PER CAPITA INCOME CONVERGENCE ACROSS DISTRICTS

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Abstract
This study examines whether or not there is a conditional convergence of per capita income in Gunungkidul Regency. The calculation of conditional convergence is carried out by including the influence of control variables which are expected to affect the steady-state conditions of each district. This research uses labor productivity and the working-age population as control variables. The Central Bureau of Statistics publishes the research data. The dynamic panel regression analysis method is used in this study. The results showed that there was a convergence of per capita income across districts in Gunungkidul Regency. The poor district will tend to grow faster than rich ones so that all economies will eventually converge in terms of per capita income. Therefore, the income gaps across districts will disappear. An increase in worker productivity and the working-age population cause an increase in the gross regional domestic product (GRDP) and support process of per capita income convergence across districts.

Keywords: per capita, income, convergence, district, productivity,

INTRODUCTION
Neo-Classical growth theory states that inequality in terms of per capita income between regions will decrease along with the ongoing economic development. Poor region tends to grow at faster rates than rich ones (Barro and Sala-i Martin, 2004). As a result, in terms of per capita income, the poor region will tend to catch up with the rich ones. In this process, differences in economic growth between regions will be lost due to the free movement of capital and labor between regions. Free movement of endowment factors will equalize the value of marginal products between regions. The mobility of production factor leads to reduce a difference in per capita income between regions. If this process occurred continuously, all regions would see convergence in terms of per capita income.
Some research partly shows the evidence of income convergence (Gyawali et al., 2008; Schmitt and Starke, 2011; Jayathakumaran and Lee, 2013; Gömleksiz et al., 2017). Gyawali's et al., (2008) showed evidence of income convergence in Alabama, the US. Incomes have grown at higher rates in Census Block Groups with lower income levels in 1980. In line with Gyawali's et al., (2008), Schmitt and Starke (2011) show that there is very strong evidence of convergence across all categories of social expenditure in OEDC countries when conditional factors are taken into account. The speed of convergence is highly driven by globalization and European Union membership and is shaped by existing welfare state structures. Mean whiles, Jayathakumaran, and Lee (2013) show that the relative per capita income series of ASEAN 5 countries are consistent with stochastic convergence. Furthermore, Gömleksiz et al. (2017) confirm the validity of the convergence hypothesis at a regional level. In the context of the convergence

process, it is possible to include that the role of government is likely to be regional decisive in solving economic disparities.

Conversely, some studies do not support the income convergence (Hammond, 2006; Duasa, 2010; Chikte, 2011, Djennas and Ferouani, 2014). Hammond (2006) found divergence in income among the non-metropolitan regions and mixed evidence of convergence in metropolitan regions and states in the US. Differences in human capital (as well as employment concentrations in farming and mining) appear to have influenced the relative performance of metropolitan and non-metropolitan regions during the last 30 years, suggesting a role for agglomeration economies in the observed trend toward divergence. In line with the results of previous studies, Duasa (2010) showed that there is no evidence of convergence in the Organization of Islamic Conference (OIC) either the pre or post-reform period. Meanwhile, Chikte (2011) found strong evidence of a divergence in per capita income of the 15 states in India. The standard deviation of a net domestic product has increased over time indicating the evidence of divergence in the pre-post-reform period. Djennas and Ferouani (2014) did not find any kind of income convergence across countries in Africa.

Furthermore, another study found uncertain results between income convergence and divergence such as Pfitzner and Lang (2014). They examined the convergence of per capita incomes across the counties in North and South Carolina. The results indicate that for the full period, per capita incomes converged across counties for both North and South Carolina. However, based on the sub-period analysis, incomes diverged during the 1979 –1989 decade. Income inequality increased across counties, and wealthier counties grew significantly faster than poorer ones in North and South Carolina in the 1980s. Finally, for the most recent reported sub-period, 1999 – 2010, income inequality increased slightly across counties in both states, and there was no evidence of beta convergence.

The roots of disparity lay in differences in the initial endowments factor (Engerman and Sokoloff, 2002). Income inequality between regions arises as a result of differences in resources ownership. Differences in the investment, technology, population growth, infrastructure, and other differences between regions cause each region does not have the same conditions. A quantity and quality of resources are associated with per capita income of the resident. Regions with substantial and qualified resources tend to produce more output so that their per capita income higher than poor ones.

