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Industrialization and Convergence of West Java Manufacturing Labor Productivity, Indonesia

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Abstract

West Java as a national manufacturing center has experienced industrialization since 1989. This is marked by the continuous increase in the manufacturing sector so that it is able to shift other sectors. Unfortunately, the industrialization that occurred in West Java was not followed by a reduction in the manufacturing labor productivity in West Java. The convergence of manufacturing labor productivity in West Java is an important phenomenon because inequality can lead to a different pace of development and exacerbate inequality. This study uses dynamic panel data regression with the first-different GMM (FD-GMM) method for inferential analysis and Location Quotient (LQ), Klassen Typology and the calculation of the coefficient of variation for descriptive analysis. The results showed that only 7 out of 27 regencies/cities in West Java had the economy dominated by the manufacturing sector and there were fluctuations in the productivity of the manufacturing workforce in these areas. Based on Klassen's Typology, there are still many areas that are categorized as developing and underdeveloped areas. However, there is a decrease in inequality between regions as seen from the results of the convergence analysis. Sigma convergence and beta convergence occurred in West Java with the time needed to close half the gap (half-life convergence) of less than one year. Factors that significantly affect the convergence process of manufacturing labor productivity are the manufacturing labor productivity lag, FDI, DDI, and real wages of manufacturing workers.

Key words : Industrialization, convergence, manufacturing, productivity, panel.

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INTRODUCTION

Indonesia as a developing country has a focus on economic development to become a developed country. One of the important things in a developing country is industrialization. Weiss (1998), explains that industrialization occurs when a traditional economy with agriculture as the main sector is replaced by a modern economy with the manufacturing as the main sector. This is marked by the continuous increase in the manufacturing sector so that it is able to shift other sectors.

West Java as the manufacturing center of Indonesia, has the largest contribution of the manufacturing sector, industrial companies, and industrial workers in Indonesia. Of There are 74 industrial estates in Indonesia, 40 of them are located in West Java (Kemenperin, 2014). West Java has experienced industrialization which is signed by the contribution of the manufacturing sector in West Java from 2014-2019 that always exceeds the agricultural, forestry, and fisheries sectors and it becomes the largest contribution. In 2019, the contribution of the manufacturing sector reached 41.6% of West Java's GRDP.

Industrialization that occurred in West Java is one of the efforts of economic development, but it is not followed by a decrease in the productivity gap of manufacturing workers. This is not in accordance with the theory from Todaro & Smith (2015), which says that economic development is multidimensional which includes various aspects of society such as the development of economic activities and people's living standards, including eradicating poverty and reducing inequality. Thus, good economic development should be able to create jobs, increase income, and improve the welfare of the community to be able to overcome the problem of inequality.

Table 1. Statistical Description

Year	Max	Min	MMR	Mean
2014	905,05	7,30	124,01	115,88
2015	633,08	9,41	67,28	105,56
2016	571,01	7,32	77,96	130,60
2017	575,20	7,49	76,85	108,23
2018	449,64	9,39	47,90	110,11
2019	362,53	4,35	83,41	71,01

Source: Central Bureau of Statistics (processed)

The inequality of manufacturing labor productivity in West Java can be seen through the Maximum-to-Minimum Ratio (MMR). MMR is used to measure regional inequality quickly, easily understood, and politically powerful (Shankar & Shah, 2003). West Java's MMR is quite high, even well above one, as shown in Table 1. MMR increased the most in 2019, to 35.51, indicating that the productivity of manufacturing workers in West Java is becoming increasingly unequal. Based on BPS data, it is known that there are only six regencies/ cities in West Java that have manufacturing labor productivity above the average West Java manufacturing workforce productivity in 2014-2019. Meanwhile, 21 other regencies/ cities are still below the average productivity of West Java's manufacturing workforce in 2014-2019.

Inequality in manufacturing labor productivity exists in West Java. Regional inequality, according to Bhinadi (2003), can be measured through production per worker, also known as labor productivity. Labor productivity is especially important in measuring regional economic disparities, according to Bawono (2011), because it considers the pattern of changes in economic structure and labor absorption, also can be studied by sector.

Inequality in the productivity of manufacturing workers can cause negative consequences such as inhibiting the increase in income and exacerbating disparities because it is related to income distribution so that it can slow down the process of equity (Ismail et al., 2012). Therefore, the decline in the disparity or convergence of inter-regional manufacturing

labor productivity in West Java is a phenomenon that is expected to occur.

The reduction in regional disparities (convergence) can be accelerated by investment. It is one of the crucial factors for the progress of economic development or long-term economic growth involving production activities in all economic sectors (Wahyuni, 2011). Nugroho (2019), added that the manufacturing is an attractive sector for investors, both foreign and domestic investors, and large investments in an area will spur the growth of the manufacturing. Investment, which is seen from Foreign Direct Investment (FDI) and Direct Domestic Investment (DDI), is one of the physical capital. Firdaus & Yusop (2009), state that the ability to converge labor productivity in a region is influenced by physical capital and human capital, which are factors supporting economic activity to determine economic growth. In addition to physical capital and human capital, wages are also a factor that can accelerate convergence. Giving wages to workers will motivate and strengthen the relationship between employers and their workers and can encourage labor productivity in the long term.

Nugroho (2019), researched the convergence of labor productivity in large and medium-sized industries. This study resulted that sigma, absolute beta, and conditional beta in Java Economic Corridor occurred. Factors that increase large and medium-sized industries labor productivity in the Java Economic Corridor are fixed capital, wages, export orientation, electricity consumption, and the manufacturing revolution 4.0 dummy. A similar study was researched by Bahar (2019), with the systematic estimation method GMM (Sys-GMM). The research was conducted by separating large and medium-sized industries labor productivity into two groups, the labor-intensive and capital-intensive groups. The results of this study indicate that the variables of real wages, physical capital stock, human capital stock, and bank credit structure significantly and positively affect large and medium-sized industries labor productivity in Sumatra and Java Economic Corridor.

