THE DEVELOPMENT OF INEQUALITY AND POVERTY IN INDONESIA, 1932–2008

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We estimate inequality in Indonesia between 1932 and 2008. Inequality increased at the start of this period but declined sharply from the 1960s onwards. The increase was due to a shift from domestic to export agriculture over the period up to the Great Depression. During the 1930s, as the price of export crops declined, the income of rich farmers suffered a blow. Yet this was counterbalanced by an increasing gap between expenditures in the urban and rural sectors, causing an overall rise in inequality. As for the second half of the century, we find that the employment shift towards manufacturing and services—combined with an increase in labour productivity in agriculture—accounts for inequality's decline, which was halted in the 1990s. These inequality trends affected poverty as well, but prior to the 1940s the negative impact of the rise in inequality was offset by an increase in per capita GDP. Between 1950 and 1980 a decline in inequality, combined with increased per capita GDP, rapidly raised a large portion of the population above the poverty line.

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INTRODUCTION

Income inequality has received considerable attention over the past few decades, but most long-run studies still focus on Western countries and Western offshoots[1] (see, for example, Piketty 2003; Saez and Veall 2005; Piketty and Saez 2006). Few use comparable data to address long-run inequality and poverty trends in less developed countries (Banerjee and Piketty 2005; Bértola et al. 2010; Leigh and Van der Eng 2010; Van Zanden et al. 2014).

At the same time, although there is a large body of literature on inequality and poverty in Indonesia, no consensus has yet been achieved on the magnitude of these two variables or on their patterns of change over time (Booth and Sundrum 1981). Data on inequality are especially scarce and often limited to the final three decades of the 20th century (see, for example, Nugraha and Lewis 2013). Although data on poverty are more plentiful (Booth 1993; Priebe 2014), they rarely start before the 1980s and often suffer from a surplus of definitions and methods.

The problems in calculating both inequality and poverty can, to a certain extent, be traced back to the data sources. Indeed, the introduction of Indonesia's National Socio-economic Survey (Susenas) in 1963–64 generated a large amount of data on household expenditures, triggering many studies of inequality and poverty. Unfortunately, frequent changes in the definition of poverty have complicated the challenge of making comparisons over time. In addition, the reliability of the Susenas data has been questioned (Booth 1993, 55). Sudjana and Mishra (2004) argue that relatively wealthy households are under-represented in these data and that this creates a significant bias that increases over time. This under-representation goes far in accounting for the fact that total private household expenditures estimated on the basis of Susenas in the 1980s and 1990s turn out to be much lower than what is reported in the national income accounts (Van der Eng 2001). The income-inequality estimates suffer from even worse defects: so much worse, in fact, that at first they were not even reported in official publications. Income-tax data represent less than 5% of all income earners, and the Susenas data include no information on income prior to 1979. These shortcomings oblige us to rely on expenditure data for any long-run analysis of inequality in Indonesia.

1 For instance, settler destinations such as the United States and Australia.

Table 1 presents the results of one such analysis—the World Income Inequality Database (WIID 2015) and Statistics Indonesia (BPS) (2015)—which, unlike our findings in this article, suggests a roughly constant level of inequality from 1960 onwards. If one accepts this conclusion, however, it remains to be explained why three decades of New Order policies and the 1970s oil boom, both of which caused significant structural change within the economy, had no significant impact on inequality. Our aim in this article is to offer a more reliable long-run picture of expenditure inequality in Indonesia during the 20th century.

In the remainder of this article we construct new historical series of inequality and poverty, extending back to 1932. This makes it possible to discern trends in inequality and poverty over the entire 20th century, in turn allowing us to make several valuable, if tentative, observations on the underlying causes of these trends.

INEQUALITY MEASURES

Most estimates of inequality in Indonesia are based on expenditure data rather than income data (see, for example, Booth and Sundrum 1981; Hughes and Islam 1981; Frankema and Marks 2009; Van der Eng 2009), not only because expenditure data are available in greater quantity but also because they constitute a more reliable indicator of the actual welfare (consumption) of the population.[2] Moreover, they allow one to circumvent the problem, inherent in income-based estimates, of overestimation at the top of the distribution and underestimation at the bottom—and hence of an overestimation of income inequality. Factors such as non-market income (see Nugraha and Lewis 2013), progressive taxation—reducing the expenditure of the wealthy more than proportionately—and saving rates dependent on income (Dynan, Skinner, and Zeldes 2004) contribute to a deviation between the two pictures of inequality generated by the two types of data. Likewise, by-employment—that is, part-time employment in addition to the individual's main job—which is relatively widespread in the rural sector (where average income is relatively low), further biases the picture one can obtain on income inequality on the basis of expenditure data (Van der Eng 2002, 147). This is because income is calculated from a person's main occupation. By-employment is higher in

