	0.3288	0.0183	0.0729
15	Transport Equipment	0.2243	0.2303	0.3439	0.0060	0.1135
16	Manufacturing, Nec; Recycling	0.2220	0.3033	0.3942	0.0812	0.0909
17	Electricity, Gas and Water Supply	0.3085*	0.3474*	0.4527*	0.0390	0.1052
18	Public Admin and Defence; Compulsory Social Security	0.3640*	0.3711*	0.3920	0.0071	0.0209
19	Other Community, Social and Personal Services	0.2555	0.2450	0.3066	-0.0104	0.0615
20	Private Households with Employed Persons	0.0000	0.0000	0.0000	0.0000	0.0000
21	Services	0.2353	0.2739	0.3144	0.0386	0.0405
				Average	0.0301	0.0608

*****five highest services coefficients*

Table 2.3. Services coefficients of various sectors in India for 2000, 2005 and 2010

	Industry	Total Information Used				
		2000	2005	2010	Change 2000-2005	Change 2005-2010
1	Agriculture, Hunting, Forestry and Fishing	0.1047	0.1186	0.1197	0.0139	0.0011
2	Mining and Quarrying	0.1213	0.1471	0.1508	0.0257	0.0038
3	Food, Beverages and Tobacco	0.3853*	0.4035*	0.4390*	0.0182	0.0356
4	Textiles and Textile Products	0.3961*	0.3899	0.4059	-0.0062	0.0160
5	Leather, Leather and Footwear	0.4165*	0.3720	0.3969	-0.0445	0.0249
6	Wood and Products of Wood and Cork	0.2878	0.3001	0.3270	0.0123	0.0269
7	Pulp, Paper, Paper , Printing and Publishing	0.3644	0.3764	0.4415*	0.0119	0.0651
8	Coke, Refined Petroleum and Nuclear Fuel	0.1192	0.3357	0.5323*	0.2166	0.1966
9	Chemicals and Chemical Products	0.3623	0.3927	0.4352	0.0304	0.0425
10	Rubber and Plastics	0.4007*	0.4139*	0.4802*	0.0133	0.0663
11	Other Non-Metallic Mineral	0.3320	0.3954*	0.4330	0.0633	0.0376
12	Basic Metals and Fabricated Metal	0.3574	0.3914	0.4114	0.0340	0.0200
13	Machinery, Nec	0.3523	0.3985*	0.4141	0.0462	0.0156
14	Electrical and Optical Equipment	0.3400	0.4087*	0.4495*	0.0687	0.0408
15	Transport Equipment	0.3883*	0.3821	0.3836	-0.0062	0.0016
16	Manufacturing, Nec; Recycling	0.3545	0.2870	0.2166	-0.0676	-0.0704
17	Electricity, Gas and Water Supply	0.3234	0.3434	0.3764	0.0200	0.0330
18	Public Admin and Defence; Compulsory Social Security	0.0000	0.0000	0.0000	0.0000	0.0000
19	Other Community, Social and Personal Services	0.1982	0.1083	0.0638	-0.0899	-0.0445
20	Private Households with Employed Persons	0.1966	0.1083	0.0638	-0.0883	-0.0445
21	Services	0.2270	0.2543	0.2693	0.0273	0.0149
				average	0.01425	0.02299

Table 2.4 Services coefficients of various sectors in Indonesia for 2000, 2005 and 2010

	Industry	Total Information Used				
		2000	2005	2010	Change 2000-2005	Change 2005-2010
1	Agriculture, Hunting, Forestry and Fishing	0.0830	0.0881	0.0888	0.0050	0.0008
2	Mining and Quarrying	0.0245	0.0359	0.0462	0.0114	0.0103
3	Food, Beverages and Tobacco	0.1976	0.2100	0.1840	0.0123	-0.0260
4	Textiles and Textile Products	0.1720	0.2319	0.2010	0.0599	-0.0309
5	Leather, Leather and Footwear	0.2388	0.2690*	0.2755*	0.0302	0.0065
6	Wood and Products of Wood and Cork	0.2508*	0.2316	0.2484	-0.0192	0.0168
7	Pulp, Paper, Paper , Printing and Publishing	0.2517*	0.2471*	0.2957*	-0.0046	0.0486
8	Coke, Refined Petroleum and Nuclear Fuel	0.0149	0.0151	0.0228	0.0002	0.0077
9	Chemicals and Chemical Products	0.0649	0.0931	0.1145	0.0281	0.0214
10	Rubber and Plastics	0.1449	0.2058	0.2291	0.0609	0.0233
11	Other Non-Metallic Mineral	0.1183	0.1330	0.1878	0.0147	0.0548
12	Basic Metals and Fabricated Metal	0.1355	0.1420	0.1904	0.0065	0.0484
13	Machinery, Nec	0.2405	0.2537*	0.3295*	0.0132	0.0758
14	Electrical and Optical Equipment	0.3520*	0.3370*	0.2761*	-0.0149	-0.0609
15	Transport Equipment	0.1570	0.1987	0.2375	0.0417	0.0389
16	Manufacturing, Nec; Recycling	0.2284	0.2393	0.2628	0.0109	0.0235
17	Electricity, Gas and Water Supply	0.0761	0.1572	0.2299	0.0811	0.0728
18	Public Admin and Defence; Compulsory Social Security	0.2680*	0.2077	0.2356	-0.0603	0.0279
19	Other Community, Social and Personal Services	0.1313	0.2142	0.2272	0.0829	0.0130
20	Private Households with Employed Persons	0.0000	0.0000	0.0000	0.0000	0.0000
21	Services	0.2591*	0.2664*	0.3092*	0.0074	0.0428
				Average	0.0175	0.0198

*five highest services coefficients

Table 2.5 Services coefficients of various sectors in China for 2000, 2005 and 2010

	Industry	Total Information Used				
		2000	2005	2010	Change 2000-2005	Change 2005-2010
1	Agriculture, Hunting, Forestry and Fishing	0.1705	0.1423	0.1613	-0.0282	0.0190
2	Mining and Quarrying	0.2441	0.2139	0.2612	-0.0302	0.0473
3	Food, Beverages and Tobacco	0.2615	0.2204	0.2541	-0.0411	0.0337
4	Textiles and Textile Products	0.2746	0.2434	0.2820	-0.0312	0.0386
5	Leather, Leather and Footwear	0.3215*	0.2478	0.2715	-0.0737	0.0237
6	Wood and Products of Wood and Cork	0.3015	0.2389	0.2755	-0.0627	0.0366
7	Pulp, Paper, Paper , Printing and Publishing	0.3200	0.2601	0.3011	-0.0599	0.0410
8	Coke, Refined Petroleum and Nuclear Fuel	0.2451	0.1828	0.1893	-0.0623	0.0065
9	Chemicals and Chemical Products	0.3003	0.2538	0.3088	-0.0465	0.0550
10	Rubber and Plastics	0.2897	0.2390	0.2927	-0.0507	0.0537
11	Other Non-Metallic Mineral	0.3428*	0.2781*	0.3315*	-0.0647	0.0534
12	Basic Metals and Fabricated Metal	0.3374*	0.2481	0.2856	-0.0893	0.0375
13	Machinery, Nec	0.3124	0.2679	0.3276	-0.0445	0.0597
14	Electrical and Optical Equipment	0.2911	0.2453	0.3302*	-0.0458	0.0849
15	Transport Equipment	0.3149	0.2834*	0.3452*	-0.0315	0.0618
16	Manufacturing, Nec; Recycling	0.2740	0.2145	0.2423	-0.0595	0.0278
17	Electricity, Gas and Water Supply	0.2754	0.2186	0.2855	-0.0569	0.0669
18	Public Admin and Defence; Compulsory Social Security	0.4740*	0.3737*	0.3708*	-0.1004	-0.0028
19	Other Community, Social and Personal Services	0.3134	0.2824*	0.3242	-0.0311	0.0419
20	Private Households with Employed Persons	0.0000	0.0000	0.0000	0.0000	0.0000
21	Services	0.3420*	0.3088*	0.3508*	-0.0332	0.0420
				Average	-0.0497	0.0394

*five highest services coefficients

Appendix 3: Sources of Output Growth

Table 3.1 Source of output growth for service sector of Brazil 2000-2010
(Constant price 2005)

Brazil		Overall Services			
		2000-2005		2005-2010	
		US$ million	%	US$ million	%
Change in services output		**-114,368.95**	**100.00**	**660,774.08**	**100.00**
1	Domestic final demand effect	**-122,580.10**	**107.18**	**615,911.96**	**93.21**
	Services	-113,454.88	99.20	516,836.35	78.22
	Non-services	-9,125.23	7.98	99,075.61	14.99
2	Export effect	**12,727.12**	**-11.13**	**28,877.49**	**4.37**
	Services	1,732.63	-1.51	17,438.79	2.64
	Non-services	10,994.49	-9.61	11,438.70	1.73
3	Technical coefficient effect	**-4,515.97**	**3.95**	**15,984.63**	**2.42**
	Services	-11,471.51	10.03	29,105.56	4.40
	Non-services	6,955.54	-6.08	-13,120.93	-1.99

Table 3.2 Source of output growth for service sector of Russia 2000-2010
(Constant price 2005)

Russia		Overall Services			
		2000-2005		2005-2010	
		US$ million	%	US$ million	%
Change in services output		**205,048.38**	**100.00**	**208,941.18**	**100.00**
1	Domestic final demand effect	**177,062.46**	**86.35**	**160,891.27**	**77.00**
	Services	159,911.03	77.99	150,548.40	72.05
	Non-services	17,151.43	8.36	10,342.87	4.95
2	Export effect	**13,243.48**	**6.46**	**8,097.40**	**3.88**
	Services	7,268.05	3.54	9,666.57	4.63
	Non-services	5,975.44	2.91	-1,569.17	-0.75
3	Technical coefficient effect	**14,742.44**	**7.19**	**39,952.51**	**19.12**
	Services	4,397.96	2.14	36,364.00	17.40
	Non-services	10,344.47	5.04	3,588.52	1.72

Table 3.3 Source of output growth for service sector of India 2000-2010
(Constant price 2005)

India		Overall Services			
		2000-2005		2005-2010	
		US$ million	%	US$ million	%
Change in services output		**265,356.68**	**100.00**	**245,482.11**	**100.00**
1	Domestic final demand effect	**198,743.07**	**74.90**	**203,374.05**	**82.85**
	Services	172,920.52	65.17	178,233.25	72.61
	Non-services	25,822.55	9.73	25,140.81	10.24
2	Export effect	**50,500.10**	**19.03**	**25,249.58**	**10.29**
	Services	35,758.48	13.48	13,167.03	5.36
	Non-services	14,741.62	5.56	12,082.55	4.92
3	Technical coefficient effect	**16,113.51**	**6.07**	**16,858.48**	**6.87**
	Services	23,109.35	8.71	17,750.30	7.23
	Non-services	-6,995.84	-2.64	-891.82	-0.36

Table 3.4 Source of output growth for service sector of Indonesia 2000-2010
(Constant price 2005)

Indonesia		Overall Services			
		2000-2005		2005-2010	
		US$ million	%	US$ million	%
Change in services output		**19,659.33**	**100.00**	**183,120.23**	**100.00**
1	Domestic final demand effect	**17,114.64**	**87.06**	**169,073.01**	**92.33**
	Services	16,344.44	83.14	151,205.51	82.57
	Non-services	770.19	3.92	17,867.50	9.76
2	Export effect	**-2,046.13**	**-10.41**	**4,934.60**	**2.69**
	Services	1,251.29	6.36	2,291.51	1.25
	Non-services	-3,297.42	-16.77	2,643.09	1.44
3	Technical coefficient effect	**4,590.90**	**23.35**	**9,112.60**	**4.98**
	Services	4,083.23	20.77	5,816.63	3.18
	Non-services	507.66	2.58	3,295.96	1.80

Table 3.5 Source of output growth for service sector of China 2000-2010
(Constant price 2005)

China		Overall Services			
		2000-2005		2005-2010	
		US$ million	%	US$ million	%
Change in services output		**906,661.00**	**100.00**	**3,003,478.00**	**100.00**
1	Domestic final demand effect	**769,778.16**	**84.90**	**2,527,689.21**	**84.16**
	Services	672,114.85	74.13	2,247,281.10	74.82
	Non-services	97,663.32	10.77	280,408.11	9.34
2	Export effect	**227,607.42**	**25.10**	**273,416.47**	**9.10**
	Services	102,862.78	11.35	105,724.88	3.52
	Non-services	124,744.64	13.76	167,691.59	5.58
3	Technical coefficient effect	**4,590.90**	**23.35**	**9,112.60**	**4.98**
	Services	4,083.23	20.77	5,816.63	3.18
	Non-services	507.66	2.58	3,295.96	1.80

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

Analysis of seaports efficiency in supporting inter-island transportation

Adenanthera L Dewa[1], Nugroho S B Maria[2], Mudjahirin Thohir[3], Indah Susilowati[4]*

[1,2,4] Faculty of Economics and Business, Diponegoro University, Semarang, Indonesia.
[3] Faculty of Humanities, Diponegoro University, Semarang, Indonesia.

Article Info

Article history:
Received : 26 December 2017
Accepted : 25 January 2018
Published : 6 March 2018

Keywords:
archipelago, efficiency, preferences, perception, ATLAS.ti, DEAmax,

JEL Classification:
R3, R4, R41

DOI: 10.20885/ejem.vol10.iss1.art6

Abstract

This study analyzes the efficiency of 15 ports in Indonesia that connect the islands; users' perceptions on the needs of sea transport facilities both in ships and terminals; and a network of passenger facility needs based on preference. The research uses the sequential mixed method. The results show that 4 of the 15 port samples have not yet reached efficiency. The main reasons why users choose ships are because ships have complete facilities and are therefore more convenient, allow them to carry more goods, at affordable ticket prices, and users usually travel in groups. Users are most concerned with and want complete facilities, comfort, safety and order, viability and accessibility to reach the ports and board the ships.

Introduction

Indonesia is an archipelago consisting of over 16,056 large and small islands separated by 12 seas and 47 straits. These separate islands require sea transportation facilities. Sea transportation is an important part of economic growth both regionally, nationally and internationally. The port is also an important infrastructure to develop the regional economy especially to equalize development. The results of a study analyzing spillover effects from land-based ports to the mainland indicate that in areas with a distance to the nearest major port of more than 150 km, the manufacturing sector contributed only 5.9-7.1% to Gross Regional Domestic Product (GRDP). An area located 29-67 km from the nearest main port has a relatively low poverty rate of 10.3-12.2%, or 10% lower than other areas located more than 200 km from the nearest main port. Other results indicate that ports on the island of Java and those outside of Java have differences (Yudhistira & Sofiyandi, 2017).

Research conducted in the port of Rotterdam, The Netherlands, also shows that the port has contributed 3.5% of the Dutch economy (Wildenboer, 2015). This economic growth is related to the increasingly smooth distribution of goods, especially exports and imports. The study used the number of containers and tons of cargo as the main indicators to measure how much port development has increased the number of goods distributed Many of the characteristics and performance of ports affect economic growth. There are some key factors determining port performance: location, access from inland, accessibility, company presence at the port, terminal efficiency, port costs, and growth in economic and development activities (Langen, Range, & Langen, 2012).

Other research states that The Marine Transportation System (MTS) is very valuable to the United States because it a) provides a global gateway to the world market for US businesses and consumers; this became an important passageway for military mobilization; b) provides domestic transport networks for goods and passengers; c) creates jobs that support maritime operations (commercial and recreational); d) generates tax/tariff revenue and operating income for federal, state and local governments; e) supports the use of recreation by the public. The data show that this MTS generates $ 750 billion in the United States and handles 95% of all foreign trade (American Association of Port Authorities, 2005).

Passenger ports are also important in the development of marine transportation. A study was conducted at 20 major passenger ports in Europe to identify and classify the various services provided and the private and public benefits generated by the provision of services in all passenger ports (Vaggelas & Pallis, 2010). The study found that 1) operational management status will change to a new model if it is managed commercially; 2)

P ISSN 2086-3128 | E ISSN 2502-180X
*Corresponding Author e-mail: indahsusilowati@undip.ac.id

increased adoption of market value will encourage private players to be more active in service strategies; 3) the number of professionally managed and profit-oriented ports is growing; 4) specialization services by private operators increase business and industry activities; 5) there is an emerging perspective that ports should be public infrastructure and administered by the government (Vaggelas & Pallis, 2010).

Ports of passengers and goods in Indonesia are public infrastructure managed by the ministry of transportation through Pelindo Limited Company. The data show that empirically, sea transport modes have an important role primarily due to the geographical conditions of the Indonesian archipelago. However, in reality, Indonesia's national shipping competitiveness is still relatively weak. The national fleet share growth is 46.4% for domestic transport and 3.65% for overseas transport. Indonesia's geographical condition of which 75% of its territory is the sea has a real potential of sea transportation of 20 billion dollars, but the Gross Domestic Product (GDP) of the sea transportation sector only reached the US $ 1.95 billion or only about 9.7% of its true potential. In fact, the market size for sea transportation, when compared with other modes, remained very low at 1.0% in 2011, which then increased to 3.5% in 2012 and 6.1% in 2013. These figures are fairly low if compared with Indonesia's market size potential (Ministry of Transportation, 2016).

Surveys of private companies managing sea transportation show that some of the reasons for the low role of sea transport in Indonesia are government regulations and their weak implementation, old and not regularly upgraded fleet, investment difficulties due to perception that sea transportation generates low yields, high ports operation and sunk costs, and the lack of port and terminal facilities (Indonesian Marine Council, 2012). Therefore, the Indonesian government has launched a sea toll road for the next five years. The various structures and infrastructures are aimed at port development and improvement of port facilities and passenger terminal. The move is quite successful as indicated by the increasing market size of sea transportation to 12.25% in 2014. Departing from the background mentioned above, this study aims to (1) analyze the efficiency of 15 ports in Indonesia that connect the islands; (2) analyze users' perceptions of the needs of sea transport facilities both in ships and terminals; (3) build a network of passenger facility needs based on preference.

Research Method

Passenger ports are an important part of transportation, especially for maritime areas. However, due to its small contribution to GDP, this type of port has received little attention in research. Thus the definition of passenger ports becomes unclear and is considered a small part of the port function. Ship passengers possess special characteristics because the journey takes longer and is sometimes full of uncertainty due to natural factors such as high waves (Vaggelas & Pallis, 2010).

Ports are often considered to have a simple function, namely ship service, passenger service, and cargo service. However, services can be sorted in more detail into services for the ship convenience to dock, where the dock's length and depth become the determinant variables; passenger comfort regarding rest, meal and hygiene facilities; and security and safety (American Association of Port Authorities, 2005).

Servqual, or service and quality, is a new term that refers to the improvement of service in various fields particularly, in this context, ports. According to ISO, the definition of quality is complex with the ultimate goal of providing satisfaction for customers by meeting their implicit and explicit needs. The optimization of service usually receives inadequate attention because it will increase operational service cost. Since ports are public infrastructure, facility improvements that require high investment often do not take into account the rapid returns, so the government has a big role and responsibility so that funds spent from the State Revenue and Expenditure Budget can encourage improved service and port efficiency (Pantouvakis, Chlomoudis, & Dimas, 2008).

The method used in this research is a sequential mixed method that combines quantitative and qualitative analysis. Qualitative analysis is used to explain the preferences of passengers and other actors related to the condition of ships and ports. Information about passenger preferences can be obtained not only through passengers but also through other actors, such as ticketing agencies, merchants, and labor suppliers. The three actors are chosen as informants because they are directly or indirectly interact with the passengers so that they are considered to understand the characteristics of the ship passengers. This research uses Data Envelopment Approach and ATLAS.ti.

In general, there are two types of approach for measuring efficiency levels: parametric and nonparametric (Saaty, 2008). The approach of Stochastic Frontier Approach (SFA), Thick Frontier Approach (TFA) and Distribution-Free Approach (DFA) are the parametric approaches, while nonparametric approaches include Data Envelopment Approach (DEA) and Free Disposable Hull (FDH). DEA is a non-parametric linear

programming approach assisted with technical efficiencies software packages, such as Banxia Frontier Analysis (BFA) and Warwick for Data Envelopment Analysis (WDEA) (Charnes, Cooper, Lewin, & Seiford, 1994).

DEA is used to measure the efficiency of an Economic Activity Unit (EAU). There are three benefits derived from efficiency measurement using DEA namely:

a. Serving as a benchmark to obtain the relative efficiency that is useful for facilitating comparison between existing economic units.
b. Measuring the various efficiencies between economic units to identify factors
c. determining the policy implications to increase the efficiency level.

Coelli, Rao, O'Donnell, & Battes (2005) illustrate a simple idea involving firms that use two inputs (x1 and x2) to produce an output (y). The assumption used in the illustration is Constant Return Scale. Using an isoquant curve with a fully efficient firm condition depicted on the SS line in Figure 1. Point P describes the use of a given input by the firm to produce one unit of output. Companies that are not technically inefficient in production are depicted over the QP range which is the sum of the input usage proportionately reduced without reducing the output. This is denoted in percent by calculating the ratio of QP / 0P, which indicates the input that can be reduced. The level of company technical efficiency can be described through the following ratio:

$$TE = 0Q/0P \quad (1)$$

The value of the equation is equal to 1-QP / 0P. The value to be obtained ranges from 0 to 1 and this becomes an indicator of the degree to which the company has achieved technical efficiency (technically efficient). For example, point Q is a technical efficiency point because it lies in the isoquant curve.

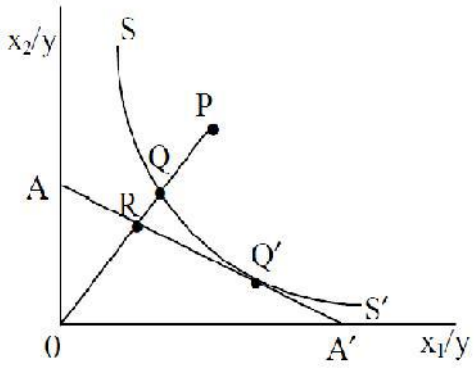


Figure 1. Technical Efficiency and Allocative Efficiency

Results and Discussion

Assessment of performance results between companies or management units can be compared by using some tools, but the most commonly used is Data Envelopment Analysis. DEA is a non-parametric optimization technique using a linear programming tool to measure the relative efficiency of a set of Decision Making Units. In this study, to evaluate the driving performance of each older driver by combining all the 16 hierarchically structured indicators in one index score, a multiple layer DEA based composite indicator model (Babaee, Bagherikahvarin, Sarrazin, Shen, & Hermans, 2015; Drennan & Brecher, 2012).

The first objective of this research is to analyze the efficiency of 15 ports in Indonesia that connect the islands. Port efficiency measurements were made using DEA analysis. The input variables consist of (i1) The dock length (m); (i2) the dock depth (m); (i3) Pelindo Human Resources (org); (i4) terminal building width (m2); (i5) parking area width (m2); and (i6) availability of passenger boarding bridges (PBB). The output variables consist of (o1) maximum ship tonnage (GT / thousand); (o2) the number of ship visits (units); (o3) the number of passengers arriving (org); (o4) the number of passengers departing. Table 1 contains detailed data on ports, inputs, and outputs.

Table 1. Detailed data on ports, inputs, and outputs

		Average until August 2017									
		Output	Output	Output	Output	Input	Input	Input	Input	Input	Input
		Visits/GT/ thousands	Visits/ unit	Arrival/ Persons	Departure/ Persons	Dock/m	Depth/m	Pelindo HR/persons	Building/ m2	Parking/ m2	PBB
1	Tanjung Emas	56.521	13	5.963	5.228	493	9	13	4.450	10.542	0
2	Tanjung Perak	157.691	29	18.261	26.760	1.457	11	25	12.950	9.297	1
3	Tanjung Priok	132.763	27	9.621	10.788	902	11	25	7.266	11.283	0
4	Belawan	51.545	12	4.375	5.548	502	10	17	3.577	8.423	1
5	Makasar	64.580	14	11.739	13.704	871	9	13	3.990	7.276	0
6	Jayapura	45.271	12	6.102	11.505	472	9	10	2.672	5.872	0
7	Fakfak	34.796	10	5.281	5.957	402	9	7	2.170	5.290	0
8	Sampit	30.278	9	3.676	2.514	397	9	7	1.720	4.380	0
9	Kumai	46.711	12	5.538	4.222	481	8	10	2.250	3.975	0
10	Merauke	35.938	10	4.124	3.970	428	9	10	2.465	5.250	0
11	Karimunjawa	6.270	3	312	172	121	3	4	492	2.500	0
12	Kijang, Kepri	34.979	10	5.152	4.827	272	9	10	1.450	2.230	0
13	Lembar	36.224	16	4.744	3.628	291	9	10	1.803	2.445	0
14	Bau Bau	32.278	11	3.281	3.889	210	9	10	1.570	2.350	0
15	Batulicin	29.279	8	2.831	2.916	164	8	7	540	1.210	0

Source: Pelindo Data, 2017

The input and output variables are then analyzed using DEA through the input-oriented model approach, and the results show that 11 ports have reached efficiency: Tanjung Perak, Tanjung Priok, Napier, Jayapura, Fakfak, Kumai, Karimunjawa, Kijang, Kepri, Sheet, Odor Odor, Batulicin. Meanwhile, the following four ports have not achieved efficiency:

Tanjung Emas with an efficiency value of 93.65% and an inefficiency value of 6.35%

Table 2. Inefficiency Value at Port of Tanjung Emas, Semarang

Input	Actual	Target	To Gain	To Gain (%)	Achieved (%)
Dock/m	493	461,7002	-31,2998	-6,35%	**93,65%**
Depth/m	9	8,428605	-0,57140	-6,35%	**93,65%**
Pelindo HR/persons	13	12,17465	-0,82535	-6,35%	**93,65%**
Building/m2	4450	2768,319	-1399,16	-31,44%	**68,56%**
Parking/m2	10542	4799,063	-5073,64	-48,13%	**51,87%**
PBB	0	0	0	0,00%	**100,00%**

Source: raw data processed with DEAMAX, 2017

Belawan with an efficiency value of 76,43% and an inefficiency value of 23,57%

Table 3. Inefficiency Value at Port of Belawan

Input	Actual	Target	To Gain	To Gain	Achieved
Dock/m	502	383,6794	-118,321	-23,57%	**76,43%**
Depth/m	10	7,643017	-2,35698	-23,57%	**76,43%**
Pelindo HR/persons	17	11,08305	-4,00687	-23,57%	**76,43%**
Building/m2	3577	2546,688	-843,093	-23,57%	**76,43%**
Parking/m2	8423	4586,965	-1985,29	-23,57%	**76,43%**
PBB	1	0	1	100,00%	**100,00%**

Sampit with an efficiency value of 96,28% and an inefficiency value of 3,72%

Table 4. Inefficiency Value at Port of Sampit

Input	Actual	Target	To Gain	To Gain	Achieved
Dock/m	397	320,1466	-62,0863	-15,64%	**84,36%**
Depth/m	9	8,066183	-0,57140	-6,35%	**93,65%**
Pelindo HR/persons	7	6,739622	-0,26038	-3,72%	**96,28%**
Building/m2	1720	1656,021	-63,9785	-3,72%	**96,28%**
Parking/m2	4380	4105,515	-162,922	-3,72%	**96,28%**
PBB	0	0	0	0,00%	**100,00%**

Source: raw data processed with DEAMAX, 2017

Merauke with an efficiency value of 81,89% and an inefficiency value of 18,11%.

Table 5. Inefficiency Value at Port Merauke

Input	Actual	Target	To Gain	To Gain	Achieved
Dock/m	428	350,4832	-77,5168	-18,11%	**81,89%**
Depth/m	9	7,369974	-1,81114	-20,12%	**79,88%**
Pelindo HR/persons	10	8,18886	-1,81114	-18,11%	**81,89%**
Building/m2	2465	1968,253	-446,446	-18,11%	**81,89%**
Parking/m2	5250	4299,152	-950,848	-18,11%	**81,89%**
PBB	0	0	0	0	**100,00%**

Source: raw data processed with DEAMAX, 2017

The results of data processing show that the port with the lowest efficiency is one of the big ports, Belawan, with 23% inefficiency value. After further analysis, it was found that inefficiency occurred in all ports due to wastefulness and unused input scale. Ports can serve more output than they do as shown in the tables. Inefficient ports will achieve 100% optimal efficiency when using the following benchmarks:

Table 6. Benchmark efficiency of passenger ports

NO	DMU	Score	Benchmark (Lambda)
1	Tanjung Emas	0,936512	03(0,221108); 05(0,171050); 11(0,115476); 12(0,170477); 13(0,001134); 15(0,320755)
2	Belawan	0,764302	02(0,014865); 03(0,230851); 06(0,131931); 11(0,245213); 15(0,377140)
3	Sampit	0,962803	07(0,657845); 11(0,126217); 13(0,039425); 15(0,176514)
4	Merauke	0,818886	03(0,073687); 05(0,002416); 07(0,374948); 09(0,135254); 11(0,260633); 13(0,074714); 15(0,078349)

Source: raw data processed with DEAMAX, 2017

Table 5.6 shows that inefficient ports will achieve efficiency concerning benchmarked ports, as described below:

1. Tanjung Emas Port will achieve efficiency when referring to the Ports of Tanjung Priok, Makassar, Kijang Kepri, Karimunjawa, Lembar, and Batulicin
2. Belawan Port will achieve efficiency when referring to the Ports of Tanjung Perak, Tanjung Priok, Makasar, Jayapura, Karimunjawa, and Batulicin.
3. Sampit Port will achieve efficiency when referring to the Ports of Fak-fak, Karimunjawa, Lembar, and Batulicin
4. Merauke Port will achieve efficiency when referring to the Ports of Tanjung Priok, Makassar, Fak-fak, Kumai, Karimunjawa, Lembar, and Batulicin

The second objective of this research is to analyze the user perception toward the requirement of sea transport facility both in ship and port terminal. The UNCTAD report shows how to assist developing countries by improving port performance. Its important view is to reduce transportation costs and improve the

quality of port services in an integrated manner to achieve global trade (UNCTAD, 2016). Perception data is obtained through in-depth interviews of informants which include passengers, ticket agents, shop owners and port officers. The coded interview data are grouped into two: the reasons for choosing ships and port facilities. The interview result shows that the characteristics of the ship passengers are having low education, low economic life, from rural/mountainous areas, departing in groups or with family, and are informal workers.