Many manufacturing studies have been carried out in West Java, but comprehensive research linking the determinants of the manufacturing sector with regional disparities through convergence by comparison of descriptive and inferential methods has not been carried out. It is necessary to accelerate the process of convergence and reduce inequality in West Java. Therefore, this study aims as follows: (1) Analyzing the manufacturing sector in regencies/ cities in West Java in 2014-2019, (2) Analyzing the inequality of manufacturing labor productivity in regencies/ cities in West Java in 2014-2019, (3) Analyzing the sigma and beta convergence of manufacturing labor productivity in West Java for the 2014-2019 period, and (4) Analyzing the determinants of manufacturing labor productivity in West Java for the 2014-2019 period. This research is expected to provide policy advice to the government, not only regarding the development of West Java manufacturing, but also managing regional policies related to it.

METHOD

This research has covered all groups of manufacturing units in West Java, including micro and small industries, and the period in this research is more recent. We use two types of data analysis, namely descriptive analysis and inferential analysis. Descriptive analysis is used to answer the first objective to part of the third objective, while inferential analysis is used to answer part of the third and fourth objectives.

LQ (Location Quotient) analysis is used to see the specialization and concentration of the

manufacturing sector. The LQ value indicates the degree of specialization and concentration of the regional manufacturing sector. If the LQ value is more than 1, then the area has a manufacturing sector as the base sector. If the LQ value is less than 1, then the manufacturing sector is not a base sector. The following LQ formulations are:

$$LQ = (x\_i / x) / (X\_i / X) \quad (1)$$

LQ divides the contribution of the manufacturing sector of districts/ cities to the contribution of the provincial manufacturing sector as a reference area. The numerator is calculated by dividing the value added of the district/ city manufacturing sector (xi) and the total value added (x). The denominator is calculated by dividing the value added of the province's manufacturing sector (Xi) and the total value added of all sectors in the province (X).

The distribution pattern of labor productivity compared to the growth rate of the manufacturing sector is shown by the Klassen typology (Sjafrizal, 2008). This comparison is seen from the four quadrants. Districts/ cities that have higher labor productivity and manufacturing sector growth rates than provinces are in quadrant I. If district/ city manufacturing labor productivity is higher than the province but the growth rate is lower, then the district/ city is in quadrant II. If the district/ city manufacturing sector growth rate is higher than the province and labor productivity is lower than the province's, the district/ city is in quadrant III. Finally, if the districts/ cities labor productivity and growth rate is lower than the province's, they are grouped into quadrant IV.

Part of the third and fourth objectives can be answered by using a model based on Solow's theory. The Solow model explains that regions with different economic conditions will experience convergence, or the economy of poor regions will grow faster and catch up with developed regional economies (Mankiw, 2016). Convergence depends on when each of these areas started. In addition, Barro & Sala-i Martin (2004), also mention that convergence is a phenomenon that leads to a meeting point, or there is a catching-up effect by underdeveloped regions towards developed regions. If there is no convergence, then the underdeveloped regions that started with poverty will remain poor forever. Barro & Sala-i Martin (2004), also divide convergence into two concepts, sigma convergence (σ) and beta convergence (β).

Sigma convergence (σ) shows the smaller the dispersion (inequality) of manufacturing labor productivity in a certain period of time seen from the coefficient of variation. If the coefficient of variation decreases over time, the inequality between regions will also decrease. While beta convergence (β) shows that manufacturing labor productivity variables in poor areas grow faster than rich regions, so that poor regions can catch up with rich regions and have an economic level equivalent to rich regions (Barro & Sala-i Martin, 2004).

Sigma convergence is measured using the coefficient of variation (CV). The formula is the division of the variance (σ) and the average ($\bar{x}$) of manufacturing labor productivity. The formula is written as follows:

$$CV = \sigma / \bar{x} \quad (2)$$

Beta convergence consists of absolute beta convergence and conditional beta convergence. Absolute beta convergence only looks at the characteristics of manufacturing labor productivity variables and assumes that all regions converge at the same steady state level even though each region starts with a different level of economy, technology, labor growth, and the rate of depreciation in each region. Conditional beta convergence adds several control variables, namely considering other factors that can affect the convergence process of an area towards the steady state level of each region, as described by (Ray, 1998). The beta

convergence equation is derived from the Karagiannis equation (2007) to become:

$$lny_{it} = \gamma lny_{i,t-1} + X_{it}\beta + u_{it} \quad (3)$$

The existence of the dependent variable lag or in this study is the lag of manufacturing labor productivity, causing endogeneity problems because the lag variable is correlated with individual effects which are part of the error terms (*uit*). This problem causes the use of the Ordinary Least Square (OLS) estimator on the Common Effect and Fixed Effect Model and the Generalized Least Square (GLS) on the Random Effect Model to be biased and inconsistent. According to Anderson & Hsiao (1982) in Syawal (2011), this problem can be overcome by instrumenting the variables that correlate with the error with the help of instrument variables. However, this estimator still produces an inefficient estimate. Therefore, a dynamic panel model estimation is proposed using the Generalized Method of Moment (GMM) procedure which is proven to be more efficient (Baltagi, 2005). A first difference transformation is used to solve the problem of correlation between the lag of the dependent variable and the error component t aims to eliminate individual effects on the model.