2 Francois and Rojas-Romagosa (2005, 17) argue that expenditure measures are subject to biases caused by borrowing and lending. However, borrowing and lending tend to be equal in the long run, so the impact is insignificant.

the relatively low productivity sectors, so income-based inequality measures that do not take account of by-employment will overestimate inequality. By-employment is also especially high among the poor. Indeed, in the WIID's income-inequality estimates for Indonesia for 1984–96 (WIID 2015), the Gini coefficients derived from expenditure data are 8%–23% lower than those estimated from income data (table 1).[3]

The fact that income inequality is greater than expenditure inequality is not the only problem to complicate poverty analysis. If we were to follow the income approach we would find that the level of inequality between 1984 and 1996 is even more stable than the level indicated by the expenditure approach (table 1)—a somewhat surprising finding, given the many significant economic and social developments that Indonesia experienced during the New Order period (1966–98). Our primary purpose in this article, therefore, is to construct an alternative series for expenditure inequality and provide a more accurate, if imperfect, picture of change in inequality over the long run.

Our starting point is Van Leeuwen's (2007) dissertation,[4] which provides data on expenditure and population shares for six urban and four rural household categories for several benchmark years between 1932 and 2008. Since the data and their construction are well described, we will give only a brief description here and then move on to estimating expenditure Ginis.

For the period after 1975, data on the share of each household category in total income were obtained from the social-accounting matrices provided by Statistics Indonesia (BPS), Indonesia's central statistics agency.[5] Since the data provided therein on all income, expenditure, and production streams within the Indonesian economy are consistent, they can be regarded as more reliable than the Susenas data. Our data on each household category are limited to income and the number of people in that category, so our estimates are equivalent

3 The Gini coefficient is a commonly used measure of inequality in the distribution of income or expenditure, ranging in value from zero (complete equality) to one (maximal inequality).
4 These data are available at http://www.iisg.nl/indonesianeconomy/humancapital and http://www.basvanleeuwen.net/Papers.htm.
5 Eight volumes of *Sistem neraca social ekonomi Indonesia* [Indonesian social-accounting matrix], for 1975, 1980, 1985, 1990, 1993, 1999, 2005, and 2008.

to what is referred to in the literature as ‘social tables’ (see, for example, Lindert and Williamson 1982).

For the period before 1975, we have no direct observations on either the share of household categories in the total population or their expenditure share. Backcasting using a logarithmic trend for each household category on the post-1975 data, we found that the change in the share of each household class in the total population diminished prior to the 1960s, indicating that before 1960 the share of each household class in the total population remained quite constant. Indeed, given that the shifts in household-category shares generally start slowly and do not speed up until after urbanisation and industrialisation take flight, we expect that the population shift from rural to urban household categories must have been slow prior to 1960. We find that in 1920, roughly 76% of the labour force was employed in agriculture (and, needless to say, lived in rural areas), but by 1960 that figure had declined to 67% (Van der Eng 1996). This finding supports the plausibility that the household population shares for 1960 can be combined with the income shares for the previous periods, resulting in our social table (table 4). Consistent data on household expenditure are lacking for the pre-1970 period as well.

Following Van der Eng (2001), we opted to use household-expenditure data from several surveys in the period 1932–59 (table 3). Using the household classification from the post-1970 social tables, we divided households in the surveys into 10 categories. We then calculated the average expenditure per household in each category and multiplied this by the share of that household class in the total population to obtain the total expenditure share of that category (table 4). Since not all of the surveys contained all of the household categories, a few observations are missing from our social tables. We filled in these missing observations by using the relation with the other household classes over time and, within a year, across household classes.[6]

6 For example, let us assume that we lack an observation for household class *x* for 1939. We calculate the ratio between its share and that of each of the other household classes in the years before and after 1939 and then choose the ratio that minimizes the sum of the squared differences for those two years. We then use this ratio to fill in the missing observation. Since the number of missing observations is small, so is any bias resulting from this method.

