FACULTY OF ECONOMICS AND MANAGEMENT
BOGOR AGRICULTURAL UNIVERSITY

CERTIFICATE

Presented to :

Aisyah Fitri Yuniasih

as *Presenter* at

THE 14th MIICEMA CONFERENCE

Malaysia-Indonesia International Conference on Economics, Management and Accounting

ASEAN ECONOMIC COMMUNITY 2015 :
ISSUES AND CHALLENGES

Bogor, Indonesia, October 9 - 10, 2013

Dean,

Yusman Syaukat, PhD

DISPARITY, CONVERGENCE, AND DETERMINANTS OF REGIONAL LABOUR PRODUCTIVITY IN INDONESIA

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ABSTRACT

Indonesia has experienced regional economic disparity problems, including in labour productivity where labour productivity disparity in Eastern Indonesia is more unequal than in Western Indonesia. This study employs dynamic panel approach to analyze convergence and identify determinants of regional labour productivity during the period of 1987-2011. The Sys-GMM model shows that regional convergence process occurs. Restricted physical and human capital stock, total trade, and real wage have positive impact on aggregate labour productivity. Furthermore, physical and human capital stock, total trade, and real wage have positive impact, while depreciation rate have negative impact on agriculture and manufacturing sector labour productivity.

Keywords: labour productivity disparity, agriculture, manufacturing, dynamic panel

JEL classification: O47, O53

INTRODUCTION

Generally, economic development has focused on an effort to increase economic growth which is closely related to national income both in total and per capita term. It aims to improve citizen's welfare as a final goal. The result of economic growth is expected to be distributed evenly throughout the citizen so that the socio-economic issues such as unemployment, poverty, income distribution inequality, etc can be solved through the principle of trickle-down effect mechanism (Todaro and Smith, 2006). Indonesia's economic development based on Statistics Indonesia data during the period 2007-2011 in Figure 1 shows that an increase in Indonesia's economic growth is accompanied by accomplishment in term of decreasing unemployment rate and

percentage of poor people. However, this achievement is not followed by a more equitable income distribution improvement as seen from the Gini coefficient data of 0.36 in 2007, although it was slightly down to 0.35 in 2008, but then continued to increase to 0.41 in 2011. This is an early indication that the economic disparity is an economic development problem which still hits Indonesia today.

[Place Figure 1 here]

Indonesia consists of 33 provinces with different economic structures according to the various factors endowments possessed. Regional disparities in economic performance occur because of the differences in the speed of economic growth among provinces, where provinces rich with factor endowments certainly grow faster than provinces with factor endowment scarcity. Economic development process classifies Indonesian provinces into two classifications, namely more developed provinces and less developed provinces.

Labour productivity as a measurement of regional disparity is not only rarely used in Indonesia disparity research, but it also has some plus points over other measurements (Bawono, 2011). This measurement is more sensitive to the differences of labour amount compared to the use of output that is usually approached by Gross Regional Domestic Product (GRDP) as a measurement. Besides that, by using labour productivity we can do sectoral decomposition which cannot be done if we use output per capita which is usually approximated by GDRP per capita as a measurement.

Statistics Indonesia's data show that during the period of 2007-2011 DKI Jakarta (DKI) province, with the average aggregate labour productivity of Rp. 87.52 million per worker, is the province with the highest average aggregate labour productivity in Indonesia. The province with the lowest average aggregate labour productivity in Indonesia was Nusa Tenggara Timur (NTT) province with average aggregate labour

productivity of only Rp. 5.76 million per worker or one-fifteenth of average aggregate labour productivity of DKI province. The province with the lowest average aggregate labour productivity in Western Indonesia is Bengkulu province with Rp. 9.84 million per worker or about one-ninth of average aggregate labour productivity of DKI province which is the highest in Western Indonesia. Kalimantan Timur (Kaltim) province is the province with the highest average aggregate labour productivity in Eastern Indonesia with average aggregate labour productivity of Rp. 80.07 million per worker or approximately fourteen times average aggregate labour productivity aveage of NTT province, which is the lowest in Eastern Indonesia. It shows that regional disparity of aggregate labour productivity occurs in Indonesia, where labour productivity in Eastern Indonesia is more unequal than in Western Indonesia.

