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TWO DECADES OF STRUCTURAL TRANSFORMATION AND DYNAMICS OF INCOME EQUALITY IN INDONESIA

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Abstract

Successful reductions in poverty, resulting from substantial increases in income and structural transformation, have been associated with growing levels of income inequality. This paper explores the link between structural transformation and inequality in Indonesia by applying Theil's L decomposition (both static and dynamic) to the National Socio-Economic Surveys of 1996, 2005, and 2014 and panel data analysis of provincial macroeconomic datasets. This study confirms that, as has been seen in other developing countries, Indonesia has experienced an agriculture–service transition, before the industry sector has matured. Moreover, the Inverted U Kuznet curve exists in Indonesia. Inequality will increase in tandem with an increase in per capita income until it reaches an income level beyond which the inequality starts to decline. From both static and dynamic decomposition of Theils's L, this study found that (i) the root cause of increasing inequality in Indonesia is the pure inequality effect (unexplained effect); (ii) population shifts from the agriculture sector to either the industry or service sectors, from rural to urban areas and from informal to formal employment are the second contributor to explain increases in inequality; (iii) an increase in educational attainment has also contributed to increasing inequality during the last 2 decades; and (iv) even though the contribution is cancelled out, increasing inequality has been curbed by the growing income from those working in the agriculture sector, in the informal sector, by those living in rural areas, and by those without formal education. Finally, our estimation results suggest that the structural transformation of economic development was responsible for the growing inequality in Indonesia. Nevertheless, the increasing share of service sector to the national gross domestic product has degraded the growth rate of inequality during the observation period.

Keywords: inequality, Gini Index, Theils, decomposition, Indonesia

JEL Classification: D63, L16, O15, O53

Contents

1. INTRODUCTION

Despite some impediments such as the Asian financial crisis of 1997–1998, Indonesia has been perceived as a remarkable success story in tackling poverty over the last 30 years. In the past 3 decades, socioeconomic conditions in Indonesia have been improving rapidly. The World Bank reported that the per capita gross domestic product (GDP) (constant, 2010, $) of Indonesia had jumped from $1,095 (1980) to $3,834 (2015). From 1980 to 2015, the transformation of the Indonesian economy as the relative shares of three sectors in GDP has been clearly observed. The share of agriculture output in GDP has declined continuously since 1980, while the share of the industry sector and the service sector has increased significantly. This substantial increase in income and the transformation of the Indonesian economy have been accompanied by improvements in social indicators such as the massive decrease in the absolute poverty incidence from 28.60% (1980) to 11.13% (2015) in headcount ratios (measured by the national poverty line).

Despite the impressive progress in reducing extreme poverty, growth in Indonesia has not always been inclusive. The rate of poverty reduction has started to slow down with inequality continuing to rise significantly. The Gini coefficient measured by expenditure (consumption) has also increased from roughly 0.33 in 1996 to 0.41 in 2015. Rising inequalities can be a catalyst for collective behavior such as the expansion in social protests that have been seen lately in Indonesia, which slows down economic growth. Even when social protests or social tensions do not urge social conflict, rising inequality can increase resistance and undermine a government's ability to introduce very important reforms needed for economic growth (Coudouel, Dani, and Paternostro 2006).

The structural transformation of the economy has been closely related to the growing economy and changing employment patterns. Extensive structural change is both a cause and consequence of the exceptionally rapid economic growth that has enabled the region to raise living standards and reduce poverty at a historically unprecedented rate (Aizenman, Lee, and Park 2012). However, as the Kuznet hypothesis suggests, the structural transformation to a more market-oriented economy would lead to income inequality. Dastidar (2012) found that in developing countries that undergo structural alteration from the agriculture to service sector, inequality is likely to rise in the process. In the case of Indonesia, De Silva and Sumarto (2013) confirmed that changes in the sectoral composition of growth away from agriculture and toward industry and services, driven in part by increased global integration and rural–urban migration, are thought to be the root causes of rising inequality.

However, looking at the economic transition in the last 2 decades (1996–2015), Indonesia experienced a unique economic transition from agriculture to services, even before the industry sector matured. The share of agriculture output in GDP and employment has decreased significantly, while the opposite has occurred in the service sector. Surprisingly, the industry sector remains ambiguous as the share of industry sector to GDP is falling, from 43.5% (1996) to 40.0% (2015), while its employment share is increasing, from 17.35% (1996) to 20.69% (2015). This indicates that the industry sector has experienced a decline in productivity per worker, as a decrease in its share of GDP is not followed by a decrease in its share of employment. Therefore, this paper would like to address the dynamics of income inequality in respect to structural transformation in Indonesia during 1996–2014.

Using two different approaches—Theil's decomposition approach to observe the static and dynamic changes of inequality, and the econometrics approach—this paper aims to deeply explore the link between structural transformation and inequality in Indonesia. Inequality decomposition means exploring the structure of inequality, i.e., the disaggregation of total inequality in relevant factors such as rural–urban and sectoral occupation. Theil's T decomposition measures inequality into 'within' and 'between' components. Average income may vary from sector to sector that implies 'between group' inequality. For policy purposes, decomposition is useful to be able to search the sources of inequality: if most inequality is due to disparities across region (rural and urban), then the policy for tackling inequality should focus on regional economic development, with special attention to helping the poorer regions. Moreover, incomes vary within each sector, adding a "within group" component to total inequality. Moreover, the dynamic decomposition allows us to observe a change in inequality over time that could be separated into four components: pure inequality effect, 'within' group allocation effect, 'between' group allocation effect and income effect. On the other hand, econometric estimation using provincial data tests statistically whether the relation between structural transformation and growing inequality exists.

The structure of the paper is as follows. Section 2 reviews previous literature that has focused on structural transformation and inequality. Section 3 gives a brief overview of the inequality trends and structural changes in Indonesia. Section 4 provides details of the method used in this paper. Section 5 scrutinizes the decomposition of inequality within and across sectors as well as estimating econometrically the impact of structural changes on income inequality in Indonesia. Section 6 concludes the important findings of this article.

2. LITERATURE REVIEW

Kuznets did one of the earliest pieces of research in economic development, which observed structural transformation and inequality. He argued (Kuznets 1955) that as an economy transforms to a more advanced type of economy, market forces first increase then decrease the overall economic inequality of the society, which is illustrated by the inverted U-shape of the Kuznets curve. Structural change refers to shifts in the relative importance of sectors of the economy on its way to development, including changes in the location of economic activities (urbanization) and other resulting aspects of industrialization (Ibrahim and Ali 2013).

Since his work, research on economic development and its impact on income distribution have been abundant. Some support, even with empirical evidence, the existence of Kuznets curve in countries, and some do not. Anand and Kanbur (1993), Deininger and Squire (1998), and Frazer (2006), found no empirical evidence of Kuznets curve using pooled data from a variety of countries. Specifically, Oyatt (2016) argued that in Turkey the Kuznetsian argument could be false, as the assumptions made in Kuznets curve do not hold in the Turkish case.

Nevertheless, other researchers have opposite results about the inequality even after they took the degree of structural transformation into account. In Nigeria, Ibrahim and Ali (2013) found that there was a relationship between inequality, poverty, and structural transformation. However, the relationship between inequality and the sluggish structural transformation that happened through Dutch disease is not significant. Empirical evidence on the effect of structural transformation on inequality is also found in Ivory Coast (Paul 2016). The research found that structural transformation causes change in the earning ratio between sectors, which in turn,

alters the inequality across sectors. The decomposition of the Gini coefficient showed that the inequality within non-agriculture sectors is higher than in agriculture sectors, although inequality across sectors is significantly less important than household characteristics to the total inequality in Ivory Coast.