Passengers are users of various means of public transport, including users of land, air and sea transportation. Passengers are a group of people on a journey with the same purpose. Transportation and travel conditions will affect passenger behavior. The main factors are environmental factors covering the social environment, the natural environment, and the economic environment; personal factors include education, social status and age; and group factors that passengers in traveling will interact with other passengers (Li, Jin, & Guo, 2013).

The next step is to connect between the codes with transcripts of interview results so that quantitative results will be obtained from qualitative data. Quantitative is used as a measure of emphasis or how significant the perception of the informants is against the predetermined criteria. The more frequently the criteria are mentioned, the more important the criteria are. The results of code and criteria processing using ATLAS.ti show that the characteristics of ship passengers are those with low education, working in the informal sector and departing in groups. Meanwhile, the reasons for choosing a ship as a mode of transportation are due to the affordable ticket price, the facilities, the possibility to carry large quantities of goods, and the convenience. Passengers will choose the sustainable mode of transportation due to several factors: costs that must be incurred, attitudes and character of passengers, risks or security of transportation and travel modes, as well as terminal and surrounding conditions (Chee & Fernandez, 2013). The respondents' perception of the ports indicates that ports are now more attractive because of their complete facilities, safety, and viability, as shown in the following table:

Table 7. Passenger Preferences on Ship Selection

NO	CODING CRITERIA	VALUE	NO	CODING CRITERIA	VALUE
1	**Reasons for preferring ships**	**26**	2	**Port Facilities**	**27**
	a. Affordable Tickets	**5**		**a. Viability**	**5**
				(i) Clean toilet and public facilities	3
	b. Comfortability	**5**		(ii) Flood safe	2
	(i) Spacious	1			
	(ii) Clean bathroom	1		**b. Facilities and comfortability**	**13**
	(iii) Comfortable passenger cabin	1		(i) Mosque	2
	(iv) Socializing	2		(ii) Free toilet	4
				(iii) seats and space for rests	1
	c. Facilities	**8**		(iv) shops/kiosks	2
	(i) Free meals and drinks	3		(v) spacious hall	1
	(ii) Cafe and entertainment	3		(vi) the clean waiting lounge	3
	(iii) Safety	2			
				c. Accessibility	**4**
	d. Travelling in large groups	**2**		(i) Easy access from outside the port	2
				(ii) Easy access to board the ships	2
	e. Carrying many goods	**6**			
				d. Security and orderliness	**5**

The results indicate that the main reasons why passengers choose ships are because ships have complete facilities, allow them to carry more goods, are more convenient, affordable ticket prices, and because passengers usually travel in groups. Users are most concerned with and want complete facilities, comfort, safety and order, viability and accessibility to reach the ports and board the ships.

The third purpose of this research is to build the network of passenger facility needs based on informant preference. The result is shown in figure 2:

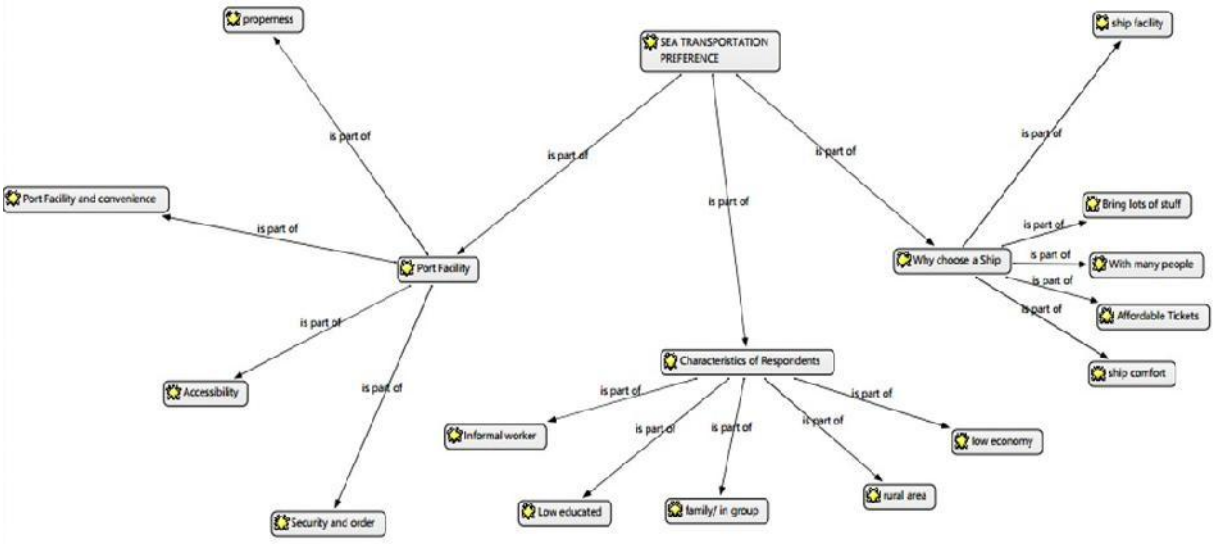


Figure 2 Preference Network of Shipboard Facilities

Conclusion

It can be concluded that 11 (73.33%) ports have reached efficiency, while the other four ports have not reached efficiency, although they are main ports, namely, Belawan, Tanjung Emas, Sampit, and Merauke. Port of Belawan obtains the lowest efficiency value with 76,43%. The four ports have not achieved efficiency due to input wastefulness compared to the output produced.

Based on preference analysis, the main reasons why passengers choose ships is because ships have complete facilities, allow them to carry more goods, are more convenient, affordable ticket prices, and because passengers usually travel in groups. Users are most concerned with and want complete facilities, comfort, safety and order, viability and accessibility to reach the ports and board the ships.

Reference

American Association of Port Authorities. (2005). *Maritime transportation system security recommendations*. Washington DC.

Babaee, S., Bagherikahvarin, M., Sarrazin, R., Shen, Y., & Hermans, E. (2015). Use of DEA and PROMETHEE II to assess the performance of older drivers. *Transportation Research Procedia*, *10*(July), 798–808. https://doi.org/10.1016/j.trpro.2015.09.033

Charles, A., Cooper, W. W., Lewin, A. Y., & Seiford, L. M. (1994). *Data envelopment analysis: Theory, methodology, and applications*. *Data Envelopment Analysis: Theory, Methodology, and Applications*. Texas: University of Texas. https://doi.org/10.1007/978-011-0637-5

Chee, W. L., & Fernandez, J. L. (2013). Factors that influence the choice of mode of transport in Penang: A preliminary analysis. *Procedia - Social and Behavioral Sciences*, *91*(225), 120–127. https://doi.org/10.1016/j.sbspro.2013.08.409

Coelli, T. J., Rao, D. P., O'Donnell, C. J., & Battes, G. E. (2005). *An introduction to efficiency and productivity analysis* (second ed). Springer. https://doi.org/https://doi.org/10.2307/2531310

Drennan, M., & Brecher, C. (2012). Can transportation increase economic efficiency? *Access Magazine*, (40), 29–33.

Langen, P. W. De, Range, L. H., & Langen, P. W. De. (2012). Combining models and commodity chain research for making long-term projections of port throughput: An application to the Hamburg-Le Havre range. *European Journal of Transport and Infrastructure Research*, *3*(12), 310–331.

Li, B., Jin, Q., & Guo, H. (2013). Research on psychological characteristics of passengers in terminal and some related measures. *Procedia - Social and Behavioral Sciences*, *96*(Cictp), 993–1000.

https://doi.org/10.1016/j.sbspro.2013.08.113

Pantouvakis, A., Chlomoudis, C., & Dimas, A. (2008). Testing the servqual scale in the passenger port industry: A confirmatory study. *Maritime Policy and Management*, *35*(5), 449–467. https://doi.org/10.1080/03088830802352095

Saaty, T. L. (2008). Decision making with the analytic hierarchy process. *International Journal of Services Sciences*, *1*(1), 83. https://doi.org/10.1504/IJSSCI.2008.017590

UNCTAD. (2016). *Review of Maritime Transport 2016*. *Review of Maritime Transport -UNCTAD/RMT/2016*. https://doi.org/10.1017/CBO9781107415324.004

Vaggelas, G. K., & Pallis, A. A. (2010). Passenger ports: Services provision and their benefits. *Maritime Policy and Management*, *37*(1), 73–89. https://doi.org/10.1080/03088830903461209

Wildenboer, E. (2015). *The relation between port performance and economic development (Literature review and case study of the Hamburg-Le Havre Range)*. *Erasmus University Rotterdam*. Rotterdam.

Yudhistira, M. H., & Sofiyandi, Y. (2017). Seaport status, port access, and regional economic development in Indonesia. *Maritime Economics & Logistics*, (4). https://doi.org/10.1057/s41278-017-0089-1

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

Strategies for increasing tax revenue in tourism sector

Horas Djulius

Faculty of Economics and Business, Universitas Pasundan, Bandung, Indonesia

Article Info

Article history:
Received : 8 September 2017
Accepted : 28 January 2018
Published : 6 March 2018

Keywords:
tax morale, tax complience, public service, ordered probit

JEL Classification:
H26, H71, L83

DOI: 10.20885/ejem.vol10.iss1.art7

Abstract

This study examines taxpayer considerations to fulfill their obligations since law enforcement and tax administration improvement were not adequate to explain the gap between actual tax and its target. A survey was conducted to hotel, restaurant and tourist destination managers in Bandung since one-third of local taxes derived from the tourism sector. We use a probit model to clarify the influence of religious activities, trust in government institutions, public services, people's pride, pro-democratic attitude, to taxpayer morality. The study concludes that taxpayers in the tourism sector have a higher local tax morality than central tax morality and only the public services which have a consistent and significant impact on both tax moralities. The local governments and central government can develop improved strategies to increase revenue from tourism sector by providing better public service, which directly or indirectly enhances the tourism sector performance.

Introduction

For almost ten years tax realization and target in Indonesia has a rising trend. Improvement of this target is in line with the need for development funding, and the increased realization is aligned with economy capability. The problem is since 2009 there has been an increasing gap between an actual and targeted tax (Negara, 2016). Historical data shows that the ratio continues to fall until 81% in 2015 and 2016. Assuming that the determination of the targeted tax has taken into account economy capability to finance the development then it is likely the problem lies in the effort to achieve the tax realization. There are indications that the tax amnesty program launched by the government in 2016 has not been able to lead the tax realization approaching its target.

There are differences between tax compliance and tax morale though there is no doubt that they have a close relationship (Bilgin, 2014; Filippin, Fiorio, & Viviano, 2013; Zeng, 2014). Some tax compliance determining factors are the tax law system, tax law enforcement, and the nature of government spending (Rashidah & Faisal, 2015). Included in the tax law system are the complexity, ambiguity and the legal system of tax fairness (Zeng, 2014). On the other hand, the tax morale is closer to the value of the taxpayer which drives him to comply (Cummings, Martinez-Vazquez, McKee, & Torgler, 2009; Schneider, Torgler, & Schneider, 2006). In short, tax morale is an intrinsic motivation for paying taxes. Thus there is complementary nature between tax compliance and tax morale (Alasfour, Samy, & Bampton, 2016). Therefore, examine the level, and the factors that affect tax morale may help to understand the conditions of tax compliance that exist in the country (Alasfour et al., 2016; Doerrenberg & Peichl, 2013).

Factors affecting tax morale can be divided into two parts: social factors (irregular behavior based on social norms) and institutional factors. The social norm is the regularity of behavior which is based on the belief shared socially how people should behave which triggers the enforcement of conduct determined by social sanctions (Xin Li, 2010). In the context of tax payments, social factors mean people's willingness to pay taxes voluntarily according to social norms embraced by the community (Fehr & Fischbacher, 2004). The social norm is the regularity of behavior which is based on the belief shared socially how people should behave which triggers the enforcement of conduct determined by social sanctions. In the context of tax payments social factors mean people's willingness to pay taxes voluntarily according to social norms embraced by the community (Fehr & Fischbacher, 2004; Xin Li, 2010).

The religious activity consists of three elements, one of which is guilt and shame. Feelings of guilt and shame can arise in society and make it an adopted norm. Guilt arises when the individual realizes that they have been acting irresponsibly and breaking the rules or social norms which have been internalized. If the obligation to pay taxes to the government is the accepted social norm then people who choose not to pay

P ISSN 2086-3128 | E ISSN 2502-180X
*Corresponding Author e-mail: horasdjulius@unpas.ac.id

taxes would feel guilty (Onu, 2016; Torgler, 2010). Institutional factors related to aspects which can explain how citizens perceive how taxes are being spent. These factors include support for democracy, trust in government, and preferences for redistribution (OECD, 2013). If people believe that government professionalism can be maintained, then the community tax morale will also be maintained (Alasfour et al., 2016; Vlachos & Bitzenis, 2016).

The next institutional factor that also dominant is public services or public goods. The higher benefit of public services and public goods benefit perceived by the public, the higher society tax morale. In a country where there is fiscal decentralization, there are two types of public service that are provided by the central government and local governments. Communities may be able to distinguish which public services are provided by the central government and which are provided by the local government. The question is whether the public's knowledge of this will have an impact on their tax morale to the central government tax and local government tax. Logically, the difference in public service perceived by the public will lead to differences in tax morale as well. The public perception of particular public service may also affect the perceptions of other public services. Disappointment in receiving public services from one level of government will bring the public to lower level of tax morale. Public spending may affect tax morale of society through public goods or public services perceived by the public (Torgler, 2010; Torgler, Schneider, & Schaltegger, 2010). National pride is the positive effect that the public feels towards their country caused by national identity. If national pride public is high, then there will be a push to fulfill obligations as citizens, which means tax morale will also rise (Macintyre, 2015).

Through a democracy, people believe that the executive is proper running because it monitored by the legislature. Likewise, the judicial body may perform its function as law enforcement which guarantees every citizen is carrying out its obligations and accept their rights. The higher the taxpayer's participation in political decision-making is the higher the confidence and tax morale. Such community participation is closely related to the determination of public services received by the public (Cummings et al., 2009; Daude & Melguizo, 2010). What has not been widely discussed in the literature is the tax morality for certain tax types and at certain government levels. Thus this research will add to the tax morality literature about certain types of taxes.

This study highlights the preferences of related-to-tourism sector company managers. From their business activities, these managers pay local taxes and central government taxes. That is, implicitly this research exploring whether there is a different level of tax morality between local taxes and central government taxes. Also, this study emphasizes the depth analysis of the predictor(s) that significantly affect the level of tax morality. This variable can form the basis for determining the tax revenue increase strategy set by the government.

Research Method

The study population was the small-medium sized businessman in the tourism sector in Bandung. They are local taxpayers as well as central government taxpayers. The tourism sector in Bandung city was selected because one-third of Bandung local tax contributed from hotel and restaurant taxes. Small-medium scale enterprises were chosen because in such business person who determines tax payments the company is the leader of the company itself. In fact, in many cases, the company is still in the form of the individual company where the owner doubles as manager. Also, the selection of small and medium-sized businesses also based on the fact that they often do not have staff who skilled enough to handle tax reporting so that relevant to taxpayer compliance (Abrie & Doussy, 2006; Kamleitner, Korunka, & Kirchler, 2012). Based on these criteria, we chose three types of business which included in the population, namely: (I) hotel, (ii) the restaurant, and (iii) tourist destination. The following table shows the sample population which selected based on cluster random sampling method.

Table 1. Population and Sample

	Population Size	Sample Size
Hotels (1,2 and 3 star hotels)	80	15
Restaurant (small and medium scale)	343	65
Tourist Attraction	11	2
Number of Population and Sample	434	82

The minimum sample size of 82 is based on the following calculations.

$$n = \frac{N}{1+Nd^2} = \frac{434}{1+434(0,10)^2} = 82 \quad (1)$$

We surveyed in the January-March 2017 period because the time is close to the tax reporting deadline. Reporting deadline for the personal income tax is the end of March, and the corporate income tax is in April. Thus this period considered relevant to selected because is close to the decision of the taxpayer to report on their income taxes.

The questionnaire was prepared based on the variables measured. The dependent variable or tax morale is measured by an index ranking according to the respondent answers. The questions are "If there is a chance, do you want to avoid taxes either partially or totally?". Respondents were given the index 1 to 4, each of which means: do not want, do not particularly want, want, and, really do not want. When the survey conducted, the question is not delivered straightforward but through an in-depth discussion about what they do and consider in paying taxes.

Other variables measured by an index of 1 to 10 according to the respondents' answers to the questions given. For example, questions that measure the "trust in government institutions" conducted by the question "How do you believe the government/parliament in carrying out its role as good as possible?". Index 1 means "no confidence" and the index of 10 means "very confident". The index range made long enough to form the semantic differential scale.

All questions were divided into two parts to the context of the central tax (or the central government) and the context of local taxes (or local government). The division is conducted to examine whether there are differences in the tendency tax morale and the factors that affect it.

We use ordered probit model because of its ability to cover ordinal scales (more than two outcomes) of dependent variables. In this study, the dependent variable is "tax morale" by the index of 1,2,3,4. Therefore, the model probit is expected to be able to capture the order of the answers given. Here are the general models of an ordered probit we used.

$$TAMO_i = \beta_0 + \beta_1 RELI_i + \beta_2 TRUST_i + \beta_3 PUBLIC_i + \beta_4 PRIDE_i + \beta_5 DEMOC + \varepsilon_i \quad (2)$$

Where TAMO measures tax morale, RELI covers religiosity; TRUST is trust in government institutions, PUBLIC the public services received by communities, PRIDE the pride of being part of the community, DEMOC is a proxy for the degree of direct democracy.

Results and Discussion

Differences in tax morale

The previous section described the measurement of tax morale and the meaning of each index. In contrast with the rest of the independent variables the higher the variable scale tax morale continued to show unfavorable conditions. Table 2 shows the distribution of respondents' answers on tax morale for central government tax and local government tax.

Table 2. Dependent Variables Frequencies

TAMO-Central Gov Tax			TAMO-Local Gov Tax		
Dep. Value	Count	Percent	Dep. Value	Count	Percent
1	7	6.86	1	18	17.65
2	16	15.69	2	46	45.10
3	72	70.59	3	38	37.25

Table 2 provides an overview that respondents are more likely to respond positively to local taxes than central government taxes. The similarity of respondents' answers to tax morale of local taxes and central government taxes is that they do not have a score of 4. It means that respondents tend not to choose the extreme answer that is "really want to avoid tax". Thus, the selection of a score of 1-4 for the tax morale variable is effective. The courtesy of the Indonesians may make them hesitate to be candid about "wanting to avoid taxes". In other words, in addition to score one, it can be said that there is a desire to avoid taxes. Furthermore, diversity in respondents' answers was tested using the mean difference test as follows.

Table 3. Test for Equal Dependent Variable Means

	Central Gov TAMO	*LocalGov TAMO*
Mean	2.77451	2.196078
Variance	0.453601	0.515628
t	-9.18326 ***	

Note : ***, significant at 0.01 level

Table 3 shows the differences in tax morality between local taxes and central government taxes. It is an interesting finding because since 2000 Indonesia has been in the era of regional autonomy. This difference will have a different problem handling.

Description of independent variables

Once we perceive the difference of tax morality between local tax and central government tax then next we test whether there is a difference between the predictors in both levels of the tax. The average value of the five predictors, which has a scale of 1-10, is shown in the following table.

Table 4. Descriptive Independent Variable

In the context of the central government-Indonesian citizen					
	RELI	PRIDE	PUBLIC	TRUST	DEMOC
Mean	5.91	5.62	7.19	6.44	5.61
Maximum	8.00	8.00	10.00	9.00	8.00
Minimum	4.00	4.00	5.00	4.00	4.00
In the context of the local government-Bandung citizen					
	RELI	PRIDE	PUBLIC	TRUST	DEMOC
Mean	5.92	5.46	7.18	6.00	5.60
Maximum	8.00	9.00	10.00	8.00	8.00
Minimum	4.00	2.00	5.00	4.00	4.00

The lowest score is pro-democratic attitude, followed by people's pride in their nationality and then religious activity. The next one is the trust on government institution and the highest in the public service received and perceived by the community. It appears that there is no significant difference in scores for both taxes, local taxes, and central government taxes. That is, people perceive nothing different to religiosity, the pride of society to nationality, public service, belief in government institutions and attitude to democracy, but on the other hand, they have different tax morality between local taxes and central government taxes.

Factors affecting tax morale

Once we know that there is a tax morale difference between local taxes and central government taxes than the next step, using the probit model, we explore how predictor variables affect tax morale. The following table denotes the estimation of tax morale probit model on both tax levels.

Decentralization is a transfer of authority from central government to local authorities to manage its local affairs based on the initiatives and aspirations of its people within the framework of the unitary Republic of Indonesia. The Bandung local government, which receives most of the authority from the central government, will then provide services corresponding to the authority obtained. Taxpayers in the tourism sector would easily be able to identify any tax, whether it is a central tax or local tax. Likewise, they can distinguish any city government services arising from the delegation from part of the authority.

Table 5 provides information on the variables that affect tax morale for central government tax. All variables have negative influences on the tax morale by the research hypothesis. The first variable is public religiosity. It is difficult to measure a person's religiosity only by what is observed. However, this study measures some tangible activities as a proxy of one's religiosity. We use frequency of a person going to a mosque, church, temple or monastery as the main indicator. This measure is simpler than that of previous researchers that one's religiosity can be subdivided into guilt and shame as well as duty and fear. For

Indonesians, this value can be proxied from their frequency of worship. Unfortunately, the influence of religiosity on tax morale is insignificant which means we cannot take a conclusion about the relationship between the frequency of worship with tax morale, for the type of central government tax.

Table 5. Ordered Probit For Central Government Tax Morale

Y= Tax Morale for Central Gov Tax		
Variable	Coefficient	z-Statistic
RELI	-0.052	-1.232
TRUST	-0.381	-2.101**
PUBLIC	-0.383	-2.776**
PRIDE	-0.112	-0.511
DEMOC	-0.127	-1.692
	Limit Points	
LIMIT_2:C(6)	-7.934	-5.551***
LIMIT_3:C(7)	-6.380	-4.512***

Note: *** and ** indciate significant at 0.01 and 0.05 level

Table 6. Ordered Probit For Local Government Tax Morale

Y= Tax Morale for Local Gov Tax		
Variable	Coefficient	z-Statistic
RELI	-0.080	-1.299
TRUST	-0.199	-1.665
PUBLIC	-0.586	-3.255***
PRIDE	-0.0364	-0.522
DEMOC	-0.2789	-2.189**
	Limit Points	
LIMIT_2:C(6)	-9.577	-4.353***
LIMIT_3:C(7)	-8.562	-3.453***
LIMIT_4:C(8)	-5.781	-3.145***

Note: *** and ** indicate significant at 0.01 and 0.05 level

The second variable to affect tax morale is trust in government institutions. This variable is linked to several indicators such as corruption in government institutions revealed and known by the public (Alasfour et al., 2016; Bouckaert & van de Walle, 2003; Vlachos & Bitzenis, 2016). The data in table 4 states that the trust in government institution is moderate with an index of 6, perceived by respondents either to the central government or local government. The number of corruption cases involving the government does have a dual meaning. The first meaning, many government apparatus is corrupt, and therefore people do not believe in a government institution. Secondly, the government is seriously implementing the anti-corruption agenda and therefore trust in government is high. Back to table 5 and table 6, trust in central government has a significant influence, but not to local governments. Possibly, this is relevant to the existence of a corruption eradication commission that reveals many corruption cases on a national scale. If we believe that the tax morale is behind the tax compliance, then public confidence in the government becomes one of the concerning aspects and become the basis for tax realization policy (Doerrenberg & Peichl, 2013; Luttmer & Singhal, 2014; Sá, Martins, & Gomes, 2014). Unfortunately, we find no significant relationship between trust in government and tax morale on the local government level.

The third variable and perhaps the most important variable in this study is the public service received by the taxpayers. From the statistics in table 4, we find that this variable has the highest index, both for services provided by the central government or by the local government. Interestingly, public services have a significant effect on tax morality, for both levels of government service. Services and public goods impacting the tourism sector development within an area is provided by the central and local governments. Usually, the central government provides indirect services, whereas, local governments provide direct and indirect services. When viewed from the tourism sector development some services have an impact on the supply side and other have an impact on the tourism market. The integrated tourism industry consists of travel organization,

transportation, accommodation, food and beverage, handicraft, tourism assets in the destination, leisure tours and support services (UNEP-WTO, 2005).

Central and local governments can provide direct services throughout the business line, or, may also provide indirect services. Improving the quality of human resources in the tourism sector is an example of direct service, whereas, airport improvements, railway stations, and bus terminals, or even highway congestion control are examples of indirect services affecting the tourism sector. Also, there are more government services that impact tourism marketing that may be perceived by tourism actors quite hard to undertake. Related to this, some government activities are tourism exhibition, tourism-sector gathering, and direct promotion at home and abroad. Interestingly, lately, the press became an effective medium in conducting tourism marketing. However, the news that the press do is related to the creativity of local governments in developing the tourism sector in the region. The more creative the local government to package the tourism sector, the more news issued the more intensive tourism marketing. All of them are forms of government services that are consecutive to the development of tourism sector.

People's pride of being a citizen is the fourth variable expected to affect taxpayers' morale in the tourism sector. In many other countries, people's pride is influential, and some do not affect, on the tax morality. In fact, the urban population is made up of various ethnicities, so the proud being citizen becomes a very important issue that can support development (Xin Li, 2010). Unfortunately, this variable is the lowest index among other variables. Also, people's pride does not have a significant effect on tax morality.

The last variable which hypothesized to influence tax morale is the pro-democratic attitude of the community. The pro-democratic attitude index for the two levels of government is not much different, as illustrated in Table 4. However, its effect on tax morality is different. Against the morality of the central tax, the influence is not significant while toward regional tax, it is significant. Although somewhat difficult to explain, this possibility is related to the effectiveness of executive, legislative and judicial work at the local level, which is more easily observed by local communities and appraised higher than the national level.

Conclusion

Bandung is a model of a city whose tax revenues are formed primarily by the tourism sector. This city's tourism type is based on creative industries particularly from fashion and culinary. In fact, the tax realization of this sector is still below its potential. This study reveals what lies behind taxpayer compliance, specifically is tax morality, which underlies the tax revenue of the tourism sector. This study also measures the level of taxpayers' morality for central government tax and local taxes. The probit model clarifies the influence of religious activities, trust in government institutions, public services, people's pride, pro-democratic attitude, to taxpayer morality. The influence of each predictor turns out to be different in explaining the morality of local taxes and central taxes. There is only one variable that significantly affects both, i.e. public service. Thus, the tax revenue increase strategy might begin with increasing the public service related to the type of tourism available, in this case, is creative industry-based tourism.

Local governments must creatively cooperate with the central government and private parties in maximizing their role of providing public service to taxpayers in the tourism sector. Taxpayers will benefit if local governments can invite the private sector in marketing the tourism sector. Likewise, the tourism sector will benefit if local governments can engage the central government to share the role of providing the necessary public services. Increasing the number and quality improvement of urban infrastructure, which can be met together by the central government and local governments is a public service that indirectly impacts the tourism sector. Improving the investment climate, improving the quality of human resources, or improving the network of actors in the tourism sector are some other strategies that can directly improve the development of tourism sector that can be pursued by the local government.

Acknowledgement

The author is grateful to the Research Center of Faculty of Economics & Business-Universitas Pasundan for supporting this research, through a research funding scheme for the first semester of 2017. We also appreciate the anonymous referees of the journal for their extremely useful suggestions to improve the quality of the article.

Reference

Abrie, W., & Doussy, E. (2006). Tax compliance obstacles encountered by small and medium enterprises in South Africa. *Meditari Accountancy Research*, *14*(1), 1–13. https://doi.org/10.1108/10222529200600001

Alasfour, F., Samy, M., & Bampton, R. (2016). *The determinants of tax morale and tax compliance: Evidence from Jordan. Advances in Taxation* (Vol. 23). https://doi.org/10.1108/S1058-749720160000023005

Bilgin, C. (2014). Determinants of tax morale in Spain and Turkey: An empirical analysis. *European Journal of Government and Economics*, *3*(1), 60–74.

Bouckaert, G., & van de Walle, S. (2003). Comparing measures of citizen trust and user satisfaction as indicators of "good governance": Difficulties in linking trust and satisfaction indicators. *International Review of Administrative Sciences*, *69*(3), 329–343. https://doi.org/10.1177/0020852303693003

Cummings, R. G., Martinez-Vazquez, J., McKee, M., & Torgler, B. (2009). Tax morale affects tax compliance: Evidence from surveys and an artefactual field experiment. *Journal of Economic Behavior and Organization*, *70*(3), 447–457. https://doi.org/10.1016/j.jebo.2008.02.010

Daude, C., & Melguizo, Á. (2010). *Taxation and more representation? On fiscal policy, social mobility and democracy in Latin America. OECD Development Centre*.

Doerrenberg, P., & Peichl, A. (2013). Progressive taxation and tax morale. *Public Choice*, *155*(3–4), 293–316. https://doi.org/10.1007/s11127-011-9848-1

Fehr, E., & Fischbacher, U. (2004). Social norms and human cooperation. *Trends in Cognitive Sciences*, *8*(4), 185–190. https://doi.org/10.1016/j.tics.2004.02.007

Filippin, A., Fiorio, C. V., & Viviano, E. (2013). The effect of tax enforcement on tax morale. *European Journal of Political Economy*, *32*, 320–331. https://doi.org/10.1016/j.ejpoleco.2013.09.005

Kamleitner, B., Korunka, C., & Kirchler, E. (2012). Tax compliance of small business owners: A review. *International Journal of Entrepreneurial Behaviour & Research*, *18*(3), 330–351. https://doi.org/10.1108/13552551211227710

Luttmer, E. F. P., & Singhal, M. (2014). Tax morale. *Journal of Economic Perspectives*, *28*(4), 149–168. https://doi.org/10.1257/jep.28.4.149

Macintyre, A. J. (2015). *An empirical examination of the consequences of national pride: Analyses of survey and experimental data. School of Economics and Finance, Queensland University of Technology.*

Negara, S. D. (2016). *Indonesia's 2016 budget: Optimism amidst global uncertainties. PERSPECTIVE Yusof Ishak Institute*.

OECD. (2013). *What drives tax morale? Tax and Development Programme Centre for Tax Policy and Administration*.