Besides regional labour productivity disparity as an aggregate, regional labour productivity disparity in sectoral level also plays a crucial role. Agriculture and manufacturing sectors are the two most dominant sectors of GDRP nominal of the provinces in Indonesia and absorb more than 50 % of Indonesian workers during the period of 2007-2011. Table 1 gives an overview of the disparity condition of labour productivity in agriculture and manufacturing sectors during the period 2007-2011, which in general is equal to the disparity condition of aggregate labour productivity, in that labour productivity in Eastern Indonesia is more unequal than in Western Indonesia.

[Place Table 1 here]

This disparity problems needs to be attended seriously since the case of economic disparities that occur in various countries has been proved in stimulating the emergence of social upheavals that can harm or disrupt the macro economic performance which has been achieved (Sufii, 2010). Disparity in labour productivity

will be an obstacle to the national income or economic growth because it can lead to inequality of income distribution (Williams, *et al* 2003).

Productivity growth is the main source of sustainable economic growth and the improvement of people's standard of living (Williams, *et al* 2003). Productivity growth can increase the amount of production output for particular input so that it can increase national income and ultimately increase income per capita as the main indicator of people's standard of living. Furthermore, the growth of labour productivity allows producer to increase supply without increasing production cost so that aggregate demand can grow faster without having to impose an increase in production cost on the price paid by consumers which can trigger inflation.

Better understanding of labour productivity disparity and convergence can provide appropriate government policy implications so that the development strategy will not be regional and sectoral bias. This is done in order to reduce regional disparities and to achieve more balance regional and sectoral development. Based on the background and problems above, this study aims to analyze regional disparity of labour productivity in Indonesia, identify the regional convergence of labour productivity, identify determinants of labour productivity, and formulate government policies to address the regional disparity of labour productivity in Indonesia.

LITERATURE REVIEW

Garcia and Soelistianingsih (1998) used data of 26 provinces in Indonesia following the economic growth model of Barro periods 1975-1993, 1980-1993, 1983-1993 with a cross section method of Ordinary Least Square (OLS). Research results showed that the level of education positively affect regional economic growth while the birth rate negatively affect regional economic growth. The role of the oil and gas sector

had positive influence on regional economic growth in the period 1975-1993 but not significant in the period 1983-1993. Limitation of this study was the use of cross-sectional OLS estimation technique that did not take the individual heterogeneity into the analysis.

Resosudarmo and Vidyattama (2006) estimated the per capita income growth of 26 provinces in Indonesia during in the period 1993-2002 to identify the determinants of regional income disparity in Indonesia by using panel data analysis with Fixed Effect Model (FEM). Even there was a disparity of regional income, but the conditional convergence of per capita income growth also occurred between region where the savings in physical capital, trade openness, and contribution of the oil and gas sector were determinants of the growth of provincial income per capita in Indonesia. Although the method which was used produced a more consistent estimator than OLS and Random Effects Model (REM), but the estimator still faced the endogeneity problems caused by the use of static panel data analysis method where there was a variable on the right side of the equation which is not really an exogenous variable.

Firdaus and Yusop (2009) conducted a dynamic analysis of regional convergence in 26 provinces of Indonesia from 1983 to 2003 with panel OLS, FEM, REM, First Difference Generalized Method of Moments (FD-GMM), and the System of Generalized Method of Moments (Sys-GMM) approach. The use of dynamic panel data analysis methods solved the endogeneity problem. Sys-GMM estimator which was proved to be unbiased, consistent, and valid indicated that a process of convergence among provinces in Indonesia occurred in the period 1983-2003, although the speed of convergence was relatively low if we compared to other developing countries. However, this research used GDP per capita which was not possible to be used on sectoral decomposition analysis.

Purawan (2010) conducted an analysis of regional economic convergence in Indonesia by using a measure of output per worker or labour productivity. This study used data 26 provinces in Indonesia during 1992-2007 with FEM panel data approach. The result was that the process of convergence on pre-decentralization happens faster than on post-decentralization. Physical capital stock accumulation, FDI, trade openness, and contribution of oil and gas had a positive effect while human capital accumulation, population growth, financial development, and inequality had a negative effect on Indonesia labour productivity on pre decentralization period. Human capital stock accumulation, population growth, FDI, inequality, trade openness, and contribution of oil and gas had a positive effect while physical capital stock accumulation and financial development had a negative effect on Indonesia labour productivity post desentralisation period.

Susanti (2005) analyzed the sectoral labour productivity convergence among provinces in Indonesia 1987-2003 period using Sigma convergence and Beta convergence method with cross section and panel data approach. Sigma convergence analysis showed a decrease in sectoral labour productivity disparity where the strong convergence occurred in mining and quarrying, manufacturing, and construction sectors as well as the aggregate while the finance, leasing, and services encountered a process of divergence. The analysis of absolute beta convergence occurred. Absolute convergence of aggregate labour productivity was lower than 9 other sectors and sectors that had the highest speed of convergence was the manufacturing sector. Panel data approach gave faster speed of convergence. But, this study used only the beginning of period labour productivity as a factor affecting the convergence of labour productivity.