Ahluwalia (1976), Dastidar (2012), and Cheong and Wu (2014) stressed the significant role of structural changes in driving inequality. Ahluwalia used cross-country data from 60 countries, including 40 developing countries, 14 developed countries, and six socialist countries. The U-shaped relationship is better explained by per capita gross national product rather than by structural shift variables. But, the results show that the share of agriculture in GDP and the urban share of total population are both significantly related to the pattern of income inequality, and increasing urbanization may raise the income shares of the lowest income groups.

Dastidar (2012), in his detailed research on different patterns of structural change in developing and developed countries, used panel data from 78 countries over the period from 1980 to 2005. The classic pattern of structural transformation that developed countries experience started from the agriculture sector, moved to the industry sector, and eventually to the service sector. However, the experience of developing countries differs in that the service orientation followed industrialization in developed nations, while preceding it in poor or developing countries. A fixed-panel data regression was used and shows that when the economy moves directly from agriculture to the industry sector, inequality for both developed and developing countries decreases. However, a high level of initial inequality might hold the effect of intersectoral shifts (e.g., a fall in the share of agriculture sector and a corresponding rise in the industry sectors), and thus re-increase the inequality. This is mostly the case for the developing countries, i.e., the People's Republic of China (PRC) (Cheong and Wu 2014). Industrialization in the PRC has been empirically proven to cause inequality.

The effect of the agriculture–service transition on inequality is different for developing and developed countries. In developing countries, a falling share of agriculture with a corresponding rise in the share of services would raise overall inequality, while for developed countries this structural change does not have a significant impact on inequality. While we found differences in the effect of structural transformation on inequality, Aizenmann, Lee, and Park (2012) summed up that each country faces different structural changes and the relative importance of a given structural change differs across countries. They even observed the structural changes in a broader perspective, looking not only at the relative importance of the economy sector, but also at the non-economic political, social, and cultural spheres. Even the structural changes in terms of technological advancement can have different effects on equality, depending on the nature of the technology.

3. STYLIZED FACTS: INEQUALITY AND STRUCTURAL CHANGES IN INDONESIA

3.1 Trends of Poverty, Inequality, and Economic Transformation

Indonesia's experience of tackling poverty over the last 30 years, despite some impediments such as the Asian financial crisis of 1997–1998, has been perceived to be a remarkable success story in Asia. Improvements in democracy, rapid political and institutional reforms, a combination of proper economic policy packages, and the

creation of fair economic institutions have generated substantial and sustained growth and the transformation of the Indonesian economy. These have contributed to large improvements in social welfare as well as a massive decrease in the incidence of poverty.

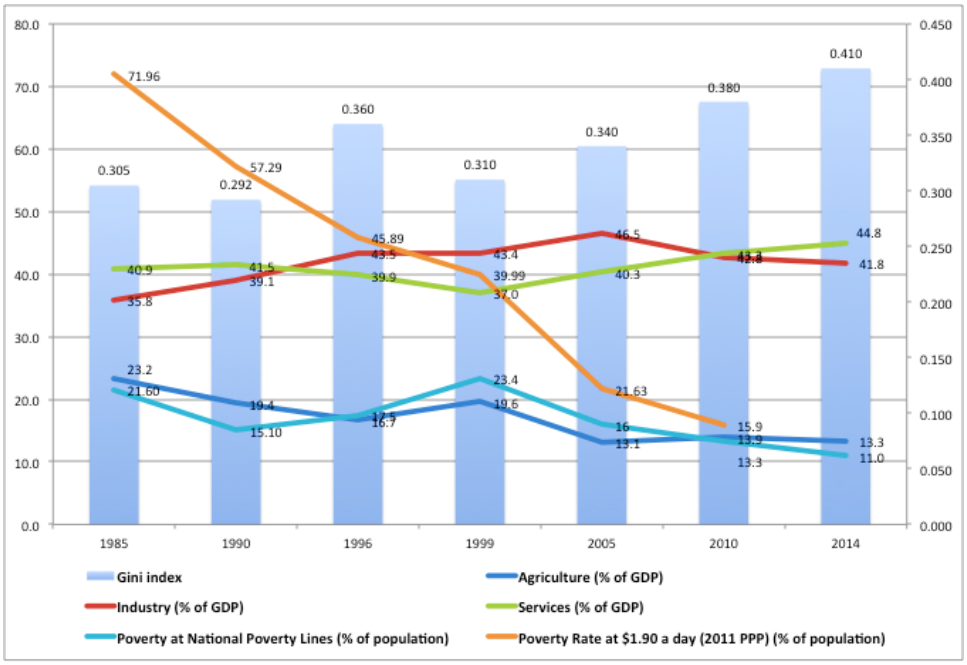
The headcount index, measured with the national poverty line, declined from 21.6% (1984) to 11.0% (2014), while the headcount ratio of $1.90 per day (public–private partnership) had decreased from 71.96% (1984) to 15.90% (2010) (Figure 1).[1] Poverty figures, however, fluctuated over time and increased sharply from 17.47% in 1996 to 23.43% in 1999 when the economic crisis hit. Dartanto and Otsubo (2016) observed that the Asian financial crisis in 1997–1998 caused almost 18.5% of nonpoor household to fall into poverty. The economic crisis, followed by a massive contraction in both the industry sector and service sector, hit urban households. The poverty rate in urban areas, where most activities are located, jumped significantly by around 4.5% compared to the precrisis level.

The incidence of poverty in Indonesia appears to have declined significantly, although the rate of the reduction has begun to slow down recently. Indonesia follows the same pattern as that of other countries in Southeast Asia, namely that a substantial decrease in poverty has been accompanied by increases in the Gini index, particularly during the last 2 decades. Similar to poverty figures, income inequality has fluctuated over time. In the period 1996–1999, inequality dropped slightly from 0.36 (1996) to 0.31 (1999) due to the Asian financial crisis that hit high-income households and reduced the income gap (Dartanto and Otsubo 2016). Economic recovery after the crisis has initiated a growing inequality in Indonesia since the welfare of the rich grows faster than that of the poor. From 2005 to 2014, inequality has sharply increased from 0.36 to 0.41 (Figure 1).

An increase in inequality is probably a consequence of structural transformation in the Indonesian economy. The economy has moved to more service-oriented sectors before the manufacturing and industry sectors (manufacturing plus mining, utilities, and construction) have matured. Figure 1 shows that the trend of the Gini coefficient and the share of the agriculture sector to GDP are moving in opposite directions, while the Gini coefficient and the share of the service sector to GDP are moving in a similar direction. Capital-intensive and skill-intensive sectors such as finance and telecommunications employ fewer people and thus, deprive the poor and unskilled labor force from benefiting from a rising economy. De Silva and Sumarto (2013) confirmed that the root causes of rising inequality are rural–urban migration, together with changes in the sectoral composition of growth away from agriculture and toward industry and services.

[1] The poverty line in Indonesia is measured by a 'basic need' approach (expenditure) rather than an 'income' approach. The poverty line consists of a food and nonfood poverty line. The food poverty line is calculated based on the minimum nutritional requirement of 2,100 calories/capita/day (National Congress of Nutritionists, 1978) taken from 52 commodities. The nonfood poverty line is calculated based on the consumption of essential non-food items including 51 commodities in the urban area and 47 commodities in the rural area. In 2012, the average monthly money metric of the national poverty line was Rp240,441 ($21) in rural areas and Rp277,382 ($24) in urban areas.