The resulting social tables are consistent over time, with a steady increase in non-agricultural household expenditure shares. Moreover, Van Leeuwen (2007, appendix 4) shows that the results are also consistent with existing current-price GDP estimates. More importantly, we can use these tables to estimate the trend in the Gini measure of inequality by applying the trapezoid approximation method employed by Milanovic, Lindert, and Williamson (2007), even though it ignores the overlap factor (see appendix B). First we calculate the cumulative share of expenditure class[7] *i* in the population and in total income, denoted by *p* and *L(p)*, respectively; together they can be used to estimate the Lorenz curve. In this case, since we order households according to expenditure level (from highest to lowest), the Lorenz curve is above the 45-degree line. If we have *k* classes in the population, we can estimate the Gini as follows:

$$G = \sum_{i=1}^{k} (p_i - p_{i-1})\,(L(p_i) - p_i + L(p_{i-1}) - p_{i-1})$$

where

$$p_0 = L(p_0) = 0$$
$$p_k = L(p_k) = 1$$

Table 5 and appendix A figure A1 show that the trend of our estimates of inequality for rural and urban areas combined—that is, 'total' inequality—compares quite well with those based on data, drawn from Leigh and Van der Eng's (2010) article, on the income share of the upper quantiles of the population (to which we refer subsequently as 'income share inequality'). Whether we assume a Pareto or a log-normal distribution for converting data on the Lorenz curve into Gini coefficients (see appendix A for a description), we consistently find that inequality peaks in the 1930s. Gini coefficients for the rural and urban sectors, derived from the household-categories subdivision and reported in the second and third columns of table 5, follow a similar trend.

The results of our inequality estimates in table 5 meet our expectations: an increase in inequality during the economic crises of the 1930s and 1990s and a decline from the 1940s

7 The sum of the shares of all classes up to and including class *i*.

until the 1970s. The estimated Gini for 1980 and 1985 is low (0.24) but not implausible, because this is in line with estimates elsewhere: 0.18 in China in 1995, 0.25 in Egypt in 1965, and 0.16 in Luxemburg in 1986 (WIID 2007). In addition, several authors have stressed the low level of expenditure inequality in Indonesia (see, for example, Van der Eng 2009, 7). Furthermore, in table 5, before 1960 the trend in the income-share Ginis resembles that of our expenditure Ginis—especially between 1925 and 1932, a period in which both series are distinguished by a sharp increase in inequality. Even if we assume, as we do in the notes to table 5, that Booth's (1988, table 7) estimate is too low and that a Gini of 0.45 in 1925 would be more appropriate, inequality must have increased considerably between 1925 and 1932. After 1960 the newly estimated expenditure Ginis move in the same direction as the Ginis based on the income quantiles, albeit at different rates (see also appendix figure A1).[8] To summarise, for the post-war period we find a decreasing trend until the early 1980s and an increase in inequality from about the early 1990s.

The overall pattern that emerges from table 5 is one of increasing inequality in the 1920s and 1930s and decreasing inequality in the second half of the century. This is consistent with the hypothesis of Lindert and Williamson (2003): since land rents were largely owned by the rich and wages by the poor, the greater use of abundant land resources for export production prior to the 1930s increased land rents relative to wages and contributed to a growth in income inequality in Indonesia. Pursuing this line of reasoning, Leigh and Van der Eng (2010) argue that the rapidly expanding use of labour for export-oriented production since the 1970s should have contributed to a reduction in inequality, and therefore that the maximum level of inequality must have been reached in the 1960s.

Alternatively, the transition from a rural to an industrial economy in developing countries, which has been modelled by Lewis (1954) and Kuznets (1955), should lead to a general increase in the income share of the modern sector, with inequality increasing to the point at which the majority of the workforce is employed in the high-productivity modern sector. According to Lindert and Williamson, it was a shift in agriculture's market orientation from

8 For us this is not a problem, since we are more interested in the pattern than the level. However, if one wants to construct a consistent series based on income inequality, it is advisable to extend our pre-1960 expenditure series with either the income Ginis or the average Gini estimated from the income shares benchmarked on the income Ginis.