The dependent variable used is the productivity of manufacturing workers which is calculated by dividing the gross regional domestic product real in the manufacturing sector with manufacturing workers. While the independent variables in this study are the manufacturing labor productivity lag, Foreign Direct Investment/ FDI (Thousand US$), Domestic Direct Investment/ DDI (million Rupiahs), the percentage of educated manufacturing workers (%), and the real wages of manufacturing workers (hundred thousand Rupiahs/ manufacturing worker).

The data used in this study is panel data, which is a combination of cross-sectional and time-series data. Districts/ cities in West Java, which consists of 18 districts and 9 cities, were used as cross-sectional data in this study. Meanwhile, the time-series data used in the study covers the years 2014 to 2019. This data is secondary data from BPS-Statistics Indonesia and Ministry of Investment in Indonesia. Data from BPS-Statistics Indonesia consists of Sakernas 2014-2019, West Java in Figures, and dynamic tables obtained through the BPS website for each district/ city).

RESULTS AND DISCUSSION

West Java has experienced industrialization since 1989, marked by the shift from the agricultural sector as the leading sector to the manufacturing sector. West Java also has the largest number of manufacturing companies and is a concentrated area of manufacturing industry in Indonesia, which is characterized by the large number of units and manufacturing workforce.

However, based on Location Quotient (LQ) analysis, out of 27 districts/cities in West Java, there are seven regions that have the manufacturing sector as the base sector. LQ is calculated by comparing the contribution of the district/city manufacturing sector to the contribution of the manufacturing sector in the reference area (West Java). The sector is called the base sector if the value is more than one. LQ also is an index of relative specialization because it compares the level of industry specialization at the local level with the level of industrial specialization of the entire economy that is the reference area (Fracasso & Vittuacci Marzetti, 2017).

West Java Province has seven regions with an LQ value of more than one, meaning that the manufacturing sector is the economic base sector. These areas are Bogor Regency, Bandung Regency, Indramayu Regency, Purwakarta Regency, Karawang Regency, Bekasi Regency,

and Cimahi City. The focus of the development sector in these areas is related to the manufacturing sector.

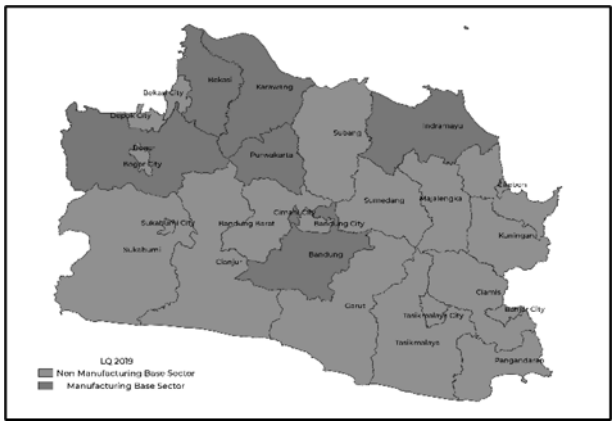


Figure 1. Location Quotient (LQ) Map of the Manufacturing Sector by Districts/ Cities in West Java 2019

This is in line with the Regional Regulation Number 22 of 2010 concerning the Regional Spatial Plan of the Province of West Java in 2009-2029, which divides the Province of West Java into six development areas, namely Bodekpunjur, Purwasuka, Ciayumajakuning, Priangan Timur-Pangandaran, Sukabumi and its surroundings, and the Basin. Bandung. The Bodekpunjur development area directs Bogor Regency and Bekasi Regency to be a buffer in the National Activity Center system for the Jabodetabek urban area which will develop the manufacturing sector. The Purwasuka development area directs Purwakarta Regency for non-polluting and non-extractive industrial activities. Furthermore, Karawang Regency is directed to become a supporting node for the development of the Bodebek Urban Area National Activity Center. Then the Ciayumajakuning development area directs Indramayu Regency to become a Regional Activity Center with integrated facilities and infrastructure, and is directed to the main activities of industry, agribusiness, and agro-industry. The Bandung Basin development area directs Cimahi City as the core city of the National Activity Center with the main activities of creative industries, high technology, and non-polluting industries; and Bandung Regency are directed as part of the National Activity Center with the main activities of non-polluting industry and agro-industry. Meanwhile, the East Priangan-Pangandaran development area and the surrounding Sukabumi development area do not have areas with a manufacturing base sector.

Manufacturing labor productivity is also considered as a benchmark for people's living standards and is a major source of economic growth (ILO, 2015). Manufacturing labor productivity in West Java shows a declining trend. However, when compared by region, manufacturing labor productivity has decreased in standard deviation (tabel 2).

Table 2. Statistical Description of Manufacturing Labor Productivity

Year	Mean	Median	Standard Deviation	Max	Min
2014	115,88	58,64	186,68	905,05	7,30
2015	105,56	40,85	143,16	633,08	9,41
2016	130,60	66,01	153,85	571,01	7,32
2017	108,24	41,65	140,08	575,20	7,49
2018	110,11	44,32	131,85	449,64	9,39
2019	71,01	27,75	88,31	362,53	4,35

Source: authors(processed)

Regions that have high manufacturing labor productivity are Bogor Regency, Indramayu Regency, Purwakarta Regency, Karawang Regency, Bekasi Regency, Cimahi City, and Bandung City in 2019. If we look closely by year, manufacturing labor productivity in these areas also fluctuates the order.

The shift in position between regions is explained by the Klassen Typology. This analysis will be reviewed through the growth rate of GRDP in the manufacturing sector and the value of manufacturing labor productivity in the period 2014 and 2019. Klassen typology analysis will produce four quadrants.