However, resources include not only capital resources and natural resources but also human resources. Human resources as one of the production factors other than natural resources, capital, entrepreneurs to produce output. Capital and natural resources are only passive production factors, while humans are active factors of production which can accumulate capital, exploit natural resources and build a better performance. Human resources are the most important factors and determine the progress of a region. The higher the quality of human resources, the higher the efficiency and productivity of a region. Countries that implement the development paradigm with human dimensions have been able to develop even though they do not have abundant natural resource wealth. Emphasis on human investment is believed to be the basis for increasing total output. Land, lab or, physical capital can experience diminishing returns, but

human resource does not. The science and human capital are essential factors in spurring economic growth.

In term of macroeconomics perspective, human resources are indicated by the number of working age population. The higher the working age population, the higher the amount of output that can be produced. If the working age population have sufficient skills, the lab or productivity will increase. An increase in lab or productivity has an impact on increasing output. If the community member in lagging regions is given sufficient skills, their productivity will increase so that this region can catch up with developed ones.

Furthermore, the remainder of this paper is organized as follows. Section 2 reviews the theoretical. We describe our data and methodology in Section 3. Section 4 reviews the empirical results. Section 5 carries the conclusion.

THEORETICAL REVIEW

Inequality between regions becomes an interesting phenomenon to be studied. Inequality in developing countries is relatively higher because, at the beginning of the development process, existing development opportunities are generally used by more developed regions, while underdeveloped regions are not able to take advantage of this opportunity due to limited facilities and infrastructure. Inequality arises because not all community members can take advantage of opportunities arising from economic growth. It is related to the diversity of resources between community members including diversity in education. Those who have high education and expertise can take advantage of the opportunity, while others cannot take a benefit of some opportunity arising from economic development. This condition causes a high economic growth that followed by worsening income distribution.

Generally, urban areas have better infrastructure than that in rural so that they become new investment destinations. Better infrastructure leads to lower production costs so that the output can be produced more cheaply. Therefore, companies want to locate themselves or build their factories in locations with better infrastructure so that they get lower production costs. It means that investments tend to be concentrated only in a few places (Lall et al., 2004), which lie close to the market, port or high way. The excellent infrastructure encourages companies to put themselves in only a few cities. Consideration of the benefits of agglomeration causes companies often occupy close to each other so that some economic activities are concentrated in urban areas.

On the other hand, the ability of the population varies between regions. Urban residents tend to have high education and skills so that they benefit from urban agglomeration. They can work in productive economic sectors. Meanwhile, rural residents do not have adequate education and skills so they cannot get jobs in productive economic sectors. With various considerations in production efficiency, the company determines the specifications of the workers needed. Specifications of the workers needed to make not all residents able to meet the required specifications. Occasionally some job vacancies in an industry are not filled, while at the same time some job seekers do not get the job they are looking for. Job seekers who do not get a job will become unemployed or forced to work in the informal sector with lower productivity. Those who have high education and expertise can take advantage of this opportunity, while workers

who do not have sufficient education and expertise will be excluded. Differences in the level of education and skills between residents of urban and rural areas lead to imbalances in lab or productivity between the two regions.

Besides physical infrastructure, another problem that needs to be addressed is human resources. The qualified workers cannot be obtained instantly. In order to realize the quality of human resources, it is required a long process through severe and sustainable investment in education. It is light that education is the most important factor that directly contributes to the development of human resources quality. Education is closely related to economic activity because the main production factors in economic activities are lab or or human. An improvement in the employment side will increase the quality of social capital that available to do an economic activity. The development of human resources has a multiplier impact, especially, on the lagging regions that it can catch up with developed ones.

However, the main problem of human resources is low lab or productivity. Lab or productivity is an important economic indicator that is closely linked to economic growth, competitiveness, and living standards within an economy. Human resources occupy a very strategic position in realizing the availability of goods and services. Lower lab or productivity has an impact on the smaller number of goods and services produced by the economy. Therefore, lab or productivity must be increased to improve the population welfare. An increase in lab or productivity will increase the number of goods and services produced by an economy so that the welfare of the population also increases.