Onu, D. (2016). Measuring tax compliance attitudes: What surveys can tell us about tax compliance behaviour. https://doi.org/10.1108/S1058-749720160000023006

Rashidah, A. R., & Faisal, D. (2015). Humanomics article information. *Humanomics*, *31*(3), 354–371. https://doi.org/10.1108/H-04-2014-0037

Sá, C., Martins, A., & Gomes, C. F. (2014). Tax morale, occupation and income Level: An analysis of Portuguese taxpayers. *Journal of Economics, Business and Management*, *2*(2), 112–116. https://doi.org/10.7763/JOEBM.2014.V2.108

Schneider, F., Torgler, B., & Schneider, F. (2006). *What shapes attitudes toward paying taxes ? Evidence from multicultural European countries*.

Torgler, B. (2010). Post-communist economies tax morale in transition countries, (July 2012), 37–41.

Torgler, B., Schneider, F., & Schaltegger, C. A. (2010). Local autonomy, tax morale, and the shadow economy. *Public Choice*, *144*(1), 293–321. https://doi.org/10.1007/s11127-009-9520-1

UNEP-WTO. (2005). Making tourism more sustainable. A guide for policy makers. *Environment*, *54*(2), 222. https://doi.org/92-807-2507-6

Vlachos, V. A., & Bitzenis, A. (2016). Tax compliance of small enterprises in Greece. *International Journal Entrepreneurship and Small Business*, *28*(2/3), 380–389. https://doi.org/10.1504/IJESB.2016.076646

Xin Li, S. (2010). Social identities, ethnic diversity, and tax morale. *Public Finance Review*, *38*(2), 146–177. https://doi.org/10.1177/1091142110369239

Zeng, T. (2014). *What affects tax compliance behaviour: A survey study*. *International Proceedings of Economics Development and Research* (Vol. 69). https://doi.org/10.7763/IPEDR.

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

Cross–asset class portfolio between gold and stocks in Indonesia

Mesakh Prihanto Surya Putra, Apriani Dorkas Rambu Atahau, Robiyanto Robiyanto*

Faculty of Economics and Business, Satya Wacana Christian University, Salatiga, Indonesia
* Corresponding Author

Article Info

Article history:
Received : 2 February 2018
Accepted : 25 March 2018
Published : 30 April 2018

Keywords:
Cross-asset class portfolio, DCC-GARCH, Hedging effectiveness, Risk-adjusted return

JEL Classification:
G10; G11; G15

DOI: 10.20885/ejem.vol10.iss1.art8

Abstract

This study observes the effectiveness of hedging by using the gold commodity futures instrument as a hedge asset towards Indonesian stock which is represented by sectoral indices and Composite Stock Price Index (CSPI). It uses DCC-GARCH which can dynamically accommodate the correlation between gold and the stock. This study finds that gold could become a safe haven asset towards stock in Indonesia. In addition, this study reveales that gold can effectively become a hedge asset for the stocks in Indonesia and the hedged portfolio resulted in a higher risk-adjusted performance of the portfolio of investment.

Introduction

Since the Bretton Wood System collapsed in 1968–1973, the important role of gold as a criterion of the currency value in the international monetary system is no longer in place. Nevertheless, the usage of gold by the investors remains because of its hedging and safe- haven capability towards the other assets. Other than that, gold is also the type of precious metal that universally acceptable, durable, easily authenticated, and relatively transportable compared to other assets (Worthington & Pahlavani, 2007). Gold is considered as an asset that frequently observed and provides an effective hedging abillity when the inflation occurred (Dempster & Artigas, 2010).

Baur & Lucey (2010) define hedge as an asset which has negative correlation or zero correlation toward another asset when the market does not show any turmoil condition. While safe haven is defined as an asset that has negative correlation or zero correlation towards another asset when market turmoil occurs. The previous research by Capie, Mills, & Wood (2005) showed that gold could become a hedge asset against Dollar. Beckmann, Berger, & Czudaj (2014); Robiyanto, Wahyudi, & Pangestuti (2017a) also found that generally gold is a hedge asset against the other assets in a portfolio and it depends on the economic environment that had been observed. Baur & Lucey (2010) found that gold is a hedge asset of stock in the United States of America and the United Kingdom, gold is also a hedge asset for the bond in Germany. Furthermore, Baur &Lucey (2010) have concluded that gold is a safe haven asset against stock in 15 trading days after the turmoil market has occurred. Based on the previous studies, it could be inferred that gold is decent to become a hedge asset and safe haven toward the other asset for minimizing the risk of the portfolio.

Putting gold in one portfolio of stock investment is possible since the portfolio that has been composed is a cross-asset class portfolio. Greer (1997) stated that asset allocation should be using the cross-asset class portfolio to adjust the actual market condition. The cross-asset class portfolio is defined by Baur (2013) as a portfolio that has been composed of assets in different classes, for instance, fixed-income assets (bond, government bond), stock, and cash.

Enhancing numbers of assets in different asset classes into the portfolio is a part of portfolio diversification strategy. Diversification by adding numbers of a different asset class that invested can reduce the total risk of a portfolio because the diversifiable risk of the portfolio is effectively reduced. Markowitz (1952) also introduced modern portfolio theory that assumes a normal distribution of stock return and used single index model that generates a constant correlation. Utilization of a normally distributed assumption by Markowitz due to the formulation of the modern portfolio that had been composed by Markowitz using mean and variance and both can be clearly described when the stock return is normally distributed. (Damodaran, 2008).

However, the utilization of assumption that assumes a normal distribution of stock return is not in accordance with the actual condition because the stock return tends to abnormally distributed in actual condition (Robiyanto, 2017a; Robiyanto, 2017b; Robiyanto & Puryandani, 2015; Robiyanto et al., 2017b). Research conducted by Aparicio & Estrada (2001); Ogata (2012); Robiyanto, Hersugondo, & Puryandani (2015) proved that the stock return is abnormally distributed and it reinforced the criticism of modern portfolio. Other than that, the dynamic condition of the market will be better if it was followed by the utilization of dynamic portfolio that considers and adjusts the portfolio with time-varying correlations than the utilization of single index portfolio.

Some of the studies that use the dynamic portfolio to evaluate the portfolio performance and the effectiveness of hedging process are the studies that have been done by Robiyanto et al. (2017b). However, both of the studies do not use the calculation of Adjusted Sharpe Index (ASI). The calculation of ASI is useful to reduce the bias that might be appeared in the estimation of standard deviation at traditional Sharpe Index calculation (Jobson & Korkie, 1981; Robiyanto, 2018). Besides using Sharpe Index that utilizes standard deviation or total risk, this research also uses Treynor Index that utilizes beta or undiversifiable risk (Zulkafli, Ahmad, & M., 2017). The return of each index in Indonesia will be paired with gold to measure the portfolio performance that can be shown by the risk-adjusted return (Sharpe, ASI, and Treynor) calculation. This research uses not only the Composite Stock Price Index (CSPI) on the Indonesian Stock Exchange (IDX) but also nine sectoral indices. Nine sectoral indices are chosen to know the effectiveness of hedging in every sector of Indonesia capital market. The differences between each character of the indices may provide different results of the hedging effectiveness and the portfolio performance, thus making this research appealed to be done.

This research aims to examine the effectiveness of hedging by combining gold with an Indonesian stock which is represented by the CSPI or nine sectoral indices into one dynamic portfolio. Furthermore, this study aims to analyze the dynamic portfolio performance that would be shown by the risk-adjusted return by composing a hedged portfolio between gold and Indonesian stock using the DCC-GARCH method. The benefits of this research are as reference material for investors in deciding the hedging strategy on the portfolio and this research also useful for academics in providing additional information about investment knowledge and portfolio management especially on the creation of hedging strategy.

Research Methods

Monthly closing prices of the Composite Stock Price Index (CSPI) in the Indonesian Stock Exchange (IDX) and nine Sectoral Indices which are Agriculture Index, Mining Index, Basic Industry and Chemicals Index, Miscellaneous Industry index, Consumer Goods Industry Index, Property and Real Estate Index, Infrastructure, Utilities, and Transportation Index, Finance Index, and also Trade, Services, and Investments Index are used as the data in this research. Research period between January 2011 to April 2017. This research also uses monthly closing prices of gold from January 2011 to April 2017. Data obtained from Bloomberg.
The data of CSPI return and nine sectoral indices are obtained by using a formula as follows:

$$R_{Index,t} = \left[\frac{P_{Index,t} - P_{Index,t-1}}{P_{Index,t-1}} \right] \quad (1)$$

Where,
$P_{Index,t}$ = Monthly closing prices of CSPI or nine sectoral indices at time t
$P_{Index,t-1}$ Monthly closing prices of CSPI or nine sectoral indices at time t - 1
The data of gold return are also obtained by using a formula as follows:

$$R_{Gold,t} = \left[\frac{P_{Gold,t} - P_{Gold,t-1}}{P_{Gold,t-1}} \right] \quad (2)$$

Where,
$P_{Gold,t}$ = Monthly closing prices of gold at time t
$P_{Gold,t-1}$ = Monthly closing prices of gold at time t - 1

This study uses DCC-GARCH as a method to create the dynamic portfolio, and the calculation has been done by using Eviews. Hence this study calculates the Hedging Effectiveness by using a formula that has been developed by Ku, Chen, and Chen (2007) as follows:

$$HE = \frac{\text{Variance (unhedged)} - \text{Variance (hedged)}}{\text{Variance (hedged)}} \quad (3)$$

Variance (hedged) shows the variance of the portfolio that consists of gold and CSPI or nine Sectoral Indices while variance (unhedged) is the variance of CSPI or 9 Sectoral Indices. The greater Hedging Effectiveness in portfolio shows that portfolio strategy which has been used is a good strategy because the magnitude of Hedging Effectiveness indicates the magnitude of risk reduction in the portfolio (Kumar 2014).

Research about the risk-adjusted return of the hedged portfolio and unhedged portfolio can be done by the calculation of Sharpe Index which has been introduced by Sharpe (1966) with the following formula:

$$\text{Risk-Adjusted Return} = \frac{\text{Average of Portfolio Return} - \text{Risk–Free Rate}}{\text{Portfolio Standard Deviation}} \quad (4)$$

The standard deviation of the portfolio can be obtained by using the following formula:

$$\text{Standard Deviation } (\sigma_i) = \sqrt{\Sigma \frac{[(R_{i,t} - E(R_{i-t})]^2}{N}} \quad (5)$$

The calculation of Adjusted Sharpe Index also has been done by previous researchers like Ahmad & Ibrahim (2002); Pangestuti, Wahyudi, & Robiyanto (2017) and Zulkafli et al. (2017) by using the following formula:

$$\text{Adjusted Sharpe Index (ASI)} = \text{Sharpe Index} \times \frac{\text{Number of Observations (N)}}{\text{Number of Observations (N)} + 0.75} \quad (6)$$

The calculation of risk-adjusted return by Treynor's Index can be done by using a formula as follows:

$$\text{Treynor's Index: } \frac{\text{Average Return on Portfolio} - \text{Risk–Free Rate}}{\beta i} \quad (7)$$

The Coefficient of βi is obtained by doing a regression test of the CSPI's return or nine sectoral indices' return with the market return, and the regression model can be formulated as follows:

$$R_{i,t} = \sigma_i + \beta_i R_{m,t} + e_{i,t} \quad (8)$$

Where,
$R_{i,t}$ = average monthly return of CSPI or nine sectoral indices
σ_i = Constant
β_i = beta coefficient of CSPI or nine sectoral indices
$R_{m,t}$ = Daily market return of portfolio in month t
$I_{,t}$ = Unexplained residual return of the regression in month t, noted: $E(ie_{,t}) = 0$

Sharpe's Index, ASI, and Treynor's Index are tested by using two-sample t-test. Normality test is conducted before the hypothesis test to know whether this study needs to use Independent t-test or Mann Whitney test.

Results and Discussion

Unit root test

Arouri, Lahiani, & Nguyen (2014) stated that to do a test of time series data, the data should be stationary which is the Mean, and the Variance is equal all the time. Therefore, Unit Root Test has been done in this study to know whether the return of gold and return of stock are stationary or not. One of the Unit Root Test tools that are frequently used by the researchers like Kumar (2014), Sharma & Mathur (2016), Dajcman, Festic, & Kavkler (2012) is Augmented Dickey-Fuller (ADF). Hence, this study uses ADF as a tool to do Unit Root Test which can be seen in Table 1. Based on the result of the Unit Root test, the return data of gold and the return data of stock are stationary because the probability score is less than 0.05 which means the null hypothesis of unit root test that said the data are not stationary is rejected. Furthermore, DCC-GARCH can be applied because the data are stationary.

Analysis of DCC-GARCH between Gold and CSPI

The dynamic conditional correlation (DCC) between CSPI and gold is shown in Figure 1. The graph of the dynamic conditional correlation between CSPI and gold shows that in 2011 until at the beginning of the second quarter of 2013, the dynamic correlation scores between gold and CSPI are tended to negatively correlated and tend to have zero correlation. In that period, the dynamic correlation scores between gold and CSPI are also positively correlated, but the positive correlation scores are below 0.2 which is classified as very weak correlation

by Evans (1996). In other words, gold can become a good diversifier and good hedge asset for the CSPI in 2011 until at the beginning of second quarter of 2013. In the middle of the second quarter of 2013, the dynamic correlation between gold and CSPI decreased into minus 0.996.

Table 1. Augmented Dickey-Fuller Test

Description	ADF-Statistics	Probability
Gold	-9.654	0.000
CSPI	-8.868	0.000
Agriculture	-10.521	0.000
Basic Industry and Chemical	-8.784	0.000
Consumer Goods	-7.076	0.000
Financial	-8.787	0.000
Mining	-9.796	0.000
Miscellaneous	-9.072	0.000
Property and Real Estate	-7.807	0.000
Trade, Services and Investments	-8.328	0.000
Infrastructure, Utilities, and Transportation	-9.013	0.000

Source: Bloomberg, processed.

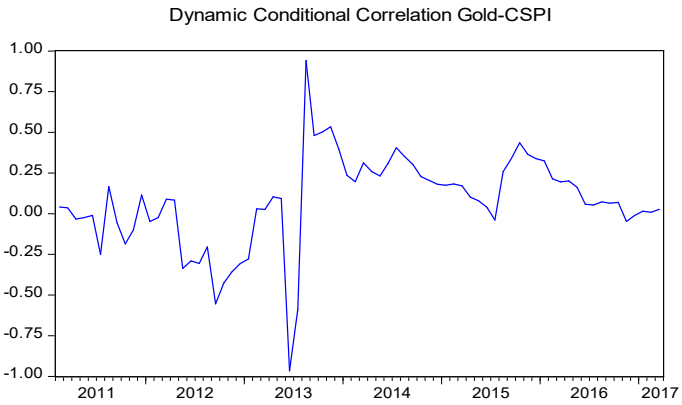


Figure 1. DCC Gold-CSPI

Figure 2. Dynamic Portfolio Weight Gold-CSPI

The sharp decline of the dynamic correlation score occurred when Indonesia was experiencing a minor crisis that was caused by the United State's tapering off issues and it caused the movement of investment funds from developing countries to the developed countries. Claessens & Kose (2013) explained that the shifting of external funding from one country to another shows Sudden Stop Crisis that is able to cause turmoil in the capital market. Therefore, the ability of gold to give a negative correlation in the portfolio that consists of CSPI can be classified as a safe haven. However, the negative correlation only occurred for approximately two months because in August 2013, the dynamic correlation score was soaring up into 0.941 and it is classified as a very strong correlation by Evans (1996). This evidence showed that gold could only become a safe haven asset temporary which was approximately 40 trading days and after that the gold price would follow the fall of CSPI

price that had been caused by the sudden stop crisis. This finding is consistent with the research conducted by Baur & Lucey (2010) who also found that gold can only become a safe haven asset temporary which is 15 trading days. Portfolio data processing using dynamic portfolio weight can be seen in Figure 2.

In Figure 2, it can be seen that after 40 trading days of market turmoil in 2013, investors are advised to form a 100% portfolio on CSPI investment and 0% on gold investments so the investors will not invest in two assets that have a positive correlation strong and it is on a bearish trend which will make the loss even greater. The dynamic portfolio weight has an average weight of 48.45% for gold and 51.55% for CSPI.

Analysis of DCC-GARCH between Gold and Nine Sectoral Indices

The DCC-GARCH graph between gold and the agriculture index in 2011 until at the beginning of second quarter of 2013 shows negative correlation scores and also zero correlation. However, in August 2011, the dynamic correlation scores were greater than zero (approximately 0.01 until 0.04), but according to Evans (1996) those correlation scores were classified as very weak correlation or in the other word, gold had a role as a diversifier in that period as can see in Figure 3.

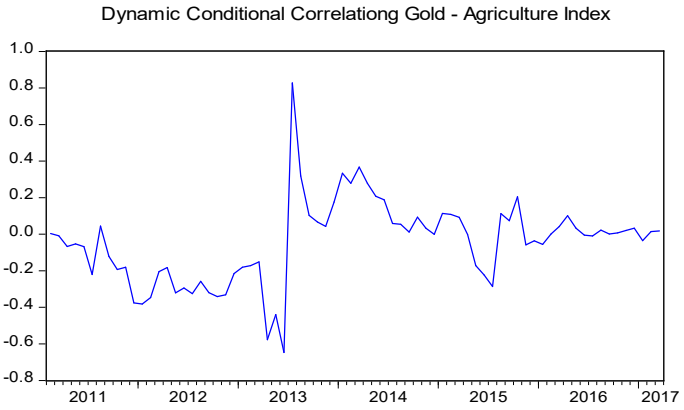


Figure 3. DCC Gold-Agriculture Industry

In the second quarter of 2013, the correlation score between gold and agriculture index decreased into minus 0.65, but at the beginning of third quarter of 2013, the correlation score increased into 0.83 which is classified by Evans (1996) as very strong correlation. The correlation scores that were generated in the second quarter of 2013 were simultaneously occurred with the sudden stop crisis. This evidence showed that gold could become a safe haven asset for the agriculture index in 40 trading days. In 2014 the correlation scores between gold and agriculture index began to shrink in the range of -0.29 to 0.37. The correlation score was obtained by performing a hedged portfolio assessment based on the weighting shown in Figure 4.

The average of dynamic portfolio weight between gold and agriculture index in Figure 4 is 47.10% weight of gold and 52.90% weight of Agriculture Index. Just like the portfolio weight between gold and CSPI, Investors are also suggested to form a portfolio that consists of 100% stock investment and 0% gold investment after 40 trading days from the occurrence of capital market turmoil in Indonesia.

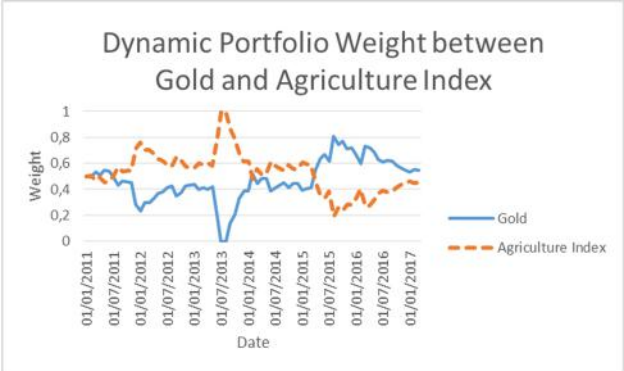


Figure 4. Dynamic Portfolio Weight Gold-Agriculture Industry

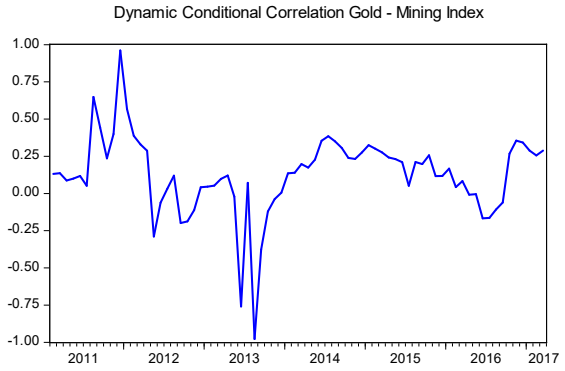


Figure 5. DCC Gold-Mining Industry

Figure 6. Dynamic Portfolio Weight Gold-Mining Industry

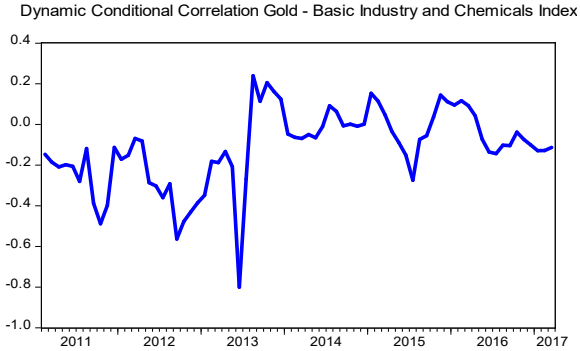


Figure 7. DCC Gold-Basic Industry

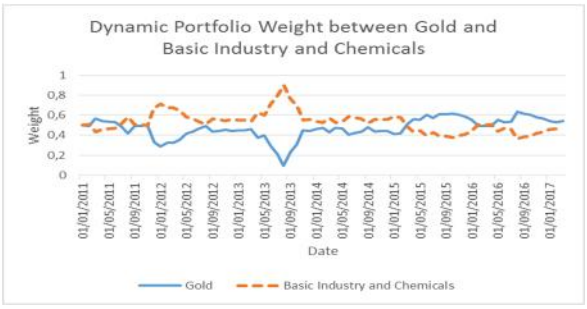


Figure 8. Dynamic Portfolio Weight Gold-Basic Industry

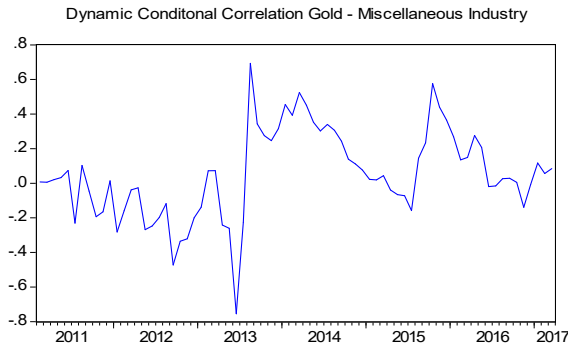


Figure 9. DCC Gold-Miscellaneous Industry

Figure 10. Dynamic Portfolio Weight Gold-Miscellaneous Industry

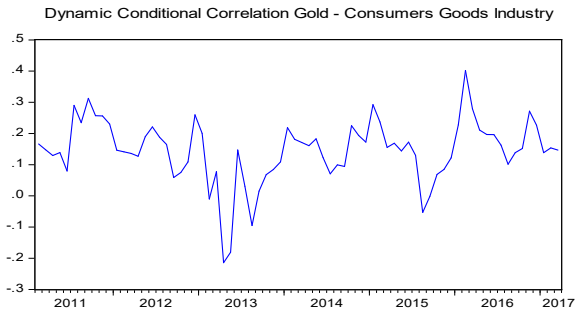


Figure 11. DCC Gold-Consumer Industry

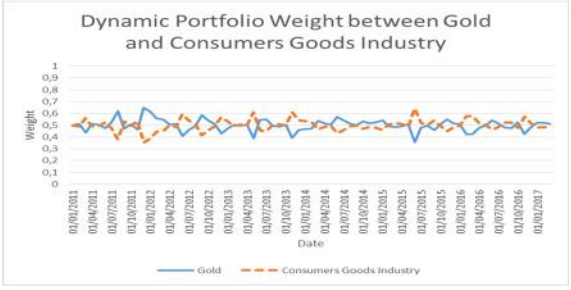


Figure 12. Dynamic Portfolio Weight Gold-Consumer Industry

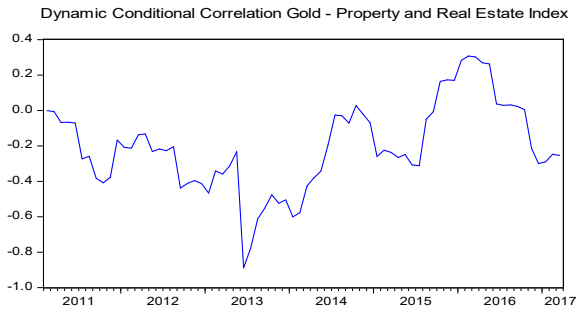


Figure 13. DCC Gold-Property Industry

Figure 14. Dynamic Portfolio Weight Gold-Property Industry

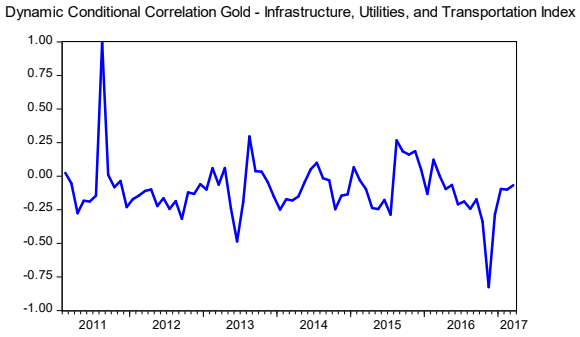


Figure 15. DCC Gold- Infrastructure Industry

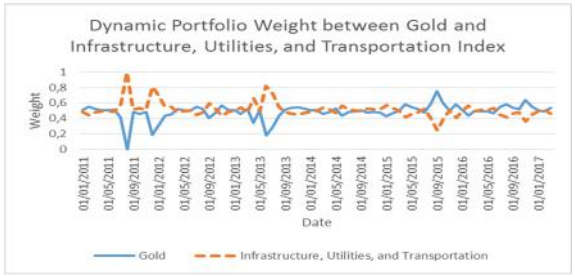


Figure 16. Dynamic Portfolio Weight Gold-Infrastructure Industry

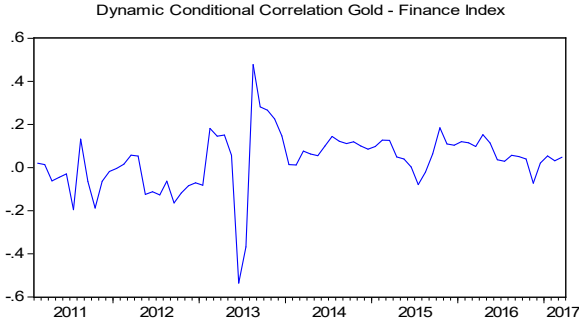


Figure 17. DCC Gold-Financial Industry

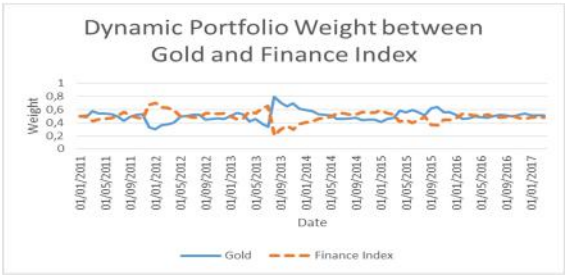


Figure 18. Dynamic Portfolio Weight Gold-Financial Industry

Figure 19. DCC Gold-Trade Industry

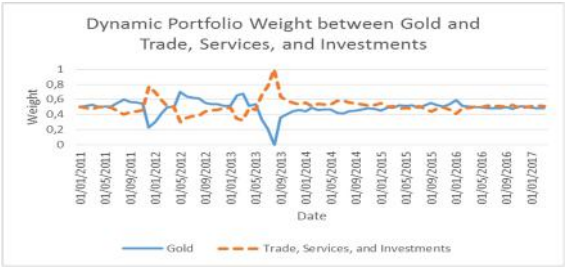


Figure 20. Dynamic Portfolio Weight Gold-Trade Industry

The next primary sector index is mining index which has the dynamic conditional correlation against the gold in Figure 5 with the average of dynamic portfolio weight in the amount of 46.18% weight of gold and 53.82% weight of mining index (Figure 6). The highest correlation score between gold and mining index was occurred in December 2011 in the amount of 0.961, while the lowest correlation score between gold and mining index occurred in August 2013 in the amount of minus 0.978. In 2013, the correlation scores between gold and mining index were also negative which mean the gold can become a safe haven asset towards mining index.

Figure 7 shows DCC-GARCH between gold and basic industry and chemicals index that classified as a secondary industry sector. The dynamic correlation scores between gold and basic industry and chemicals index were in the range of minus 0.81 to 0.24. This evidence shows that gold can become not only diversifier but also hedge asset in the research period. In the second quarter of 2013 the correlation scores between gold and basic industry and chemicals index decreased into minus 0.8, and it proves that gold can become a safe haven asset for the basic industry and chemicals index. The establishment of the portfolio between gold and basic industry and chemicals index uses dynamic portfolio weight with the average weight of 54.27% for gold and 45.73% for basic industry and chemicals index as shown in Figure 8.

The next secondary industry sector is miscellaneous industry index which has the dynamics conditional correlation as shown in Figure 9. The result of dynamic conditional correlation has been composed based on the portfolio weighting as shown in Figure 10 by the average weight of 68.2% for gold and 31.78% for miscellaneous industry index. The correlation scores between gold and miscellaneous industry index in 2011 until March 2013 fluctuated in the range of minus 0.47 to 0.1which means gold can become both a diversifier and a hedge for the miscellaneous industry index. In the second quarter of 2013, the correlation score decreased into minus 0.75, but in June 2013 the correlation score increased into 0.69 so that the gold can be classified as safe have an asset for the miscellaneous industry index because market turmoil occurred in that period. After the sudden stop crisis in 2013 elapsed, the correlation scores between gold and miscellaneous industry index fluctuated in the range of weak correlation.

Gold can only become a diversifier for consumer goods industry index which can be seen from the dynamic correlation scores in DCC-GARCH graph (Figure 11) that shows a fluctuation of correlation score in the range of 0.01 until 0.4. However, sometimes gold become a hedge asset as shown in August 2015 because of the negative correlation (approximately minus 0.05) in that time besides gold can also become a safe haven asset for the consumer goods industry index due to the negative correlation in time of market turmoil. The establishment of the dynamic portfolio was based on the dynamic portfolio weight which can be seen in Figure12 with the average weight of 49.96% for gold and 50.04% for consumer goods industry index.

Property and real estate index which classified as the tertiary index has dynamic correlation score as shown in Figure 13. The dynamic correlation in Figure 13 was built by the dynamic portfolio weight which can be seen in Figure 14. The average weight of the portfolio is in the amount of 56.38% for gold and 43.62% for property and real estate index.

The highest correlation score between gold and property and real estate index occurred in February 2016 in the amount of 0.3 while the lowest correlation score between gold and property and real estate index occurred in June 2013 in the amount of minus 0.89 along with the occurrence of sudden stop crisis. Based on Figure 13, the gold can be classified as a diversifier, hedge, and also safe haven asset for the property and real estate index.