Jiang (2012) conducted an analysis on the effect of openness and labour productivity convergence provinces in China from 1984 to 2008 period by using a panel data approach. This study found that the openness of the regional economy using total trade variable positively affected regional labour productivity growth besides physical capital, population growth and human capital variables. When regional heterogeneity and economic openness were accounted, conditional convergence occurred rapidly on Chinese labour productivity. However, this research had not identified the real wage impact on regional labour productivity yet.

METHODOLOGY

The data used in this study are secondary data in the form of balanced panel data (pooled data) of 26 provinces in Indonesia during the period of 1987-2011. The data are from Statistics Indonesia. The analysis of labour productivity regional disparity in Indonesia uses the weighted coefficient of variation used by Akita and Takaoka (2003) with the formula:

$$CV = \frac{1}{LP}\sqrt{\frac{Li}{L}\sum_{i=1}^{n}(LP_i - LP)^2} \quad (1)$$

The estimation model of labour productivity convergence in aggregate, agriculture sector, as well as manufacturing sector are calculated using a dynamic panel data analysis with System-Generalized Method of Moment (Sys-GMM) approach. This is due to the existence of dependent variable lag, namely labour productivity, as an independent variable in the specification model. Dynamic relationship leads to the emergence of endogeneity problem. If the model is estimated by static panel data analysis, the estimators will be biased and inconsistent (Verbeek, 2004). Evaluation is done to determine the exact model that should meet the criteria of unbiased, consistent, and valid.

Model specification of labour productivity convergence in aggregate, agriculture, and manufacturing sector in Indonesia used in this study follows the modified model of Jiang (2012). Aggregate model uses the restricted model which is done by considering the effect of the depreciation rate (ngd) both in the physical capital stock and human capital stock variables. The econometric aggregate model specification is:

$$\ln LP_{it} = \beta_1 \ln LP_{i,t-1} + \beta_2 \ln sngd_{it} + \beta_3 \ln hngd_{it} + \beta_4 \ln(TRADE_{it}) + \beta_5 \ln rw_{it} + \varepsilon_{it} \quad (2)$$

The models of agriculture and manufacturing sectors estimation use unrestricted model. Increment _agr is added to each variable of agricultutal sector model and increment _man is added to each variable of manufacturing sector. The econometric specification of the model is:

$$\ln LP_{it} = \beta_1 \ln LP_{i,t-1} + \beta_2 \ln s_{it} + \beta_3 \ln h_{it} + \beta_4 ngd_{it} + \beta_5 \ln(TRADE_{it}) + \beta_6 \ln rw_{it} + \varepsilon_{it} \quad (3)$$

where:

i = province unit (26 provinces in Indonesia)

t = time period group unit (8 groups of the time period)

LP = labour productivity (real GDRP divided by the working population aged 15 years and above in million rupiah per worker unit)

s = physical capital stock (aggregate model uses the proportion data of real Gross Fixed Capital Formation (GFCF) to real GDRP as proxy, agriculture dan manufacturing sector models use the proportion data of government development expenditure realisation to nominal GDRP in associated sector as proxy)

h = human capital stock (the proportion data of the working population aged 15 years and above who graduated from high school)

ngd = depreciation rate (calculated by the formula $(n_{it} + g_{it} + \delta_{it})$ where n is the growth rate of labour, g is the growth rate of technological progress, and δ is the depreciation rate of capital. Value of $(g_{it} + \delta_{it})$ is assumed to be 0.05 as used by Firdaus and Yusop (2009) and is constant for all provinces in each year)

sngd = the restricted physical capital stock (the value of the physical capital stock variable divided by depreciation rate variable)

hngd = the restricted human capital stock (the value of the human capital stock variable divided by depreciation rate variable)

RW = real wage (the average wage of the working population aged 15 years and above with the main occupation as labours divided by the GDRP deflator in Rupiah unit)

TRADE = total trade (the proportion of total trade openness both international and interprovinsial which is real export plus real import to real GDRP, the value of aggregate total trade is also used in agriculture and manufacturing models)

The advantage of panel data analysis method compared to cross section data analysis methods is that panel data analysis method allows for the division of total period of research into several shorter time spans. Annual data in this study are divided into triennial period based on the identification of business cycle used by Firdaus and Yusop (2009). Dependent variable value uses variable value at the end of the period, while for the lag it uses variable value at the beginning of the period. Independent variable values are calculated as the average of the corresponding time period. Convergence process occurs when the coefficient of β_1 is less than one, with the speed of convergence expressed as $\lambda = -\ln(\beta 1)$. The time required to fulfill half of gap (half-time convergence) is calculated with the formula $\ln(2) / \lambda$.