The economic growth is also related to the magnitude of a workforce. The workforce is showed by the working-age population aged 15-64 years old who are available to work. The number of working age population shows the amount of lab or available in the region. The large population of productive age encourages economic growth. Generally, this growth is associated with the innovation of entrepreneurs. Meanwhile, the innovation is implemented by the young entrepreneur who found a new knowledge and new production process. Innovations are sources of economic growth through the development of innovative and productive activities.

Innovation shows the improvement of technologies such as new product inventions, opening new markets or finding new production processes. Innovation is related to the improvement of the economic system that originates from the creativity of its resident. Therefore, the increase in output is not only caused by the growth of capital stock but also due to technological progress. A large number of productive age is expected to be the driving force of the economy, both as a qualified workforce and opening employment opportunities that will absorb the workforce. If this role is implemented, it will help the government in subsidizing the elderly population or those under 15 years.

However, the size of the productive age provides not only opportunities, but also challenges. If the government is unable to take advantage of this opportunity, then the economy will experience stagnation and even decline. Conversely, if the workforce is absorbed in the production process, then the high income will be realized. The increase in income will have an impact on the increase in savings. Furthermore, the increase in savings will spur investment and economic growth. This condition is an opportunity for a region to accelerate the economic growth by utilizing the abundance of the workforce.

If the lagging regions can take advantage of the workforce abundance and increase worker productivity, then this region will be able to catch up with developed ones. Thus there has been income convergence which is marked by a decrease in income disparity across regions. Convergence movements are indicated by the ability of the lagging regions to catch up with the developed ones. However, if there is no convergence, then regions that were initially poor will remain forever poor. If the two regions have a same steady state when viewed from the level of investment, population growth, and workforce, then convergence will be achieved.

There are 2 (two) convergence concepts, namely σ convergence and β convergence. The concept of σ convergence refers to the dispersion that can be measured by, for example, the standard deviation of the logarithms of income per capita between regions. If the value shows a decrease, then there will be income convergence and vice versa. Meanwhile, the concept of β convergence states that the poor economy can catch up with the rich ones in terms of income per capita (Barro and Sala-i Martin, 2004). The concept of β convergence is divided into 2 (two), namely absolute convergence and conditional convergence. Absolute convergence refers to convergence measurements based on initial income levels only. Measurement of absolute convergence is done without including control variables that are characteristic of each region. Each region is considered to have the same steady-state conditions so that in convergence calculations do not include other variables such as investment and population growth that differ between regions. Also, the calculation of conditional convergence is done by including the influence of control variables which are expected to affect the steady-state conditions of each region.

Furthermore, this study focuses in Gunungkidul Regency as one of the regencies in Indonesia with high unbalance growth. Gunungkidul Regency has high economic groswth, but there is an unbalanced growth across districts. According to the size of income per capita, there are three districts namely districts with high per capita income, districts with medium per capita income and district with low per capita income. Three districts belonging to the high per capita income category are Wonosari, Nglipar and Playen districts. Meanwhile, the districts that are classified as moderate per capita income are Semin, Ponjong, Girisubo, Patuk, Purwosari, Tanjungsari, Rongkop, Panggang, Semanu, and Saptosari. The district group with a low level of per capita income include Karangmojo, Ngawen, Paliyan, Tepus, and Gedangsari. The position of Wonosari District as the center of local government allows the development of the secondary and tertiary sector, while other districts are still focused on the primary sector. The concentration of economic activities in Wonosari causes an income disparity across districts.

METHODOLOGY

This study uses data from the Central Bureau of Statistics Gunungkidul. The research data includes per capita income, worker productivity, and the working-age population during the period 2009-2016. The selection of the starting point of the study in 2009 was due to the change in the economic structure which was marked by an increase in the share of the tertiary sector that had exceeded the share of the primary sector. Meanwhile, the endpoint selection in 2016 was due to this publication in this year is the latest data.