Figure 1: Structural Transformation, Poverty, and Inequality Trends, 1985–2014



GDP = gross domestic product, PPP = public–private partnership.

Notes: The Gini Index in 1985 is the 1984 figure. Data on the Gini Index from 1996–2014 and the GDP Share of 2010 and 2014 refers to the BPS's publication.

The World Development Indicators category 'Industry' includes mining and quarrying, manufacturing, utilities (electricity, gas, and water), and construction.

Source: World Development Indicators and Badan Pusat Statistik (BPS), the Central Statistical Agency.

Table 1: Inequality Trends in Indonesia

Description	Unit	1984	1990	1996	1999	2005	2010	2014
Gini index		0.305	0.292	0.313	0.290	0.340	0.380	0.410
Income share held by lowest 10%	%	3.74	4.17	4.00	4.25	3.67	3.36	3.04
Income share held by lowest 20%	%	8.68	9.39	9.01	9.58	8.34	7.63	7.04
Income share held by highest 20%	%	39.46	38.90	40.71	38.88	42.76	43.65	47.76
Income share held by highest 10%	%	24.91	24.68	26.57	25.08	28.51	28.18	32.41
Ratio between the highest 10% and the lowest 10%		6.66	5.92	6.64	5.90	7.77	8.39	10.67
Ratio between the highest 20% and the lowest 20%		4.55	4.14	4.52	5.13	5.72	6.32	6.78

Source: World Development Indicators and Badan Pusat Statistik (BPS), the Central Statistical Agency.

Another measure of inequality (Palma Ratio) is the ratio between the income share of the lowest 10% and the income share held by the highest 10%. Table 1 shows that the income share ratio is continuously increasing, which means a wider income gap between the richest and the poorest. In 1996, the richest had six times more income than the poorest, while in 2014 the richest had ten times more income than the poorest. The 10% and 20% richest Indonesians account for more than 32.4% and 47.8% of the

income, respectively. The wider income gap can be a catalyst for social jealousy that can be a wick for social and political chaos. These numbers indicate a huge concentration of wealth within a small elite.

This income distribution gap is estimated to widen in the foreseeable future. Even when social protests or social tensions do not urge social conflict, rising inequality can increase resistance and undermine a government's ability to introduce important reforms needed for economic growth (Coudouel, Dani, and Paternostro 2006).

3.2 Structural Transformation: Sector of Occupation, Employment Status, and Urban–Rural Population

Many countries, including Indonesia, have witnessed tremendous economic growth accompanied by structural transformation. The most visible pattern of structural transformation is the changing trends of sectoral GDP. As we have seen in Table 2, there is undoubtedly structural change in Indonesia, with a growing service sector and a decreasing agriculture sector. The industry sector has remained indeterminate during the last 2 decades.

Indonesia has experienced economic growth during the last 2 decades, with almost two-fold GDP per capita increases, while GDP growth rate has moderately slowed down from 7.6% (1996) to 4.8% (2015). While the industry sector witnessed immense growth from 1985 to 2005, with its share of GDP growing from 35.85% (1985) to 46.54% (2005), its contribution to the economy became indeterminate as its growth continued to drop and its share decreased in the last decade. However, its share of employment has moderately increased from 17.35% (1996) to 20.69% (2015).

Table 2: Sectoral Gross Domestic Product and Employment

Indicators	Unit	1985	1996	2005	2015
GDP (constant 2010)	$ billion	212.5	471.4	571.2	942.3
GDP per capita (constant 2010)	$	1,288	2,358	2,525	3,703
Sectoral composition of GDP					
Agriculture, value added	% of GDP	23.21	16.7	13.13	13.52
Industry, value added	% of GDP	35.85	43.5	46.54	39.92
Service etc., value added	% of GDP	40.94	39.9	40.33	46.56
GDP growth rate	%	3.48	7.6	5.69	4.8
Per capita GDP growth rate	%	1.38	6	4.19	3.5
Sectoral growth of GDP					
Agriculture, yearly growth	%	4.25	3.1	2.72	4
Industry, yearly growth	%	11.19	10.7	4.60	2.7
Service etc., yearly growth	%	4.45	n/a	7.87	n/a
Sectoral composition of employment					
Agriculture	% of employment	54.36	44.27	44.93	34.03
Industry	% of employment	8.24	17.35	17.79	20.69
Service, etc.	% of employment	29.73	38.37	37.28	45.29

GDP = gross domestic product.

Source: World Development Indicators and Badan Pusat Statistik (BPS), the Central Statistical Agency.

On the other hand, the agriculture and service sector have shown consistent trends from 1985. The agriculture sector shows decreasing trends, both in its share of GDP and its share of employment, from 23.21% of GDP (1985) to 13.52% (2015), and from 54.36% of employment (1985) to 34.03% (2015). The service industry, on the other hand, shows an increasing trend, reflecting its growing importance in the economy. It was only 29.73% of the labor force in the service sector in 1985, and it swelled to 45.29% in 2015.

Nevertheless, Aizenmann, Lee, and Park (2012) argue that there is considerable interaction between different kinds of structural changes, which makes it unproductive to think of each structural change in isolation. Economic sectoral transformation inevitably affects employment, hence the evidence of rural–urban migration and the increasing importance of the formal sector, instead of the informal.

Just as the structural transformation decreased the agriculture sector, Table 3 shows that the rural population has decreased significantly during the last 3 decades, from 74% (1985) to 46% (2014). Looking at the poverty perspectives, poverty in rural areas is significantly higher (3%) than in urban centers. Fortunately, rural poverty has decreased in the last decade from 16.0% (2005) to 11.3% (2014). And, as more of the labor force leaves agriculture and moves to the industry and service sectors, there is more labor moving into formal employment. This is seen in a reduction of informal sector shares in employment from 70.22% (2005) to 59.38% (2014).

Table 3: Rural Development and the Informal Sector

Description	Unit	1985	1996	2005	2014
Urban–rural development					
Rural population	% of population	74	63	54	47
Rural poverty: headcount ratio at national poverty lines	% of rural population	n/a	23.4*	16.0	11.3
Urban poverty: headcount ratio at national poverty lines	% of urban population	n/a	19.4*	11.7	8.3
Informal sector					
Informal employment	million worker	n/a	n/a	66.96	68.07
Informal employment	% of employment	n/a	n/a	68.23	64.67

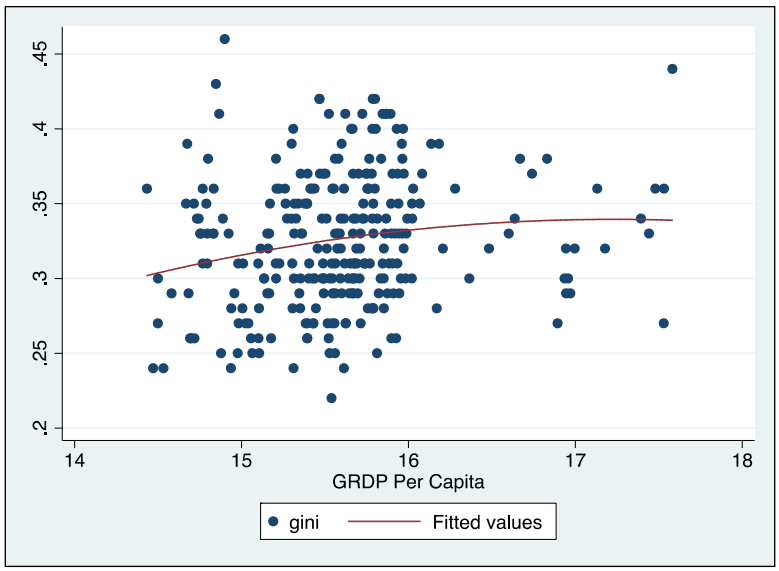
Note: * 1999 figures.