RESULTS AND DISCUSSION

Labour productivity disparity is a phenomenon experienced by Indonesia during the period 1987-2011. Prediction of the convergence is expected to reduce that inequality. This requires the condition in which provinces with lower labour productivity grow faster than provinces with higher labour productivity. Weighted coefficient of variation values of aggregate labour productivity in Indonesia, calculated based on Statistics Indonesia's data over the period 1987-2011, show a significant downward trend from year to year, both nationally, in Western Indonesia, as well as in Eastern Indonesia (Figure 2). In 2011, based on the value of the weighted coefficient of variation, the condition of equality in labour productivity disparity occurred both nationally, in Western Indonesia, as well as in Eastern Indonesia, with the weighted coefficient of variation value around 0.81 (Figure 2).

[Place Figure 2 here]

Kaltim province was a province with the highest aggregate labour productivity in Indonesia during the period 1987-2007 with aggregate labour productivity average of Rp. 78.55 million per labour where economic structure is dominated by the mining and quarrying and manufacturing sector. The position is taken over by DKI province in the period 2007-2011 with average aggregate labour productivity of Rp. 87.74 million per worker. DKI province begins to increase its labour productivity through the improvement of financial sector contribution, which for the last 6 years has reached, in average, 28.89 % of the DKI province's real GDRP and has only absorbed, in average, 7.53 % of DKI province's labour. The economic structure of DKI province is dominated by tertiary sectors such as trade, hotels, and restaurants, as well as the transportation and communications with higher value added.

NTT province is quite consistent to be a province with the lowest labour productivity in Indonesia during the period 1987-2011 with an average of Rp. 4.33 million per worker. The position was taken over by Maluku province in 1999 with average aggregate labour productivity of Rp. 3.10 million per worker. The low labour productivity in NTT province is due to the low educational level of workers there. Statistics Indonesia's data show that, during the period 1987-2011, NTT province is the province with the lowest average proportion of high school graduate workers, which is, in average, only about 10 %.

Disparity in agriculture sector labour productivity in Indonesia based on the the weighted coefficient of variation value calculated using Statistics Indonesia's data during the period 1987-2011 appears to fluctuate. The average values of the weighted coefficient of variation are 0.35 nationally, 0.28 in Western Indonesia and 0.51 in Eastern Indonesia (Figure 3). The province with the highest average agriculture sector labour productivity during the period 1987-2011 is DKI province with an average of Rp. 19.83 million per worker while the lowest is NTT with an average of Rp. 2.65 million per worker.

[Place Figure 3 here]

Higher disparity is shown in the manufacturing sector with the values of weighted coefficient of variation of 1.09 nationally, 0.70 in Western Indonesia, and 1.76 in Eastern Indonesia (Figure 4). The province with the highest average manufacturing sector labour productivity is Kaltim province with an average of Rp. 345.06 million per worker. NTT becomes the province with the lowest average manufacturing sector labour productivity with an average of Rp. 0.90 million per worker. In general, labour productivity in agriculture and manufacturing sector is more unequal in Eastern Indonesia than in Western Indonesia.

[Place Figure 4 here]

Estimation model of labour productivity convergence in aggregate, agriculture, and manufacturing sector with Sys-GMM dynamic panel approach can be seen in Table 2. Estimator coefficients of lag labour productivity variable with Sys-GMM approach which the values lie between the estimators with FEM and POLS approaches state that contimuum requirements are met and the estimators are not biased. LM test results show that m1 significance test gives significant result while m2 significance test gives insignificant results stating that estimators with Sys-GMM approach are also consistent. Sargan test results that provide insignificant results state that the estimators with Sys-GMM approach use valid instruments. This three test result above state that models with Sys-GMM approach met the appropriate dynamic panel data model's criteria.