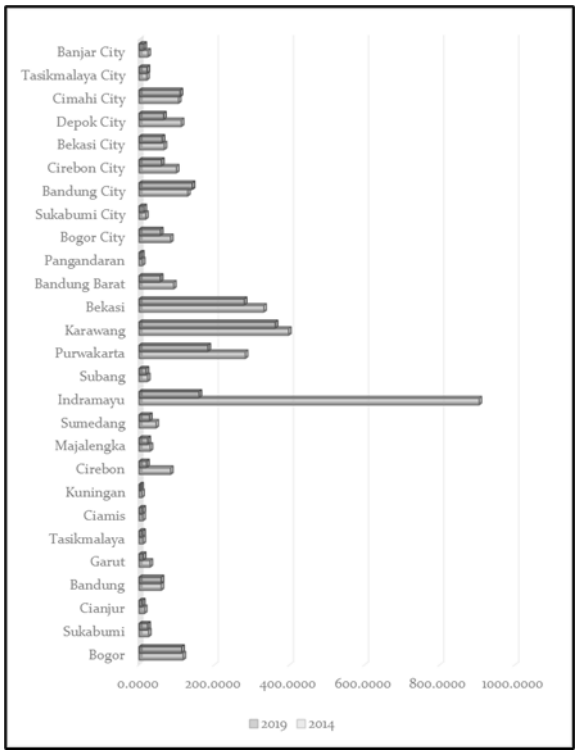


Figure 2. Regency/ City Manufacturing Labor Productivity in West Java Provincein 2014-2019 (Millions of Rupiah Per Labor)

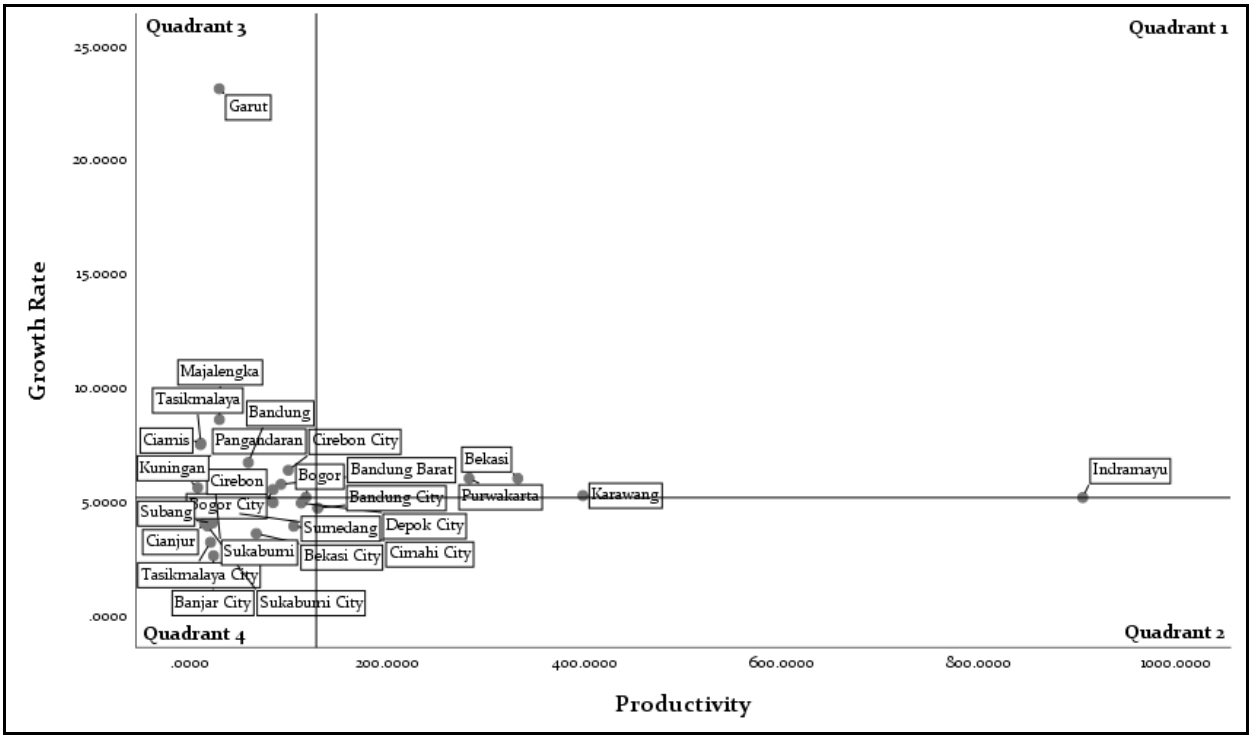
Quadrant I consists of regions with a manufacturing sector GDP growth rate and the value of manufacturing labor productivity above the province or can be called regions with fast growing manufacturing labor productivity. There are four regions in quadrant I in 2014 namely Indramayu Regency, Purwakarta Regency, Bekasi Regency, and Karawang Regency. In 2019, there is only one area in quadrant I, namely Bandung City. Other regions cannot maintain their position in quadrant I because of the focus of development on the agricultural sector and the natural resources that support it.

Quadrant II consists of regions that have a manufacturing labor productivity value above the average, but the manufacturing sector GRDP growth rate is below the average or commonly referred to as developed but depressed regions. In 2014, there was one area in quadrant II, namely Bandung City. This region has increased to four regions in 2019, namely Indramayu Regency, Purwakarta Regency, Karawang Regency, and Bekasi Regency.