Informal employment is estimated by referring to the procedures of the Badan Pusat Statistik (BPS), the Central Statistical Agency, on informality proxy, which count the following employment statuses: the self-employed, the self-employed assisted by family or temporary workers, agriculture freelance workers, non-agriculture freelance workers, and unpaid workers.

Source: World Development Indicators and Badan Pusat Statistik (BPS), the Central Statistical Agency, and some figures are the author's estimation.

The structural changes in Indonesia, which have changed the main sector from agriculture to service (and industry), are undoubtedly associated with the changes in rural–urban population migration and informal–formal labor migration. As the economy moves away from the agriculture sector, the labor force is leaving the informal sector and migrating to urban areas, entering the industry and service sectors of the economy. This has been happening in Indonesia in the past 2 decades. However, despite the growing economy and the structural transformation that accompanies it, Indonesia has also experienced growing inequality (Figure 1).

Figure 2: The Relationship between Income per Capita (Gross Regional Domestic Product) and the Gini Index



GRDP = gross regional domestic product.
Source: Authors' estimation.

Figure 2 shows the well-known 'Kuznets curve', which illustrates how inequality will increase in the early stages of development (as measured in per capita income) until it reaches an income level beyond which the inequality starts to decline. Figure 2 confirms this conjecture (as depicted by the inverted U curve), albeit not very strongly. Some provinces that have passed the maximum threshold may accelerate the economic growth without increasing the income inequality. The possible explanation of the inverted U-curve is that some provinces are moving into more service-oriented economies and capital-intensive sectors—such as mining, financial, and telecommunications—that create fewer job opportunities, particularly for unskilled labor. This deprives the poor of benefiting from a rising economy. However, a substantial increase in income will encourage a significant increase in educational attainments and human capital. These enable more people to benefit and actively participate in the development process that will lead to a reduction in inequality.

4. RESEARCH METHODOLOGY

This paper uses two approaches, namely non-parametric (decomposition) and parametric (panel of data analysis) to assess the relationship between structural transformation and the growing inequality in Indonesia. Decomposition, both static and dynamic, aims to see whether changes in inequality can be explained by changes in the composition of the subgroups, while econometric analysis at the provincial level intends to confirm statistically whether the change of economic structure is closely related to increases in inequality in Indonesia.

4.1 Gini Coefficient

The most frequently used income-distribution measurement is the Gini coefficient, or Gini index. The Gini coefficient is derived from the Lorenz curve, which sorts the population from the poorest to the richest, and shows the cumulative proportion of the population on the horizontal axis *x* and the cumulative proportion of income on the vertical axis *y*. A perfect 45-degree diagonal line is drawn above the Lorenz curve, representing perfect equality. The Gini coefficient is defined as the ratio of the area below the diagonal line and above the Lorenz curve to the formed triangle area on the right-side of the Lorenz curve.

Let x_i be a point on the x-axis and y_i a point on the y-axis. Then,

$$Gini = 1 - \sum_{i=1}^{N} (x_i - x_{i-1})(y_i + y_{i-1}) \quad (1)$$

As the Lorenz curve approaches the diagonal line (which represents perfect equality) the numerator area becomes smaller, thus decreasing the Gini coefficient. On the other hand, when the Lorenz curve moves away from the diagonal line, the Gini coefficient increases. A high Gini coefficient thus implies deep inequality, and a low Gini coefficient implies a more equal society. Equation 1 also implies that the Gini ratio ranges from 0 to 1, with 0 being perfect equality. The main drawback of the Gini coefficient is that it is not easily decomposable or additive across groups. That is, the sum of the Gini coefficient of its subgroup, is not equal to the total Gini of society.

4.2 Static and Dynamic Decomposition of Theil's Index

The most commonly used decomposable of inequality measurements are Theil indexes and the Mean Log Deviation (MLD) (Haughton and Khandker 2009). Both belong to the family of generalized entropy (GE) inequality measures. Equation 2 gives the general formula:

$$GE(\alpha) = \frac{1}{\alpha(\alpha-1)}\left[\frac{1}{n}\sum_{i=1}^{N}\left(\frac{y_i}{\bar{y}}\right)^{\alpha} - 1\right] \quad (2)$$

where $\bar{y}$ is the mean income per person (or expenditure per capita); n is the number of population; and α in the GE class represents the weight given to distances between incomes at different parts of the income distribution, and can take any real value number. Setting $\alpha = 0$ then we can have GE(0) that also known as Theil's L or MLD.

MLD or Theil's L is often used to decompose the inequality within or between groups. In addition to common decomposition of static inequality, which is decomposing the inequality index at one period (static), MLD also allows us to decompose the change of inequality index for different periods (dynamic). The MLD index of the population is measured using Equation 3 where *n* is the aggregate of individuals or households, μ is the average of individual income, y_i is the as income of i^{th} individual or households.

$$I_0 = \frac{1}{n}\sum_{i=1}^{n} \log\left(\frac{\mu}{y_i}\right) \quad (3)$$

Decomposition of inequality breaks down the inequality measure into two components: the unexplained component or 'within group' inequality, and the explained component or 'between group' inequality. A moderately simple mathematical derivation is used to derive Equation 3 to decompose the inequality index. A population with *m* subgroups, with each subgroup containing *k* number of individuals with an average income of μ_k within the subgroups, will have I_0 value of:

$$I_0 = \sum_{k=1}^{m} \frac{n_k}{n} I_0^k + \sum_{k=1}^{m} \frac{\mathrm{n_k}}{n} \log \frac{\mu}{\mu_k} \tag{4}$$

with y_{kj} as income of j^{th} individual in k^{th} subgroup.

The first component, $\sum_{k=1}^{m} \frac{n_k}{n} I_0^k$, measures the 'within subgroups' inequality, which is the weighted average of inequality in each subgroup, with the population proportion of the subgroup as the weight. A subgroup with a high inequality level will contribute more to population inequality. The second component, $\sum_{k=1}^{m} \frac{\mathrm{n_k}}{n} \log \frac{\mu}{\mu_k}$, measures the income inequality in the 'between subgroups', which is the weighted average of the subgroup's average income deviation from the population income average. Subgroups with higher inequality than the average will positively affect the inequality index (increasing the total inequality), while large population subgroups with lower inequality will negatively affect the index.

Equation 4, the static decomposition, decomposes the inequality index of a population at one period, within and between the subgroups. A dynamic analysis, however, requires observing the decomposition of the income distribution changes. Starting from the basic alteration of Equation 4 to a dynamic equation, which can be rewritten as:

$$\Delta I_0 = \Delta I_w + \Delta I_B = \Delta\left(\sum_{k=1}^{m} v_k I_0^k\right) - \Delta\left(\sum_{k=1}^{m} v_k \log \lambda_k\right) \tag{5}$$

with $v_k = \frac{\mathrm{n_k}}{n}$ being the subgroup *k*'s population proportion to the total population, and $\lambda_k = \frac{\mu_k}{\mu}$, being the ratio between the average income of subgroup *k* to the average income of the total population. A rather scrupulous mathematical exercise is required to further derive Equation 5 to become Equation 6 below.[2]

$$\begin{aligned} \Delta I_0 \cong & \sum_{k=1}^{m} \overline{v_k}\, \Delta I_0^k + \sum_{k=1}^{m} \overline{I_0^k}\, \Delta v_k + \sum_{k=1}^{m} \left(\overline{\lambda_k} - \overline{\log \lambda_k}\right) \Delta v_k \\ & + \sum_{k=1}^{m} \left(\overline{\theta_k} - \overline{v_k}\right) \Delta \log \mu_k \end{aligned} \tag{6}$$

Macro variables such as $\overline{v_k}, \overline{I_0^k}, \overline{\lambda_k}$, and $\overline{\theta_k}$ use the average value of the initial and final period of each variables, with $\theta_k = v_k \lambda_k$. A positive value of a component shows that it increases the divergence of income, while a negative value means the convergence effect of the component to the total change of inequality.