[Place Table 2 here]

Coefficient estimators of lag labour productivity variable both in aggregate, agriculture, and manufacturing sector model with Sys-GMM approach are smaller than one. This states that the process of convergence occurs related to labour productivity disparity in aggregate, agriculture, and manufacturing sector in Indonesia. The speed of aggregate labour productivity convergence is 0.06518 per year with half time convergence of approximately was 11 years. The speed of agriculture sector labour productivity convergence in the Indonesia is 0.27069 per year, slightly slower than in the manufacturing sector of 0.361681 per year, so the half time convergence in manufacturing sector is around 2 years, slightly faster than that in agriculture sector which is about 3 years.

The results of convergence speed and half time convergence in this study are slightly faster than those study conducted by Susanti (2005) in 26 provinces in Indonesia during the period 1987-2003, which found that the speed of convergence of aggregate labour productivity at 0.0498 with half time convergence of 14 years, speed

convergence of agriculture sector labour productivity at 0.0933 with half time convergence of 11 years, then the speed of convergence in manufacturing sector labour productivity at 0.0654 with half time convergence of 7 years. The addition of several variables that are suspected to affect labour productivity such as the physical capital stock, human capital stock, depreciation rate, total trade, and real wage as well as the use of dynamic panel data analysis methods that can overcome the problem of endogeneity and produce an unbiased and consistent estimator in this study are considered as the cause of the more rapid convergence speed occurred.

Speed of convergence of labor productivity in agriculture and manufacturing sector in Indonesia is faster than speed of convergence of aggregate labor productivity. This means that the slow convergence of aggregate labor productivity is influenced by other sectors besides agriculture and manufacturing sector. Therefore, agriculture and manufacturing sector can be used as a reference for other sectors to be able to accelerate their labor productivity convergence in order to accelerate aggregate labor productivity convergence. Generally, based on the value of weighted coefficient of variation, labour productivity in manufacturing sector is more unequal than in agriculture sector. However, the results of the study state that the speed of convergence and half-time convergence of labor productivity in manufacturing sector is faster than in agriculture sector.

Statistics Indonesia's data show that in average during the period 1987-2011, physical capital stock in agriculture sector is higher than in manufacturing sector, human capital stock in agriculture sector is lower than in manufacturing sector, employment in agriculture sector is higher than in manufacturing sector, total trade in agriculture sector is higher than in manufacturing sector, and real wages in agriculture sector is lower than manufacturing sector. This condition influences the speed of

convergence and half time convergence of labor productivity in manufacturing sector which is faster than in agriculture sector.

The convergence models above can provide information on several factors that affect regional labour productivity in Indonesia, both in the aggregate, agriculture, and manufacturing sector with the assumption that they provide the same effect on both Western and Eastern Indonesia. Intervention on these factors can be done so that labour productivity can be increased and the convergence process can be accelerated. Intervention should focus on provinces with lower labour productivity so that labour productivity can improve more rapidly and the convergence process can occur faster.

Physical capital stock and human capital stock, both restricted or not, have positive effect on Indonesia's labour productivity in aggregate, agriculture, and manufacturing sector in Indonesia in accordance with their role in increasing production capacity according to the endogenous economic growth model prediction. Depreciation rate, in this case representing the growth rate of labour, because technology growth rate and capital depreciation growth rate are considered to be constant, has negative effect on labour productivity in agriculture and manufacturing sector. The increase in the number of workers demands greater share of investment in the economy to provide the investment needs for new workers to maintain capital output ratio. If the increase in the number of workers exceeds the increase in investment, the investment per worker will decline and negatively affects labour productivity.

Total trade has a positive effect on aggregate labour productivity, agriculture, and manufacturing industries in Indonesia. There are five potential pathways according to Jiang (2012) that connect the effect of trade openness on regional labour productivity in Indonesia, which are among others, technology transmission through

imitation process, intense competition climate that encourages innovation, access to skilled foreign workers that can improve the technical and managerial skills, the emergence of new companies that can take advantage of their predecessors through fixed cost savings associated to import export strategies that make it easier for new companies to penetrate the industry, as well as increased demand by downstream companies for input produced by upstream companies.

Regression coefficient estimator of real wage variable in aggregate, agriculture, and manufacturing sector show positive signs. Positive relationship between real wages and labour productivity is influenced by the increasing the opportunity cost of lost work due to an increase in real wages that can boost the performance of the workforce. In addition, higher real wages will increase labour costs thereby encouraging companies to substitute labour unit with capital unit which in turn increase the marginal product of labour or labour productivity.