The DCC-GARCH graph (Figure 15) shows a dynamic conditional correlation between gold and infrastructure, utilities, and transportation index. In August 2011, the perfect correlation (1,0) between gold and infrastructure, utilities, and transportation index occurred. However, in general, the correlation scores were in the range of minus 0.826 to 0.296 which mean the correlation was still in the good range for a diversifier and hedge asset. The negative correlation that occurred in the second quarter of 2013 shows that gold can become a safe haven asset for infrastructure, utilities, and transportation index. The dynamic portfolio was established based on the dynamic portfolio weight as shown in Figure 16 with the average weight of 48.67% for gold and 51.33% for infrastructure, utilities, and transportation index.

The next tertiary sector index is financial sector index which has the dynamic conditional correlation as shown in Figure 17. In Figure 17, it appears that the dynamic correlation between gold and financial sector index fluctuated in the range of minus 0.20 to 0.18. In the other word, gold can become both diversifier and hedge asset for financial sector index. In the second quarter of 2013, the dynamic correlation score between gold and financial sector index decreased from 0.15 to minus 0.54. The negative correlation between gold and financial sector index in time of market turmoil shows that gold can become a safe haven asset for financial sector index. The establishment of the dynamic portfolio was using the dynamic portfolio weight as shown in Figure 18. The average weight of the dynamic portfolio weight is in the amount of 50.65% for gold and 49.35% for the financial sector.

Dynamic conditional correlation between gold and trade, services, and investments index as shown in DCC-GARCH graph (Figure 19) shows that in the period of 2011 to March 2017, the correlation scores between gold and trade, services, and investments index were in the range of minus 0.402 until 0.372 which mean the gold can become a diversifier and safe haven asset for the trade, services, and investments index. In the second quarter of 2013, gold was negatively correlated (-0.183) with trade, services, and investments index for 40

trading days when the market turmoil occurred. This shows that gold can become a safe haven asset for trade, services, and investments index. The establishment of dynamic portfolio used dynamic portfolio weight as shown in Figure 20 which has the average weight in the amount of 49.03% for gold and 50.97% for trade, services, and investments index.

Hedging effectiveness of cross asset class portfolio

Base on the calculation of hedging effectiveness, Table 2 is represent the result of hedging effectiveness has been established. The result of Hedging Effectiveness calculation in Table 2 shows that gold can give the biggest reduction of risk to the Property and Real Estate Index with a value of 66.42% and it shows that gold can become a good hedge asset for the Property and Real Estate Index by reducing 66.42% of investment risk. The magnitude of Hedging Effectiveness value between gold and the Property and Real Estate Index shows that the risk of the Property and Real Estate Index tend to be high in the research period, and it is shown at the variance of the Property and Real Estate in the amount of 0.005 which has been reduced by the hedging process into 0.002.

Table 2. Gold Hedging Effectiveness

Description	Hedging Effectiveness
CSPI	25.30%
Agriculture	59.36%
Basic Industry and Chemical	57.57%
Consumer Goods	22.77%
Financial	52.07%
Mining	46.70%
Miscellaneous	49.87%
Property and Real Estate	66.42%
Trade, Services and Investments	40.47%
Infrastructure, Utilities, and Transportation	48.39%
Average	46.89%
Minimum	22.77%
Maximum	66.42%

The reduction of risk has occurred because of the negative correlation between gold and the Property and Real Estate index at the time of research period so that the total risk was reduced as a result of mutually negating price movement. The gold can also give a big reduction of risk to the Agriculture index with the Hedging Effectiveness value of 59.36%. It means that gold can reduce the total risk of hedge portfolio that consists of gold and Agriculture index in the amount of 59.36%. The smallest Hedging Effectiveness value is shown by the portfolio combination of gold and Consumer Goods Industry Index with the Hedging Effectiveness value of 22.77%. However, all of the Hedging Effectiveness scores is greater than zero which mean that gold can become the hedged asset for stock in Indonesia and this finding supports the study that has been done by Kumar (2014); Robiyanto et al. (2017b).

Risk-Adjusted Return of Sharpe Index, Adjusted Sharpe Index, and Treynor's Index

Risk-adjusted return that has been obtained by the calculation of Treynor, ASI, and Sharpe formula, can be seen in Table 3. Base on the calculation of risk-adjusted return by using three performance indicators which are Sharpe Index, Adjusted Sharpe Index, Treynor's Index, it can be inferred that the risk-adjusted return of hedged portfolio consisted of gold and Agriculture Index, gold and Minning Index, gold and Basic Industry and Chemicals Index, and also gold and Property and Real Estate Index are greater than the risk-adjusted return of unhedged portfolio. It means that gold can improve the risk-adjusted performance of those four sectoral indices. Furthermore, this study establishes a hypothesis for the overall risk-adjusted return testing by using two-sample t-test.

The null hypothesis is "the risk-adjusted return of the hedged portfolio is less than the risk-adjusted return of unhedged portfolio" while the alternative hypothesis is "the risk-adjusted return of the hedged portfolio is greater than the risk-adjusted return of the unhedged portfolio." This alternative hypothesis is the tailed right side (Levine, Krehbiel, & Berenson, 2006). After the hypothesis has been established, the normality

test should be done to know whether this study needs to use Independent t-test or Mann Whitney test. The output of the normality test can be seen in Table 4.

Tabel 3. Risk-Adjusted Return of Sharpe Index, Adjusted Sharpe Index, and Treynor's Index

Description	Unhedged Portfolio			Gold Hedged Portfolio		
	Sharpe	ASI	Treynor	Sharpe	ASI	Treynor
CSPI	0.051	0.050	0.002	-0.008	-0.008	-0.000
Agriculture	-0.069	-0.068	-0.006	-0.068	-0.067	-0.008
Basic Industry and Chemical	0.068	0.067	0.003	0.017	0.017	0.000
Consumer Goods	0.177	0.175	0.012	0.124	0.122	0.017
Financial	0.108	0.107	0.005	0.036	0.035	0.002
Mining	-0.189	-0.187	-0.015	-0.186	0.184	-0.018
Miscellaneous	0.058	0.057	0.003	-0.019	-0.018	-0.001
Property and Real Estate	0.153	0.151	0.008	0.121	0.119	0.008
Trade, Services and Investments	0.095	0.094	0.005	0.032	0.032	0.002
Infrastructure, Utilities, and Transportation	0.009	0.009	0.000	-0.044	-0.044	-0.004

Table 4. The Result of Normality Test By Using Kolmogorov Smirnov

Description	Sig.
Unhedged Sharpe Index	0.1920
Unhedged Adjusted Sharpe Index	0.1920
Unhedged Treynor's Index	0.0950
Hedged Sharpe Index	0.2000
Hedged Adjusted Sharpe Index	0.2000

Base on the result of normality test, the Sharpe Index, Adjusted Sharpe Index, Treynor's Index is normally distributed because all of the P-Value of the Indices is greater than 0.05 and it means that this study will use Independent t-test. The Independent t-test requires levene test as the procedure to know whether the data is equal variance assumed or equal variance not assumed. The output of Levene test is shown in Table 5

Table 5. The Result of Levene Test

Description	Sig.
Sharpe Index	0.687
Adjusted Sharpe Index	0.687
Treynor's Index	0.710

The output of Levene test shows that the Sharpe Index, Adjusted Sharpe Index, and Treynor's Index is classified as equal variance assumed because all of the P-Value of the Indices is greater than 0.05. Hence the *P*-Value that will be used is the P-Value that classified equal variance assumed which can be seen in Table 6.

Table 6. The Result of Independent t-test

Description	Sig.
Sharpe Index	0.161
Adjusted Sharpe Index	0.161
Treynor's Index	0.326

The result of independent t-test showed that the three indices which are Sharpe Index, Adjusted Index, Treynor's index of all risk-adjusted return have P-Value that less than 0.05. It means that generally the risk-adjusted return of the hedged portfolio is less than the risk-adjusted return of the unhedged portfolio. This result shows that in general, composing a portfolio which consists of gold and Indonesian stock, can make the risk of the portfolio reduced but will not increase the risk-adjusted performance. This result is supporting the research conducted by Robiyanto et al. (2017b) who also found that gold can not improve the risk-adjusted performance of a portfolio which consists of Composite Stock Price Index and gold. However, the hedged portfolio consisted

of gold and Agriculture Index, gold and Minning Index, gold and Basic Industry and Chemicals Index, and also gold and Property and Real Estate Index have better risk-adjusted performance than the unhedged portfolio. This finding is consistent with the research conducted by Kumar (2014) and Arouri et al. (2014) who also found that hedging process will improve the risk-adjusted performance of a portfolio.

Conclusion

This research concluded that gold is negatively correlated with stocks in Indonesia which are represented by Composite Stock Price Index and nine sectoral indices. The existence of a negative correlation between those two assets showed that gold could have a negative correlation with stock in Indonesia. Even, gold can become a safe haven asset for the CSPI and nine sectoral indices because gold is negatively correlated with stock in time of turmoil market that occurred in developing countries including Indonesia.

This study shows that gold can effectively become hedge assets for the Indonesian stocks by producing the score of hedging effectiveness that greater than zero. After comparing the risk-adjusted return between unhedged portfolio and hedged portfolio which has been compiled by dynamic portfolio, it is generally known that hedge and safe haven could not increase the risk-adjusted performance or in the other word, gold could not make the risk-adjusted return of hedged portfolio greater than an unhedged portfolio. However, the establishment of portfolio by combining the gold with Agriculture Index, Mining Index, Consumer Goods Industry Index, or Property and Real Estate Index showed a result that risk-adjusted return of hedged portfolio is greater than the risk-adjusted return of unhedged portfolio or in the other word the risk-adjusted performance of hedged portfolio is better than the risk-adjusted return of unhedged portfolio and these findings support the findings that have been found by Kumar (2014); Arouri et al. (2014); and Robiyanto et al. (2017b).

The focus of this research is on the establishment of a portfolio that contains only two assets which is gold and CSPI or each of nine sectoral indices in a portfolio while a portfolio usually consists of more than two assets. This limitation appears because this research used bivariate analysis as an analysis tool which is only can measure the correlation score of a portfolio that consists of two. Therefore, future research that observes a hedging strategy between gold and Indonesian Stock by using multivariate analysis is needed.

Investment manager and investors need to dynamically establish a combination of the portfolio between gold and stocks that classified into Agriculture Index, Mining Index, Consumer Goods Industry Index, or Property and Real Estate Index. Investment manager and investors also need to use gold as a hedged asset in their portfolio that consists of stock in Indonesia. Investment manager and investors are recommended to use the gold futures contract position to reduce the transaction cost and maximize the portfolio returns.

References

Ahmad, Z., & Ibrahim, H. (2002). A study of performance of the KLSE Syariah Index. *Malaysian Management Journal, 6*(1&2), 25-34.

Aparicio, F. M., & Estrada, J. (2001). Empirical distributions of stock returns: European Securities Markets 1990 - 1995. European Journal of Finance 7, 1-21. doi: 10.1080/13518470121786.

Arouri, M. E. H., Lahiani, A., & Nguyen, D. K. (2014). World gold prices and stock returns in China: Insights for hedging and diversification strategies. *HAL Working Paper* Retrieved from https://hal.archives-ouvertes.fr/hal-00798038.

Baur, D. G., & Lucey, B. M. (2010). Is gold a hedge or a safe haven? An analysis of stocks, bonds, and gold. The Financial Review, 45, 217-229. doi: 10.1111/j.1540-6288.2010.00244.x.

Capie, F., Mills, T. C., & Wood, G. (2005). Gold as a hedge against the dollar. *Journal of International Financial Markets, Institutions, and Money, 15*(4), 343-352. doi: 10.1016/j.intfin.2004.07.002.

Claessens, S., & Kose, M. A. (2013). Financial Crises: Explanations, Types, and Implications. International Monetary Fund Working Paper. Retrieved from https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Financial-Crises-Explanations-Types-and-Implications-40283.

Dajcman, S., Festic, M., & Kavkler, A. (2012). European stock market comovement dynamics during some major financial market turmoils in the period 1997 to 2010 – a comparative DCC-GARCH and wavelet

correlation analysis. *Applied Economics Letters*, *19*(13), 1249-1256. doi: 10.1080/13504851.2011.619481.

Damodaran, A. (2008). Strategic Risk Taking, a Framework for Risk management. In Y. J. Wind (Ed.), New Jersey: Pearson Education Inc.

Dempster, N., & Artigas, J. C. (2010). Gold: Inflation hedge and long-term strategic asset. *The Journal of Wealth Management*, *13*(2), 69-75.

Evans, J. D. (1996). *Straightforward statistics for the behavioral science.* California: Brooks/Cole Publishing Company.

Greer, R. J. (1997). What is an asset class, anyway? *Journal of Portfolio Management*, *23*(2), 86 - 91.

Jobson, J. D., & Korkie, B. M. (1981). Performance hypothesis testing with sharpe and treynor measures. *The Journal of Finance*, *36*(4), 889-908. doi: 10.1111/j.1540-6261.1981.tb04891.x.

Ku, Y. H. H., Chen, H. C., & Chen, K. H. (2007). On the application of the dynamic conditional correlation model in estimating optimal time-varying hedge ratios. *Applied Economics Letters*, *14*(7), 503-509. doi: 10.1080/13504850500447331.

Kumar, D. (2014). Return and volatility transmission between gold and stock sectors: Application of portfolio management and hedging effectiveness. *IIMB Management Review*, *26*(1), 5-16. doi: 10.1016/j.iimb.2013.12.002

Levine, D. M., Krehbiel, T. C., & Berenson, M. L. (2006). *Business Statistics, A First Course* (Vol. 4). Upper Saddle River, New Jersey: Pearson Prentice Hall.

Markowitz, H. M. (1952). Portfolio selection. *Journal of Finance*, *7*(1), 77-91. doi: 10.1111/j.1540-6261.1952.tb01525.x

Ogata, H. (2012). Optimal portfolio estimation for dependent financial returns with generalized empirical likelihood. *Advances in Decision Sciences*, *2012*, 1-8. doi: 10.1155/2012/973173

Pangestuti, I. R. D., Wahyudi, S., & Robiyanto, R. (2017). Performance evaluation of equity mutual funds in Indonesia period of 2012-2014. *Jurnal Keuangan dan Perbankan*, *21*(4) 527-542.

Robiyanto, R. (2017a). The analysis of capital market integration in ASEAN region by using the OGARCH approach. *Jurnal Keuangan dan Perbankan*, *21*(2), 169-175.

Robiyanto, R. (2017b). Month of the year effect pada pasar obligasi di Indonesia. *Jurnal Ekonomi dan Bisnis*, *20*(2), 291-302. doi: 10.24914/jeb.v20i2.1093.

Robiyanto, R. (2018). Performance evaluation of stock price indexes in the Indonesia stock exchange. *International Research Journal of Business Studies*, *10*(3) 173-182. doi: 10.21632/irjbs.10.3.173-182.

Robiyanto, R., Hersugondo, S., & Puryandani, S. (2015). Chinese zodiac effect and precious metals returns of 1900-2013. *International Journal of Applied Business and Economic Research*, *13*(5) ,2759-2773.

Robiyanto, R., & Puryandani, S. (2015). The Javanese Lunar Calendar's effect on Indonesian stock returns. *Gadjah Mada International Journal of Business*, *17*(2), 125-137. doi: 10.22146/gamaijb.6906.

Robiyanto, R., Wahyudi, S., & Pangestuti, I. R. D. (2017a). Testing commodities as safe haven and hedging instrument on ASEAN's five stock markets. *Jurnal Ekonomi Kuantitatif Terapan*, *10*(2) 231-238. doi: 10.24843/JEKT.2017.v10.i02.p11 .

Robiyanto, R., Wahyudi, S., & Pangestuti, I. R. D. (2017b). The Volatility–Variability hypotheses testing and hedging effectiveness of precious metals for the Indonesian and Malaysian capital markets. *Gadjah Mada International Journal of Business*, *19*(2), 167-192. doi: 10.22146/gamaijb.26260.

Sharma, R., & Mathur, S. K. (2016). Forecasting portfolio value-at-risk via DCC-MGARCH Model: Impact of Brexit on valuation of UK Pound and Indian Rupee. *Journal of International Economics*, *7*(2), 56-63.

Sharpe, W. F. (1966). Mutual fund performance. *Journal of Business*, *39*(1), 119-138. doi: http/dx.doi.org/10.1086/294846

Worthington, A. C., & Pahlavani, M. (2007). Gold investment as an inflationary hedge: Cointegration evidence with allowance for endogenous structural breaks. *Applied Financial Economics Letters, 3*(4), 259-262. doi: 10.1080/17446540601118301

Zulkafli, A. H., Ahmad, Z., & M., E. E. (2017). The performance of socially responsible investments in Indonesia: A study of the Sri Kehati Index (SKI). *Gadjah Mada International Journal of Business, 19*(1), 59-76. doi: 10.22146/gamaijb.17959

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

Trade openness and female-male earnings differentials: Evidence from Indonesia

Maryam Jamielaa

Graduate Program in Economics, Faculty of Economics and Business, Universitas Indonesia, Indonesia.

Article Info

Article history:
Received: 18 October 2017
Accepted: 1 March 2018
Published: 1 April 2018

Keywords:
Trade Openness, Gender Wage Gap, Quantile Regression

JEL Classification:
C21, F16, J31

DOI: 10.20885/ejem.vol10.iss1.art9

Abstract

In the past two decades, Indonesia has experienced an increase in total trade and FDI. In the period 2008-2014, there was an increase of FDI volume, which was followed by a widening trend in the female and male earnings gap. This study investigates the impact of trade openness on female-male earnings differentials and how the impact differs across the wage distribution. This thesis used data employment from the National Labor Survey (SAKERNAS) published by Statistics Indonesia and FDI data released by the Investment Coordinating Board (BKPM). Furthermore, after applying the *OLS* and the Quantile Regression estimation method, it appears that gender wage gap is narrower in low quantile wage distributions than in high quantile distributions. Also, another important finding emerges from the results of provincial income groups, which shows that gender wage differentials are narrower in high-income and middle provinces than in low-income provinces.

Introduction

Over the last decade, the implication of trade openness on female-male earnings differentials has triggered a compelling discussion among academics. Since the early 1980s, many developing countries have decided to engage in the global market. As countries became more integrated into the open market, trade volume and direct investments in those countries increased substantially. As a consequence, this impacted many sectors of the economy, including the domestic labor market. According to literature, trade liberalization creates domestic competition which tends to reduce discrimination in the labor market, including gender wage disparity (Becker, 1957). In the past two decades, Indonesia has experienced an increase in total trade and FDI. Moreover, as can be seen in Figure 1, the increase of FDI volume was also followed by a widening trend on female and male earnings gap from period 2008-2014. This study investigates the impact of trade openness on female-male earnings differentials and how the impact differs across the wage distribution.

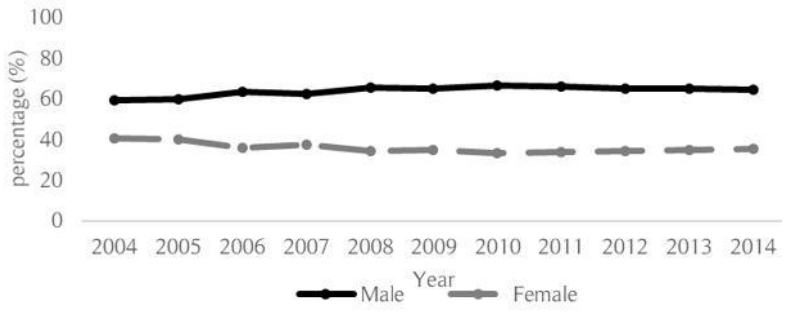


Figure 0. Female and Male Share of National Income (2004-2014)
Source: Author's Compilation from Indonesia Human Development Report

Furthermore, previous studies related to gender wage disparity are not abundant. Most of the studies tried to identify gender wage gaps in Indonesia without taking into account the effect of trade liberalization. For example, Feridhanusetyawan, Aswicahyono, & Perdana (2001), Pirmana (2006), and Taniguchi & Tuwo (2014) only focus on investigating female-male earnings differentials in rural and urban areas by using Oaxaca-Blinder Decomposition and SAKERNAS data in the different period. Similarly, applying a different decomposition method, Sohn (2015) analyzed the gender wage gap using Indonesia Family Life Survey (IFLS) data across a quantile wage distribution without

P ISSN 2086-3128 | E ISSN 2502-180X
*Corresponding Author e-mail: ella_291085@yahoo.com

include trade openness variable. However, those studies only focused on decomposing gender wage gap in Indonesia without taking into account contribution of globalization. Therefore, to contribute to the lack of literature on this issue, this study attempts to research the impact of trade openness on gender wage differentials and its impact on quantile wage distribution.

To investigate the effect of trade openness and gendered wages, this study follows the methodology of Hazarika & Otero (2004) and Han et al. (2012). These studies analyze by combining micro-data level and macro-data level. Moreover, to get a complete picture on the effect of trade openness on gender wage discrepancy, this study also examines the impact of trade liberalization on the gender wage differentials by applying the quantile regression method (QRM). Furthermore, for further analysis, this research classifies all provinces into three-province categories, which are low, middle and high-income groups, and then investigates the impact of trade liberalization on gender wage discrepancy in each provincial group. This paper uses data employment, provincial trade volume and GRDP per province from the National Labor Survey (SAKERNAS) published by Statistics Indonesia, and data FDI released by Investment Coordinating Board (BKPM). The data used in this research is constructed into a pooling cross-sectional data covers 33 provinces in Indonesia in the period 2008-2014.

Research Method

The key objectives of this study are to investigate the impact of trade openness on gender wage inequality, whether the earnings difference between male and female will be narrowed or widened. In this study, the standard Mincerian "human capital model" of wage determination that includes controls for human capital characteristics is adopted. In general, the standard Mincerian wage model is modeled as a linear function of the years of schooling, experience and the squared of experience (Lemieux, 2003).

$$\ln w = \ln w_0 + rS + \beta_1 X + \beta_2 X^2 \quad (1)$$

Since the objectives of this study are to investigate the impact of trade openness on gender earnings differential; several variables are inserted into the standard Mincerian wage model. Following Hazarika and Otero (2004) Braunstein and Brenner (2007), and Han et al. (2012), these previous studies use the extended Mincerian wage model by introducing interaction term between dummy variable gender and variable trade openness to capture the impact of trade liberalization on female-male earnings differentials.
The baseline specification is as expressed as follows:

$$\ln(W_{i,r,t}) = \beta_0 + \beta_1 Fema_{\ i,r,t} + \beta_2 Openness_{r,t} + \beta_3 Female_{i,r,t} \times Openness_{r,t} + \beta_4 X_{i,r,t} + \beta_5 Y_{r,t} + \varepsilon_{i,r,t} \quad (2)$$

where:
i = individual; r = province; t = time period.
$\ln(W_{i,r,t})$ is a natural logarithm of real hourly wage of an individual.
$Female_{i,r,t}$ is a dummy variable (female=1; male=0).
$Openness_{r,t}$ is a variable to measure trade openness exposure in each province. In this study, FDI and Trade as share of GRDP are used.
$Female_{i,r,t} \times Openness_{r,t}$ is an interaction term between the dummy variable gender and variable trade openness, which become the variable of interest in this study.
$X_{i,r,t}$ are control of each individual's characteristics.
$Y_{r,t}$ is a provincial GRDP.

To examine the impact of trade openness on female-male earnings differential, we see the partial effect of the coefficient of the interaction term between trade openness variable and the dummy variable gender ($Female_{i,r,t} \times Openness_{r,t}$) on the dependent variable $\ln(W_{i,r,t})$.

Where:

$$\frac{\partial(lnWage)}{\partial(Openness)} = \beta_2 + \beta_3 Female$$

If the dummy variable gender (*Female)* = 1, then,

$$\frac{\partial(lnWage)}{\partial(Openness)} = \beta_2 + \beta_3$$

And, if the dummy variable gender (*Female)* = 0, then,

$$\frac{\partial(lnWage)}{\partial(Openness)} = \beta_2$$

If the value of the coefficient of β_3 is positive, then trade openness has more impact on female's wages than on male's wages, which means that the gender wage gap will be narrowed; If the value of coefficient of β_3 is negative, then trade openness has less impact on female's wages than on male's wages, which means that the gender wage gap will be widened;

Following Hazarika & Otero (2004), Braunstein & Brenner (2007), and Han et al. (2012), the model specification is estimated using the OLS and Quantile Regression estimation method. Moreover, after running a regression using the OLS estimation method and quantile regression with the pooled sample, for further analysis, there will be a second regression with three different samples. The samples are classified into three categories based on income per province, which are low, middle and high-income provincial groups.

This study uses individual data level and only covers 33[1] provinces in Indonesia (out of 34 provinces) in the period 2008-2014. This study uses secondary data from the National Labor Survey (SAKERNAS) published by Statistics Indonesia (BPS). SAKERNAS data is published twice a year in Semester I in February and Semester II in August. In February, SAKERNAS data only covers individual's data at a provincial level, while, in August, SAKERNAS data includes individual's data more specific at the municipality level. SAKERNAS data provides comprehensive employment data for individual's characteristics, such as age, gender, level of education (the highest level of education attainment), the total number of hours of work, sectors, occupation, employment status, and total wage/salary in a week.

In this study, the observations are limited to individuals who are of working age, between 15 and 65 years old, in the period 2008-2014. Also, the total number of observations is approximately 4,171,088 records. Since SAKERNAS data is not gathered from the same households every year, then, SAKERNAS data cannot be constructed into panel data. Hence, this study applies pooling cross-sectional data.

Results and Discussion

A Dummy variable for female

From OLS results, the value of the estimated coefficient for dummy variable Female is negative, which indicates women labor earn less than their colleagues (Table 1). Interestingly, when the quantile regression is applied, the results show that, even though the value of the estimated coefficient is negative, but the magnitude is larger in low-quantile than in high-quantile wage distribution. In low-quantile wage distribution, on average, female labor still earns 52% less comparable with male labor, while in high-quantile wage distribution, female labor 24% less than her coworkers (Table 2, Tabel 3 and Table 4). This finding provides the evidence that, in Indonesian labor market, there is an incidence of "sticky floors effect" which became a factor in the setting of women's wages (Cameron et al., 2015). This phenomenon is usually found in developing countries. Several previous studies which conducted in developing countries, such as India (Khanna, 2012), Vietnam (Pham & Reilly, 2007), Thailand (Adireksombat et al., 2010) and China (Xiu & Gunderson, 2014), also provided strong evidence about sticky floors effect on their local labor market. Moreover, if we take a further analysis, we can see that in high, middle, and low-income provincial groups, the same pattern of the female-male discrepancy also occurs. The apparent difference is that the gap is more severe in high-income provinces than in low-income provinces. In richer and poorer provinces, women labor earns 38% and 31% less than her coworker respectively.

One possible explanation emerges from those previous studies is that female workers at low-quantile wage distribution usually get lower pay because of their low returns to job tenure or experience, low level of education and also a greater burden of their family responsibilities as family taker and childbearing. In Indonesia case, many female workers engage in informal sectors which provides lower pay. Moreover, there are many obstacles for women labor to shift from informal into formal sectors. In Indonesia, one of the prominent obstacles is social norms that discourage women to involve in the labor market (Kercheval, 2012). Traditionally, women with children have several family responsibilities that compel them to spend fewer working hours in labor market than her coworkers. This factor makes them less productive and less attractive to the employers. Therefore, this condition also contributes to the lower of women labor participation in the labor market, which leads to the higher female-male earnings differentials in Indonesia.

[1] This study does not include North Kalimantan Province due to the availability of its data, since North Kalimantan was just established in 2012.

Variable of openness

The impact of trade liberalization on wages can examine the value of the estimated coefficient for *FDI_GRDP* and *Trade_GRDP*. In general, the value the value of the estimated coefficient for both variables are positive. As can be seen in Table 1, the increase of 1% of FDI as a share of GRDP will be increase wage by 0.016 natural log points. Moreover, the impact of trade liberalization is bigger for workers in high-quantile than in low-quantile wage distribution, which indicates that the salary of workers with high-skilled jobs is more responsive to international trade. This finding is in line with a previous study conducted by Lee and Wie (2015). They found that in Indonesia, FDI caused demand to shift toward more skilled labor and increased their wages. The fundamental factor driving the shifting demand for skilled labor is skilled-biased technological change. In developing countries, like Indonesia, where the country has low levels of economic development and technological progress, an increase of FDI or trade can affect demand for more skilled workers. Moreover, their finding even though is contradictive with H-O model, but showed that the increase of 10% point of foreign technological changes measured by FDI net inflow would raise the wage bill of non-productions workers by 5.2% point. It can be concluded that, in Indonesia industries, demand shifts toward skilled workers are influenced by foreign technologies embedded in imported equipment.

Furthermore, the value of the estimated coefficient is larger in high-income provinces than in low-income provinces. It can be seen that from the OLS results, a 1% increase in FDI share of provincial GRDP can raise wages in high, middle, low-income provinces by 7%, 3%, and 0.08% respectively. A plausible explanation why this condition exists because richer provinces in Indonesia tend to have good infrastructure and near to government centers, which permitting rich provinces develop of a good industrial base were than poorer provinces. By offering a good quality of infrastructure and industrial base, richer provinces are more productive in operating their business then poorer provinces. Therefore, an increase of FDI will induce a larger increase of plants' productivity in well-developed provinces than in least-developed provinces. This finding corroborates the idea of Han et al. (2012), who suggested that the impact of trade liberalization contributes to larger wage inequality in high-exposures regions than in low-exposures regions.