[2] For a detailed derivation see Mookherjee dan Shorrocks (1982).

The first component in Equation 6, $\sum_{k=1}^{m} \overline{v_k}\, \Delta I_0^k$, shows the pure inequality or unexplained effect. The second component, $\sum_{k=1}^{m} \overline{I_0^k}\, \Delta v_k$, is the allocation effect on the 'within' group, while the third component, $\sum_{k=1}^{m} \left(\overline{\lambda_k} - \overline{\log \lambda_k}\right) \Delta v_k$, is the allocation effect on the 'between' group, which can be either positive or negative, depending solely on Δv_k, since the value of $\overline{I_0^k}$ and $\left(\overline{\lambda_k} - \overline{\log \lambda_k}\right)$ are always positive. Lastly, the fourth component is the income effect, which measures the effect of changes in average income across the group. The value of the coefficient, $\overline{\theta_k} - \overline{v_k}$, depends on whether there are individuals in the subgroup who have incomes that are higher than average. If the rich group raises its average income, the inequality will increase. On the other hand, if the income average of the poor group increases, the inequality will decrease.

4.3 Econometrics Model

In estimating the empirical relation between income inequality and structural change, we combined and modified the model of Dastidar (2012), and Dartanto and Patunru (2016). Dastidar seeks to capture the impact on inequality of the agriculture–industry transition and the agriculture–service transition, while Dartanto and Patunru build econometric models to capture the relationships reflected in the Poverty–Growth–Inequality Triangle. To capture structural transformation, our proposed model includes the sectoral output share variables to capture the effect of alternate patterns of structural change in inequality (Dastidar 2012). This study categorizes the economy into three sectors, namely: agriculture, industry (including mining, manufacturing, utilities, and construction), and services. We also accommodate growth and poverty as explanatory variables to capture the poverty–growth–inequality triangle as many researchers also found that Gini is influenced by growth and poverty (Chen and Ravallion 1997; Easterly 1999; and Dollar and Kraay 2002). This study also includes control variables of foreign direct investment (FDI), gross enrollment ratio, and government investment in infrastructure and human capital. The econometric model, then, is as follows[3]:

$$G_{it} = \alpha_i + \beta_1 . X_{AGRit} + \beta_2 . X_{SER\ (or\ IND)it} + \beta_3 . g_{it} + + \beta_4 . pov_{it} + \delta . control_{it} + \varepsilon_{it} \quad (7)$$

where,
G = the Gini coefficient;
X_{AGR} = the share of agriculture in aggregate output (percentage);
X_{IND} = the share of the industry sector in aggregate output (percentage);
X_{SVC} = the share of the service sector in aggregate output (percentage);
g = economic growth;
pov = poverty rate;

[3] Dastidar (2012) explains that in Equation 7, if the share of service sector in aggregate output is not included in the equation, then β_1 will be the effects of change in share of agriculture sector, in place of service sector, while holding the industry sector constant. On the other hand, in Equation 7, the share of industry sector is not included in the model, which will alter the interpretation to agriculture–industry transition. The β_1 in the second model will show the effects of increase (decrease) of agriculture share in place of decrease (increase) of industrial share, while holding the service share constants.

control = control variables, including gross participation rate of high school, FDI (in logarithm), share of infrastructure expenditure to total government expenditure, share of human capital expenditure (health and education) to total government expenditure;
i = province, i=1,...,34;
t = year t=2000, 2001, …, 2013.

The econometric model is estimated using a panel data set. The data include 33 provinces in Indonesia with an unequal number of observations over time for each province between 2000–2013. Most of data are taken from the latest publication of Badan Pusat Statistik (BPS), Indonesia's central statistics bureau and datasets from the Indonesia Database for Policy and Economic Research (INDO-DAPOER) World Bank.

5. RESULTS AND ANALYSIS OF STRUCTURAL TRANSFORMATION AND INEQUALITY DECOMPOSITION

5.1 Static Decomposition

The decomposition of the MLD in this paper is based on three kinds of partition: sector of occupation (agriculture, industry, and service), location (urban and rural), and employment status (formal and informal). The sectoral shifts in Indonesia, as in other developing countries, have jumped from the agriculture sector to the service sector, without the maturity of the industry sector. The share of population in the service sector grew significantly although the industrial sector experienced a stagnancy during the last 2 decades from 44.47% (1996) to 56.83% (2014) (Table 4).

In the past 2 decades, the average income in the agriculture sector has always been lower than the other sectors, which corresponds to the low average income in rural, relative to urban, areas. However, the relative income shows that there is convergence among sectors, locations, and employment statuses, as the relative income of those working in the service sector, urban areas, and in formal sectors is decreasing.[4] The relative income in the service and industry sectors has been decreasing for 2 consecutive decades. On the other hand, the relative income of those working in the agriculture sector fall from the average income of society. This means that this group has not benefitted much from the progress of economic development.

The decomposition in the Theil's L (MLD) and Gini Index results support the hypotheses of Dastidar (2012) and Paul (2016), in which inequality in the agriculture sector remains lower than the other sectors, even after structural transformation has taken place. Inequality in the service sector, as measured by the MLD and Gini index, has remained high for two consecutive decades.

There have been two different patterns of inequality in Indonesia. In the period 1996–2005, both industry and service sectors, as well as households living in urban areas, experienced decreasing inequality, while the agriculture sector and those living rural areas experienced a decrease in inequality measured by both the Theil's and Gini Index.

[4] Convergence means that the relative income is close to 1.

Table 4: Descriptive Analysis of Subgroup Partition

	Population Share			Mean Income (1996=100)			Relative Income			Theil's Inequality			Gini Index		
	1996	**2005**	**2014**	**1996**	**2005**	**2014**	**1996**	**2005**	**2014**	**1996**	**2005**	**2014**	**1996**	**2005**	**2014**
Sector of Occupation															
Agriculture	45.37	53.75	32.38	45,844	68,196	155,869	0.68	0.80	0.68	0.127	0.192	0.168	0.276	0.340	0.322
Industry	16.80	22.69	19.72	77,696	100,029	227,724	1.16	1.17	1.00	0.271	0.238	0.261	0.407	0.381	0.400
Services	37.83	23.56	47.90	87,967	110,118	278,473	1.31	1.29	1.22	0.274	0.263	0.283	0.406	0.399	0.415
Employment Status															
Informal	63.78	68.23	64.67	56,689	72,575	193,994	0.84	0.85	0.85	0.198	0.197	0.238	0.345	0.347	0.382
Formal	36.22	31.77	35.33	85,515	112,614	292,443	1.27	1.32	1.28	0.294	0.273	0.277	0.422	0.406	0.411
Location															
Rural	66.17	56.67	50.14	49,511	60,903	167,844	0.74	0.71	0.73	0.139	0.138	0.171	0.291	0.291	0.325
Urban	33.83	43.33	49.86	101,591	117,202	290,052	1.51	1.37	1.27	0.294	0.258	0.299	0.420	0.395	0.425
Completed Education															
Not completed Formal Education	39.31	29.56	21.93	48,681	60,421	229,436	0.73	0.71	1.00	0.153	0.139	0.263	0.303	0.291	0.401
Compulsory (SD-SMP)	42.29	46.26	53.75	63,320	71,371	184,161	0.94	0.84	0.81	0.212	0.162	0.191	0.356	0.315	0.344
Secondary (SMA)	14.41	18.43	8.23	103,168	121,754	280,918	1.54	1.43	1.23	0.241	0.220	0.222	0.381	0.365	0.368
Tertiary (University)	3.99	5.75	16.10	159,108	208,227	349,337	2.37	2.44	1.53	0.347	0.337	0.400	0.454	0.448	0.482
Household Size															
<=2 HH Member	14.72	18.51	19.69	103,563	120,388	318,852	1.54	1.41	1.39	0.321	0.278	0.295	0.442	0.411	0.421
>2-<=5 HH Member	61.39	65.20	66.64	64,437	80,334	213,686	0.96	0.94	0.93	0.213	0.206	0.239	0.360	0.355	0.383
> 5 HH Member	23.89	16.29	13.67	51,607	65,276	172,537	0.77	0.77	0.75	0.212	0.236	0.263	0.358	0.379	0.402
Total	**100**	**100**	**100**	**67,129**	**85,295**	**228,772**	**1.00**	**1.00**	**1.00**	**0.253**	**0.243**	**0.272**	**0.391**	**0.385**	**0.408**