The effect of physical capital stock on labor productivity in agriculture sector is lower than in manufacturing sector while physical capital stock in agriculture sector is higher than in manufacturing sector. Development of the physical capital stock associated with government subsidies has a less tendency to increase labor productivity. Human capital stock in manufacturing sector is greater than in agriculture sector so that the influence of human capital stock in manufacturing sector is greater than in agriculture sector. The influence of the growth of employment in agriculture sector is greater than in manufacturing sector. This is in line with the amount of labour in agriculture sector, which is also larger than in manufacturing sector. In case of total trade, agriculture sector has a greater impact than manufacturing sector due to the proportion of trade to riil GDRP in agriculture sector which is greater than in manufacturing sector. Finally, the effect of real wage on labor productivity in

manufacturing sector Indonesia is slightly larger than in agriculture sector where real wage average per month in manufacturing sector is higher than in agriculture sector.

CONCLUSION AND POLICY RECOMMENDATION

Conclusion

Based on the discussion of the results of the analysis outlined above and referring to the original objectives of this study, the conclusions that can be taken from this study are:

1 Labour productivity disparity is a phenomenon experienced by Indonesia, both in aggregate, agriculture, and manufacturing sector during the period 1987-2011 in which the regional disparities in Eastern Indonesia is more unequal than in Western Indonesia.

2 Labour productivity regional convergence in aggregate, agriculture, and manufacturing sectors occur in Indonesia during the period 1987-2011 with the speed of convergence and half time convergence of aggregate labour productivity is slower than in agriculture and manufacturing sector. Speed of convergence and half time convergence of labour productivity in agriculture sector is slower than manufacturing sector.

3 Lag labour productivity, restricted physical capital stock, restricted human capital stock, total trade, and real wage have positive effect on aggregate labour productivity in Indonesia during the period 1987-2011.

4 Lag labour productivity, physical capital stock, human capital stock, total trade, and real wage have positive effect while the depreciation rate has negative

impact on agriculture and manufacturing sector labour productivity in Indonesia during the period 1987-2011.

5 Human capital stock is a factor that has the highest effect on labor productivity in Indonesia, both in aggregate, agriculture, and manufacturing sectors during the period 1987-2011.

6 The effect of physical capital stock, human capital stock, and real wages in agriculture sector is smaller than in manufacturing sector, while the effect of depreciation rate and total trade in agriculture sector is greater than in manufacturing sector during the period 1987-2011.

Policy Recomendation

1 Although government must implement fair policies to all people, government should prioritize to overcome labour productivity disparity in Eastern Indonesia than in Western Indonesia due to the disparity condition which is worse in Eastern Indonesia in order to reduce the disparity and accelerate convergence process. The intervention of regional labour productivity determinants for provinces with lower labour productivity should be greater than that for provinces with higher labour productivity.

2 Government should increase physical capital stock accumulation through increased share of investment in the economy in the right amount to provide investment needs for new worker in order to maintain the output capital ratio and push the economy towards the steady state condition by increasing the proportion of real GFCF to real GDRP, the proportion of government development expenditure to nominal GDRP in agriculture and manufacturing sector.

3 Government should increase the human capital stock accumulation associated with human resources quality improvement; for example by implementing competency-based job training, developing standardization and certification of labour competencies, improving the relevance and quality of vocational training institutes, including the improvement of professionalism among job training instructors, and upgrading work training facilities.

4 Government should anticipate an increase in employment growth by increasing the share of investment in the economy in a sufficient amount to provide investment needs for new workers to maintain capital output ratio. If the increase in the number of workers exceeds the increase in investment, the investment per worker will decline and negatively affect labour productivity.

5 Government should encourage the improvement in Indonesia's trade openness degree through the removal of trade barriers, both tariff and non-tariff policies, combined with the appropriate protection for domestic producers.

6 Government should increase real wage through the establishment of minimum wage policy which is balanced with decent living needs.

7 In order to more rapidly improve regional labour productivity in Indonesia, government should focus on determinants that produce more dominant effects. The main determinant of regional labour productivity in aggregate, agriculture, and manufacturing sector is human capital stock.