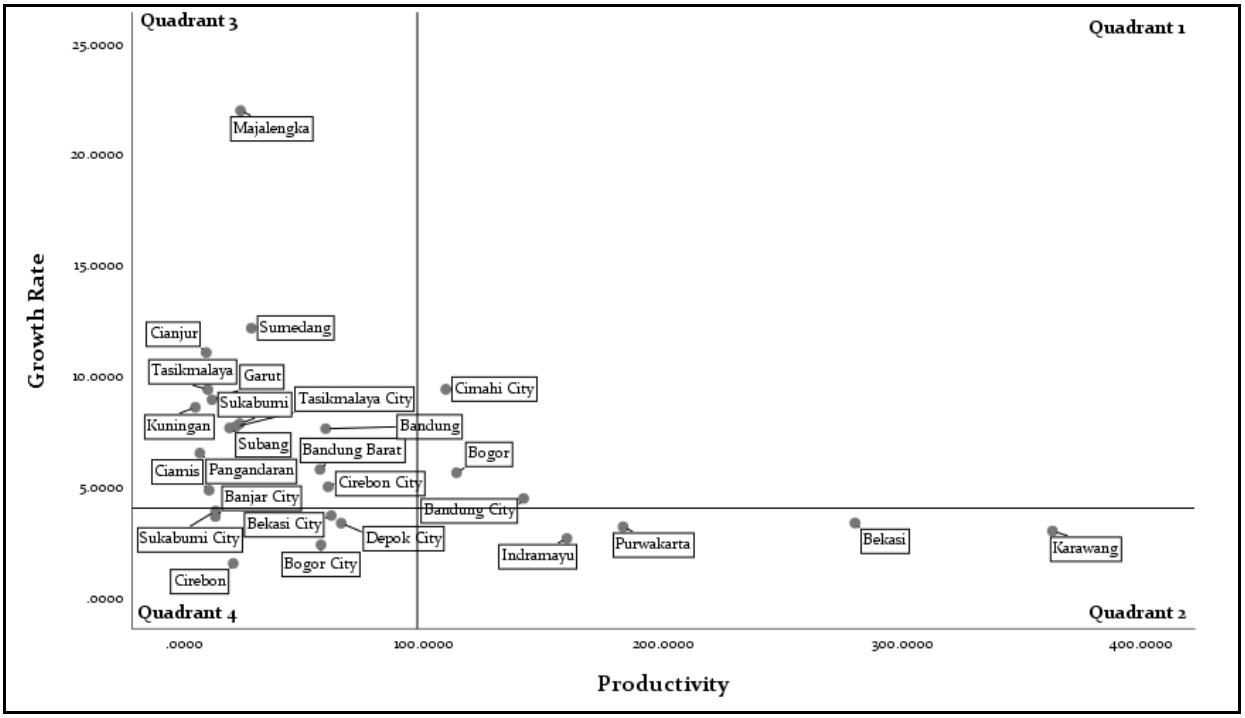
The next quadrant consists of regions with an above-average GRDP growth rate in the manufacturing sector, but below-average manufacturing labor productivity values. These areas are called fast growing areas in the manufacturing sector. Regions in quadrant III have quite good manufacturing growth but the productivity of their workforce is not optimal, so policies need to be taken so that their rapid growth can increase the value of the productivity of their manufacturing workforce. This quadrant dominates areas in West Java. There were 12 districts/ cities in quadrant III in 2014 and increased to 16 districts/ cities in 2019.

Finally, quadrant IV consists of regions with a GRDP growth rate in the manufacturing sector and a manufacturing workforce productivity value below the average, or commonly referred to as underdeveloped areas. There are 10 regions in quadrant IV in 2014 namely Cianjur Regency, Cirebon Regency, Sumedang Regency, Subang Regency, Sukabumi City, Banjar City, Tasikmalaya City, Bekasi City, Depok City, and Cimahi City. These underdeveloped areas decreased in 2019 to six regions, namely Cirebon Regency, Bogor City, Sukabumi City, Bekasi City, Depok City, and Banjar City.

Based on the Klassen typology analysis, there are still many regions that fall into quadrants III and IV. The number of regions that fall into quadrants III and IV respectively in 2014 and 2019 are 22 and 20 regions. This shows that there is an inequality in the productivity of manufacturing workers in regions/ cities in West Java.



(a)



(b)

Figure 3. The Description of the Klassen Typology (a) in 2014 and (b) in 2019.

Sigma convergence occurs when the disparity of labor productivity in the manufacturing sector is getting smaller or the coefficient of variation is decreasing. Figure 4 shows the productivity in West Java fluctuates and has a downward trend. In 2014, the coefficient of variation of manufacturing labor productivity was 1.61 and then decreased to 1.36 in 2015. Then, from 2015 to 2019 it tended to fluctuate, down in 2016, rising again in 2017, down in 2018, and rise again in 2019. However, when viewed as a whole from 2014 to 2019 it decreased by 1.61 to 1.24. This means that overall, manufacturing labor productivity in West Java is

heading in one direction or there is a sigma convergence on manufacturing labor productivity in 2014-2019.

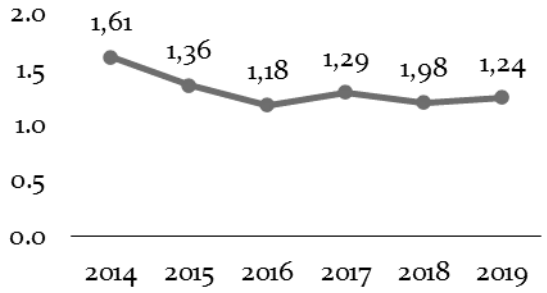


Figure 4. The Coefficient of Variation of Manufacturing Labor Productivity in West Java 2014-2019

The FD-GMM estimation method was used to perform beta convergence analysis in this study. The estimation results show that all assumption tests have been met, the Arellano-Bond m1 and m2 test and the Sargan test assumptions that meet the hypothesis or parameters that are consistent and valid. In addition, the significant p-value at the five percent significance level and the positive labor productivity lag variable coefficient value is less than one, which is 0.4469, which means that there has been convergence in the research period.