HH = household, SD = *Sekolah Dasar*/Primary School, SMP = *Sekolah Menengah Pertama*/Junior High School, SMA = *Sekolah Menengah Atas*/Senior High School.

Note: the relative income is the sectoral income divided by the average income.

Source: Authors' calculations using the National Socioeconomic Survey (SUSENAS) Dataset (1996, 2005, and 2014).

There has been an opposite pattern of inequality in the period 2005–2014 because the Asian financial crisis, which hit high-income households mainly located in urban areas, reduced the income gap. On the other hand, the rupiah's depreciation during the crisis benefited export-oriented farmers, mostly located in outside Java. Consequently, the agriculture sector experienced an increase in inequality. Economic recovery after the crisis has initiated a growing inequality in Indonesia since the welfare of the rich (the urban and capital-intensive sector) has grown at a higher rate than that of the poor (the rural and agriculture sector).

The trend in inequality within the rural and urban areas is completely different to that discussed by Oyyet (2016) in Turkey. The Theil's L and Gini index show that inequality in urban areas is greater than in rural areas in Indonesia, which is in line with Kuznets' (1955) hypothesis. However, the results also show the growing disparity of income within each area. Similar trend are also found among formal and informal employees. While the formal sector has more inequality than the informal sector, each sector's 'within' inequality has been increasing since 2005.

The decomposition of the Theil's L index in Table 5 shows that the inequality within sectoral groups has been increasing rapidly because more labor moves from the agriculture—a sector with the least inequality—to the service and industry sectors, which have higher inequalities. This movement is corresponding to the decrease of 'between sectoral' inequality. Kuznets (1955) argued that the inequality between the agriculture and non-agriculture sectors should increase as the economy develops based on the assumption of perfect industrialization. In Indonesia's case, however, it did not happen because the economy has jumped from the agriculture to the service sector. This led to an imperfect industrialization. Table 5 confirms that the structural transformation from the agriculture to either the industry or service sectors in the last 2 decades does not contribute significantly to the increased inequality in Indonesia, as the ratio of the 'between' group is only around 18% (1996), 10%(2005), and 10.5% (2014).

As we have seen, Indonesia has witnessed a rather rapid urbanization, especially in the last 2 decades. 'Within' location inequality also shows an increasing trend. Migration from rural to urban areas increases inequality because it has created an unequal proportion of the population. One possible reason for the increasing 'within' location inequality and thus decreasing 'between' location inequality during the last 2 decades could be that the new labor arrivals from the rural to urban areas have entered the urban informal sector, in which average incomes are lower than the urban modern sector. This is confirmed by the increasing inequality within the informal sector during the last decade.

Among the partitions, location, educational attainment, and sectoral occupation are the most important factors to explain inequality, although their importance is declining. In 1996, 'between' location inequality contributed up to 24.24% of the total inequality, compared to the 'between' sectoral inequality which only accounted for 18.29%. However, in 2014, urban–rural inequality decreased to only 13.60%, compared to sectoral inequality, of 10.48%, and employment inequality of 7.32%. Therefore, the static decomposition suggests that most inequality is due to disparities across regions (rural and urban), and therefore the policy for tackling inequality should focus on regional economic development, with special attention to helping villages.

Table 5: Static Decomposition of Theil's L

	Year			Change	
Partition	**1996**	**2005**	**2014**	**1996–2005**	**2005–2014**
Sector of Occupation					
Within group (Iw)	0.207	0.219	0.241	0.013	0.022
Between group (Ib)	0.046	0.024	0.031	–0.022	0.007
Theil index (I0)	0.253	0.243	0.272	–0.010	0.029
Ratio (Ib/I0) in%	18.29	9.84	11.39	–8.45	1.55
Employment Status					
Within group (Iw)	0.233	0.221	0.252	–0.011	0.031
Between group (Ib)	0.020	0.022	0.020	0.002	–0.002
Theil index (I0)	0.253	0.243	0.272	–0.010	0.029
Ratio (Ib/I0) in%	7.97	9.01	7.32	1.04	–1.69
Location					
Within group (Iw)	0.191	0.190	0.235	–0.001	0.045
Between group (Ib)	0.061	0.053	0.037	–0.008	–0.016
Theil index (I0)	0.253	0.243	0.272	–0.010	0.029
Ratio (Ib/I0) in%	24.24	21.88	13.60	–2.36	–8.28
Educational Attainment					
Within group (Iw)	0.198	0.176	0.246	–0.022	0.071
Between group (Ib)	0.055	0.067	0.025	0.013	–0.042
Theil index (I0)	0.253	0.243	0.272	–0.010	0.029
Ratio (Ib/I0) in%	21.63	27.71	9.37	6.09	–18.35
Household Member					
Within group (Iw)	0.229	0.224	0.253	–0.004	0.029
Between group (Ib)	0.024	0.019	0.019	–0.005	0.000
Theil index (I0)	0.253	0.243	0.272	–0.010	0.029
Ratio (Ib/I0) in%	9.56	7.76	6.86	–1.80	–0.90

Ib = "Theil's L index Between" group; Iw = "Theil's L index" Within group.

Notes: The authors would like to thank to Ananda Dellina who helped to create the Excel calculations of dynamic decomposition.

Source: Authors' calculations using the National Socioeconomic Survey (SUSENAS) Dataset (1996, 2005, and 2014).

This decomposition also confirms that both sectoral occupation and educational attainment could explain the sources of inequality in Indonesia. During the last decade, improving access to education, as shown by a decrease—from almost 40% in 1996 to around 22% in 2014—in the numbers of household heads without formal education, has reduced 'between' group inequality in Indonesia. Results from the static decomposition suggest that occupation, location, and education are the three factors that the government should pay attention to in order to tackle inequality in Indonesia.