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Figure 1 Overview of economic development in Indonesia during the period of 2007-2011

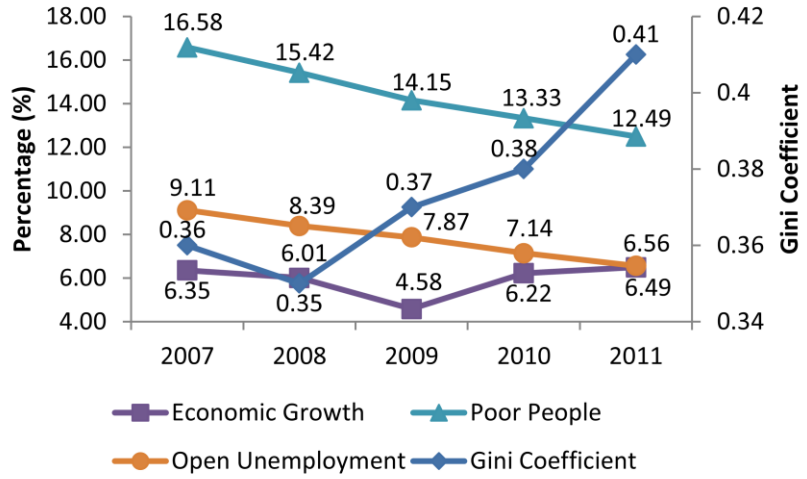

Figure 2 Weighted coefficient of variation value of aggregate labour productivity in Indonesia during the period of 1987-2011

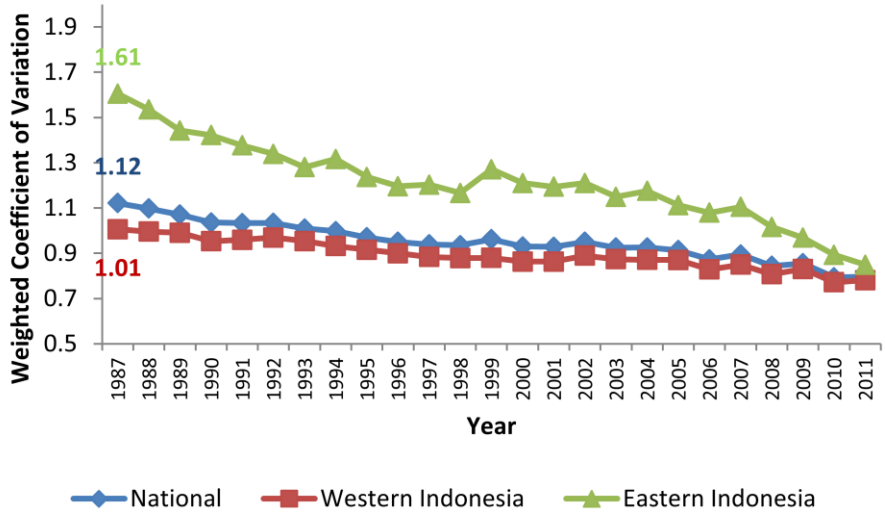

Figure 3 Weighted coefficient of variation value of agricultural labour productivity in Indonesia during the period of 1987-2011

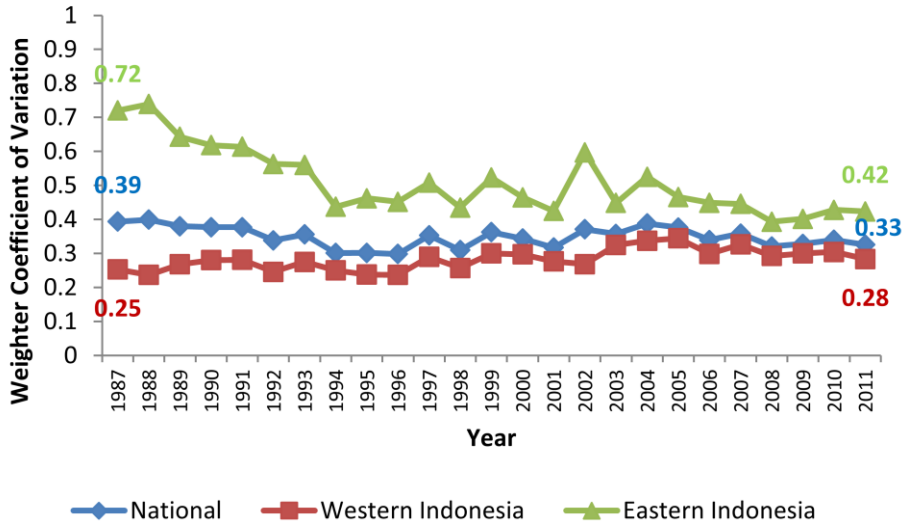

Figure 4 Weighted coefficient of variation value of manufacturing labour productivity in Indonesia during the period of 1987-2011