Interaction term

To determine the impact of trade openness on gender wage differentials, we focus on the value of this interaction term. From overall results, the value of the estimated coefficient for interaction term is positive. This indicates that, with the increase of trade openness, the female-male earnings differentials are expected to be narrowed. Analyzing more specific, the estimated coefficient for interaction term in low-quantile is bigger than in high-quantile wage distribution, which indicates that female workers with low-paid jobs are more benefit from trade liberalization than female workers with high-paid jobs. One plausible explanation for this condition is that, according to Heckscher-Ohlin (H-O) trade theory, the exposure of international trade will automatically induce an increase of demand of abundant factor production, such as labor. Since Indonesia is one of developing countries which has abundant low-skilled labor which is attached with the stereotype of female workers, the presence of international trade induces higher demand of female workers and increases relative wages for female workers. This mechanism leads to a narrowing gender wage gap in Indonesia for workers at bottom wage distribution. On the other hand, a widening impact of FDI on gender earnings differentials might be caused by the presence of technological changes which affects relative wages by shifting demand for high-skilled labor (Lee & Wie, 2015). An upgrading technology also induces the need to employ better-qualified workers which is more beneficial for male workers. The foreign technological change is often embedded imported equipment. To be able to operate the equipment, firms should conduct several on-the-job training for their workers. Moreover, in Indonesia, the employers are more prefer to send male workers to the training than female workers because male workers have longer job tenure than female workers have. Female workers have shorter job tenure because in a certain age, many female workers exit the labor market due to family responsibilities (such as, married, pregnant or take care their children) and there are so many barriers that prevent them to re-entry the labor market after they exit. Because of this condition, many employers prefer not invest on female workers because they have to spend more money to train a new worker. This condition leads to imbalance skills between women and men in high-skilled jobs, thus, widening the gender wage gap in Indonesia.

Furthermore, comparing results from three provincial income groups, it can be seen that the value of estimated coefficients is higher in high-income provinces than in middle or low-income provinces. It indicates that the effect of FDI on the earnings differentials between female and male workers is narrower in high-income provinces than in middle and low-income province. This finding supports the evidence that a country or a region should reach a certain level of development before gender inequality can be reduced (Dollar & Gatti, 1999). It implies that the improvement in gender wage equality is highly correlated with income province.

Control variables

For the control variables, all the signs of the estimated coefficients are in line with theory, except work_hour (Table 1). This variable is expected to be positive, however, in this study, work_hour interestingly have a negative value. Also, others variables, such as age, tenure, location, marital status, and education, significantly increase individual's wage. While variable age squared (agesq) has a negative and significant estimated coefficient, which indicates that as age is increasing, the productivity will decline and decrease individual's wage. For education variable, it shows that return of education for tertiary education level/ university is highest among another level of education. While a return to education for primary education is the lowest.

Table 1. OLS and Quantile Regression Results for All Provinces

	Ln(Wage)			
	OLS	**Q.01**	**Q.05**	**Q.09**
Key Variables:				
Female	-0.30***	-0.42***	-0.27***	-0.22***
	(0.018)	(0.005)	(0.002)	(0.003)
FDI_GRDP	0.016	0.016***	0.015***	0.020***
	(0.010)	(0.001)	(0.0007)	(0.001)
FDI_Female	0.007	0.015***	0.006***	-0.004***
	(0.005)	(0.002)	(0.001)	(0.001)
Trade_GRDP	0.002**	0.001***	0.002***	0.002***
	(0.0008)	(5.31e-05)	(2.51e-05)	(3.67e-05)
Trade_Female	0.0004	0.001***	0.0002***	-0.0004***
	(0.0005)	(8.70e-05)	(4.12e-05)	(6.02e-05)
Control Variables:				
Age	0.04***	0.05***	0.03***	0.03***
	(0.002)	(0.001)	(0.0005)	(0.0007)
Agesq	-0.0004***	-0.0006***	-0.0004***	-0.0003***
	(2.04e-05)	(1.22e-05)	(5.76e-06)	(8.42e-06)
Tenure	0.02***	0.02***	0.02***	0.01***
	(0.0007)	(0.0002)	(0.0001)	(0.0002)
Work_hour	-0.02***	-0.01***	-0.02***	-0.02***
	(0.0005)	(0.0001)	(5.04e-05)	(7.37e-05)
Loc	0.07***	0.10***	0.05***	0.04***
	(0.01)	(0.004)	(0.002)	(0.002)
Marital_status	0.13***	0.15***	0.13***	0.12***
	(0.01)	(0.004)	(0.002)	(0.003)
Educ_elementary	0.13***	0.15***	0.12***	0.10***
	(0.012)	(0.006)	(0.003)	(0.004)
Educ_juniorschool	0.29***	0.31***	0.27***	0.28***
	(0.018)	(0.006)	(0.003)	(0.004)
Educ_seniorschool	0.46***	0.47***	0.46***	0.45***
	(0.03)	(0.006)	(0.003)	(0.004)
Educ_college	0.90***	0.90***	0.88***	0.82***
	(0.037)	(0.008)	(0.004)	(0.005)
Sector_manu	-0.14***	-0.18***	-0.13***	-0.14***
	(0.05)	(0.02)	(0.008)	(0.01)
Sector_nonmanu	-0.16***	-0.30***	-0.13***	-0.10***
	(0.03)	(0.02)	(0.007)	(0.01)
Lngrdp	-0.20***	0.06***	0.02***	0.02***
	(0.07)	(0.002)	(0.0007)	(0.001)
Constant	7.80	6.43***	8.10***	8.74***
	(0.39)	(0.04)	(0.02)	(0.03)
Dummy Region	Yes	Yes	Yes	Yes
Dummy Occupation	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes
N	986,750	986,750	986,750	986,750
R^2	0.397			
Pseudo R^2		0.148	0.267	0.282

Note: Robust standard errors in parentheses are clustered on the province. *Coefficient for variables which both interaction terms for FDI and Trade are jointly significant at 1 percent. *** p<0.01, ** p<0.05, * p<0.1

Table 2. OLS and Quantile Regression for High-Income Provinces

	Ln(Wage)			
	OLS	Q.01	Q.05	Q.09
Key Variables:				
Female	-0.32***	-0.44***	-0.30***	-0.22***
	(0.04)	(0.006)	(0.003)	(0.005)
FDI_GRDP	0.07***	0.06***	0.07***	0.09***
	(0.014)	(0.003)	(0.002)	(0.002)
FDI_Female	0.02	0.03***	0.02***	0.008***
	(0.01)	(0.004)	(0.002)	(0.003)
Trade_GRDP	0.004**	0.004***	0.003***	0.004***
	(0.001)	(8.03e-05)	(4.17e-05)	(6.20e-05)
Trade_Female	0.0004	0.001***	0.0004***	-0.001***
	(0.001)	(0.0001)	(7.05e-05)	(0.0001)
Control Variables:				
Age	0.04***	0.04***	0.03***	0.03***
	(0.002)	(0.001)	(0.0006)	(0.0009)
Agesq	-0.0004***	-0.0005***	-0.0004***	-0.0003***
	(2.76e-05)	(1.52e-05)	(7.87e-06)	(1.17e-05)
Tenure	0.02***	0.02***	0.02***	0.01***
	(0.001)	(0.0003)	(0.0001)	(0.0002)
Work_hour	-0.02***	-0.01***	-0.02***	-0.02***
	(0.0007)	(0.0001)	(6.99e-05)	(0.0001)
Loc	0.06*	0.07***	0.04***	0.03***
	(0.03)	(0.004)	(0.002)	(0.003)
Marital_status	0.11***	0.12***	0.11***	0.11***
	(0.02)	(0.005)	(0.003)	(0.004)
Educ_elementary	0.13***	0.17***	0.13***	0.10***
	(0.020)	(0.008)	(0.004)	(0.006)
Educ_juniorschool	0.33***	0.35***	0.31***	0.30***
	(0.023)	(0.008)	(0.004)	(0.006)
Educ_seniorschool	0.52***	0.53***	0.51***	0.50***
	(0.029)	(0.008)	(0.004)	(0.006)
Educ_college	0.99***	0.95***	0.98***	0.93***
	(0.052)	(0.01)	(0.005)	(0.008)
Sector_manu	-0.09	-0.09***	-0.09***	-0.10***
	(0.067)	(0.020)	(0.011)	(0.016)
Sector_nonmanu	-0.16***	-0.24***	-0.14***	-0.09***
	(0.04)	(0.02)	(0.01)	(0.02)
Lngrdp	-0.06	-0.02***	-0.07***	-0.06***
	(0.079)	(0.003)	(0.002)	(0.003)
Constant	9.18***	7.62***	9.59***	9.84***
	(1.51)	(0.07)	(0.04)	(0.06)
Dummy Occupation	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes
N	515,490	515,490	515,490	515,490
R^2	0.413			
Pseudo R^2		0.158	0.272	0.305

Note: Robust standard errors in parentheses are clustered on the province. *Coefficient for variables which both interaction terms for FDI and Trade are jointly significant at 1 percent. *** p<0.01, ** p<0.05, * p<0.1

Table 3. OLS and Quantile Regression for Middle-Income Provinces

	Ln(Wage)			
	OLS	Q.01	Q.05	Q.09
Key Variables:				
Female	-0.30***	-0.40***	-0.27***	-0.22***
	(0.013)	(0.008)	(0.004)	(0.006)
FDI_GRDP	0.03*	0.03***	0.02***	0.02***
	(0.014)	(0.003)	(0.001)	(0.002)
FDI_Female	0.01	0.03***	0.007***	-0.005*
	(0.006)	(0.004)	(0.002)	(0.003)
Trade_GRDP	0.0007**	-0.0001*	0.0008***	0.002***
	(0.0003)	(6.78e-05)	(3.27e-05)	(4.70e-05)
Trade_Female	0.0006	0.001***	0.0005***	0.0002**
	(0.0005)	(0.0001)	(5.43e-05)	(7.81e-05)
Control Variables:				
Age	0.04***	0.05***	0.04***	0.03***
	(0.004)	(0.002)	(0.0009)	(0.001)
Agesq	-0.0004***	-0.0006***	-0.0004***	-0.0003***
	(4.36e-05)	(2.32e-05)	(1.12e-05)	(1.61e-05)
Tenure	0.02***	0.02***	0.02***	0.01***
	(0.001)	(0.0004)	(0.0002)	(0.0003)
Work_hour	-0.02***	-0.01***	-0.02***	-0.02***
	(0.001)	(0.0002)	(9.67e-05)	(0.0001)
Loc	0.06***	0.11***	0.04***	0.05***
	(0.015)	(0.006)	(0.003)	(0.004)
Marital_status	0.14***	0.16***	0.13***	0.13***
	(0.014)	(0.008)	(0.004)	(0.006)
Educ_elementary	0.13***	0.14***	0.12***	0.11***
	(0.016)	(0.011)	(0.005)	(0.008)
Educ_juniorschool	0.25***	0.26***	0.23***	0.25***
	(0.021)	(0.012)	(0.006)	(0.008)
Educ_seniorschool	0.40***	0.41***	0.39***	0.39***
	(0.033)	(0.011)	(0.005)	(0.008)
Educ_college	0.79***	0.81***	0.76***	0.69***
	(0.036)	(0.014)	(0.007)	(0.010)
Sector_manu	-0.27***	-0.41***	-0.24***	-0.18***
	(0.072)	(0.029)	(0.014)	(0.020)
Sector_nonmanu	-0.18***	-0.33***	-0.16***	-0.10***
	(0.020)	(0.027)	(0.013)	(0.020)
Lngrdp	0.074*	0.067***	0.064***	0.11***
	(0.035)	(0.005)	(0.002)	(0.003)
Constant	7.10***	6.52***	7.47***	7.18***
	(0.59)	(0.10)	(0.05)	(0.07)
Dummy Occupation	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes
N	249,956	249,956	249,956	249,956
R^2	0.386			
Pseudo R^2		0.149	0.264	0.269

Note: Robust standard errors in parentheses are clustered on the province. *Coefficient for variables which both interaction terms for FDI and Trade are jointly significant at 1 percent. *** p<0.01, ** p<0.05, * p<0.1

Table 4. OLS and Quantile Regression Results for Low-Income Provinces

	Ln(Wage)			
	OLS	Q.01	Q.05	Q.09
Key Variables:				
Female	-0.27***	-0.37***	-0.22***	-0.19***
	(0.024)	(0.011)	(0.005)	(0.007)
FDI_GRDP	0.0008	0.005**	0.002	0.0006
	(0.005)	(0.002)	(0.001)	(0.001)
FDI_Female	0.002	0.005*	0.001	-0.002
	(0.002)	(0.003)	(0.001)	(0.002)
Trade_GRDP	0.004**	0.004***	0.003***	0.002***
	(0.001)	(0.0002)	(0.0001)	(0.0001)
Trade_Female	0.0005	0.002***	-0.0002	-0.001***
	(0.00131)	(0.000416)	(0.000203)	(0.000256)
Control Variables:				
Age	0.04***	0.05***	0.04***	0.03***
	(0.003)	(0.002)	(0.001)	(0.001)
Agesq	-0.0005***	-0.0005***	-0.0004***	-0.0003***
	(3.30e-05)	(2.78e-05)	(1.36e-05)	(1.71e-05)
Tenure	0.02***	0.02***	0.02***	0.01***
	(0.002)	(0.0005)	(0.0003)	(0.0003)
Work_hours	-0.02***	-0.01***	-0.02***	-0.02***
	(0.0004)	(0.0002)	(0.0001)	(0.0001)
Loc	0.05***	0.09***	0.03***	0.02***
	(0.01)	(0.008)	(0.004)	(0.005)
Marital_status	0.17***	0.18***	0.17***	0.13***
	(0.02)	(0.01)	(0.005)	(0.006)
Educ_elementary	0.15***	0.15***	0.15***	0.12***
	(0.02)	(0.01)	(0.006)	(0.008)
Educ_juniorschool	0.27***	0.28***	0.26***	0.26***
	(0.036)	(0.014)	(0.007)	(0.009)
Educ_seniorschool	0.39***	0.38***	0.40***	0.38***
	(0.0445)	(0.0135)	(0.00660)	(0.00831)
Educ_college	0.81***	0.85***	0.81***	0.65***
	(0.040)	(0.017)	(0.008)	(0.010)
Sector_manu	-0.38***	-0.48***	-0.35***	-0.31***
	(0.092)	(0.036)	(0.018)	(0.022)
Sector_nonmanu	-0.23**	-0.33***	-0.19***	-0.17***
	(0.075)	(0.033)	(0.016)	(0.020)
Lngrdp	0.055	0.093***	0.047***	0.008***
	(0.031)	(0.005)	(0.002)	(0.003)
Constant	7.47***	5.89***	7.72***	9.09***
	(0.425)	(0.104)	(0.051)	(0.064)
Dummy Occupation	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes
N	221,304	221,304	221,304	221,304
R^2	0.376			
Pseudo R^2		0.144	0.257	0.258

Note: Robust standard errors in parentheses are clustered on the province. *Coefficient for variables which both interaction terms for FDI and Trade are jointly significant at 1 percent. *** p<0.01, ** p<0.05, * p<0.1

Conclusion

The main objectives of this research are, first, to see the impact of trade openness on gender wage differentials and, secondly, to examine whether its impact differs across wage distributions. By looking at the estimated

coefficient of the interaction term between the trade openness variable and dummy variable female (*FDI_Female* and *Trade_Female*), it is concluded that both FDI and trade contribute to the reduction of the gender wage gap in low and middle-quantile wage distributions. While, in high-quantile wage distribution, it appears that trade openness brings negative impact by widening the female-male earnings differential. Moreover, it also can be concluded that FDI gives larger impact on female-male earnings differentials than trade does. For further analysis, the impact of trade liberalization on the female-male earnings differentials is also examined from three different income provincial groups. From overall results, it suggests that the effect of FDI on the earnings discrepancy between female and male workers is narrower in high-income provinces and middle provinces than in low-income province. From this results, a conclusion can be drawn that the reduction of the gender wage differentials is highly correlated with income provinces.

Another important finding in this study is that female workers in Indonesia, on average, earn less than male workers. From the OLS results, a female worker's hourly wage is 25.9% below a comparable male worker's hourly wage. The evidence from quantile regression, it appears that female-male wage differentials are more severe in lower-wage distributions than in higher wage distributions. Moreover, another striking finding is that the impact of FDI on a worker's wages is positive, which means that an increase of FDI will also induce the increase of an individual's real wages. Supporting previous studies by Lee & Wie (2015) and Feenstra & Hanson (1995), this study finds that FDI increases wages for high-skilled labor more than low-skilled labor.

The impact of trade openness on female-male earnings differentials should be of the main agenda to policymakers and academics. From the main findings above, it shows that trade openness might affect the dynamic of gender wage differentials in the local labor market. Evidence from quantile regression results shows that, in high quantile wage distributions, the gender wage gap widens due to the impact of trade openness. One of the issues that emerge from this study is that the larger gap in high-skills occupations is mainly occurred by the imbalance skill levels between male and female workers. To be able to solve this issue, the Indonesian Government should set a policy priority to accomplish an equal opportunity for both women and men to get training or education. Moreover, the Indonesian Government or policymakers should establish a policy intervention to persuade local and foreign firm to provide an equal opportunity for their female and male employees to gain on-the-job training or vocational education programs to close the skill gap between female and male labors. By doing this, it is expected that female worker's relative wages will be raise and, eventually, it leads to the reduction of female-male earnings differentials, especially in high-skills occupations.

References

Adireksombat, K., Fang, Z., & Sakellariou, C. (2010). *The evolution of gender wage differentials and discrimination in Thailand: 1991-2007: An application of unconditional quantile regression. Working Paper No. 2010/05.* Economic Growth Centre, Division of Economics. Singapore: Nanyang Technological University.

Arora, R. U. (2012). Gender inequality, economic development, and globalization: A state level analysis of India. *The Journal of Developing Areas, 46*(1), 147-164.

Artecona, R., & Cunningham, W. (2002). *Effects of trade liberalization on the gender wage gap in Mexico.* Development Research Group. The World Bank.

Becker, G. (1957). *The economics of discrimination.* Chicago: The University of Chicago Press.

Berik, G., Meulen Rodgers, Y. V., & Zveglich, Jr, J. (2004). International trade and gender wage discrimination: Evidence from East Asia. *Review of Development Economics, 8*(2), 237–254.

Berman, E., Bound, J., & Stephen, M. (1998). *Implications of skill-biased technological change: International Evidence.* Working Paper, National Bureau of Economic Research, International Trade and Investment, Labor studies and Productivity, Cambridge.

Black, S., & Brainerd, E. (2004). Importing quality? The impact of globalization on gender discrimination. *Industrial and Labor Relations Review, 57*(4), 540-559.

Braunstein, E., & Brenner, M. (2007). Foreign direct investment and gendered wages in Urban China. *Feminist Economics, 13*(3-4), 213 – 237. doi:10.1080/13545700701439432

Cameron, L., Suarez, D. C., & Pye, E. (2015). *Gender inequality in Indonesia.* Monash University, Center for Development Economic and Sustainability (CDES). Melbourne: Australian Department of Foreign Affairs and Trade (DFAT).

Chen, Z., Ge, Y., Lai, H., & Wan, C. (2013). Globalization and gender wage inequality in China. *World Development, 4*, 256–266.

Dollar, D., & Gatti, R. (1999). *Policy research report on gender development: Gender inequality, income, and growth: Are good times good for women?* Poverty Reduction and Economic Management Network. The World Bank.

Driffield, N., & Taylor, K. (2000). FDI and the labor market: A review of the evidence and policy implications. *Oxford Review of Economic Policy, 16*(3), 90-103.

Feenstra, R. C., & Hanson, G. H. (1997). Foreign direct investment and relative wages: Evidence from Mexico's Maquiladoras. *Journal of International Economics, 42*, 371-394.

Feridhanusetyawan, T., Aswicahyono, H., & Perdana, A. A. (2001). *The male-female wage differentials in Indonesia.* CSIS Working Paper Series, Center for Strategic and International Studies (CSIS), Department of Economics, Jakarta.

Fitrania, S. (2013). *Master Thesis: The Impact of globalization on gender wage gap in Indonesia: A sub-national level analysis.* Tilburg University.

Fussell, E. (2000). Making labor flexible: The recomposition of Tijuana's maquiladora female labor force. *Feminist Economics, 6*(3), 59-79.

Han, J., Liu, R., & Zhang, J. (2012). Globalization and wage inequality: Evidence from urban China. *Journal of International Economics, 87*, 288-297.

Hazarika, G., & Otero, R. (2004, June). Foreign trade and the gender earnings differential in Urban Mexico. *Journal of Economic Integration, 19*(2), 353-373.

Juhn, C., Ujhelyi, G., & Villegas-Sanchez, C. (2014). *Men, women, and machines: How trade impacts gender inequality.* NBR Working Paper, Natioanal Bureau of Economic Research, Cambridge.

Kercheval, J., Markowitz, D., Monson, K., & Read, B. (2012). *Perempuan dalam kepemimpinan - penelitian mengenai hambatan terhadap ketenagakerjaan dan pekerjaan yang layak bagi perempuan.* International Labor Organization, Jakarta.

Khanna, S. (2012). *Gender wage discrimination in India: Glass ceiling or sticky floor?. Working Paper No.214.* Centre for Development Economics, Department of Economics. New Delhi: Delhi School of Economics.

Lee, J.-W., & Wie, D. (2015). Technological change, skill demand, and wage inequality: Evidence from Indonesia. *World Development, 67*, 238-250.

Lemieux, T. (2003). *The "mincer equation" thirty years after schooling, experience and earnings:. Working Paper No. 62.* Center For Labor Economics. Berkeley: University of California.

Menon, N., & Rodgers, Y. V. (2009). International trade and the gender wage gap: New Evidence from India's Manufacturing Sector. *World Development, 37*(5), 965–981.

Meulen Rodgers , V. Y., & Zveglich, Jr, J. E. (2012). *Inclusive growth and gender inequality in Asia's Labor Market.* Economics and Research Department. Manila: Asian Development Bank.

Ministry of Children and Women Empowerment of Indonesia. (2014). *Human development gender-based report 2014.* Jakarta: Ministry of Children and Women Empowerment of Indonesia.

Oostendorp, R. H. (2009). Globalization and the gender wage gap. *The World Bank Economic Review, 23*(1), 141-161.

Pham, T.-H., & Reilly, B. (2007, April 02). The gender pay gap in Vietnam, 1993–2002: A quantile regression approach. *Journal of ASIAN Economics, 18*, 775–808.

Pirmana, V. (2006). *Earnings differential between male-female in Indonesia: Evidence from SAKERNAS Data.* Departement of Economics. Bandung: Padjajaran University.

Reilly , B., & Dutta, P. V. (2005). *The gender pay gap and trade liberalisation: Evidence for India.* PRUS Working Paper, University of Sussex, Department of Economics.

Seguino, S. (1997). Gender wage inequality and export-led growth in South Korea. *The Journal of Development Studies, 34*, 102-132.

Sohn, K. (2015). Gender discrimination in earnings in Indonesia: Fuller picture. *Bulletin of Indonesian Economic Studies, 51*(1), 95–121. doi:10.1080/00074918.2015.1016569

Taniguchi, K., & Tuwo, A. (2014). *New evidence on the gender wage gap in Indonesia: ADB Economics Working Paper Series.* Asian Development Bank. Manila: ADB Economics.

Thomas, D. (1990). Intra-household resource allocation: An inferential approach. *The Journal of Human Resources, 24*(4), 635-664.

United Nations Development Programme (UNDP). (2016). *Human Development Report 2016: Human development for everyone.* New York: UNDP.

Wooldridge, J. M. (2012). *Introductory econometrics a modern approach: 5th Edition.* Cengage Learning.

Xiu, L., & Gunderson, M. (2014). Glass ceiling or sticky floor? Quantile regression decomposition of the gender pay gap in China. *International Journal of Manpower, 35*(3), 306-325.

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

Comparison analysis of imported coffee of Malaysia from Indonesia and Vietnam

Eko Atmadji[1)]*, Esther Sri Astuti S. A.[2)], Yosra Hersegoviva Suhardiman[1)]

[1)] Department of Economics, Universitas Islam Indonesia, Yogyakarta, Indonesia.
[2)] Maastricht University, Maastricht, Netherlands

Article Info

Article history:
Received: 8 September 2017
Accepted: 28 January 2018
Published: 26 March 2018

Keywords:
coffee trade, import demand, ARDL

JEL Classification:
Q12, Q13, N5

DOI: 10.20885/ejem.vol10.iss1.art10

Abstract

Malaysia is an important coffee export destination for Indonesia. Recently Vietnam shifts Indonesian position as a number one coffee exporter in Malaysia. Based on this background, this study compares the position of Indonesian and Vietnamese coffee in the eyes of Malaysians by using demand function. The data is time series and co-integration test should be applied. Co-integration test is using Bound Test in ARDL method. Indonesian coffee demand by Malaysians is co-integrated, whereas the demand for Vietnamese coffee by Malaysia does not contain co-integration. It means, Vietnamese coffee is not a serious competitor to Indonesian coffee in Malaysian market.

Introduction

Indonesia is the world's fourth largest exporter of coffee after Brazil, Vietnam, and Columbia. Before 2000, the top three world coffee exporters were Brazil, Columbia and Indonesia (Pendergrast, 2010; Samper & Fernando, 2003). However, after 2000, Indonesia's ranking goes to the fourth after Vietnam entered the market and surprisingly succeeded in producing and exporting its coffee enormously. Hence, along with Vietnam's rise in world coffee exports and become the second largest coffee exporter, Indonesia's major coffee export destination countries were shifting their imports of coffee from Indonesia to Vietnam. The ranking of the top three Vietnamese coffee export destination countries—USA, Japan, and Germany—is equal to the ranking of the top three destinations of Indonesian coffee exports. For the top three coffee importing countries, Vietnamese coffee provides a new alternative to Indonesian coffee but at a more competitive price.

The aggressiveness of Vietnam in its attempt to dominate world coffee has begun to appear in Malaysia, the fifth top Indonesian coffee importers. In order to maintain Indonesian coffee domination in Malaysia, some actions should be done. One of the things is to know the taste of coffee lovers in Malaysia to coffee from Indonesia and Vietnam. This study will compare the tastes of Malaysians to Indonesian coffee and Vietnamese coffee. The conclusion of the taste is taken from the estimation of Indonesian and Vietnamese coffee demand of Malaysian. For the purpose, the data should be collected fifteen years back when Vietnamese coffee began to enter the Malaysian coffee market. Because the data is in time series, several tests should be applied before estimating the demand function.

The third wave in the coffee industry brings the culture of drinking coffee to an incredible level. In the last ten years, the coffee-drinking culture has ceased to be a routine and a companion of social events but has become a tradition with special coffee ceremonies (Manzo, 2010). With the increasing status of coffee as a globally styled drink, the demand for coffee has increased, which has resulted in doubling coffee production in the last fifty years (Pokorna & Smutka, 2010). Even in the last fifteen years world coffee production has increased sharply.

The change in drinking coffee style alters the pattern of world coffee import demand (Food and Agriculture Organization, 2015). The study of Goddard & Akiyama (1989) demonstrates that there was increasing of price elasticity of each type of coffee and the income elasticity of the United States coffee demand between 1962-1984. The results of cross elasticity indicated that there were types of coffee that mutually substituting and complementary. The conclusion of the study, coffee is an increasingly unappreciated commodity as a classy drink. Most of these coffee imports are for instant coffee production. But different conclusions occurred after 1990. Since the 1980s in the United States, the coffee drinking patterns have slowly changed where coffee drinkers are not satisfied with just instant coffee and ground

P ISSN 2086-3128 | E ISSN 2502-180X
*Corresponding Author e-mail: eko@uii.ac.id

coffee only. New products of ready-to-drink coffee are emerging and the number of new wave coffee lovers is increasing very rapidly and in greater numbers than regular coffee lovers in the next twenty years (Lewin, Giovannucci, & Varangis, 2004). According to Igami (2015), price elasticity for coffee consumption decreased from 1989 to 2014 along with the declining income elasticity. These results support Lewin's estimation that there has been a massive pattern of consumption changes and coffee becomes more luxurious commodity.

For Indonesia, Hutabarat (2010) shows that up to 2001, Indonesia's coffee position in the eyes of consumers in major Indonesian coffee importing countries is inferior goods except for Japan, Germany and the Netherlands. With such a position it is concluded that Indonesian coffee products are the main ingredient for instant coffee making in instant coffee producing countries. However, Nugroho (2016) found that Indonesia's global coffee income elasticity value is 0.15 from 1990 to 2008. This shows that Indonesian coffee since the era of second wave drinking coffee pattern has been a necessity. Coffee patterns involving baristas in coffee shops increase the need for Robusta coffee. For the baristas, the advantage of Robusta coffee, which is the main product of Indonesian coffee, is easier to be processed into a variety of coffee drinks, as well as its cheaper price.

Research Method

The competition between Indonesian coffee and Vietnamese coffee is due to the fact that the two countries have the same advantages over coffee from Brazil and Columbia that is primarily robusta coffee. In Malaysia, coffee from both countries began to compete since 2000 when Vietnam entered the world coffee market and directly dominated robusta coffee market. This study uses data from 2000-2014. Data is taken from the comtrade website where the data of world commodity trade is recorded. The variables used are the import volume of Indonesian and Vietnamese coffee (in kilograms) for Malaysia, the price of imported coffee from Indonesia and Vietnam (in US $), then the per capita income of the Malaysian population (in US $). For data on coffee prices from Indonesia and Vietnam are obtained by dividing the value of coffee imports with the volume of coffee imported coffee country of the origin. This is a proxy of the real Indonesian and Vietnamese coffee prices. The real price of Indonesian and Vietnamese coffee is the composite price which is the sum of the weighted average price of each type of coffee imported. The weighted use is the share of coffee volume of each type of coffee from the total volume of coffee imported in each country. One problem that arises when using real coffee prices, real coffee import price and volume data is too micro to note on import data. International trade data usually uses aggregate data and thus requires special techniques to proxy from individual data. The next variable is per capita Nominal Gross Domestic Product which is the value of nominal GDP per capita in US $.

Because this study is using time series data, then three tests should be completed before making a final estimation. The first test is to find out whether the data is stationary at the level or the first difference. Since most time series data is stationary at first level it is necessary to do a second test that is co-integration test. The purpose of the co-integration test is to find out whether long-term analysis exists in this study. If it does not pass the co-integration test, short-term analysis will be performed. The relationship between long-term and short-term will be detected using the model ECM (Error Correction Model). The third test is the classical assumption test.

The estimated model is the Malaysian import demand for Indonesian coffee and Vietnamese coffee. There will be two models to compare the result of price elasticity and income. The results of this comparison will show the tastes of Malaysian coffee consumers to Indonesian coffee and Vietnamese coffee. The second formulation of the model is as follows.