5.2 Dynamic Decomposition

Table 6 shows the decomposition of inequality changes from 2 decades ago (1996–2014) and from the last decade (2005–2014). Increases in inequality of as much as 0.019 (Theil's Index) or 0.017 (Gini Index) during the last 2 decades are mostly due to the pure inequality effect (unexplained effect), if we consider occupational sectors, i.e., agriculture, industry, and service, as the partition. Although inequality within the

industry sector decreases, as can be observed by a decrease in the pure inequality in industry (negative 0.0017), inequality within the agriculture and service sector still increases. The negative sign of "within sectoral" income effect during 1996–2014 suggest that the income of the subgroup has converged, however, effects from the income effect is overpowered by the effects of the increase in pure inequality, thus increasing overall inequality. Looking in detail, the greatest contributor to the increase in income inequality during 1996–2014 was the fast growth of the service sector in which all components of dynamic decomposition have a positive value. While the economic transition from agriculture to other sectors in the economy has contributed to a decrease in equality, this contribution has been cancelled out by the increasing inequality in both the industry and service sectors.

If we consider a real partition, rural–urban population shifts contribute most to the increases in inequality, accounting for 0.0226 of the changes in inequality. The population shifts from rural to urban areas have caused an increase in inequality during 1996–2014. On the other hand, the employment status partition could not explain the source of the inequality increases, since the pure inequality effect is higher than the change in I_0 *(Theils).* Even when employment shifts from the formal to the informal sector and raises income in the informal sector (which should promote convergence) the pure inequality effect is so high that it overpowers it. The education partition also confirms that the growing inequality during the last 2 decades is most likely to have been the result of a pure inequality effect. Though the growing income of households without formal education and households with compulsory education has contributed to reduce inequality during this period, these contributions could not cancel out the growth of inequality due to the pure effect and allocation effect. Unfortunately, the growing income of those who completed secondary education and have a university education has positively contributed to rising inequality during 1996–2014, as shown by the positive income effects (Figure 6).

During the period 2005–2014, Indonesia experienced a substantial increase in equality as the inequality measures increased by almost 0.024 (Gini Index) and 0,029 (Theil). In sectoral partition, allocation effects contribute to 0.0197 of the increase in inequality, while area and employment status partition could powerfully explain the increase in inequality. Population shifts from rural to urban in 2005–2014 account for a 0.0081 increase in inequality, which overpowers the convergence effect from the income increases in the rural area.

Examining the periods 1996–2005 and 2005–2014, we observe two different patterns. Inequality decreased from 1996 to 2005 while from 2005 to 2014, it increased. Although inequality began to increase after the economic recovery during 2000–2005, the impact of a decrease in inequality as a result of the 1998 financial crisis was greater than the increase in inequality during 2000–2005. Consequently, if we look at the two points of 1996 and 2005, then inequality seems to be decreasing during 1996–2005. In the context of sectoral occupation, while pure inequality (unexplained) dominated an inequality increase during 1996–2005, the allocation affect within group components contributed most of the inequality increases in this period. However, the pattern would be different if we looked at the rural–urban partition and the household–member partition, as pure inequality contributed most to rising inequality during 2005–2014.

Table 6: Structural Transformation and Dynamic Decomposition of Income Inequality

Partition	Pure Inequality	Allocation Effect on 'Within Group' Component	Allocation Effect on 'Between Group' Component	Income Effect
Period of 1996–2014 (Δ Theil = 0.019)				
Sectoral Occupation (Total)	0.020	0.017	-0.005	-0.010
Agriculture	0.017	-0.019	-0.138	-0.314
Industry	-0.003	0.008	0.029	0.032
Service	0.005	0.028	0.104	0.272
Location (Total)	0.022	0.022	0.004	-0.026
Rural	0.019	-0.025	-0.167	-0.389
Urban	0.003	0.047	0.171	0.363
Employment Status (Total)	0.022	-0.001	0.000	0.000
Informal	0.027	0.002	0.009	-0.251
Formal	-0.005	-0.003	-0.009	0.251
Educational Attainment (Total)	0.037	0.013	0.023	-0.046
Not Completed	0.041	-0.010	-0.050	-0.153
Compulsory (SD-SMP)	-0.007	0.006	0.029	-0.135
Secondary (SMA)	-0.002	-0.017	-0.080	0.109
Tertiary (University)	0.005	0.035	0.124	0.132
Household Size (Total)	0.024	0.003	0.001	-0.006
<=2 HH Member	-0.004	0.015	0.054	0.192
>2-<=5 HH Member	0.018	0.012	0.053	-0.087
> 5 HH Member	0.010	-0.024	-0.106	-0.112
Period of 1996–2005 (Δ Theil = –0.009)				
Sectoral Occupation (Total)	0.024	-0.010	-0.001	-0.021
Agriculture	0.033	0.013	0.087	-0.200
Industry	-0.007	0.015	0.060	0.048
Service	-0.002	-0.038	-0.148	0.131
Location (Total)	-0.013	0.013	0.003	-0.011
Rural	-0.001	-0.013	-0.099	-0.234
Urban	-0.013	0.026	0.102	0.223
Employment Status (Total)	-0.006	-0.004	-0.001	0.003
Informal	0.001	0.009	0.045	-0.144
Formal	-0.006	-0.013	-0.046	0.147
Educational Attainment (Total)	-0.029	0.008	0.008	0.005
Not Completed	-0.005	-0.014	-0.102	-0.136
Compulsory (SD-SMP)	-0.020	0.007	0.040	-0.066
Secondary (SMA)	-0.004	0.009	0.044	0.106
Tertiary (University)	0.000	0.006	0.027	0.100
Household Size (Total)	-0.004	0.002	0.001	-0.006
<=2 HH Member	-0.007	0.011	0.041	0.105
>2-<=5 HH Member	-0.003	0.008	0.038	-0.045
> 5 HH Member	0.006	-0.017	-0.078	-0.067

continued on next page

Table 6 *continued*

Partition	Pure Inequality	Allocation Effect on 'Within Group' Component	Allocation Effect on 'Between Group' Component	Income Effect
Period of 2005–2014 (Δ Theil = 0.029)				
Sectoral Occupation (Total)	0.001	0.021	-0.003	0.009
Agriculture	-0.010	-0.039	-0.223	-0.100
Industry	0.004	-0.007	-0.030	0.018
Service	0.007	0.066	0.250	0.091
Location (Total)	0.037	0.008	0.000	-0.016
Rural	0.018	-0.010	-0.068	-0.168
Urban	0.019	0.018	0.068	0.152
Employment Status (Total)	0.029	0.002	0.001	-0.003
Informal	0.027	-0.008	-0.036	-0.111
Formal	0.002	0.010	0.037	0.108
Educational Attainment (Total)	0.060	0.011	0.021	-0.055
Not Completed	0.040	0.010	0.050	-0.062
Compulsory (SD-SMP)	0.014	-0.002	-0.012	-0.088
Secondary (SMA)	0.000	-0.026	-0.121	0.045
Tertiary (University)	0.006	0.029	0.103	0.049
Household Size (Total)	0.029	0.000	0.000	0.000
<=2 HH Member	0.003	0.003	0.013	0.084
>2-<=5 HH Member	0.022	0.003	0.014	-0.045
> 5 HH Member	0.004	-0.007	-0.027	-0.039

HH = household, SD = *Sekolah Dasar*/Primary School, SMP = *Sekolah Menengah Pertama*/Junior High School, SMA = *Sekolah Menengah Atas*/Senior High School.

Source: Authors' estimation using the National Socioeconomic Survey (SUSENAS) Dataset (1996, 2005, and 2014).

5.3 Regression Results

In Table 7, we present the main results from the estimated fixed effects panel data models (based on the Hausman specification test). In the context of structural transformation and inequality, the econometric estimations show similar findings to Theils' L decomposition, namely that there is evidence of the relationship between structural transformation and growing inequality in Indonesia. The magnitude of coefficients from both models seems to support the idea of structural transformation leading to an increase in inequality in Indonesia.