domestic to export, and not (as argued by Kuznets) a shift from agriculture to manufacturing and services, that caused an increase in inequality prior to the 1930s. While both hypotheses predict an initial increase in inequality, that of Lindert and Williamson implies that the gap between rural and urban inequality continues to widen as the increase in the urban sector's income outpaces that of the rural sector, whereas the Kuznets hypothesis maintains that the migration of labour from the lower-productivity agricultural sector to the higher-productivity urban sector narrows the gap. Thus, according to Lindert and Williamson we should expect a decrease in wages in agriculture relative to other sectors, whereas according to Kuznets we should expect a relative increase. Indeed, our dataset permits us to estimate that between rural–urban inequality[9] increased in the 1930s from 0.01 to 0.14, suggesting that expenditure in the urban sector increased versus that in the rural sector.[10] In addition, Van der Eng (1996, table A3) shows that rural employment constituted 76% of the total in 1900 and 74% in 1940, undermining the argument based on a shift from agricultural to manufacturing and services employment and again seeming to confirm the Lindert–Williamson argument. Finally, between 1900 and 1930 average labour productivity in agriculture (the contribution of the agricultural sector to GDP divided by the share of the agricultural workforce) declined, relative to the corresponding measure for services and manufacturing, from 25% to 18% (Van der Eng 2002).[11] This suggests that there was a redistribution of income in favour of the urban sector, caused by an increase in the production of export crops, which profited primarily the urban sector.[12] Indeed, between 1932 and 1939 private expenditure in the urban sector grew from 34% to 43% of the total, while the share of estate crops (mostly for export) in total agricultural GDP increased from around 11% in 1900 to 24% in 1930 (Van der Eng 1996, 260–62). This relative increase in non-rural incomes again seems to confirm the Lindert–Williamson argument.

9 The between Gini reflects the difference between the average income in rural and urban sectors. For a detailed note on the decomposition of the Gini, see footnote 10.

10 This estimate is based on three separate Gini estimates—within, between, and overlap—as suggested by Pyatt (1976). The overlap Gini takes into account the fact that an individual's wealth is relative to the various categories to which he or she belongs; for instance, a street-sweeper might be among the poorest 10% of urban workers but the wealthiest 10% of rural workers. It is also important to note that Since these are expenditure Ginis, they do not take account of the urban–rural difference in price levels. On the other hand, Asra (1999, 58) found that these price differences are in fact much smaller than official publications indicate.

11 We have to be careful in interpreting these figures, since the deflation rate in agriculture may differ from that in services or manufacturing, although probably not significantly so.

12 The earnings to labour remained in the rural sector.

This trend of an intensification of agricultural exports as identified by Lindert and Williamson came to an end during the Great Depression of the 1930s. Not only was the Ethical Policy abandoned (Timmer 2005, 20) but there was a drop in prices of the most important export commodities as well. The current-price value of exports of seven major crops, expressed in guilders, fell by 75% between 1929 and 1933, while the quantity exported decreased by 42% (Mansvelt and Creutzberg 1975, table 1), causing the share of agricultural households in total household consumption to decline from 66% in 1932 to 53% in 1942—largely as a result of a decline in the income share of richer households enjoying income from export-oriented production. Because the income share of the richer agricultural households declined, inequality in the rural sector declined relative to that in the urban sector. Yet this reduced income share of richer agricultural households increased the expenditure gap between the urban and rural sector, thus increasing the between rural–urban Gini (see footnote 10). The increasing between Gini combined with a decrease in the rural Gini resulted in an overall increase in the national Gini in 1939 (table 5). This trend of increasing inequality is not uncommon. A recent study based on tax data indicate that Hungary, a country with a rural economy then comparable to Indonesia in size relative to GDP, experienced an increase in the Gini coefficient of 0.02 points between 1928 and 1938 (Földvári 2009).

The next decade, however, was marked by a reversal of the pattern, with inequality decreasing between 1939 and 1953 from 0.60 to 0.55. Whether this is an example of the effect of war on inequality—an effect attested by several studies (see, for example, Van Zanden 1995, 646; Piketty and Saez 2006, 203)—remains unsubstantiated, owing to the lack of evidence. Likewise, it may be possible that the decline in inequality is partly attributable to a decline in racial inequality because of the withdrawal of the Netherlands from its position of political and economic domination. Van Zanden (2003) estimated the income Gini for Indonesians to be 0.32, versus 0.63 and 0.61 for Chinese and Europeans, respectively, in 1880.[13] Forty-five years later, in 1925, the pattern remained largely unchanged, with inequality of 0.37 among Indonesian taxpayers, 0.53 among Chinese taxpayers, and 0.51 among European taxpayers (Booth 1988, 326). It thus seems likely, although again

13 These Gini estimates are updated at the Global Price and Income History Group website: http://gpih.ucdavis.edu/Distribution.htm.

unsubstantiated, that the removal of the Europeans from their positions after the Second World War reduced inequality. However, notwithstanding the above suggestions, all we can state with any certainty is that changes during 1942–53 in the income share of agricultural households were relatively significant, primarily because the income share of small landowners increased while that of larger ones declined (table 4). The same applies to the urban Gini, which declined only slightly, mainly because of a relative decline in urban wages—hence the decline in overall inequality.