Table 3. Absolute Beta Convergence Estimation Results with the FD-GMM Dynamic Panel Model

Parameter	Estimasi Parameter	P-value
Dependent Variable: Productivity$_{i,t}$		
Productivity$_{i,t-1}$	0,4469	0,0000*
Wald Test	4054,61	0,0000*
AB m_1	-1,6969	0,0897**
AB m_2	1,3467	0,1781
Sargan Test	11,1096	0,2683
Implied λ	0,8055	
Half-Life Convergence	0,8605	

Note: Sig: *5%; **10%.

The absolute beta convergence results are estimated using the following equation:

$$(Productivity_{i,t})\hat{} = 0{,}4469 Productivity_{i,t-1}^{*} \quad (4)$$

The convergence of manufacturing labor productivity will be faster if the lag value is getting closer to zero because the growth of manufacturing labor productivity is getting smaller from time to time (reaching a steady state). The convergence rate of manufacturing labor productivity on absolute beta convergence or convergence speed (λ) is calculated as -ln γ. Speed of convergence in West Java is 80.55 percent per year.

The time required to close half of the initial gap is defined as T= (ln 2)/λ (Jan & Chaudhary, 2011). The time needed for districts/ cities in West Java to close half the gap in manufacturing labor productivity (half-life convergence) is less than 1 year. If this situation persists after the research period, the productivity of manufacturing workers in districts/cities in West Java will soon reach a steady state.

The next beta convergence analysis is conditional beta convergence analysis, which adds other independent variables to the model besides the manufacturing labor productivity lag variable. Other independent variables that will be included in the model are the natural logarithm of foreign investment, the natural logarithm of domestic investment, the proportion of industrially educated workers, and the natural logarithm of manufacturing real wages.

Table 4. Conditional Beta Convergence Estimation Results with the FD-GMM Dynamic Panel Model

Parameter	Estimasi Parameter	P-value
Dependent Variable: Productivity$_{i,t}$		
Productivity$_{i,t-1}$	0,4283	0,0000*
lnFDI	-7,8341	0,0110*
lnDDI	3,9066	0,0220*

Parameter	Estimasi Parameter	P-value
EDU	0,1360	0,7650
lnWAGE	27,3420	0,0680**
Wald Test	1259,3200	0,0000*
AB m_1	-1,7215	0,0852**
AB m_2	1,4697	0,1416
Sargan Test	9,8146	0,3657
Implied λ	0,8479	
Half-Life Convergence	0,8175	

Note: Sig: *5%; **10%.

The conditional beta convergence results are estimated using the following equation:

$$(Productivity_{i,t})\hat{} = 0{,}4283 Productivity_{i,t-1}^{*} - 7{,}8341 InFDI_{i,t}^{*} + 3{,}9066 InDDI_{i,t}^{*} + 0{,}1360 EDU_{i,t} + 27{,}342 InWAGE_{i,t}^{*} \quad (5)$$

The results of the estimation of conditional beta convergence in table 4 show that all assumption tests have been met, the Arellano-Bond m_1 and m_2 test and the Sargan test assumptions that meet the hypothesis or parameters that are consistent and valid. In addition, the significant p-value at the five percent significance level and the positive labor productivity lag variable coefficient value is less than one, which means that conditional beta convergence has occurred in the study period. Then, the Wald test shows significant results, which means that there is at least one significant independent variable in the model or the lag variable for manufacturing labor productivity, FDI, DDI, educated workers, and real wages together affect the productivity of manufacturing workers in the current year.

The rate of convergence of manufacturing labor productivity at conditional beta convergence or speed of convergence (λ) is 84.79% per year, which is higher than the rate of convergence at absolute beta convergence. Furthermore, it takes less than a year for districts/ cities in West Java to close half the gap in manufacturing labor productivity (half-life convergence). As a result, conditional beta convergence has a faster rate of convergence and half-life convergence than absolute beta convergence. However, this situation shows that the addition of independent variables does not show different results, because whether or not there is an additional independent variable, it still takes less than 1 year to close half the gap.

Three of the four variables have a substantial effect on manufacturing worker productivity for the current year, according to the results of table 4. These variables are FDI, DDI, and real wages. At the 5% significance level, the FDI and DDI variables are significant, whereas the real wages variable is significant at the 10% significance level.

The stock of physical capital proxied by FDI and DDI in this study has a significant effect on the productivity of manufacturing workers in West Java. The FDI coefficient of -7.8341 means that every one percent increase in FDI will reduce the productivity of manufacturing workers by 7.83 million Rupiah per labor with the assumption that other variables are constant. This situation can be caused by the pattern of manufacturing development in West Java which is not in accordance with the conditions of West Java but follows the wishes of FDI. Yusof (2011), stated that manufacturing dominated by FDI tend to be more capital intensive and reduce the demand for labor. Yusof also added that the national manufacture relies heavily on simple standardized technology from FDI, because FDI does not wish to transfer basic technology or conduct research and development together with local companies. So, if this continues, the technology that should be obtained by the community to increase its productivity cannot be realized. Another factor that causes FDI to have a negative effect on the productivity of manufacturing workers is the unequal distribution of FDI. FDI only focuses on areas with visible potential compared to other areas,

so FDI itself has been unequal from the start, as evidenced by the fact that some regencies / cities do not receive FDI every year at all. This situation is also in line with research by Nugroho (2016), that FDI has a negative effect on the productivity of Indonesian workers in 2010-2014.