Table 7 shows the results of fixed-effect estimations consisting of six models. Models 1, 2, and 3 capture the agriculture–industry transition, while models 4, 5, and 6 capture the agriculture–service transition. The significant negative sign in the agriculture share on aggregate value added in the economy and industry share shows similar results to Datisdar (2012). The negative sign on the agriculture share means a decrease in the agriculture share, while holding industry share constant and an increase in the service sector share, will increase the Gini coefficient. The negative effects of both variables persist when we use step-wise regression (see result in Models 4, 5, and 6). This might occur because the service sector has the highest inequality, compared to the agriculture and industry sectors. Thus, in the context of Indonesia, moving the business to the service sector (without the maturity of the industry sector) will increase the inequality in overall.

Table 7: Structural Transformation and Income Inequality: Fixed Effect Estimations

Dependent Variable	Inequality					
	Agriculture–Industry Transition			Agriculture–Service Transition		
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
Agriculture share in GDP	–1.627***	–0.784**	–0.789*	–1.436***	–0.603**	–0.408
	0.196	0.339	0.397	0.178	0.238	0.331
Industrial share in GDP				–0.571***	–0.181	–0.139
				0.082	0.117	0.155
Service share in GDP	0.689***	0.291	0.389*			
	0.100	0.188	0.221			
Economic growth		0.069*	0.086*		0.069*	0.063*
		0.036	0.043		0.037	0.036
Socio-demographic factors						
Poverty rate		–0.006***	–0.002		–0.006***	–0.004
		0.001	0.003		0.001	0.002
Senior high school net enrollment			0.001			0.001*
			0.000			0.000
Log of foreign direct investment			0.004**			0.005***
			0.002			0.002
Government factors						
Infrastructure share in expense			–0.077**			–0.073**
			0.033			0.033
Human capital share in expense			0.078			0.095
			0.092			0.109
Intercept	0.309***	0.442***	0.261**	0.873***	0.648***	0.471***
	0.039	0.069	0.103	0.064	0.077	0.119
R-square (within)	0.513	0.567	0.502	0.495	0.559	0.481
F-stat (Wald-chi)	36.64***	40.13***	22.45***	34.17***	51.01***	25.08***
No. Obs	288	288	171	288	288	171

F-stat = a statistical measure of the fit of linear model; GDP = gross domestic product; R-square = a statistical measure of actual data proximity to the fitted regression line; Wald-chi = a statistical measure to check whether the explanatory variables in a model are significant.

Note: Figures in parentheses are t-statistics; ***, **, * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Source: Authors' estimation.

Models 4, 5, and 6 show a decreasing agriculture share in GDP, while holding the service sector constant, which left industry sector to increase, will also increase inequality. And increasing the share of the service sector will also significantly increase the Gini ratio, which represents increasing inequality. Thus, increasing the share of the service sector tends to increase inequality, while increasing the agriculture and industry sectors will decrease inequality. The agriculture and industry sectors in Indonesia are labor-intensive, therefore increases in both sectors will benefit the labors, who are usually in lower-income jobs. This decreases inequality. On the other hand, the service sector employs highly skilled labor—which mainly comes from upper-middle income families—and is relatively more capital-intensive. Consequently, increasing the service sector will benefit only a handful of people, hence the increasing inequality.

The positive and significant value of the economic growth coefficient shows the impact of increasing economic growth toward increasing inequality, which is already discussed in Section 3.2. Similar results are also found in Dastidar (2012) and Dartanto and Patunru (2016). This indicates that economic growth is not inclusive, since the rich enjoy the benefits of growth more than the poor.

The socio-demographic variables consist of poverty rates in each province, net enrollment of senior high school in each province, and the FDI planted. The poverty rate has an insignificant, negative effect on the Gini ratio, meaning that the province, having a higher poverty rate, tends to have a lower level of inequality. There has been no consensus on the relationship between poverty and inequality. Dartanto and Patunru (2016) found an inconclusive correlation between the Gini ratio and the poverty rate, depending on the estimation methods and control variables. We have argued that regions with a high poverty rate tend to have an equal distribution since most people have a similar standard of living.

Senior high school enrollment proved to be an insignificant positive in affecting inequality, which shows similar results with Dartanto and Patunru (2016). Increasing senior high school enrollment increases the number of the skilled labor force. It has been mentioned before that raising the numbers in the skilled labor force increases inequality. FDI, however, has significantly increased inequality in Indonesia. Lipsey and Sjolhom (2004) found that FDI has benefited skilled workers more than unskilled workers in emerging economies, including Indonesia. All the more, FDI spurt the growth of *r*, income from capital, rather than *w*, wage for labor. Hence, FDI increases inequality in Indonesia.

Lastly, government factor variables consists of shares of infrastructure and shares of human capital—i.e., education and health—in government expenses. While the share of human capital in government expenses do not significantly affect inequality, the infrastructure share in local government expenses significantly reduce inequality, with 95% confidence level. These findings suggest that public investment in infrastructure will contribute to a reduction in inequality in Indonesia. In combination with the positive impact of human capital investment on inequality, this is not necessarily the government to reduce or stop this investment, but the government should ensure that low-income groups also benefits from these investments. Moreover, the local government in a province with high FDI should carefully mitigate the adverse impact of FDI on inequality, by, for instance, implementing a quota for hiring local people to work in FDI companies.

6. CONCLUSION

Indonesia has experienced a pattern similar to other countries in Southeast Asia, namely that a substantial decrease in poverty has been accompanied by an increasing Gini index, particularly during the last 2 decades. Many researchers have attempted to find the link between structural transformation and inequality. One of the oldest theories is the Kuznets curve. As the economy develops from an agriculture to an industry orientation, inequality will first increase before it eventually decreases as the economy moves to the service sector. Nevertheless, the Kuznets curve assumes that the structural changes that have happened in the economy have followed the agriculture–industry–service transition, which has commonly happened in developed countries. Indonesia shares the experience of other developing countries, and is having an economic transition from an agriculture- to a service-oriented economy, before the industry sector has actually matured.

This paper uses Theils' L decomposition and econometric estimation to explore the relationship between structural transformation and inequality in Indonesia. From the static and dynamic decomposition, this study remarks that (i) the root of increasing inequality in Indonesia is still "mysterious", since the pure inequality effect (the unexplained effect) still dominates the explanation of increasing inequality, especially when we consider the group partition of area, employment status, and educational attainment. Static decomposition has also confirmed a similar finding, that 'between' group inequality could only explain less than 25% of inequality; (ii) population shifts from the agriculture sector to either the industry or service sectors, from rural to urban areas, and from informal to formal employment are the second contributor to the increasing levels of inequality during the last 2 decades; (iii) improvements to educational attainment during the last 2 decades have contributed to an increase in equality; and (iv) even though the contribution is cancelled out, increasing inequality has been curbed by the growing income from those working in the agriculture sector, in the informal sector, by those living in rural areas and by those who do not attend formal/compulsory education. Fixed-effect estimations could be used to provide economic evidence that supports the idea that structural transformation leads to increases in inequality in Indonesia. The service sector's increasing share in the economy raises inequality because the service sector is capital and high-skill intensive. Therefore, only a few people enjoy the benefits of growth in this sector in comparison to growth in either the agriculture or industry sectors.

Elaborating on descriptive analysis, decomposition, and econometric analysis, this study recommends that due to relatively high disparities across regions (rural and urban), the policy for tackling inequality should focus on regional economic development, with special attention to helping poor villages. Moreover, econometric analysis suggests that public investment in infrastructure will contribute to a reduction in inequality in Indonesia, and provinces with high FDI should carefully mitigate the adverse impact of FDI on inequality.

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