This decline in overall inequality that began in the 1940s continued for the next three decades; what distinguished the decline during the 1960s and 1970s was that now it was rural inequality that fell below its urban counterpart. This can be explained by several factors: most notably, public expenditure on agriculture translated into an increase in the wages of rural labourers. In addition, the Green Revolution largely benefited one element in particular of the rural sector: rice farmers (Van der Eng 2009, 5–6), hence increasing the relative expenditure of small-scale rice farmers. At the same time, we can see a decline in the expenditure shares of agricultural households with medium and large landholdings, a development also reported by Van der Eng (2009, 13–14), who noted a significant decrease, especially in the outer provinces—part of a 1963–93 trend towards increasing equality which was accompanied by a Gini decrease that brought it close to Java's levels.

The trend of declining inequality in the Indonesian economy continued until the mid-1980s. For example, Timmer (2004) convincingly demonstrates that the poorest 20% of the population experienced the same expenditure growth as the moderately well off, thanks to the Soeharto government's pro-poor growth policy. If the growth-incidence curve for the period prior to 1990 was similar to that for 1996–99 (Timmer 2004), this would have contributed to the decline in inequality just as the oil price shocks had: by prompting the government to increase spending on development. Moreover, the oil price shocks and the resulting Dutch disease[14] may have hurt the poor in Indonesia less than the poor in other oil-exporting countries, not only because the government chose to invest in development but also because

14 Dutch disease, which is often paired with an increase in income from raw materials, such as oil, results in an overvaluation of the currency. In turn, this causes exports to decline and thus unemployment to rise.

it adopted a policy that combined balancing the budget and promoting export and trade liberalisation (Temple 2003).

All this changed, however, with the oil glut of 1986, when an overvalued currency (Booth 1986), combined with reduced income from oil exports, hit the economy. It is probably no coincidence that inequality started to rise again in the mid-1980s. As if that were not enough, the country was hit hard by the Asian financial crisis in 1997–98. A study based on household surveys suggests that the rapid rise in the price of rice during this crisis caused a rapid rise in poverty, inducing households to increase the share of basic foodstuffs in their budgets (Frankenberg, Thomas, and Beegle 1999). Indeed, Timmer (2005) reports that the annual increase in rice prices between 1996 and 1999 was 19.2% (compared with an increase in the consumer price index of about 10 percentage points less), greater than any increase recorded during the previous three decades. These troubles translated into the reverse of what happened in the previous decades—that is, a reduction of the share of small-scale farmers, who ended up in low-level non-agricultural positions either in the countryside or in urban areas. And even though this did not necessarily increase either rural or urban inequality, it increased the difference between them and thereby drove up overall inequality.

But what effects did this pattern of initially decreasing and then, after the mid-1980s, increasing inequality have on the actual standard of living in the population? To answer this question, we look at income growth and poverty in the next section.

POVERTY

Indonesia has proved to be fertile ground for studies looking to establish the impact of inequality on poverty, yet most of these studies treat a short time span (see, for example, Booth 1993). In the previous section we found a long-run pattern of increasing inequality up to the 1940s and decreasing inequality thereafter (with the exception of an increase of limited duration, coinciding with the economic crisis of the 1990s). This finding prompts the question: how do poverty patterns compare with those of inequality?

To answer this question, we estimate the share of the population below the relative poverty line of 50% of the median income, a definition adopted by the OECD (for a sensitivity check of 75%, see appendix 3). For the estimation, we accept the assumption that incomes are log-

normally distributed, which is an empirically justified choice (see Lopez and Servén 2006).[15] Using the log-normality assumption, we calculate the share of population below the poverty line (the poverty share, P_0) as follows:

$$P_o = \Phi\left(\ln\left(\frac{z}{v}\right) / \sigma + \sigma / 2 \right)$$

where Φ is the cumulative standard normal distribution function, v is per capita income (proxied here by per capita GDP), z is the poverty line (half of the median income in this article), and σ is the standard deviation given by

$$\sigma = \sqrt{2}\Phi^{-1}\big((1 + G)/2\big)$$

where G is the Gini coefficient. The expression for P_0 implies that both decreases in inequality (reduction in Gini-coefficient) and increases in per capita GDP cause decreases in poverty, allowing us to decompose the total effect into growth and distribution components.