Other physical capital stock variables are proxied with DDI. DDI has a significant influence on the productivity of manufacturing workers and will increase the productivity of manufacturing workers. Every one percent increase in DDI will increase the productivity of manufacturing workers by 3.91 million Rupiah per labor. Local investors will better understand the state of the manufacture in the area, so that although FDI has a negative effect, DDI will have a positive influence on labor productivity. This situation is in line with Darmawan's (2006), research that DDI will increase labor productivity.

The stock of human capital which is proxied with the variable proportion of industrially educated workers or manufacturing sector workers with a minimum education of senior high school does not have a significant effect on the productivity of manufacturing workers in West Java. This is because the manufacturing workforce in West Java is still dominated by workers with the highest education level of junior high school and below, which is 67.10% of the workforce in West Java having the highest education of junior high school and below in 2019. In addition Pritchett (1996), also explained that education does not actually increase cognitive skills but only increases wages which are considered by companies, the marginal return from education will decrease when the demand for educated workers stagnates and educated labor is allocated to sectors that can reduce economic growth. West Java has the most workers aged 35-44 years compared to those aged 25-34 years so that the marginal return will also decrease. The situation of an educated workforce that is not significant is also in accordance with a study by Nugroho (2019), which results in large and medium-sized industries educated workforce showing a not significant effect on the productivity of the large and medium-sized industries workforce on the Java Island.

The last independent variable in this study is the real wages of manufacturing workers. This variable has a significant effect on manufacturing labor productivity at a significance level of 10%. Every one percent increase in real wages will increase the productivity of manufacturing workers by 27.34 million Rupiah per labor. The relationship between the workforce and the company will be mutually beneficial. Quality workforce by producing high productivity will benefit the company, so the company will also provide wages that are in accordance with the quality of the workforce. This is also in accordance with the theory of wage efficiency by Akerlof (1982) & Katz (1986), which states that labor will provide higher labor productivity in return for higher wages. These results are also in accordance with other studies (Yuniasih, 2013; Azhara, 2014; & Nugroho, 2019).

The convergence of manufacturing labor productivity in West Java is in line with sigma convergence and absolute beta convergence. Thus, districts/ cities in West Java will go towards convergence, whether analyzed through sigma convergence, absolute beta convergence, or conditional beta convergence. This is also in line with research by (Dwijaya, 2008; Yuniasih, 2013; Azhara, 2014; Bahar, 2019; Nugroho, 2019; & Wahyuni, 2019). Convergence of labor productivity or past events will affect labor productivity in the current year or there is a dynamic nature (Baltagi, 2005). Convergence of labor productivity or past events will affect labor productivity in the current year or there is a

dynamic nature (Baltagi, 2005). The results of this study can be an evaluation for the government that the sustainability of the manufacturing sector in West Java must pay attention to the diversity of regional conditions (Radlo & Tomeczek, 2022).

CONCLUSION

Based on the research results, West Java experienced sigma convergence and beta convergence of manufacturing labor productivity. Both absolute beta convergence and conditional beta convergence took less than a year to close half the gap. This situation shows that the addition of independent variables does not show different results, because whether or not there are additional independent variables, it still takes less than one year to close half the gap. This can be due to the influence of the previous year's productivity being greater than the independent variables which are thought to accelerate convergence and technical factors in the production process dominate the determinants of productivity.

The factors that significantly affect the convergence process of manufacturing labor productivity are lag of manufacturing labor productivity, FDI, DDI, and real wages of manufacturing workers. DDI and real wages of manufacturing workers will increase the productivity of manufacturing workers, while FDI will reduce productivity of manufacturing workers. Manufacturing educated workers have no influence on the productivity of manufacturing workers in West Java.

REFERENCES

Akerlof, G. (1982). Labor Contracts As Partial Gift Exchange. *Quarterly Journal Of Economics, 97*, 543-569.

Azhara, T. (2014). Analysis Of Convergence Of Labor Productivity Between Provinces In Indonesia (Thesis) [*Analisis Konvergensi Produktivitas Tenaga Kerja Antarprovinsi Di Indonesia (Skripsi)*]. *Bogor: Bogor Agricultural University* [*Bogor: Institut Pertanian Bogor*].

Bahar, A. (2019). Convergence Of Productivity Of Large Industrial Workers In The Corridor Of Sumatra And Java In 2010-2015 (Thesis) [*Konvergensi Produktivitas Tenaga Kerja Industri Besar Sedang Di Koridor Ekonomi Sumatera Dan Jawa Tahun 2010-2015 (Skripsi)*]. *Jakarta: STIS Statistics Polytechnic* [*Jakarta: Politeknik Statistika STIS*].

Baltagi, B. (2005). Econometric Analysis Of Panel Data 3rd Edition. *United Kingdom: John Wiley & Sons*.

Barro, R. & Sala-i Martin, X. (2004). Economic Growth: Second Edition. *New York (US): Massachusetts Institute of Technology*.

Bawono, A. (2011). Spatial Linkages Differences In Regency/ City Workers' Productivity In Java [Thesis] [*Keterkaitan Spasial Perbedaan Produktivitas Tenaga Kerja Kabupaten/ Kota Di Pulau Jawa (Tesis)*]. *Bogor: Bogor Agricultural University* [*Bogor: Institut Pertanian Bogor*].

Bhinadi, A. (2003). Disparity Of Javanese Economic Growth With Outside Java [*Disparitas Pertumbuhan Ekonomi Jawa dengan Luar Jawa*]. *Journal of Development Economics* [*Jurnal Ekonomi Pembangunan*], *8*(1), 39-48.