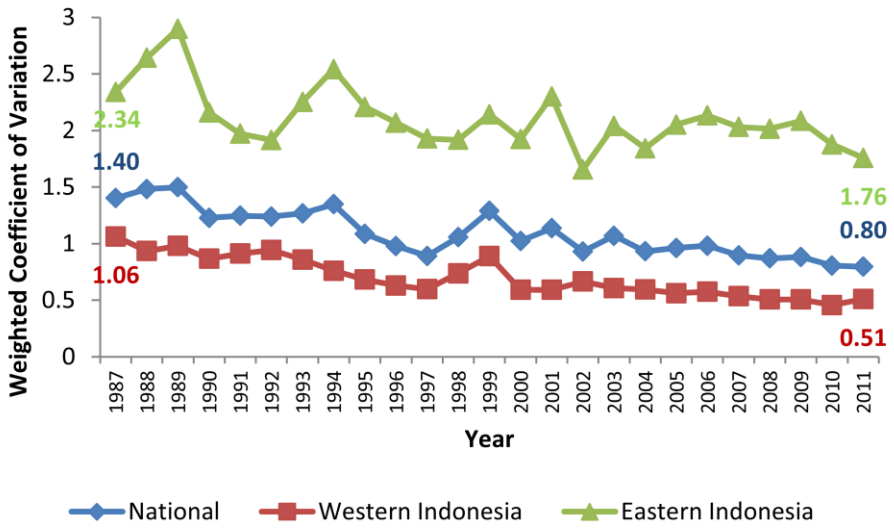

Table 1 Average labour productivity in Indonesia period 2007-2011

Region	Average labour productivity (Million Rp. Per worker)					
	Agriculture			Manufacture		
	The Highest	The Lowest	Dispersion	The Highest	The Lowest	Dispersion
National	16.39	3.29	4.98	381.43	1.28	299.14
	Riau	NTT		Kaltim	NTT	
Western	16.39	5.92	2.77	99.76	9.60	10.40
Indonesia	Riau	Jateng		Riau	Bali	
Eastern	16.19	3.29	4.92	381.43	1.28	299.14
Indonesia	Kaltim	NTT		Kaltim	NTT	

Table 2 Overview of estimation model of labour productivity convergence as an aggregate, in agricultural, and manufacturing sector in Indonesia with Sys-GMM approach

Aggregate Model		Agricultural Sector Model		Manufacturing Sector Model	
Variable	Sys GMM	Variable	Sys GMM	Variable	Sys GMM
ln_lp(-1)	0.877779	ln_lp_agr(-1)	0.581943	ln_lp_man(-1)	0.484992
	[0.000] ***		[0.000] ***		[0.000] ***
ln_sngd	0.050768	ln_s_agr	0.022961	ln_s_man	0.105028
	[0.000] ***		[0.000] ***		[0.000] ***
ln_hngd	0.071995	ln_h_agr	0.175249	ln_h_man	0.21131
	[0.000] ***		[0.000] ***		[0.000] ***
ln_trade	0.055227	ln_ngd_agr	-1.833771	ln_ngd_man	-0.039225
	[0.016] **		[0.000] ***		[0.000] ***
ln_rw	0.020200	ln_trade_agr	0.105423	ln_trade_man	0.087547
	[0.000] ***		[0.005] ***		[0.011] **
		ln_rw_agr	0.110445	ln_rw_man	0.145268
			[0.000] ***		[0.000] ***
Implied λ	0.06518	*Implied λ*	0.270691	*Implied λ*	0.361811
Half time convergence	10.63433	*Half time convergence*	2.560657	*Half time convergence*	1.91577
Goodness of Fit Test	75299.70	*Goodness of Fit Test*	1720000	*Goodness of Fit Test*	92907.81
	[0.0000] ***		[0.0000] ***		[0.0000] ***
ln_lp(-1) POLS	0.929096	ln_lp_agr(-1) POLS	0.909857	ln_lp_man(-1) POLS	0.851954
	[0.000] ***		[0.000] ***		[0.000] ***
ln_lp(-1) FEM	0.609497	ln_lp_agr(-1) FEM	0.550978	ln_lp_man(-1) FEM	0.379542
	[0.000] ***		[0.000] ***		[0.000] ***
LM Test		LM Test		LM Test	
m1	-2.0434	m1	-2.1146	m1	-2.1661
	[0.0410] **		[0.0345] **		[0.0303] **
m2	1.7691	m2	0.94265	m2	0.96645
	[0.0769		[0.3459]		[0.3338]
Sargan Test	25.8107	Sargan Test	22.81713	Sargan Test	24.49412
	[1.0000]		[0.2455]		[0.6552]

Note: ** and *** state a level of significance of 5 % and 1 %.