Model I:

$$\text{Log(INAVOL)} = \alpha_0 + \alpha_1 \text{ Log(INAPR)} + \alpha_2 \text{ Log(VIPR)} + \alpha_3 \text{ Log(MGDPCAP)} \quad (1)$$

Model II:

$$\text{Log(VIVOL)} = \beta_0 + \beta_0 \text{ Log(VIPR)} + \beta_0 \text{ Log(INAPR)} + \beta_0 \text{ Log(MGDPCAP)} \quad (2)$$

Where,

INAVOL is volume of Malaysian coffee imports from Indonesia (kilogram).
INAPR is price of Malaysian coffe imports from Indonesia (US$)
VIVOL is volume of Malaysian coffee imports from Vietnam (kilogram)
VIPR is price of Malaysian coffee imports from Vietnam (US$)
MGDPCAP is per capita nominal GDP of Malaysia (US$)

Results and Discussion

Stationarity test of each variable is the first test. The results from Table 1 show that all variables contain first difference stationarity except for the price of Vietnam coffee which is stationary at level. Due to differences in the degree of stationarity in the variables, the Engle-Granger method for co-integration test could not be performed. The ARDL (Autoregressive Distributed Lag) method of Pesaran and Shin which is bound test (Pesaran, Shin, & Smith, 2001) was applied to test the co-integration of this study. Therefore Bound test is employed to determine whether there is co-integration or not. The results of the Bound test (at Table 2) show that model I is a co-integrated. It means there is a relation between short-term and long-term patterns of Indonesian coffee import demand. In the second model, it shows that the Malaysian import demand of Vietnamese coffee only valid for short-term behavior.

Table 1. Unit Root Test using Augmented Dickey-Fuller Test

Variable	ADF test for Level	Decision	ADF test for First Difference	Decision
Log(INAVOL)	-0,557036	Not Stationary	-3,027549**	Stationary
Log(VIVOL)	-0,890933	Not Stationary	-4,229379**	Stationary
Log(INAPR)	-1,250600	Not Stationary	-4,123190**	Stationary
Log(VIPR)	-3,328860**	Stationary	-4,653650**	Stationary
Log(MGDPCAP)	-0,446510	Not Stationary	-4,419730**	Stationary

Note: ** significance at 5% using Mackinnon critical value.

Table 2. Result of Co-integration Test Using Bound Test

Variables	F-statistic	0 Bound	1 Bound	Decision
Model 1: Log(INAVOL), Log(INAPR), Log(VIPR), Log(MGDPCAP)	10.77998*	2.72	3.77	Co-integrated
Model 2: Log(VIVOL), Log(VIPR), Log(INAPR), Log(MGDPCAP)	2.474453	2.72	3.77	Not Co-integrated

Note: * significance at 1%
No asterix means insignificant

Next tests are classical assumption tests. All tests are presented in Table 3. From the table indicates that heteroscedasticity and autocorrelation do not exist in the data for the estimation of the import of Indonesian coffee and the estimation of the import of Vietnamese coffee. The White test for heteroscadasticity and Breusch-Godfrey test for autocorrelation for both estimations are low which are not rejected at significance level at 40% and 80%. However, this study does not apply multicollinearity test since the fact that an estimation will still obtain a good fit even though all predictor variables are correlated among themselves. (Kutner et.al., 2005)

Table 3. Heteroscedasticity and Autocorrelation Test

Models	White Test for Heteroscedasticity		Breusch-Godfrey Test for Autocorrelation	
	F-statitics	Conclusion	F-statitics	Conclusion
Indonesian coffee demand	0.224278	No Heteroscedasticity	0.929324	No Autocorrelation
Vietnamese coffee demand	0.415334	No Heteroscedasticity	0.003575	No Autocorrelation

After co-integration test, the next step is to estimate ECM (Error Correction Model) to find out whether short-term pattern can adjust long-term pattern. The results of the ECM estimation of Indonesian coffee import demand are listed in Table 4. The next estimation is a long run demand for Indonesian coffee. It is in the Table 5. Vietnam coffee demand estimation for short run will be in Table 6.

Table 4. ECM Estimation of Import Demand Indonesian Coffee of Malaysia

Variables	Coefficients	Std. Error	t-Statistic	Prob.
Constant	0.022	0.073	0.305	0.767
D(Log(INAPR))	-1.148	0.345	-3.331	0.009*
D(Log(MGDPCAP))	2.522	0.857	2.943	0.016**
D(Log(VIPR))	-0.389	0.175	-2.222	0.053**
ECT(-1)	-0.752	0.331	-2.268	0.050**
R-squared	0.645	Mean dependent var		0.098
Adjusted R-squared	0.487	S.D. dependent var		0.258
S.E. of regression	0.185	Sum squared resid		0.307
F-statistic	4.088	Log likelihood		6.869
Prob(F-statistic)	0.037	Durbin-Watson stat		1.503

Note: *,** significance at 1% and 5%

From the result in Table 4, in the short run, the signs of the coefficients are matched with the theory which are negative on own price, positive on income per capita, and negative on other commodity's price. The signs from short run estimation are matched with the signs from long run estimation (Table 5). The behavior of Malaysia coffee drinkers for Indonesian coffee are normal. They will respond just like law of demand when price changes, then will consider Indonesian coffee as normal goods when their income increase. For them who prefer Indonesian coffee, Vietnam coffee is just for complementary. First priority is Indonesian coffee and Vietnam coffee is just to try it or complement. From the coefficient of ECT(-1) shows that Malaysian coffee drinkers are loyal to Indonesian coffee. If there is a shock of the demand of Indonesian coffee, they will come back to Indonesian coffee eventually. However, based on Table 5, Indonesian coffee is expensive and considered as luxurious coffee generally for Malaysians. It is a good indication for Indonesia that Malaysia is a reliable market for Indonesian coffee. If Indonesian coffee producers or exporters can manage the price until considered inexpensive, the future is bright. It is difficult for other countries of coffee producers to dominate Malaysian coffee market because Indonesian coffee still dominates the market. However, if the condition of Indonesian coffee price is persistent, the coffee from other countries would replace the domination of Indonesian coffee in Malaysia. Vietnam coffee is the nearest candidate to replace Indonesian coffee.

Table 5. Estimation of Long Run Import Demand Indonesian Coffee of Malaysia

Variables	Coefficients	Std. Error	t-Statistic	Prob.
Constant	-11.082	5.219	-2.123	0.057
Log(INAPR)	-1.025	0.448	-2.287	0.043**
Log(MGDPCAP)	3.173	0.604	5.251	0.000*
Log(VIPR)	-0.708	0.266	-2.658	0.022**
R-squared	0.913	Mean dependent var		16.448
Adjusted R-squared	0.889	S.D. dependent var		0.668
S.E. of regression	0.223	Sum squared resid		0.545
F-statistic	38.359	Log likelihood		3.583
Prob(F-statistic)	0.000	Durbin-Watson stat		1.375

Note: *,** significance at 1% and 5%

The signs result of Table 6 is slightly different with Indonesian coffee demand. The cross elasticity in Table 5 is negative while the cross elasticity in Table 6 is positive. For Malaysian coffee drinkers who enjoy Indonesian coffee, for the moment, Vietnamese coffee is only the complement of Indonesian coffee. However, for people who drink Vietnamese coffee, Indonesian coffee is the substitution. Malaysian coffee drinkers only enjoy Vietnamese coffee for short term. In the long term, there is no statistical evidence that they enjoy Vietnamese coffee.

Table 6. Estimation of Short Run Import Demand Vietnam Coffee of Malaysia

Variables	Coefficients	Std. Error	t-Statistic	Prob.
Constant	0.129	0.089	1.455	0.176
D(Log(VIPR))	-1.121	0.214	-5.243	0.000*
D(Log(MGDPCAP))	-0.079	1.099	-0.072	0.944
D(Log(INAPR))	1.296	0.425	3.046	0.012*
R-squared	0.831	Mean dependent var		0.122
Adjusted R-squared	0.781	S.D. dependent var		0.510
S.E. of regression	0.239	Sum squared resid		0.571
F-statistic	16.436	Log likelihood		2.537
Prob(F-statistic)	0.000	Durbin-Watson stat		1.832

Note: * significance at 1%

Statistical proof shows that Indonesian coffee is still superior to Vietnamese coffee in Malaysians market. Probably, Malaysian market cannot attract Vietnamese coffee producers to intervene the market. Even though in 2006, 2007, and 2009 Vietnam export of coffee to Malaysia were larger than the coffee export of Indonesia, the domination went back to Indonesian coffee again until 2014. Vietnam is the new comer in international coffee market in the last 20 years. The focus probably was to the main countries which have largest consumption of coffee such as, USA and Europe. In reality, Malaysia is not an important coffee-consuming country in the world. On the average, every Malaysian consumes 1.3 kg coffee per year, fourth in Southeast Asia after the Philippines, Singapore, and Thailand, and also is 54th in the world. From this point of view, it is understandable if Vietnam was not attracted to penetrate to Malaysian market any further.

Nevertheless, along with the growth of world coffee consumption, Malaysia experienced a significant increase in coffee consumption. Coffee culture in Malaysia is rapidly growing not only because of the growth of population but also because of the influence of western coffee beverage products which change the people's taste of coffee in Malaysia (Rahman, 2010). The changing taste of drinking coffee is not only happening in Malaysia but also in the whole Asia (International Coffee Organization, 2014). Coffee shop invasion of western culture which is then counteracted by the growth of the local coffee shop is one of the main causes of the increase in coffee consumption of people in Asia and particularly in Malaysia (Isa, Subhan, & Saud, 2018). This situation is the indication that Malaysian coffee market will increase dramatically. This is good news and a bad news for Indonesia. Good news means the demand of Indonesian coffee in Malaysia will be much larger than before. However, it will attract Vietnam to penetrate Malaysian coffee market. Indonesian coffee exporter should aware because Vietnam had beaten Indonesia in coffee market domination in Malaysia easily in three years. For preparation of the next battle, Indonesian coffee producers should increase the productivity of coffee production in order to escalate the efficiency and the comparative advantage to Vietnam (Baroh, Hanani, Setiawan, & Koestiono, 2014; Egger & Orr, 2014; Hidayat & Soetriono., 2010). It is not such an easy task, however. The payoff of such task, it will continue the domination of Indonesian coffee even under the dynamism of Malaysia coffee market, such as the change of the coffee taste.

Conclusion

According to statistical evidence, Indonesian coffee still dominates Malaysian market even under the threat of Vietnamese coffee. Vietnamese coffee had been dominant in Malaysian market for three years, but Indonesian coffee took over the domination again. There are two reasons why Indonesian leads again. Firstly, Malaysian market is not top priority for Vietnamese coffee exporters. They focus on the USA and European market because the demand is immense. Secondly, Malaysian coffee drinkers are loyal to Indonesian coffee. If there is a shock on the Indonesian coffee demand in Malaysian market, they will look for Indonesian coffee again. The negligence of Indonesian coffee is only temporary. However, Indonesian coffee producers should be aware of the weaknesses of Indonesian coffee, i.e., the expensive price, and the dynamism of Malaysia coffee market. To overcome the price's problem, Indonesian coffee producers should increase the productivity of coffee production in order to escalate efficiency of production. For anticipating the dynamism of Malaysian coffee market, Indonesian coffee producers should watch over on changing consumer tastes. Besides, it is appropriate for Indonesian coffee producers to remember that Vietnam had been taken over the Malaysian market domination from Indonesia for three years. Therefore, the coffee exporters should always be aware with the competitors from Vietnam, and are able to make correct strategy to anticipate the change of Malaysian demand.

Refference

Baroh, I., Hanani, N., Setiawan, B., & Koestiono, D. (2014). Indonesian coffee competitiveness in the international market: Review from the demand side. *International Journal of Agriculture Innovations and Research*, *3*(2), 605–609.

Egger, S., & Orr, R. A. (2014). *The home barista: How to bring out the best in every coffee bean*. Melbourne: Affirm Press.

Food and Agriculture Organization. (2015). *FAO: Statistical pocketbook coffee 2015*. Retrieved from http://www.fao.org/3/a-i4985e.pdf.

Goddard, E. W., & Akiyama, T. (1989). United States demand for coffee imports. *Agriculture Economics*, *3*(2), 147–159.

Hidayat, A., & Soetriono. (2010). Daya saing ekspor kopi robusta Indonesia di pasar internasional. *Journal of Social and Agriculture Economics*, *4*(2), 62–82.

Hutabarat, B. (2010). World market condition and its impact on the performance of national coffee industry. *Indonesian Journal of Agriculture*, *3*(1), 51–59.

Igami, M. (2015). Market power in international commodity trade: The case of coffee. *Journal of Industrial Economics*, *63*(2), 225–248.

International Coffee Organization. (2014). *Coffee consumption in East and Southeast Asia: 1990 – 2012* (International Coffee Council 112th Session). London. Retrieved from www.ico.org/news/icc-112-4e-consumption-asia.pdf

Isa, A. M., Subhan, M., & Saud, M. B. (2018). Does western culture impact customer loyalty for western multinational companies in Malaysia? A case study of Starbucks. In *Enhancing business stability through collaboration* (443rd–454th ed.). CRC Press.

Kutner, M. H., Nachtsheim, C. J., Neter, J., & Wasserman, W. (2005). *Applied linear statistical models*, fifth edition. McGraw Hill/Irwin.

Lewin, B., Giovannucci, D., & Varangis, P. (2004). *Coffee markets: New paradigms in global supply and demand* (Agriculture and Rural Development Discussion Paper 3 No. 28300).

Manzo, J. (2010). Coffee, connoisseurship, and an ethnomethodologically-informed sociology of taste. *Human Studies*, *33*(2–3), 141–155.

Nugroho, A. (2016). *Economic analysis on production changes, market integration and export challenges of coffee sector in Indonesia*. Kyoto University. Retrieved from https://repository.kulib.kyoto-u.ac.jp/dspace/bitstream/2433/215968/2/dnogk02185.pdf

Pendergrast, M. (2010). *Uncommon grounds: The history of coffee and how it transformed our world.* (revised ed). New York: Basic Books.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326.

Pokorna, I., & Smutka, L. (2010). What is the structure of the coffee market: Can the real poor benefit from the coffee trade? *AGRIS on-Line Papers in Economics and Informatics*, *2*(2), 27–37.

Rahman, S. N. A. (2010). *Malaysian coffee culture: A research of social aspect, branding and design*. Universiti Teknologi Mara, Selangor, Malaysia.

Samper, M., & Fernando, R. (2003). Historical statistics of coffee production and trade from 1700 to 1960. In W. G. Clarence-Smith & S. Topik (Eds.), *The global coffee economy in Africa, Asia, and Latin América, 1500-1989* (pp. 411–462). Cambridge: Cambridge University Press.

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available athttp://journal.uii.ac.id/index.php/jep

Inclusive growth and leading sector in Bali

Ni Made Ayu Krisna Cahyadi*, Sasongko, Putu Mahardika Adi Saputra

Department of Economics, University of Brawijaya, Indonesia

Article Info

Article history:
Received: 2 July 2017
Accepted: 7 March 2018
Published: 1 April 2018

Keywords:
inclusive growth, pro-poor growth, poverty, inequality, labor absorption

JEL Classification:
O4, I320, D63

DOI:
10.20885/ejem.vol10.iss1.art11

Abstract

This research analyzes the dynamics of pro-poor growth in 9 regencies/cities of Bali province from 2007 to 2015. This research identifies pro-poor growth based on Poverty Equivalent Growth Rate (PEGR). The results show that the regions with agriculture leading sector tend to have pro-poor growth in reducing poverty and inequality but anti-poor in absorbing labors. On the contrary, the regions with high tourism potential show anti-poor growth trend in reducing poverty and inequality but pro-poor in absorbing labors.

Introduction

The economic development aims at achieving one major goal, public welfare. Some indicators, such as per capita income, poverty, inequality, and many more are used to measure the success of the development. One of the most important criteria is economic growth, which may describe the impact of development policy made by the government (Saputra, 2014; World Bank, 2016).

The theory of trickledown effect by explains that the advantages of economic growth shall influence even the bottom social layer, ranging from the formation of employment to other economic opportunities that can support economic growth equity (Nafziger, 2006). Simply speaking, economic growth will be followed by automatic vertical flow from the rich to the poor. According to Kakwani & Pernia (2000), this causes the benefit received by poor society too small regardless the belief that poverty eradication might take place although the people are economically disadvantaged.

In fact, the trickledown effect has not occurred until today. This can be seen from the increase of growth is not followed by the decreasing inequality. The economic growth in Bali in 2007 was 5,92% and on 2015 increased to 6,04%. On the other side, inequality also increased. In 2007, the Gini index was only 0,28 while on 2015 increased to 0,38 (Statistics Indonesia, 2016). The failure of trickledown effect encourages the government to formulate the economic strategies in favor of poor society as mentioned in the National Medium-Term Development Plan year 2004-2009 and 2010-2014 (National Development Planning Agency, 2004, 2010).

The two series of the National Medium-Term Development Plan prioritizes the development policy not only on pro-growth or positive economic growth but also on pro-job and pro-poor so that the society in all stratification levels gain the positive effect of the economic growth. These three types of policies are called Triple Track Strategy, which amends the trickledown effect. It is through the Triple Track Strategy that the Indonesian government is committed to achieving inclusive economic growth. Since Triple Track Strategy is a national development plan, then this policy becomes the reference policy in all regions in Indonesia, including the development policy in Bali.

Inclusive growth has been a popular term; many kinds of literature discuss its definition extensively. Ali (2007) proposes that inclusive growth focuses on the acceleration of opportunity and access expansion towards economic sources for all economic agents, especially for the group of less advantaged community. Klasen (2010) underlines the importance of recognizing the growth categorized as inclusive growth regarding two possibilities. First, the process, in which the economic growth involves public participation and thus

P ISSN 2086-3128|E ISSN 2502-180X
*Corresponding author e-mail: ayucahyadi@hotmail.com

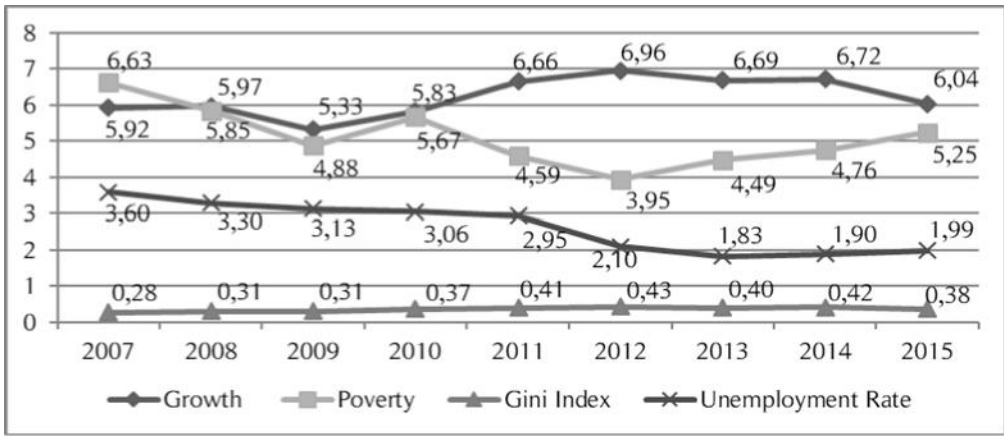
classified as inclusive. Second, the result, i.e., the extent to which the outcome gives advantages to the majority of people. The second possibility is much similar to the concept of pro-poor growth.

Pro-poor growth has various definitions. Kakwani & Pernia (2000)propose that growth is pro-poor if the poor receive more proportional benefits than the non-poor. Under the circumstances of negative growth, pro-poor growth is assumed to take place when the lost suffered by poor people is proportionally less than that suffered by the non-poor (Asian Development Bank (ADB), 1999; Grosse, Harttgen, & Klasen, 2008; Klasen, 2008; Pernia, 2003; Ravallion & Chen, 2003; Son & Kakwani, 2008)

Another definition by Aoyagi & Ganelli (2015)of inclusive growth, which is identical to the concept of pro-poor, requires the reduction of income disparity between the poor and the non-poor society. Quite similar to pro-poor growth concept which focuses on the relative growth to reduce the gap between the two groups, inclusive growth tends to reduce the inequality in general Kanbur & Rauniyar (2009). Another approach by the World Bank (2009) asserts that inclusive growth should involve labors' productivity. The increasing number and productivity of the labors are fundamental elements in sustainable growth strategy, which affects the poverty reduction as poor people rely on the labors as the most important asset in their life (Asian Development Bank, 2008)

The concept of pro-poor growth in this research is applied in Bali, one of the Indonesian provinces with its rich of tourism potentials. Trading, hotel, and restaurant sectors support the highest annual contribution to the Province's Gross Domestic Regional Product. In 2015, the contribution reached 31.11%. On the other hand, the contribution of the agriculture sector, which has been the leading sector in other areas with fewer tourism potentials, decreases year by year. Agriculture sector contributed for 19.41% in 2007, and it decreases to 14.92% in 2015 (Statistics of Bali Province, 2016).

The average of economic growth in Bali during 2007 to 2015 is 6.24% (Figure 1). Such high economic growth, however, does not guarantee the reduction of the poverty level, inequality, and employment rate in the province. It is proven by the fluctuating percentage of poor people. The number even shows a significant increase in 2013 up to 2015. The inequality, measured by Gini index, also increases every year. According to Sasongko (2009), the economic potential in one region should support the development of other regions. Apparently, this has not happened in Bali yet. The increase of inequality is supposed to be the effect of the centralization of economic activities in South Bali as the main destination of tourists' visit to Bali. Meanwhile, the unemployment rate reflecting the extent to which labors are employed rose in 2014 and 2015 due to the weakness of economic sectors in absorbing the labors.



Source: Statistics of Bali Province, 2008-2016

Figure 1. Economic Growth, Poverty, Gini Index, and Unemployment Rate In Bali Province 2007-2015 (%)

This research aims to identify and analyze the dynamics of pro-poor growth in three terms, i.e. (i) poverty reduction, (ii) inequality reduction, and (iii) labor absorption in 9 regencies/cities of Bali province from 2007 to 2015.Identification towards pro-poor growth is based on Poverty Equivalent Growth Rate (PEGR) developed by Son & Kakwani (2008) and adoption equation by Klasen (2010).In this paper, the result will show different tendencies between regions with agriculture leading sector and regions with leading tourism sector. This proves that tourism is an important role in affecting economic growth in Bali.

Research Method

The method used to identify pro-poor growth in this research is Poverty Equivalent Growth Rate (PEGR) developed by Kakwani & Son (2008). This study also adopts the technique of Klasen (2010) that identifies pro-poor growth into three terms, i.e. (i) poverty reduction, (ii) inequality reduction, and (iii) labor market which proxied by labor absorption. Both of PEGR formula by Kakwani & Son (2008) and adoption equation by Klasen (2010) is formulated as follows.

$$\gamma^* = \left(\frac{\delta}{\eta}\right)\gamma \quad (1)$$

$$IG_{ij} = \frac{G_{ij}}{G_i} G_j \quad (2)$$

Where IG_{ij} is inclusivity coefficient; G_{ij} is growth of group i in indicator j; and G_j is growth of indicator j. In this equation, i refers to a less advantaged group, while j refers to the related indicator (such as poverty, income, and so on).

About the adoption equation, three terms of pro-poor growth, i.e., poverty reduction, inequality reduction, and labor absorption are formulated as follows, in which all data are derived from the Statistics of Bali Province.

$$IG_p = \frac{G_{pg}}{G_p} G_g \quad (3)$$

$$IG_{in} = \frac{G_{in.g}}{G_{in}} G_g \quad (4)$$

$$IG_{em} = \frac{G_{em.g}}{G_{em}} G_g \quad (5)$$

Where IG_p is pro-poor growth index in poverty reduction; G_{pg} is elasticity of poverty to growth; G_p is elasticity of poverty to mean income; IG_{in} is pro-poor growth index in inequality reduction; $G_{in.g}$ is elasticity of inequality to growth; G_{in} is elasticity of inequality to mean income; IG_{em} is pro-poor growth index in labor absorption; $G_{em.g}$ is elasticity of labor absorption to growth; G_{em} is elasticity of labor absorption to labor force; and G_g is actual growth.

The result of PEGR assessment is visually presented in the 4-quadrant diagram showing the characteristics of the growth in 9 regencies/cities of Bali Province from 2007 to 2015. To identify the result of pro-poor growth index and poverty reduction, inequality, and labor absorption, the score is classified as follows:

Table 1. Identification of Pro-Poor Growth Index

Identification	Characteristic	Interpretation
$IG = G_g$	Neutral	Everyone receives the same benefits proportionally from growth
$IG > G_g$	Pro-Poor Growth	The poor receive more benefits from growth
$0 < IG < G_g$	Not Pro-Poor Yet	The non-poor receives more benefits from growth regardless poverty reduction
$IG < G_g$	Anti Poor	The non-poor receives more benefits from growth and poverty increases

Source: (Azwar, 2016)

The identification of PEGR divided into four, i.e. if $IG = G_g$ then it is categorized as neutral growth; if $IG > G_g$ then it is categorized as pro-poor growth; if $0 < IG < G_g$ then it is categorized as not pro-poor yet; and if $IG < G_g$ then it is categorized as anti-poor (see Table 1).

Results and Discussion

Pro-poor growth in poverty reduction

World Bank (2013) defines poverty as the condition of hunger, lack of housing, being sick and unable to see a doctor, lack of access to education and power, and jobless. The reduction of the poverty level is one of the indicators used to achieve pro-poor economic growth. The failure of high economic growth to reduce poverty indicates the exclusiveness of the growth enjoyed only by rich people.

Table 2 shows the average comparison of actual economic growth and pro-poor growth index in poverty reduction for nine years in 9 regencies/cities (see Appendix 1). The data in Table 2 illustrate that some

regencies/cities have achieved not pro-poor yet and neutral growth. Jembrana, Badung, Gianyar, and Bangli on average have not yet performed the pro-poor growth during 2007-2015. It means that the non-poor receives the benefits or advantages of the growth, regardless the fact of poverty reduction. Meanwhile, Tabanan, Klungkung, Karangasem, Buleleng, and Denpasar show neutral growth from 2007 to 2015. On average, this indicates that both poor and non-poor groups proportionally receive equal benefits from the growth.

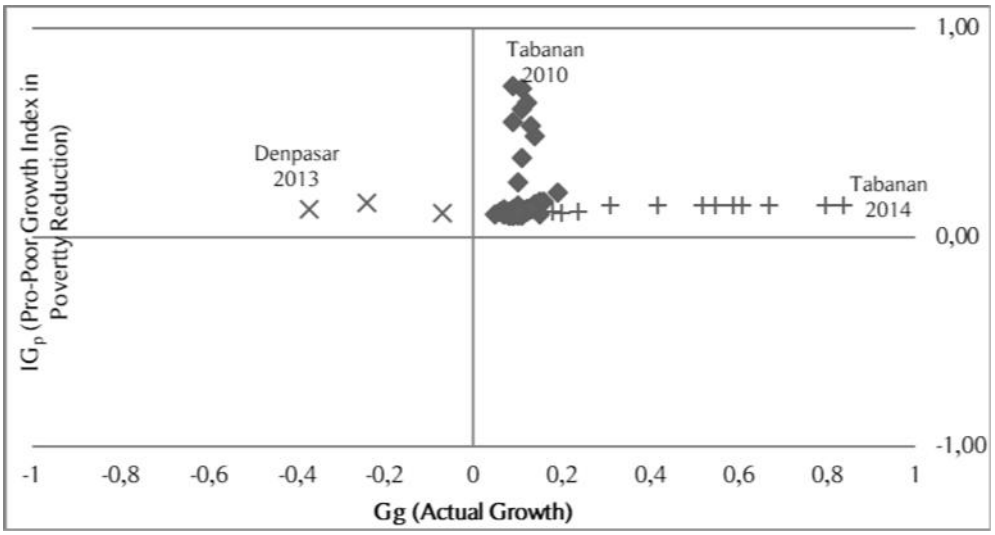
Table 2. The Average of Economic Growth and Pro-Poor Growth Index in Poverty Reduction in 9 Regencies/Cities of Bali Province 2007-2015

Regencies/Cities	IG_p	G_g	Characteristic
Jembrana	0.16	0.17	Not pro-poor yet
Tabanan	0.19	0.19	Neutral
Badung	0.13	0.19	Not pro-poor yet
Gianyar	0.15	0.17	Not pro-poor yet
Klungkung	0.15	0.15	Neutral
Bangli	0.13	0.14	Not pro-poor yet
Karangasem	0.18	0.18	Neutral
Buleleng	0.19	0.19	Neutral
Denpasar	0.12	0.12	Neutral

Source: Appendix 1

Note: IG_p=Pro-poor growth index in poverty reduction; G_g= Actual growth

Figure 2 shows that in 2013 Denpasar City had the lowest pro-poor growth index and was valued negatively; however, as the actual growth was negative, it is categorized as not pro-poor yet in poverty reduction. In 2010, Tabanan Regency achieved the highest actual growth, but its pro-poor index value was still lower than the growth itself. Therefore, the growth is categorized not pro-poor yet although there are still reducing poverty level. Quite the contrary, in 2014 Tabanan had the highest pro-poor index value and classified as pro-poor growth.



Source: Statistics of Bali Province, 2008-2016 (processed data)

Note:

IG < 0 means anti-poor growth
IG>G_g means not pro-poor growth yet
0<IG<G_g means pro-poor growth

Figure 2. Comparison Between Economic Growth and Pro-Poor Growth Index in Poverty Reduction in Bali Province 2007-2015

On average, the economic growth of the nine regencies/cities of Bali Province has not been pro-poor yet in reducing poverty. The regions, which tend to have pro-poor growth, are those functioning agriculture

sectors as their main economic driving source. In contrast, the regions with high tourism potential like Badung, Gianyar, and Denpasar tend to have anti-poor growth.

According to the research carried out in India, Besley, Burgess, & Esteve-Volart (2005) proposes that pro-poor growth, which reduces poverty, is likely to take place only in the regions with sufficient infrastructure and education facilities, whereas other regions demonstrate anti-poor growth. Another research was conducted by Duclos & Audrey (2010) in South Africa as a developed region and Mauritius representing the under-developed one. Their research shows that South Africa performs anti-poor growth, while Mauritius presents pro-poor growth. The result of the studies has a similar tendency as that shown in Bali Province.

The study also reveals that the regions with high tourism potentials or those classified as advanced area tend to show anti-poor growth, e.g., Badung, Gianyar, and Denpasar. In contrast, the underprivileged regions tend to have pro-poor growth. These trends demonstrate that regions with high tourism potential focus on developing tourism itself instead of reducing the poverty level, although local government policy on tourism development is expected to give indirect effect on the reduction of poverty.