Our estimates of the poverty headcount are presented in table 6. Whether we use the World Bank's old $1-per-day poverty line, its alternative $2-per-day poverty line, or the two poverty lines presented by Booth (1993)—one relying on the official BPS poverty line and the other on a poverty line suggested by Esmara (1986)—we see comparable trends: namely, in all series the percentage of those below the poverty line declined sharply during the 1960s and 1970s.

Table 6 also reports the magnitude of poverty before the 1960s. We find that the percentage constituted by the poor remained virtually unchanged until the 1950s, at which point it began to decline, only to rise again in the mid-1980s (the 'People' column in table 6). Our estimates of the poverty share are in the same magnitude as those of Miranti, Duncan, and Cassells

15 It may be surprising at first sight that we depart from the absolute measures of extreme poverty used almost predominantly in the literature. These range from $1 per day (see, for example, Van Zanden et al. 2014), based on consumption and inequality data drawn from household surveys, to the World Bank–inspired $2 per day (Sala-i-Martin 2002a, 2002b; Lopez and Servén 2006) in 1990 prices. We do this because methods based on an absolute threshold can be reliable only if one has reliable information on the exact distribution of incomes. If one uses an approximation instead, the reliability of any estimates of absolute poverty relies on the precision of the approximation. By choosing the estimated median as our point of reference, we can reduce the effect of approximation errors, since the median is estimated under the same assumptions as the poverty threshold.

(2014), who find a poverty share of 18.4% in 2001 and 13.3% in 2010, and Sumner and Edward (2014, appendix table A1), who find a poverty share of 21.9% in 2005 and 22.6% in 2008, evaluated at a limit of $1.25 per day.[16]

As noted, it is possible to decompose the observed changes in the poverty rate into the effect of economic growth and the effect of distributional changes, as suggested by Datt and Ravallion (1992). Table 7 shows the contributions of changing inequality and increasing per capita income to the observed changes in the poverty share. Poverty increased until the 1930s despite increasing GDP per capita, owing to an increase in income inequality. The decrease in the poverty rate during 1942–80 was attributable to economic growth that could offset the effect of distributional changes. From the 1980s, economic growth could no longer keep up with the distributional changes, and the net effect was again an increase in the poverty share.

Only between 1953 and 1980 did a decline in inequality, combined with an increase in GDP per capita, cause the poverty share to shrink. According to Timmer (2005), this is roughly the period in which the incomes of the poorest 20% grew in line with per capita GDP, thereby reducing absolute poverty. After 1985, however, economic growth (along with other, unidentified factors included in the residual) accounted entirely for further such reductions while an increasingly unequal distribution increased poverty.

CONCLUSION

Inequality in Indonesia is a much-researched topic, but measurement difficulties cause estimates to differ by as much as 30%–40%. In addition, the most frequently used series—based on expenditure data—show relatively little change in inequality between 1964 and 2008, despite Indonesia experiencing phases of rapid economic growth, an oil boom, and the Asian financial crisis during this period. Furthermore, research efforts are hampered by an insufficiency of data on patterns of inequality prior to the 1960s. We therefore constructed a long-run dataset on inequality that has the advantage of comparability over time, and used

16 Miranti, Duncan, and Cassells (2014) define poverty as comprising all individuals who cannot afford an intake of 2,100 calories per day. Sumner and Edward (2014) adopt absolute poverty measures of $1.25 and $2.00 per day. Even though these definitions are methodologically different not only from each other but also from ours, all three definitions take some form of subsistence level as their poverty line. Hence, the results should be roughly comparable.

expenditure data, which are relatively easy to obtain, to calculate the Gini coefficient. Another advantage of expenditure data, in addition to their availability, is that they provide a more accurate reflection of living standards than do income data and are therefore more useful for poverty analysis.

The remarkable finding is that expenditure and income-inequality estimates for the pre-1950 period describe comparable patterns, while after the 1950s expenditure inequality decreases much faster than income inequality. Even though we cannot pinpoint the cause, or causes, of this phenomenon, the literature quoted in this article attributes it to factors such as progressive taxation and an increase in the savings rate of those in the upper tax brackets. The inequality development in the first half of the century seems to have been driven by a shift in income generation from the rural to the urban sector. As the share of rural labour in the total workforce remained roughly constant, this shift also reduced the productivity of rural labour relative to that of urban labour, thus increasing the ratio of rural to urban inequality. In addition, the effects of the Great Depression were felt. In the 1930s the abandonment of the Ethical Policy and decreases in small farmers' incomes increased rural inequality. Within agriculture this increase was partly offset by a decrease in large farmers' export incomes, but overall inequality increased nonetheless.