Furthermore, the operational variables are defined as follows. Per capita income is the value of the district's gross regional domestic product (GRDP) at 2010 constant prices divided by the

number of population. The labor productivity is the value of the gross regional domestic product (GRDP) at 2010 constant price divided by the working population. Meanwhile, the working-age population is measured by the number of residents aged 15 years to 65 years old.

This study covers per capita income in each district in the Gunungkidul Regency and the variables that influence it during the period 2009-2016 so that the research data is in the form of panel data. Panel data have several advantages over cross-sectional data or time series data (Baltagi, 2003).

1. Controlling for individual heterogeneity. Panel data suggests that individuals, firms, states or countries are heterogeneous. Time-series and cross-section studies not controlling this heterogeneity run the risk of obtaining biased results.
2. Panel data give more informative data, more variability, less co linearity among the variables, more degrees of freedom and more efficiency.
3. Panel data are better able to study the dynamics of adjustment.
4. Panel data are better able to identify and measure effects that are simply not detectable in pure cross-section or pure time-series data.
5. Panel data models allow us to construct and test more complicated behavioral models than purely cross-section or time-series data.

Also, the research model is outlined in the dynamic models which describe that interactions between economic variables are rarely instantaneous. Furthermore, the dynamic model is formed by entering lags on both the right and left side variables of the equation. In order to obtain a simple estimation model, a reduction is made starting from the longest lag to the shortest lag to obtain the superior model. Estimation of the income convergence model is written in the following equation.

$$\Delta \ln Y_{it} = \alpha_i + \omega \ln Y_{i,t-1} + \sum_{j=0}^{k} \beta_{ij} \ln X_{1it-j} + \sum_{j=1}^{k} \gamma_{ij} \ln X_{2it-j} + e_{it} \qquad (1)$$

Respectively, Y is per capitaincome, X_1 is lab or productivity, and X_2 is working-age population. An analysis of the above equation provides an overview of the income convergence process and the influence of control variables in supporting the convergence. Income convergence occurs when the coefficient ω is negative ($\omega < 0$).The velocity of convergence λ in which the convergence per capita income level to a uniform per capita income level can be calculated according to $\lambda = -[(\frac{1}{T}) \ln(\beta + 1)]$. T denotes the length of the time interval under consideration. Meanwhile, to find out whether there is a long-term equilibrium relationship between economic variables, the Kao co integration test is used. Furthermore, the study uses the Hausman test to examine whether the fixed effects model or random effects is a superior model

EMPIRICAL RESULTS

The results of co integration testing based on the Kao method show that the t value of -4.464 with a probability value less than 0.05. It means that there is co integration between variables in the model. Therefore, in the model, there is a stable linear combination of economic variables.

The resulting residual is stationary which exhibits that the variables in the model have a long-term balance relationship in line with economic theory. The estimated model has a long-term consistency, or at least there is a causal relationship in one direction among the variables in the model.

Meanwhile, the determination of the length of lag in this study uses the Akaike Information Criterion (Liew, 2004). The smaller Akaike Information Criterion (AIC) shows a better model. Based on the results of the vector auto regression (VAR) estimation, the minimum AIC value occurred when the lag length is one year. It means that the estimated VAR with lag length one year will avoid model from specification errors and the problem of reducing the degree of freedom. Estimation of vector auto regression with lag length 1 is parsimonious VAR. Also, the results of the Hausman test show that the fixed effects model is superior to the random effects model. Therefore, the analysis is carried out based on the fixed effects model.

Based on the fixed effects model and reduction of non-significant parameters, a simple estimation is obtained. The coefficient of determination (R2) of 0.864 indicates that 86.4 percent of the variation in per capita income can be explained by variations in independent variables, while the remaining 15.6 percent is explained by residuals. Hereafter, the high F value shows that the independent variables simultaneously affect the dependent variable.