Pro-poor growth in inequality reduction

In addition to reducing poverty, pro-poor growth is intended to reduce inequality, especially–as this study concern–in terms of the income. The inequality in Indonesia occurs not only between provinces in Java Island and those out of Java, or between West and East Indonesia. Instead, it happens even in such a narrower scope as among regencies/cities in one province.

Table 3. The Average of Economic Growth and Pro-Poor Growth Index in Inequality Reduction in 9 Regencies/Cities of Bali Province 2007-2015

Regencies/Cities	IG_{in}	G_g	Characteristic
Jembrana	0.13	0.17	Not pro-poor yet
Tabanan	0.15	0.19	Not pro-poor yet
Badung	0.09	0.19	Not pro-poor yet
Gianyar	0.12	0.17	Not pro-poor yet
Klungkung	0.12	0.15	Not pro-poor yet
Bangli	0.13	0.14	Not pro-poor yet
Karangasem	0.14	0.18	Not pro-poor yet
Buleleng	0.16	0.19	Not pro-poor yet
Denpasar	0.08	0.12	Not pro-poor yet

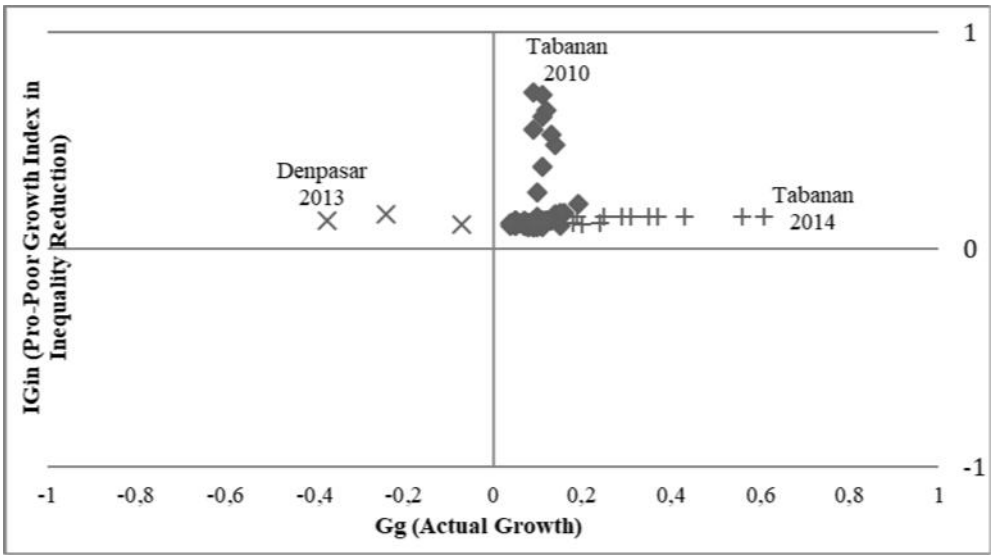
Source: Appendix 2

Note: IG_{in}=Pro-poor growth index in inequality reduction; G_g= Actual growth

The data presented in Table 3 illustrates the average comparison between actual economic growth and pro-poor growth index in inequality reduction for nine years (see Appendix 2). The table shows that all regions have achieved not pro-poor yet in inequality reduction. It means that non-poor people enjoy the benefits of growth more rather than by the poor ones, even though the inequality level is reducing.

Figure 3 reveals that the pro-poor growth in inequality reduction does not have much different result than the poverty reduction. In 2013, Denpasar City was situated in quadrant II because it had the lowest pro-poor growth index and was valued negatively so that it is characterized as anti-poor growth. In 2010, Tabanan Regency showed the highest actual growth, but it was not followed by pro-poor growth index; therefore, it is classified under the characteristic of not pro-poor yet. In a different year, Tabanan Regency is categorized pro-poor with the highest index value.

On average, all regions in Bali Province have not performed pro-poor growth yet in inequality reduction. Like the condition above of poverty reduction, regions having agriculture as their leading sector tend to have pro-poor growth in reducing inequality; whereas regions with high tourism potential tend to perform anti-poor growth. The research of Aoyagi & Ganelli (2015) shows that, even though the economic growth increases and poverty reduce in the last decade, inequality in Asia continues to increase.



Source: Statistics of Bali Province, 2008-2016 (processed data)
Note:

IG < 0 means anti-poor growth
IG>G_g means not pro-poor growth yet
0<IG<G_g means pro-poor growth

Figure 3. Comparison Between Economic Growth and Pro-Poor Growth Index in Inequality Reduction in Bali Province 2007-2015

The increase of economic growth is in fact not followed by inequality reduction, and this is noticeable in Bali Province. This is mainly caused by the centralization of economic activities in South Bali, which owns rich tourism potentials. Most investments are channeled to Badung Regency, which is located in South Bali and becoming the main destination of tourists visiting Bali. Other regions, on the other hand, still work on the agriculture industry, which seems unable to contend the existing tourism potentials.

Pro-poor growth in labor absorption

Economic growth should also be supported by the absorption of labors. High unemployment rate indirectly reflects high poverty. Thus, pro-poor growth might be achieved through labor absorption.

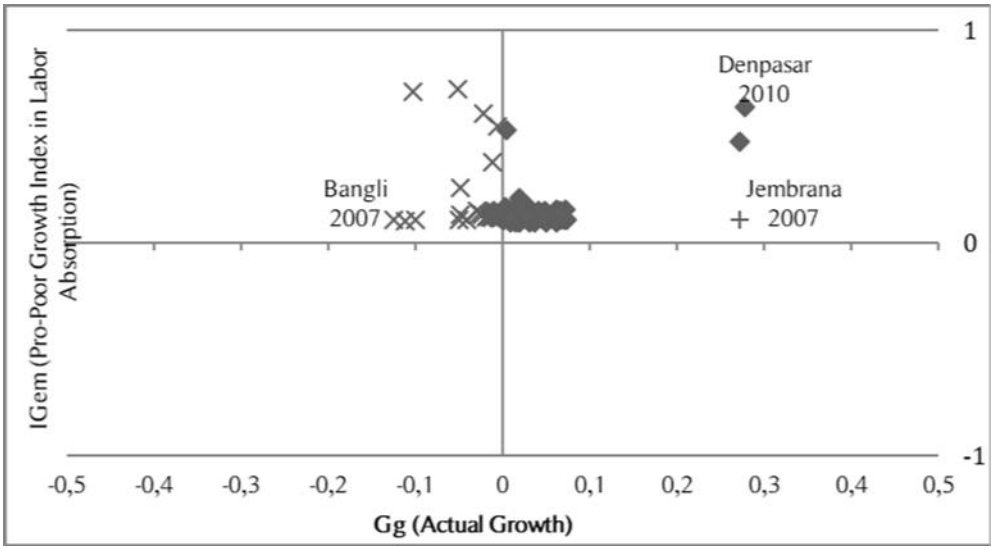
Table 4 shows the average actual economic growth and pro-poor growth index of the nine regencies/cities in Bali in labor absorption for nine years (see Appendix 3). The data presented in Table 4 indicate that all regencies/cities, excluding Bangli, have performed not pro-poor growth yet in absorbing labors. This means that mostly the non-poor receive the benefits of the growth although labor absorption rate increases. Bangli Regency, in contrast, shows anti-poor growth. This signifies that mostly the non-poor regarding labor absorption receive the benefits of the growth.

Table 4. The Average of Economic Growth and Pro-Poor Growth Index in Labor Absorption in 9 Regencies/Cities of Bali Province Year 2007-2015

Regencies/Cities	$IG_{..}$	$G_{.}$	Characteristic
Jembrana	0.04	0.17	Not pro-poor yet
Tabanan	0.01	0.19	Not pro-poor yet
Badung	0.04	0.19	Not pro-poor yet
Gianyar	0.02	0.17	Not pro-poor yet
Klungkung	0.00	0.15	Not pro-poor yet
Bangli	-0.01	0.14	Anti poor
Karangasem	0.01	0.18	Not pro-poor yet
Buleleng	0.01	0.19	Not pro-poor yet
Denpasar	0.04	0.12	Not pro-poor yet

Source: Appendix 3
Note: $IG_{..}$=Pro-poor growth index in labor absorption; $G_{.}$= Actual growth

Figure 4 informs that in 2007 Bangli Regency owned the lowest pro-poor growth index in absorbing labors; it is valued negatively and thus categorized anti-poor. Meanwhile, in 2010 Denpasar City had better condition regardless it's being classified not pro-poor yet with highest actual growth. In 2007, Jembrana Regency was the only region which once performed pro-poor growth in absorbing the labors.



Source: Statistics of Bali Province, 2008-2016 (processed data)
Note:

IG < 0 means anti-poor growth
IG>G_g means not pro-poor growth yet
0<IG<G_g means pro-poor growth

Figure 4. Comparison Between Economic Growth and Pro-Poor Growth Index in Labor Absorption in Bali Province 2007-2015

The tendency of pro-poor growth in labor absorption is quite different from that in poverty and inequality reduction. Regions with agriculture leading sector tend to have anti-poor growth in absorbing the labors. On the contrary, those with high tourism potentials have better condition although they do not fully perform pro-poor growth.

Khamis (2005) researched Argentina to examine the dynamic correlation among labor market, poverty, disparity, and pro-poor growth. The result of the analysis shows that several economic sectors in the country, such as manufacture, service, construction, and transportation, can absorb labors and even reduce the poverty level, while other sectors do not give similar influence. Another research was conducted by Selim (2006) in Bangladesh, Bolivia, and Ethiopia. The result of the study reveals that the anti-poor occurring in Bolivia in 1991-1999 was the result of low employment intensity, which increased in line with the economic growth; meanwhile, the growth was not followed by other sectors having high employment intensity.

The result of this study indicates that tourism sector in Bali plays a very vital role. Some regions like Badung, Gianyar, and Denpasar City own rich tourism potentials while other regions still struggle in the agriculture sector whose contribution decreases year by year. Tourism potentials can reflect open job opportunity. The people living in a region with low tourism potential usually migrate to another area with more prospective tourism. It is a common phenomenon especially in Bali Province in which the distance among regions is not so far that people only need little time to reach different regencies/cities.

Conclusion

About the result on the dynamics of pro-poor growth in poverty reduction, inequality reduction, and labor absorption, it can be concluded that the regions with agriculture leading sector like Jembrana, Karangasem, and Buleleng end to pro-poor in reducing both poverty and inequality. Meanwhile, Tabanan, Klungkung, and Bangli regencies which benefit from agriculture sector as their main economic driving source have not

performed pro-poor growth yet in reducing poverty and inequality. In contrast, Badung, Gianyar, and Denpasar City own anti-poor growth in reducing the two factors.

Regarding labor absorption, it is evident that the regions with agriculture leading sector, such as Jembrana, Tabanan, Bangli, Karangasem, and Buleleng, have anti-poor growth in absorbing the labors. Other regions like Badung, Gianyar, and Denpasar City have a better condition although they are not pro-poor yet in absorbing the labors. This indicates that high tourism potential in a region of Bali Province provides wide job opportunity not only for the indigenous people of the region but also for anybody coming from the surrounding regions.

Most regions in Bali Province have such minimum tourism potentials that they still rely on agriculture and fishery sectors. The increase of tourism sector in some regions might be used to develop the agriculture and fishery sectors. The local government is expected to facilitate the agriculture and fishery products to be endorsed, promoted, and used in various accommodations and restaurants situating around the visitors' tourism destination. By doing so, labor absorption might take place not only in tourism sector but also other sectors, especially agriculture which has been recently neglected. When labor absorption occurs, poverty level can be reduced, and the people's income distribution is likely to be equal.

References

Ali, I. (2007). Inequality and the imperative for inclusive growth in Asia. *Asian Development Review*, *24*(2), 1–16.

Aoyagi, C., & Ganelli, G. (2015). Journal of Asian Economics Asia's Quest for Inclusive Growth Revisited. *Journal of Asian Economics*, *40*, 29–46. https://doi.org/10.1016/j.asieco.2015.06.005

Asian Development Bank. (2008). *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank 2008-2020*. Mandaluyong City, Philippines: Asian Development Bank. Retrieved from https://www.adb.org/sites/default/files/institutional-document/32121/strategy2020-print.pdf

Asian Development Bank (ADB). (1999). *Fighting Poverty in Asia and the Pacific: The Poverty Reduction Strategy*. Manila. Retrieved from http://www.lcgbangladesh.org/PovertyIssues/reports/ADB-1999-PRS.pdf

Azwar. (2016). Inclusive Growth in South Sulawesi Province and Factors That Affect It. *Jurnal BPPK*, *9*(2), 216–242.

Besley, T., Burgess, R., & Esteve-Volart, B. (2005). *Operationalising Pro-Poor Growth: India Case Study* (Vol. 4). London. Retrieved from https://www.lse.ac.uk/asiaResearchCentre/_files/propoorgrowth.pdf

Duclos, J.-Y., & Verdier-Chouchane, A. (2010). *Analyzing Pro-Poor Growth in Southern Africa: Lessons From Mauritius And South Africa* (No. 115). Tunis, Tunisia. Retrieved from https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/WORKING PAPER 115 .pdf

Grosse, M., Harttgen, K., & Klasen, S. (2008). Measuring Pro-Poor Growth in Non-Income Dimensions. *World Development*, *36*(6), 1021–1047. https://doi.org/10.1016/j.worlddev.2007.10.009

Kakwani, N., & Pernia, E. M. (2000). What is Pro-poor Growth? *Asian Development Review*, *18*(1), 1–16.

Kakwani, N., & Son, H. H. (2008). Poverty Equivalent Growth Rate. *The Review of Income and Wealth*, *54*(4), 643–656.

Kanbur, R., & Rauniyar, G. (2009). *Conceptualizing Inclusive Development : With Applications to Rural Infrastructure and Development Assistance*. *IED Occasional Paper*. Manila.

Khamis, M. (2005). *Crisis and Recovery in Argentina: Labor Market, Poverty, Inequality and Pro-Poor Growth Dynamics* (No. Ibero-America Institute for Economic Research). *Ibero America Institute for Econ. Research (IAI) Discussion Papers 135*.

Klasen, S. (2008). Economic Growth and Poverty Reduction: Measurement Issues using Income and Non-Income Indicators. *World Development*, *36*(3), 420–445. https://doi.org/10.1016/j.worlddev.2007.03.008

Klasen, S. (2010). *Measuring and Monitoring Inclusive Growth : Multiple Definitions, Open Questions, and Some Constructive Proposals*. Manila.

Nafziger, E. W. (2006). *Economic Development*.

National Development Planning Agency. (2004). Presidential Regulation Number 7 Of 2005 on The National Medium-Term Development Plan of 2004–2009. Retrieved from https://www.bappenas.go.id/files/9814/2099/2543/RPJMN_2004-2009.pdf

National Development Planning Agency. (2010). Presidential Regulation Number 5 Of 2010 on The National Medium-Term Development Plan of 2010 – 2014. Retrieved March 12, 2018, from https://www.bappenas.go.id/files/rpjmn/RPJMN 2010-2014.pdf

Pernia, E. M. (2003). Pro-poor Growth: What is It and How is It Important? *Asian Development Bank ERD Policy Brief No.17*.

Ravallion, M., & Chen, S. (2003). Measuring pro-poor growth. *Economics Letters*, *78*(1), 93–99. https://doi.org/10.1016/S0165-1765(02)00205-7

Saputra, P. M. A. (2014). Technical efficiency and export performance: evidence for self-selection hypothesis from Indonesian manufacturing sector-level data. *International Journal of Economic Policy in Emerging Economies*, *7*(4), 383–398. https://doi.org/10.1504/IJEPEE.2014.066625

Sasongko, S. (2009). Economic Analysis and Trade of Agricultural Commodities of Regencies/Cities in East Java Province. *(Social Sciences)*, *21*(1), 87–94.

Selim, R. (2006). *Employment-Poverty Linkages and Pro-Poor Growth: A Synthesis Peper Based on Country Studies of Bangladesh, Bolivia, and Ethiopia*.

Son, H. H., & Kakwani, N. (2008). Global Estimates of Pro-Poor Growth. *World Development*, *36*(6), 1048–1066. https://doi.org/10.1016/j.worlddev.2007.10.002

Statistics Indonesia. (2016). *Bali Province in Figures*. Denpasar: Statistics of Bali Province. Statistics of Bali Province. (2016). *Bali Province in Figures*.

World Bank. (2009). What is Inclusive growth? PRMED Knowledge Brief. Retrieved from http://www.wider.unu.edu/events/research-presentations/seminars/en_GB/25-01-2012/_files/87003786608443555/default/UNU-WIDER Presentation What is Inclusive Growth.pdf

World Bank. (2013). *A Stronger, Connected, Solutions World Bank Group: An Overview of the World Bank Group Strategy*. Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/16093/32813_ebook.pdf?sequence=5&isAllowed=y

World Bank. (2016). *Poverty and Shared Prosperity 2016: Taking on Inequality*. Washington DC: World Bank. https://doi.org/10.1596/978-1-4648-0958-3

Appendix

Appendix 1: Pro-Poor Growth Index in Poverty Reduction

Regencies/ Cities	Year					
	2007		2008		2009	
	IG_p	G_g	IG_p	G_g	IG_p	G_g
Jembrana	0.05**	0.11	0.14**	0.16	0.12**	0.13
Tabanan	0.11*	0.11	0.15*	0.15	0.10**	0.11
Badung	0.12**	0.13	0.16**	0.17	0.19**	0.21
Gianyar	0.12**	0.13	0.15**	0.16	0.13**	0.14
Klungkung	0.09**	0.11	0.15*	0.15	0.09**	0.13
Bangli	0.10**	0.11	0.13**	0.14	0.14*	0.14
Karangasem	0.06**	0.12	0.15**	0.16	0.13**	0.14
Buleleng	0.11*	0.11	0.14**	0.15	0.13*	0.13
Denpasar	0.11**	0.13	0.15**	0.17	0.07**	0.13

Regencies/ Cities	Year					
	2010		2011		2012	
	IG_p	G_g	IG_p	G_g	IG_p	G_g
Jembrana	0.09**	0.55	0.08**	0.11	0.11***	0.10
Tabanan	0.09**	0.72	0.08**	0.10	0.09**	0.10
Badung	0.14**	0.48	0.08**	0.12	0.10**	0.15
Gianyar	0.13**	0.53	-0.07****	0.11	0.15***	0.11
Klungkung	0.11**	0.38	0.09**	0.10	0.08**	0.10
Bangli	0.10**	0.26	0.09**	0.10	0.10*	0.10
Karangasem	0.11**	0.61	0.09**	0.10	0.09**	0.10
Buleleng	0.11**	0.71	0.07**	0.11	0.07**	0.11
Denpasar	0.12**	0.64	0.09**	0.11	0.11**	0.13

Regencies/ Cities	Year					
	2013		2014		2015	
	IG_p	G_p	IG_p	G_g	IG_p	G_g
Jembrana	0.15***	0.11	0.59***	0.15	0.12**	0.13
Tabanan	0.08**	0.12	0.84***	0.15	0.13*	0.13
Badung	-0.24****	0.16	0.55***	0.15	0.09**	0.11
Gianyar	0.09**	0.12	0.52***	0.15	0.10**	0.11
Klungkung	0.20***	0.11	0.42***	0.15	0.12*	0.12
Bangli	0.09**	0.12	0.31***	0.15	0.12**	0.13
Karangasem	0.24***	0.12	0.61***	0.15	0.13*	0.13
Buleleng	0.18***	0.12	0.80***	0.15	0.13*	0.13
Denpasar	-0.37****	0.13	0.67***	0.15	0.10**	0.12

Note:IG_p=Pro-poor growth index in poverty reduction; G_g= Actual growth

*) Neutral growth **) Not pro-poor growth yet***) Pro-poor growth ****) Anti poor growth

Appendix 2: Pro-Poor Growth Index in Inequality Reduction

Regencies/ City	Year					
	2007		2008		2009	
	IG_{in}	G_g	IG_{in}	G_g	IG_{in}	G_g
Jembrana	0.05**	0.11	0.14**	0.16	0.12**	0.13
Tabanan	0.11*	0.11	0.15*	0.15	0.10**	0.11
Badung	0.12**	0.13	0.16**	0.17	0.19**	0.21
Gianyar	0.12**	0.13	0.15**	0.16	0.13**	0.14
Klungkung	0.09**	0.11	0.15*	0.15	0.09**	0.13
Bangli	0.10**	0.11	0.13**	0.14	0.14*	0.14
Karangasem	0.06**	0.12	0.15**	0.16	0.13**	0.14
Buleleng	0.11*	0.11	0.14**	0.15	0.13*	0.13
Denpasar	0.11**	0.13	0.15**	0.17	0.07**	0.13

Regencies/ City	Year					
	2010		2011		2012	
	IG_{in}	G_g	IG_{in}	G_g	IG_{in}	G_g
Jembrana	0.09**	0.55	0.08**	0.11	0.11***	0.10
Tabanan	0.09**	0.72	0.08**	0.10	0.09**	0.10
Badung	0.14**	0.48	0.08**	0.12	0.10**	0.15
Gianyar	0.13**	0.53	-0.07****	0.11	0.15***	0.11
Klungkung	0.11**	0.38	0.09**	0.10	0.08**	0.10
Bangli	0.10**	0.26	0.09**	0.10	0.10*	0.10
Karangasem	0.11**	0.61	0.09**	0.10	0.09**	0.10
Buleleng	0.11**	0.71	0.07**	0.11	0.07**	0.11
Denpasar	0.12**	0.64	0.09**	0.11	0.11**	0.13

Regencies/ City	Year					
	2013		2014		2015	
	IG_{in}	G_g	IG_{in}	G_g	IG_{in}	G_g
Jembrana	0.15***	0.11	0.35***	0.15	0.05**	0.13
Tabanan	0.08**	0.12	0.61***	0.15	0.05**	0.13
Badung	-0.24****	0.16	0.25***	0.15	0.04**	0.11
Gianyar	0.09**	0.12	0.29***	0.15	0.05**	0.11
Klungkung	0.20***	0.11	0.19***	0.15	0.05**	0.12
Bangli	0.09**	0.12	0.31***	0.15	0.12**	0.13
Karangasem	0.24***	0.12	0.37***	0.15	0.05**	0.13
Buleleng	0.18***	0.12	0.56***	0.15	0.05**	0.13
Denpasar	-0.37****	0.13	0.43***	0.15	0.04**	0.12

Note:IG_{in}=Pro-poor growth index in inequality reduction; G_g= Actual growth
*) Neutral growth **) Not pro-poor growth yet***) Pro-poor growth ****) Anti poor growth

Appendix 3: Pro-Poor Growth Index in Labor Absorption

Regencies/ City	Year					
	2007		2008		2009	
	IG_{em}	G_g	IG_{em}	G_g	IG_{em}	G_g
Jembrana	0.273***	0.11	0.073**	0.16	-0.023****	0.13
Tabanan	0.040**	0.11	-0.009****	0.15	0.000**	0.11
Badung	0.006**	0.13	0.003**	0.17	0.020**	0.21
Gianyar	0.067**	0.13	0.004**	0.16	0.033**	0.14
Klungkung	0.028**	0.11	0.029**	0.15	0.005**	0.13
Bangli	-0.124****	0.11	0.031**	0.14	-0.010****	0.14
Karangasem	-0.010****	0.12	0.062**	0.16	-0.025****	0.14
Buleleng	0.067**	0.11	0.006**	0.15	0.048**	0.13
Denpasar	-0.015****	0.13	0.029**	0.17	0.013**	0.13
Regencies/ City	Year					
	2010		2011		2012	
	IG_{em}	G_g	IG_{em}	G_g	IG_{em}	G_g
Jembrana	-0.005****	0.55	0.073**	0.11	0.019**	0.10
Tabanan	-0.050****	0.72	0.009**	0.10	0.062**	0.10
Badung	0.272**	0.48	-0.013****	0.12	0.049**	0.15
Gianyar	0.005**	0.53	-0.041****	0.11	0.030**	0.11
Klungkung	-0.011****	0.38	-0.111****	0.10	0.037**	0.10
Bangli	-0.047****	0.26	0.050**	0.10	0.019**	0.10
Karangasem	-0.021****	0.61	0.031**	0.10	0.014**	0.10
Buleleng	-0.103****	0.71	0.001**	0.11	0.047**	0.11
Denpasar	0.278**	0.64	-0.049****	0.11	0.016**	0.13
Regencies/ City	Year					
	2013		2014		2015	
	IG_{em}	G_g	IG_{em}	G_g	IG_{em}	G_g
Jembrana	-0.099****	0.11	0.041**	0.15	-0.012****	0.13
Tabanan	-0.011****	0.12	0.015**	0.15	0.003**	0.13
Badung	0.007**	0.16	-0.010****	0.15	0.047**	0.11
Gianyar	-0.012****	0.12	0.005**	0.15	0.071**	0.11
Klungkung	0.029**	0.11	0.012**	0.15	0.027**	0.12
Bangli	-0.013****	0.12	0.025**	0.15	-0.048****	0.13
Karangasem	0.014**	0.12	0.000**	0.15	0.007**	0.13
Buleleng	-0.019****	0.12	-0.029****	0.15	0.027**	0.13
Denpasar	0.009**	0.13	0.066**	0.15	0.028**	0.12

Note:IG_{em}=Pro-poor growth index in labor absorption; G_g= Actual growth

*) Neutral growth **) Not pro-poor growth yet***) Pro-poor growth ****) Anti poor growth

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at http://journal.uii.ac.id/index.php/jep

The determinant of equity financing in sharia banking and sharia business units

Jaenal Effendi*, Syifa Kamilia, Mustica Bintang Sabiti, Tita Nursyamsiah

Bogor Agricultural University, Bogor, Indonesia

Article Info

Article history:
Received: 2 July 2017
Accepted: 7 March 2018
Published: 1 April 2018

Keywords:
Sharia Banking, Sharia Business Unit, Equity Financing, ECM

JEL Classification:
E5, E50, G21

DOI:
10.20885/ejem.vol10.iss1.art12

Abstract

Equity financing plays an important role in mobilizing financing in the real sector. The core business of sharia banking is based on the real sector, but the financing portion in sharia banking is still dominated by debt financing. This study aims to analyze the factors that affect equity financing in General Sharia Bank (BUS) and Sharia Business Unit (SBU) in Indonesia. This study uses Error Correction Model. The results show that in the long-term model of Third Party Fund (DPK), Finance to Deposit Ratio (FDR), Non-Performing Financing (NPF), Inflation and Interest Rates Credit of Conventional Bank (SBK) has a significant positive effect on equity financing. BOPO variables (Operating Cost Ratio to the Operating Income) and Return on Assets (ROA) have a positive but not significant effect on equity financing. The DPK and FDR variables have a positive and significant effect on equity financing on the short-term model.

Introduction

The sharia banking industry in Indonesia is experiencing significant growth and improvement from year to year. Starting with the founding of Bank Muamalat in 1992 as the first Sharia bank that became the forerunner of the growth of sharia banking industry in Indonesia. Based on sharia banking statistics released by the Financial Services Authority (OJK) shows that the total assets of sharia banking continue to increase to IDR 356,504 trillion in 2016. Also, there is an escalation in the number of General Sharia Bank (BUS) to 13 and the number of Sharia Business Unit (UUS) to 21.

As an institution that has an intermediary function, it makes sharia banking as one of the important elements in supporting the economy. Therefore, the increasing number of sharia banking will affect the total assets, especially Third Party Funds (DPK) that have been collected from the public. Calculated from 2011 to 2016 the number of deposits that have been collected by Sharia banking is increasing every year and reach the number of IDR 206.407 trillion in 2016 (OJK, 2016).

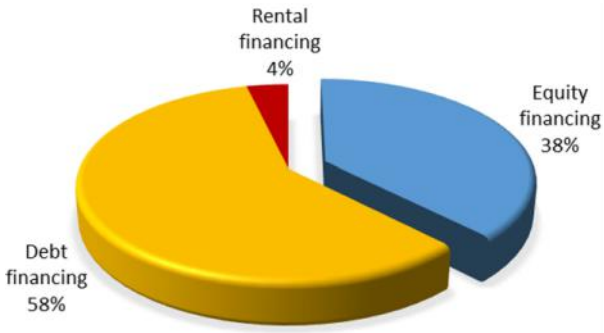
On the other hand, the number of funds disbursed for financing also increased along with the increase in the number of DPK. As of 2016, the amount of financing distributed by sharia banking reached IDR 177.482 trillion. It will affect the Finance to Deposit Ratio (FDR), which is the ratio between financing distributed by the number of DPK that has been collected and is one of the criteria in the assessment of banking performance.

Financing in sharia banking is divided into four categories based on contract type, namely equity financing with *mudharabah* and *musyarakah* contract, debt financing with *murabahah*, *istishna'* and *qardh* contracts, financing with *ijarah* contract and the last is Financing with *salam* contract (UU No. 21 of 2008). Equity financing is a type of sharia financing product where financing is based on the principle of profit sharing, which includes *mudharabah* financing and *musyarakah* financing. In general, this type of financing is used for investment or working capital.

According to Yusof (2009), sharia banking should not only orient to profit but also must prioritize the social goals to achieve prosperity and equality. The existence of equity financing is expected to encourage the realization of the goal of sharia banking in maximizing its function as an intermediary institution (Shaikh, 2017). Nevertheless, it is unfortunate that in fact the financing of sharia banking is still dominated by debt financing with *Murabaha* contract which is 58% of total financing distributed, and equity financing only has 38% portion. It is shown in Figure 1.

Sharia banking still considers that the distribution of equity financing has a considerable risk so that the proportion of financing tends to be smaller. Whereas, based on the research of Othman *et al.* (2015), which examines the efficiency of sharia banking in Malaysia and Indonesia shows that the performance of sharia banking will tend to be more efficient if the proportion of equity financing they distribute is greater.

P ISSN 2086-3128|E ISSN 2502-180X
*Corresponding author e-mail: jaenfendi@gmail.com



Source: Sharia Banking Statistics 2016

Figure 1. Proportion of financing distributed by BUS and UUS based on contract type of 2016 period

Due to the high portion of non-equity financing which is dominated by *murabahah* contract, there is an impression in the community that financing through sharia bank is no different from financing through a conventional bank. Theoretically, sharia banking is profit-and-loss sharing (PLS) system, but practically it is not very different from conventional banking (Chong & Liu, 2009). Malik *et al* (2011) argued that much of the financing offered by sharia banks actually bear a closer semblance to debt instruments than to profit-and-loss sharing. Equity financing should be the main financing for sharia banking. In addition, the financing that differentiates the sharia banking system with conventional banking because it is a financing based on the real sector. It does not reflect the real core business of sharia banking. So that it is necessary to study the general picture of equity financing as well as what factors which affect BUS and UUS in Indonesia.