Darmawan, H. (2006). The Influence Of Education, Health, And Investment On Labor Productivity At D.I. Yogyakarta (Thesis) [*Pengaruh Pendidikan, Kesehatan, Dan Investasi Terhadap Produktivitas Tenaga Kerja Di D.I. Yogyakarta (Skripsi)*]. *Yogyakarta: Indonesian Islamic University* [*Yogyakarta: Universitas Islam Indonesia*].

Dwijaya, E. (2008). Absolute Convergence Analysis of East Java Manufacturing Industry Manufacturing Productivity Year 2000-2006 (Thesis) [*Analisis Konvergensi*

Absolut Produktivitas Tenaga Kerja Industri Manufaktur Jawa Timur Tahun 2000-2006 (Skripsi)]. *Surabaya: Airlangga University* [*Surabaya: Universitas Airlangga*].

Firdaus, M. & Yusop, Z. (2009). Dynamic Analysis Of Convergence In Indonesia. *International Journal of Economics and Management, 3*(1), 73-86.

Fracasso, A., & Vittucci M. (2017). Estimating Dynamic Localization Economies: The Inadvertent Success Of The Specialization Index And The Location Quotient. *Regional Studies, 52*(1), 119–132. https://doi.org/10.1080/00343404.2017.1281388.

ILO. (2015). Key Indicators Of The Labour Market. *Geneva: International Labor Office, KILM 16*.

Ismail, R, Rosa, A. & Sulaiman, N. (2011). Globalisation And Labour Productivity In The Malaysian Manufacturing Sector. *Review Of Economic And Finance*, 76-86.

Ahmad, S., & Chaudhary, R. (2011). Testing The Conditional Convergence Hypothesis For Pakistan. P*ak. J. Commer. Soc. Sci., 5*(1), 117-128.

Karagiannis, S. (2007). The Knowledge-Based Economy, Convergence And Economic Growth: Evidence From The European Union. *The Centre Of Planning And Economic Research 11, Merikis Street, 106 72 Athens, Greece Kepe.Gr*.

Katz, L. (1986). Efficiency Wage Theories: A Partial Evaluation. *Cambridge: Working Paper No. 1906 : National Bureau of Economic Research*.

Kemenperin. (2014). *West Java National Industry Heart* [*Jabar Jantung Industri Nasional*]. https://kemenperin.go.id/artikel/9664/Jabar-Jantung-Industri-Nasional.html

Mankiw, N. (2016). Macroeconomics: Ninth Edition. *New York (US): Worth Publishers*.

Nugroho, R. (2016). Convergence Of Labor Productivity In Indonesia (Thesis) [*Konvergensi Produktivitas Tenaga Kerja di Indonesia (Skripsi)]. Surabaya: Airlangga University* [*Surabaya: Universitas Airlangga*].

Nugroho, Y. (2019). Agglomeration As Well As The Dynamics Of Labor And Manufacturing Industry Productivity In The Era Of Industrial Revolution 4.0 In The Corridor Of Java Economics (Thesis) [*Aglomerasi serta Dinamika Tenaga Kerja dan Produktivitas Industri Manufaktur Pada Era Revolusi Industri 4.0 di Koridor Ekonomi Jawa (Skripsi)*]. *Jakarta: STIS Statistics Polytechnic* [*Jakarta: Politeknik Statistika STIS*].

Pritchett, L. (1996). Where Has All The Education Gone?. *The World Bank Policy Research Working Paper No. 1581*.

Radlo, M. & Tomeczek, A. (2022). Factors Influencing Labor Productivity In Modern Economics: A Review And Qualitative Text Analysis. *Wseas Transactions on Environment And Development*. https://doi.org/10.37394/232015.2022.18.30.

Ray, D. (1998). Development Economics. *Princeton (US): Princeton University Press*.

Shankar, R. & Shah, A. (2001). Bridging The Economic Divide within Nations: A Scorecard On The Performance Of Regional Development Policies In Reducing Regional Income Disparities. *Policy Research Working Paper 2717*.

Sjafrizal. (2008). Regional Economy Theory And Application [*Ekonomi Regional Teori dan Aplikasi*]. *West Sumatra: Pranah Offet* [*Sumatera Barat: Pranita Offset*].

Todaro, P. & Smith, S. (2015). Economic Development (Ed 12th). *Harlow: Pearson*.

Wahyuni, K. (2011). The Convergence And Factors That Affect The Inequality Of The

District/City Area On The Island Of Java (Thesis) [*Konvergensi Dan Faktor-Faktor Yang Memengaruhi Ketimpangan Wilayah Kabupaten/Kota Di Pulau Jawa (Tesis)*]. *Bogor: Bogor Agricultural University* [*Bogor: Institut Pertanian Bogor*].

Wahyuni, K. (2019). The Convergence And Influence Of The Internet And Capital On The Productivity Of Industrial Workers In Indonesia [*Konvergensi Serta Pengaruh Internet Dan Modal Terhadap Produktivitas Tenaga Kerja Industri Di Indonesia*. *Prosiding Sendika, 5*(2), 54-64.

Weiss, J. (1998). Industry In Developing Countries: Theory, Policy And Evidence. *London: Roudledge*.

Yuniasih, A. (2013). Disparity, Convergence, And Determinants Of Regional Labor Productivity In Indonesia (Thesis) [*Disparitas, Konvergensi, dan Determinan Produktivitas Tenaga Kerja Regional di Indonesia (Tesis)*]. *Bogor: Bogor Agricultural University* [*Bogor: Institut Pertanian Bogor*].

Yusof, R. (2011). The Development Of The National Industry And The Role Of Foreign Investment (PMA) [*Perkembangan Industri Nasional dan Peran Penanaman Modal Asing (PMA)*]. *Journal of Economics and Education* [*Jurnal Ekonomi dan Pendidikan*], *8*(1), 71-87.