Table 4. Estimated Result (*Fixed Effects*)

No.	Variables (in a log)	Coefficient	Standard Errors
1	Per CapitaIncome (previous year)	-0.866*	0.043
2	Labor Productivity	0.775*	0.037
3	Working-Age Population	0.786*	0.050
4	Constant	-2.095*	0.237

Outcome: Change in log (Per Capita Income)

Adjusted-R^2 = 0.864   * Significant at (α=5 per cent)

The coefficient of per capita income of the previous year of -0.866 indicates that if all other things being equal, an increase of per capita income (previous year) by 1 percent causes a decrease of per capita income (current) by 0.866 percent. An increase in per capita income in lagging districts is higher than that in the advanced districts. Therefore, the lagging districts will be able to catch up from relatively advanced ones. The rate of income convergence in Gunungkidul regency is 2.01. This level shows that the speed of each district to achieve steady state is 2.01 percent per year.

Equity in infrastructure development will increase lab or productivity. The infrastructure development increases a multiplier effect, so that poor districts tend to grow faster than wealthy district. Therefore, the multiplier effect of an increase in lab or productivity causes the poor districts can catch up with rich ones in terms of the per capita income. This result supports the study of Gömleksiz et al. (2017) which states that there is clear evidence for the presence of the

unconditional convergence across regions in Turkey between 2004 and 2014. The significantly negative sign of initial year real GDP per capita with control variables reveals the existence of conditional convergence across the regions. The regions experienced a relatively slow catching-up process for this period.

The income convergence in Gunungkidul Regency is faster than that in Indonesia. Maryaningsih et al. (2014) found that the speed of income convergence in Indonesia is 1.75 percent per year. However, convergence speeds that differ from previous studies can be caused by differences in the variables used in the study, a method of analysis and scope of research. The income convergence in Gunungkidul Regency occurs quickly maybe because there are many interactions of economic agents among districts in this regency. Furthermore, the difference in economic performance between districts in Gunungkidul Regency is relatively small so that the income convergence process takes place rapidly.

The value of labor productivity coefficient of 0.775 shows that if labor productivity increases by 1 percent, it will be followed by an increase in per capita income by 0.775 percent (all other things being equal). An increase in labor productivity shows the higher number of goods and services that can be produced by a worker. Furthermore, an increase in the output will have an impact on the increase in population income. If the increase in output is faster than the increase in population, then there is an increase in per capita income. The increase in per capita income supports the income convergence process. This result support Korkma and Korkmaz (2017) who stated that productivity is one of the most important factors contributing to the economic growth. It has effects on economic growth through reducing input costs and application of efficient production process.

An increase in lab or productivity is a significant prerequisite for the growth of a region. In order to realize sustainable growth, a region requires an increase in lab or productivity in key sectors such as manufacturing, agriculture, services, transportation, communication, and construction. An increase in lab or productivity of these sectors requires improvements in lab or quality, investment, infrastructure, and government regulations.

Meanwhile, the working-age population has a positive effect on per capita income. The coefficient regression of 0.786 indicates that if the working-age population rises by 1 percent, it will cause an increase in per capita income of 0.786 percent (all other things being equal). The increase in the working-age population shows an increase of productive workers which ready to participate in the production process so that the gross regional domestic product (GRDP) also increases. An increase in GRDP will encourage an increase in per capita income. An increase in the productive age causes poor districts to grow rapidly so that this districts will be able to catch up with rich ones. Therefore, an increase in the productive age supports the income convergence process. This result is in line with Bloom et al. (2010) which state that age structure of a population may be consequential for its economic performance, as measured by per capita income. Large youth and elderly cohorts might slow the pace of economic growth, while large working-age cohorts might speed it.

CONCLUSION

There is a process of convergence in per capita income across districts in Gunungkidul Regency. The underdeveloped districts grow rapidly so that these districts can catch up with developed ones. Therefore, the gap in per capita income between districts will disappear. An increase in worker productivity and the working-age population will increase the gross regional domestic product (GRDP). If the population growth is lower than economic growth, this increase will encourage an increase in per capita income. It means that an increase in labor productivity and the working-age population support income convergence process.

In order o accelerate the process of income convergence, it is required a program to improve the quality of human resources, especially in undeveloped districts. A qualified workforce will be able to increase production efficiency so that the amount of output also increases. The effort to improve human resources can be realized through equitable access to education. Improving education needs to be prioritized for low-income households so that disadvantaged regions can grow rapidly. This growth will accelerate the process of income convergence.

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