In the second half of the 20th century we found a steep decline in inequality, driven, not surprisingly, by several factors. The shares of services and manufacturing in total employment increased at the expense of agriculture, causing (for a variety of interconnected reasons related to production technology) an increase in labour productivity in agriculture, and thus a decrease in urban–rural inequality. This also implies that the more productive urban sector accounted for nearly 50% of the workforce and contributed to a decline in overall inequality. In addition, as in many other countries, the war reduced racial inequality, contributing, if only slightly, to a reduction in inequality. Finally, other Indonesia-specific factors, such as the Green Revolution, had an impact. Until the 1990s, Indonesia's inequality level declined until it was lower than that of the Asia-Pacific region generally, but in the 1990s it reversed course; two possible culprits were the 1986 oil glut and the Asian financial crisis.

All of these changes in inequality had a profound impact on the poverty rate. During the pre-war period, because inequality and per capita GDP were rising in tandem, the poverty rate remained virtually unchanged, whereas the decline in inequality and the increase in per capita GDP during the postwar period caused the poverty share to decrease. Although inequality increased again after 1985, the poverty-reducing effect of GDP per capita growth was sufficiently strong to keep this increase from soaring to new heights. Even though this decline in the poverty rate over the 20th century can be witnessed in other developing economies as well, it was especially strong in Indonesia. Whether this was due to factors common to all developing economies or only to Indonesia-specific factors, such as the pro-poor growth policy and the availability of oil, remains a question for further research.

APPENDIX A: CONVERTING INCOME SHARES TO GINI COEFFICIENTS

The method we have presented for estimating the expenditure Ginis does not exploit all the data available for Indonesia. For example, beginning in the 1960s there are sporadic estimates of household income and expenditure Ginis from WIID (table 1). The most comprehensive dataset, however, is that of Leigh and Van der Eng (2010), who provide the shares in total income of the wealthiest Indonesians by composing a pyramid of six categories, from the top 10% to the top 0.001%, by way of the top 5%, 1%, 0.5%, and 0.01%. In order to compare them with other estimates of income inequality, we need to convert these data into Gini coefficients.

Leigh and Van der Eng provide a set of six points along the Lorenz curve to represent the six income levels of the six categories described above. If one assumes that income follows some two-parameter probability distribution (that is, log-normal or Pareto), Gini coefficients can be estimated in a straightforward way. We begin with a log-normal distribution. Following Aitchison and Brown (1966), Lopez and Servén (2006) argued that under the assumption of log-normality the Lorenz curve can be expressed as

$$L(p) = \Phi(\Phi^{-1}(p) - 1)$$

where p denotes the p^{th} quantile of the population and $\Phi(.)$ denotes the cumulative normal distribution. The standard deviation of log income, σ, can be calculated as

$$\sigma = \sqrt{2}\Phi^{-1}\left(\frac{1+G}{2}\right)$$

where G is the Gini coefficient.

To calculate the Gini coefficient on the assumption of a Pareto distribution, we have to take an extra step. We start with the cumulative distribution function of the Pareto probability distribution:

$$F(x) = P(X \leq x) = 1 - \left(\frac{x_m}{x}\right)^k$$

where $X_m > 0$ is the minimum value of x, and the positive parameter k is the Pareto index. The Lorenz curve can be derived as follows by assuming a Pareto distribution:

$$L(F) = 1 - (1 - F)^{1-\frac{1}{k}}$$

where $L(F)$ is the share of the F^{th} quantile of the population in total income. For example, if the richest 0.1% account for 1.0% of the total income, we should write $L(F) = 0.990$, $F = 0.999$. From this we can calculate k, which, as derived by Aaberge (2005), can be used to estimate the Gini coefficient:

$$G = \frac{1}{2k-1}$$

The results for our expenditure Gini, the income Ginis, and the Ginis based on assumed log-normal and Pareto distributions are presented in figure A1. The fact that the income, Pareto, and log-normal Ginis all move in the same direction is not surprising, since both the log-normal and the Pareto estimates are based on tax data and hence resemble the income approach. (The levels are not comparable, since they are estimated under different assumptions on the size distribution of income.) More interesting is that the expenditure Gini seems to follow the same pattern as the Ginis estimated from income shares (on the assumption of either a log-normal or a Pareto distribution) and the income Ginis estimated from surveys, before about 1960 and after about 1980; in the intervening two decades the expenditure Gini declines much faster than the other measures. Indeed, this is confirmed by Leigh (2007), who found that income shares had a strong positive association with the Gini

coefficient during the late 20th century. Since all the factors that made the expenditure-Gini trend deviate from the income-Gini trend are in the period from about 1960 to 1980, it follows that the income, income-share, and expenditure Ginis were positively correlated towards the end of the 20th century.