The scope of this research is limited to equity financing which is financing with *mudharabah* and *musyarakah* contract. *Mudharabah* financing is a joint venture between two or more parties, where the first party acts as the owner of the fund (shahibul maal) which provides all financial capital and the second party as the fund manager (mudharib) (Ariff &Iqbal, 2011). The profit earned is divided according to the agreement set in a contract and usually in the form of a percentage (nisbah). If the business runs a loss then the loss is borne by the shahibul mal as long as the loss is not caused by the negligence of shahibul mal. Zuhayli, (2007) said that The financing by *musyarakah* contract is financing involving the participation of two or more persons in a certain business with a certain amount of capital stipulated under the agreement to jointly run a business and share the profit or loss in the part which is determined. Both types of financing should be a priority in the sharia banking industry, but in fact, it has not been done.

Meanwhile, the scope of sharia banking in this study is limited to BUS and UUS from January 2010 to June 2015. The factors used are variables that describe internal banking performance including Finance to Deposit Ratio (FDR), Non-Performing Financing (NPF), Return on Asset (ROA), Operational Costs and Operational Income (BOPO) and DPK. Besides the internal variables of banking, the variables that describe the external condition of banks, inflation, and credit interest rate in conventional banking can also affect equity financing.

Research Methods

This study uses secondary data in the form of time series data derived from Sharia Banking Statistics OJK and Banking Statistics of Bank of Indonesia. The data is analyzed monthly from January 2010 to December 2015. The methods for analyzing the factors which are affecting equity financing in BUS and UUS in Indonesia is Engel-Granger analysis for long-term equity financing balance, and Error Correction Model (ECM) for short-term equity financing balance.

Error correction model (ECM)

ECM is one of the most widely applied dynamic models in economic analysis. This model aims to overcome the problems in time series data, which is not stationary and spurious regression.

Before the ECM method performed, it conducted a test of time series data by using unit root test, also known as Dickey-Fuller (DF) and Augmented Dicky Fuller (ADF) test. If all the variables of stationary research on the unit root test, then the co-integration test is done to determine the balance or long-term stability between the observed variables and the direction of influence given by those variables to equity financing.

One of the important assumptions in estimating the parameters of the regression model with the least squares method is the homoscedastic residual error; it means that the independent variable (Yt) must be constant (Var (Yt) = σ^2). Another assumption is that there is no correlation between errors, which also means there is no correlation between Yt variables with Yt-1 or Yt others (no autocorrelation).

Data stationarity test

The data stationarity test is done by ADF test by looking at the probability of each research variable. If the probability of each variable exceeds the critical value at the real level ($\alpha = 0.05$) at the level, then the variable is stationary at the level. However, if it is not stationary at the level, it is re-examined in the first difference. The result shows that the variable of *Mudharabah* and *Musyarakah* financing, DPK, FDR, NPF, ROA, BOPO, inflation, and lending rates in conventional banking are not stationary at the level but stationary in the first difference. Stationary data in the first difference can be concluded that it co-integrated to the degree one. Thus, the requirement of a co-integrated regression relationship has been fulfilled.

Co-integration test

Co-integration is a long-term relationship between non-stationary variables. A variable system is said to be co-integrated if some of these variables (at least one variable) are integrated to degree one and apply linear combinations of the variable system are integrated at a zero degree, i.e., disequilibrium error or residual (u) is stationary. Engel and Granger also stated that a co-integration test could be considered as a preliminary test to avoid spurious regression.

Many ways can be done in the test co-integration; there are Engel-Granger Co-integration Test, Johansen Co-integration Test, and Co-integrating Regression Durbin-Watson Test. The Co-integration test conducted in this research is Engel-Granger Co-integration Test because the equation used is a single equation. The Engel-Granger co-integration method performed used in this study is the ADF method consists of two stages. The first stage, regressing the Ordinary Least Square (OLS) equation and obtaining residuals from the equation. The second stage, using the ADF Test method to test the stationarity in the residual as in the research variables.

If the stationary residual at the level, it can be concluded that the combination of research variables is stationary. It means that although the variables used are not stationary, but in the long term, those variables tend to be in balance. The model used in this research is:

$$LnPMM_t = \beta_0 + \beta_1 LnDPK_t + \beta_2 FDR_t + \beta_3 NPF_t + \beta_4 ROA_t + \beta_5 BOPO_t + \beta_6 INF_t + \beta_7 SBK_t + \varepsilon_t \quad (1)$$

Notes:

LnPMM = Logarithm Natural Total of *Mudharabah* and *Musyarakah* financing in BUS and UUS (rupiah billion)

β_0 = Intercept

β_i = The coefficients of the variable i

LnDPK = Logarithm Natural Total of BUS and UUS (billion rupiahs) Third Party Funds

FDR = *Finance to Deposit Ratio* (percent)

NPF = *Non-Performing Financing* (percent)

ROA = *Return On Asset* (percent)

BOPO = Ratio of Operating Expenses to Operating Income (percent)

INF = Inflation (percent)

SBK = Lending Rate (percent)

ε_t = Galat (*error*)

Error correction model (ECM)

ECM model aims to overcome the problems in time series data that is not stationary. ECM appears to address the short-term and long-term effects of consistent estimations. ECM model used in this study is to see the short-term relationship of DPK, FDR, NPF, ROA, BOPO, inflation, and credit interest rate of conventional banking to equity financing. The short-term research model in this study is:

$$\Delta lnPMM_t = \alpha_1 \Delta lnDPK_t + \alpha_2 \Delta FDR_t + \alpha_3 \Delta NPF_t + \alpha_4 \Delta ROA_t + \alpha_5 \Delta BOPO_t + \alpha_6 \Delta INF_t + \alpha_7 \Delta SBK_t + u_{t-1} + \varepsilon_t \quad (2)$$

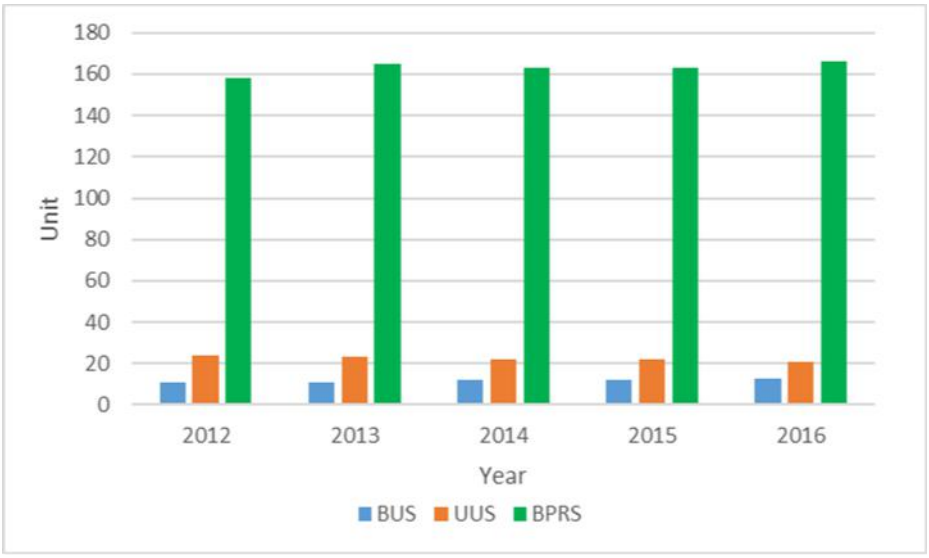
Notes:
$\Delta lnPMM_t$ = Differentiation in Natural Logarithm of Total financing of *Mudharabah* and *Musyarakah*
$\Delta lnDPK_t$ = Differentiation in Natural Logarithm Total third party funds of BUS and UUS
ΔFDR_t = Differentiation in *Finance to Deposit Ratio*
ΔNPF_t = Differentiation in *Non Performing Financing*
ΔROA_t = Differentiation in *Return On Asset*
$\Delta BOPO_t$ = Differentiation in Operating Expense Ratio to Operating Income
ΔINF_t = Differentiation in Inflation
ΔSBK_t = Differentiation in conventional bank credit interest
u_{t-1} = *Error Correction Term* (residual)
$\alpha_1,\ldots,\alpha_7$ = Variable coefficient
ε_t = *Error*

The variables in this study are as follows. *Mudharabah* and *Musyarakah* financing represent total financing on *Mudharabah* and *Musyarakah* contracts distributed by BUS and UUS, expressed in billions of rupiah. Third Party Funds (TPF) represents the total funds collected by BUS and UUS from customers, expressed in billions of rupiah. Finance to Deposit Ratio (FDR) is the ratio of sharia banking finance that compares the financing disbursed and the amount of DPK that collected, expressed in percent. Non-Performing Financing (NPF) is a financial ratio that describes the amount of nonperforming financing to total financing disbursed by sharia banks, expressed in percent. Return on Assets (ROA) is a financial ratio that measures the ability of banks in obtaining overall profits, expressed in percent. The ratio of Operating Expense to Operating Income (BOPO) is a calculation of bank efficiency by comparing operating expense and operating income, expressed in percent. The rate of inflation is a process of rising prices prevailing in the Indonesian economy, expressed in percent. Conventional bank credit interest (BCI) rate is the credit interest rate of conventional commercial banks in Indonesia for working capital, expressed in percent.

Results and Discussion

The development of equity financing in BUS and UUS in Indonesia

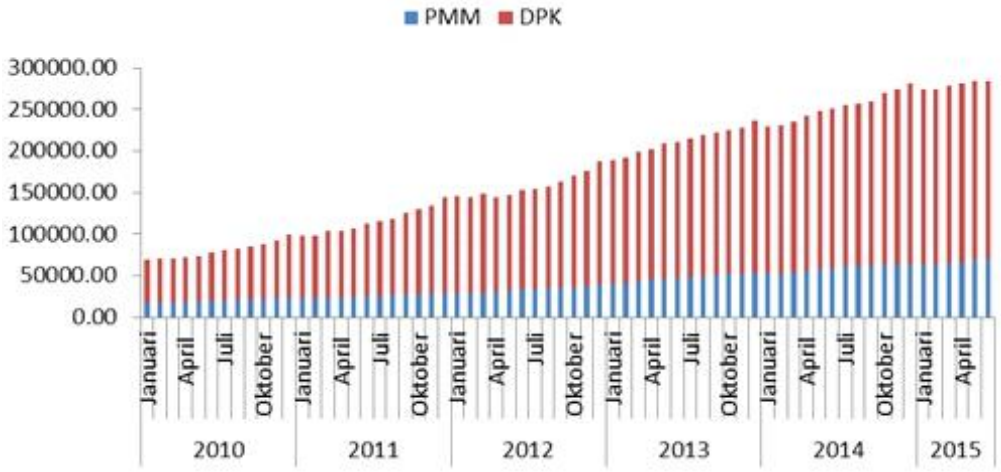
The establishment of Bank Muamalat in Indonesia in 1992 was the beginning of the growth of sharia banking. Since the government issued Law Number 21 of 2008, that one of the contents requires all conventional banks to have Sharia Business Units, the number of sharia banks have established. According to Sharia Banking Statistics data published by the Financial Services Authority until December 2016, there are 13 General Sharia Banks (BUS), 21 Sharia Business Units (UUS), and 166 Sharia Financing People Banks (BPRS). The number of UUS has decreased since conventional banks tend to change and develop UUS into BUS.



Source: Sharia Banking Statistics of FSA 2015

Figure 2. The number of BUS, UUS, and BPRS in Indonesia for the period 2012-2016

The numbers of banks are increased, followed by the increasing number of sharia banking offices from year to year. By December 2016, there were 1869 BUS offices, 322 UUS offices, and 453 BPRS offices. Sharia banking office network continues to spread to all areas in Indonesia so that it can serve all bank customers both in the collection of DPK and in disbursing financing. The amount of DPK of Sharia banking has increased along with the increase of the number of banks and the number of office networks. The increase in total DPK is followed by an increase of total equity financing during the study period.



Source: Sharia Banking Statistics of FSA 2015

Figure 3: Total DPK and equity financing at BUS and UUS period January 2010-June 2015

Financial ratios in sharia banking illustrate the development of BUS and UUS performance during the study period. The financial ratios used in this study are Non-Performing Financing (NPF), Finance to Deposit Ratio (FDR), Return on Assets (ROA) and Operating Expense Ratio to Operating Income (BOPO).

FDR is the financial ratio to sharia banking that compares the amount of financing disbursed to the number of funds collected. The FDR variable shows the banking performance and liquidity of sharia banking. The development of FDR in BUS and UUS increased every year during the research period. In SPS data in June 2015, FDR reached 96.52 percent. This shows that the liquidity of sharia banking is very high.

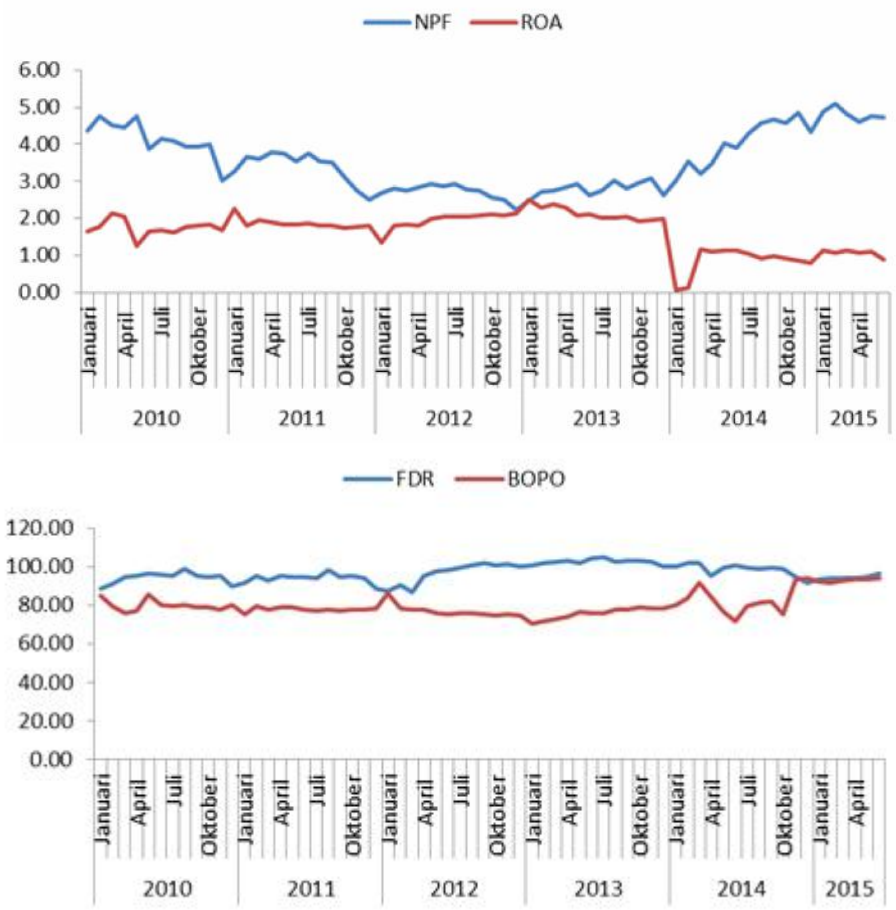
NPF is one of the financial ratios in sharia banking that compares the number of nonperforming financing to total financing disbursed. The growth of NPF in BUS and UUS increased until February 2015 reaching 5.10 percent. However, until June 2015, NPF decreased to 4.73 percent.

ROA is a financial ratio that describes the level of bank profitability to measure the level of business efficiency and profitability achieved by the bank. The development of ROA on BUS and UUS decreased in the second quarter of 2015 by 0.50 percent. The decline in ROA is due to lower earnings gains in line with slowing economic growth.

Operational Expense Ratio to Operating Income is a financial ratio that describes bank profitability. This ratio is used to measure the level of efficiency and ability of banks in conducting their operations. The development of BOPO in BUS and UUS increased until June 2015 reached 94.22 percent.

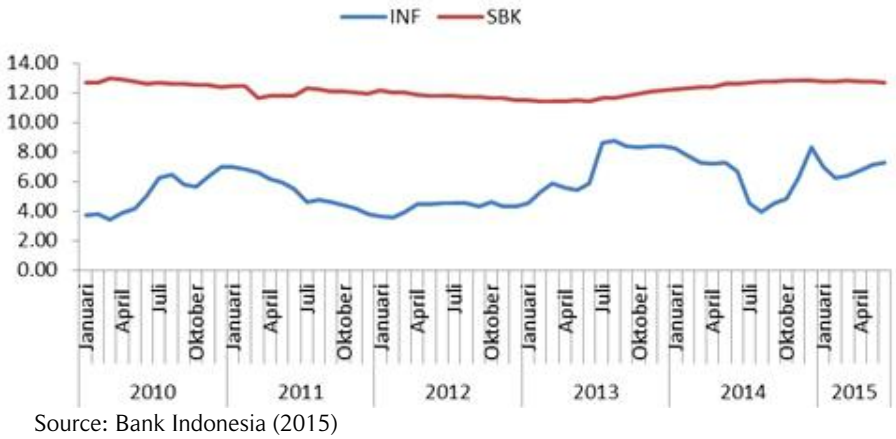
The inflation rate can be interpreted as increasing prices in general and continuously. An increase in the price of one or two items alone cannot be called inflation unless the increase extends (or causes price increases) to other goods. The inflation rate is increasing every year, but there is a decrease in August 2014 of 3.99 percent, while the credit interest rate in conventional banks is increasing every year in line with the increase of credit.

Before analyzing the factors affecting equity financing of BUS and UUS, several actions are done, such us stationarity testing on research variables, regressing long-term models, testing the residual stationarity of long-term model regression equations, testing short-term models or ECM, and regression of ECM models.



Source: Statistics of Sharia Banking OJK 2015

Figure 4: The Development of Financial Ratios in BUS and UUS in Indonesia for January 2010-June 2015



Source: Bank Indonesia (2015)

Figure 5: The development of inflation rate and conventional bank credit interest rates from January 2010 to June 2015

Data stationarity test

Stationarity testing on research variables is done using ADF Test on unit root test. The first stationarity test is done at the level. The results of the ADF Test in testing the stationarity of research variables at the level are as follows.

Table 1. Data Stationarity Test

Variables	ADF t-stat Value	Mac Kinnon Value			Notes
		1%	**5%**	10%	
LNPMM	**-1.356603**	-4.105534	**-3.480463**	-3.168093	Not Stationary
LNDPK	**-0.187465**	-4.105534	**-3.480463**	-3.168093	Not Stationary
FDR	**-2.817158**	-3.534868	**-2.906923**	-2.591006	Not Stationary
NPF	**-1.301263**	-3.534868	**-2.906923**	-2.591006	Not Stationary
ROA	**-2.522575**	-3.534868	**-2.906923**	-2.591006	Not Stationary
BOPO	**-2.367877**	-3.534868	**-2.906923**	-2.591006	Not Stationary
INF	**-2.647875**	-3.536587	**-2.907660**	-2.591396	Not Stationary
SBK	**-1.194308**	-3.534868	**-2.906923**	-2.591006	Not Stationary

The results show that the research variables either dependent variable or independent variable is not stationary at the level. Then, stationarity testing with ADF Tests back to the first difference. The result of stationarity test at first difference is as follows.

Table 2. Result of Stationarity Test at First Difference

Variables	ADF t-stat Value	Mac Kinnon Value			Notes
		1%	**5%**	10%	
D(LNPMM)	**-7.035421**	-4.107947	**-3.481595**	-3.168695	Stationary*
D(LNDPK)	**-8.593336**	-4.107947	**-3.481595**	-3.168695	Stationary *
D(FDR)	**-9.218619**	-3.536587	**-2.907660**	-2.591396	Stationary *
D(NPF)	**-9.954814**	-3.536587	**-2.907660**	-2.591396	Stationary *
D(ROA)	**-8.485385**	-3.538362	**-2.908420**	-2.591799	Stationary *
D(BOPO)	**-9.685300**	-3.536587	**-2.907660**	-2.591396	Stationary *
D(INF)	**-5.912483**	-3.536587	**-2.907660**	-2.591396	Stationary *
D(SBK)	**-8.219037**	-3.536587	**-2.907660**	-2.591396	Stationary *

Notes: *stationary at the critical value of Mac Kinnon at α = 0.05 level

Co-integration test

The result of stationary ` of the data shows that the variables used in this study are stationary at first difference and the ADF t-statistic value is greater than the critical value of Mac Kinnon. If the stationary variable is at first difference, a co-integration test can be performed. Co-integration test is performed by testing the stationarity of the residual (u) from the long-term equation model using ADF Test. If u is stationary at the level, then it can be concluded that the research model has co-integration. The test results of stationarity u are as follows.

Table 3. Test Results of Stationarity u

Variable	ADF t-stat Value	Mac Kinnon Value			Note
		1%	**5%**	10%	
u	**-5.603565**	-2.601024	**-1.945903**	-1.613543	Stationary

Notes: * stationary at the critical value of Mac Kinnon at α = 0.05 level

The stationarity test of u shows that u is stationary at the level and it can be concluded that there is co-integration in the research model. Besides, the concern about the existence of pseudo regression is not proved by the result of stationary test and co-integration test. The implication of the co-integration test is that mutual co-integrated changes can be said to be in a long run equilibrium and have a long-term relationship.

Table 4. Long-Term Model

Variables	Coefficient	Probability
LNDPK	0.892321	0.0000*
FDR	0.009589	0.0000*
NPF	0.052110	0.0000*
ROA	0.012410	0.2135
BOPO	0.000901	0.3104
INF	0.014389	0.0000*
SBK	0.078685	0.0000*
C	-2.204051	0.0000
R-squared		0.997304
Prob (F-statistics)		0.000000

Notes: * indicaes significant at α = 0.05 level

The result of regression in long-term model shows that variable of DPK, FDR, NPF, inflation, and credit interest rate in the conventional bank have a positive and significant effect on the real level (α = 0.05). These variables significantly influence the long-term equity financing. The DPK variable has a positive and significant influence on the real level (α = 0.05) to equity financing and has the coefficient value of 0.892321. That means if the DPK increases by 1%, then equity financing will increase by 0.892321% when other variables are considered constant. These findings are in line with the research hypothesis and with Sholikhah *et al*. (2017). DPK is one of the variables that show the performance of banking and is the number of funds collected by sharia banking that will be distributed for financing. This also can be explained in Figure 3, which shows that the amount collected DPK and equity financing given by BUS and UUS has increased and both have positive trends.

FDR variable has a positive and significant effect on the real level (α = 0.05) to equity financing and has a coefficient value of 0.009589. That means if FDR increases by 1%, then equity financing will increase by 0.009589% when other variables are considered constant. FDR is one of the financial ratios that show the liquidity of sharia banking that compares the financing disbursed and funds received by banks. If FDR increases, then the amount of financing disbursed will increase the amount of DPK received.

NPF variable has a positive and significant effect on the real level (α = 0.05) to equity financing and has a coefficient value of 0.052110. That means if NPF increases by 1% then equity financing will increase by 0.052110% when other variables are considered constant. Theoretically, NPF is one of the variables that shows the performance of sharia banking and the ratio of nonperforming financing with the amount of financing provided. As NPF become higher, it indicates the problem of financing. It results banks will carefully consider and re-evaluate the amount of financing as it brings many losses to them. Due to the small equity-financing portion, the NPF in equity financing is considered to have no significant effect on the financing so that sharia banking is focused on disbursing financing as the number of DPK increases.

Inflation variable has a positive and significant effect on the real level (α = 0.05) to equity financing and has a coefficient value of 0.014389. That means if inflation increases 1%, then equity financing will increase by 0.014389% when other variables are considered constant. This finding is not by the hypothesis. Normally, the effect of inflation may rise the bank lending as it indicates the increase of interest rate. The raise of interest rate may lead to the decrease of financing volume (Moussa & Chedia, 2016)

SBK variable has a positive and significant influence on the real level (α = 0.05) to equity financing and has a coefficient value of 0.078685. That means if SBK increases 1%, then equity financing will increase by 0.078685% when other variables are considered constant. High interest rates make conventional customers pay substantial interest on loans taken. This condition will have an impact on the increase of sharia bank financing because financing products in sharia bank are considered as substitution of credit in the conventional bank.

The ECM model estimation results have the criteria as a good ECM model because the variable coefficient u has a negative coefficient and a significant probability at the real level (α = 0.1). Thus, the model not only has a short-term relationship but also has a relationship in long-term balance. In the ECM model, there are two independent variables, namely DPK and FDR, which have a positive effect on equity financing. The DPK and FDR variables have a significant effect on the real level (α = 0.05).

The DPK variable gives positive and significant influence on the real level (α = 0.05) to equity financing which has a coefficient of 0.375317. That means if the DPK increases 1%, then equity financing will increase by 0.375317% when other variables are considered constant. It can be explained in Figure 3 that the increase in the number of DPK is followed by total equity financing. These findings are in line with the research hypothesis and results of Sholikhah *et al*. (2017) which states that there is a positive relationship between DPK and financing. In many cases, customer deposit is the main source of bank financing.

Table 5. Short Term Model (ECM)

Variable	Coefficient	Probability
D(LNDPK)	0.375317	**0.0034***
D(FDR)	0.004078	**0.0005***
D(NPF)	0.004039	0.6505
D(ROA)	0.008237	0.1781
D(BOPO)	0.000203	0.6901
D(INF)	0.003626	0.2413
D(SBK)	0.004571	0.7521
U(-1)	**-0.198565**	**0.0747****
C	0.013129	0.0003
R-squared		0.305799
Prob (F-statistic)		0.005963

Notes: *, ** indicate significant at α = 0.05 and 0.10 level

FDR variable gives positive and significant influence on the real level (α = 0.05) to equity financing, which has a coefficient of 0.004078. That means if FDR increases 1%, then equity financing will increase by 0.004078% when other variables are considered constant. This is due to the activities of sharia banks that collect deposits and disbursed financing. As the increase in DPK is collected, the financing disbursed will increase. Similarly, the increase is experienced by equity financing. These findings are in line with the research hypothesis that there is a positive relationship between FDR and equity financing.

Conclusion

The development of the amount of equity financing in BUS and UUS in Indonesia increases every year in line with the increase in the amount of Third Party Funds collected. However, the portion of equity financing is still small compared to the total financing disbursed. The financing disbursed is still dominated by debt financing among others by using *murabahah* scheme. Also, the significant variables affecting equity financing in long-term models are deposits, FDR, NPF, inflation, and conventional bank lending rates, where these variables have a positive effect on the real level. However, the findings on NPF and inflation variables are not in line with the research hypothesis. In the short-run model (ECM), the variable that gives positive and significant effect on the real level of equity financing is DPK and FDR.

These findings can be used as advice and input for the government and the Islamic banking to increase further the amount of financing distribution based on equity financing. This cannot be separated from the reason that equity financing should be the main financing for sharia banks and that distinguishes it from conventional banking system because it is financing based on the real sector. Sharia banking, especially BUS and UUS can increase the number of customers in equity financing by "pick up the ball" method so that the financing in the real sector will increase. Also, sharia banking must pay attention to conventional bank credit interest rates and make policies by reducing the equivalent rate of equity financing to increase the amount of equity financing in BUS and UUS and sharia financing can be more competitive than conventional bank loans.

References

Ariff, M; Iqbal, M. (2011). *The Foundations of Islamic Banking: Theory, Practice, and Education*. United Kingdom: Edward Elgal Publishing limited.

Bank of Indonesia. (2015). Inflation Rate Data [internet]. [downloaded on 11 March 2016]. Available on: http://www.bi.go.id.

Bank of Indonesia. (2015). Banking Industry Profil Report. [downloaded on 11 Maret 2016]. Available on: http://www.bi.go.id.

Chong, B. S., & Liu, M. H. (2009). Islamic banking: Interest-free or interest-based? *Pacific Basin Finance Journal*, *17*(1), 125–144. https://doi.org/10.1016/j.pacfin.2007.12.003

Financial Service Authority [OJK]. (2010-2015). Indonesian Banking Statistics. [downloaded on 11 March 2016]. Available on: http://www.ojk.go.id

Financial Service Authority [OJK]. (2016). Sharia Banking Statistics. [downloaded on 10 April 2017]. Available on: http://www.ojk.go.id

Malik, M., Malik, A., & Mustafa, W. (2011). Controversies that make Islamic banking controversial: An analysis of issues and challenges. *American Journal of Social and Management Sciences*, (March 2011), 41–46. https://doi.org/10.5251/ajsms.2011.2.1.41.46

Moussa, M. A. Ben, Chedia, H., Moussa, M. A. Ben, & Chedia, H. (2016). Determinants of Bank Lending: Case of Tunisia. *International Journal of Finance and Accounting*, *5*(1), 27–36. https://doi.org/10.5923/j.ijfa.20160501.04

Othman, N. M. M. A. . R. A. A. (2015). Equity-Based Financing and Islamic Banks Efficiency : Stochastic Frontier Analysis. In *the 2nd International Conference on Management and Muamalah*. Bangi: Faculty of Management and Muamalah, International Islamic University College Selangor.

Shaikh, S. A. (2017). Poverty alleviation through financing microenterprises with equity finance. *Journal of Islamic Accounting and Business Research*, *8*(1), 87–99. https://doi.org/10.1108/JIABR-07-2013-0022

Sholikhah, Z. (2017). Determinant of the Equity Based Financing Volume : A Case of Islamic Banks in Indonesia, *8*(1), 30–39.

Yusof, EFE; Kashoogie, J. K. A. (2009). Islamic Finance : Debt versus Equity Financing in The Light of Maqasid al-Shari'ah (MPRA Paper, pp. 1–20). Munich Personal RePEc Archive. Retrieved from http://mpra.ub.uni-muenchen.de/20722/

Zuhayli, W. (2007). *Financial Transactions in Islamic Jurisprudence Volume 1* (Second Edi). Damascus: Dar al-Fikr.

Economic Journal of Emerging Markets is Indexed by:

1) Drectory of open Access Journals; 2) Crossref; 3) EBSCO HOST Research Databases; 4) BASE Bielefeld Academic Search Engine; 6) ASEAN Citation Index; 7) Sinta, Science and Technology Index; 8) Google Scholar; 9) IPI, Indonesian Publication Index; 10) ISJD, Indonesian Scientific Journal Database; 11) Indonesia One Search; 12) Garuda Scholar

P ISSN 2086-3128

E ISSN 2502-180x