As we explain in the article, the literature suggests that a significant flattening of the expenditure distribution after 1960 accounts for the sharp decline in the expenditure Gini relative to the income Gini between about 1960 and 1980. Taxation, an increase of the unrecorded economy, and, more importantly, economic growth inducing the wealthy to increase their savings rate lifted the income Gini above the expenditure Gini. These factors became especially prevalent between about 1960 and 1980, causing the expenditure Gini to decrease relative to the other Ginis, which were less sensitive to these factors.

This implies that the income Ginis, income shares, and expenditure Ginis must have come back into correlation before 1960. This contrasts with the findings of Milanovic (2005), who argues that income and income-share Ginis have no significant association. However, we argue that the trends, not the levels, moved in the same direction. Since Milanovic relies on observations at a single point in time, differences in the levels of the income-share Ginis across countries make it difficult to interpret his regression. Indeed, the fact that country-specific effects are significant is underscored by Leigh (2007), who finds that including country-specific effects increases the R^2 of his regressions from 0.20 to 0.76, whereas including year effects (the trend) results in nothing more than a small increase in the R^2. Hence one can conclude that a difference in the two studies' data structures accounts for the differences in their results: Milanovic tests whether the top income shares and the income Ginis have a similar *level* (which, of course, is rejected), whereas Leigh tests also for a similar *trend* (which is not). Our results are consistent with the latter finding. In addition, Van Zanden et al. (2014), drawing on a large sample of countries, find that the relationship between income and expenditure Ginis indeed changes between about 1960 and 1980.

APPENDIX B: THE EFFECT OF UNKNOWN OVERLAP ON THE ESTIMATED GINI COEFFICIENTS

Since the observed social classes are not disjointed income classes, the estimated Gini coefficients are likely be subject to downward bias. The effect of the overlap factor depends

on the degree of between-group inequality—that is, the difference in average incomes of social classes. This is because the smaller the between-group differences are, the more similar the different social groups become in terms of income. This has been proven by Milanovic (2005), who simulated the effect of smaller between-country income differences and the size of overlap factor in global income-inequality estimates. In our data the similarity between different social classes increases over time, as attested by the ratio if the average income of the wealthiest and poorest social classes.

We can therefore expect that the effect of the overlap factor was greater in the second half of the 20th century than it was before the 1960s. It is unfortunately not possible to estimate the effect of the unknown overlap factor on the estimate Gini coefficients in table 5, but in Milanovic's (2005, table 3.1) simulation it did not amount to more than 10.5%–13.0%. Nor does it seem to be too sensitive to changes in between-group inequality, so the overall picture in table 5 should be valid.

APPENDIX C: ALTERNATIVE MEASURES OF INCOME INEQUALITY AND POVERTY RATES

Gini coefficients are known to be less sensitive to changes in the poorest and richest groups than to changes in the middle of the distribution (Atkinson 1970). Hence, as a robustness check, we report the ratio of average income of the second-poorest and second-wealthiest social groups.

The resulting graph indicates that the reduction in inequality in non-rural groups was more driven by a change in the middle of the distribution than inequality in rural groups. In the latter we see larger changes at the two sides of the distribution (figure A2).

In table 6, we use a poverty threshold of 50% of the median income in order to conform with the OECD definition. Yet until the 1970s this threshold was equivalent to those below $1 per day in 1990 prices. As an alternative, we also estimate the poverty share by using 75% of the median income as the threshold (appendix figure A4). Although the trends are the same, the higher threshold yields estimates that are much closer to the alternative poverty estimates in table 6.

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Table 1 *Gini coefficient of inequality, 1964-1999*[a]

	Expenditure	Income	Difference[b]
			%
1964	0.33		
1970	0.31		
1976	0.32		
1978	0.35		
1980	0.32		
1981	0.31		
1984	0.31	0.40	22.5
1990	0.32	0.39	17.9
1993	0.34	0.42	19.0
1996	0.37	0.40	7.5
1999	0.31[c]		
2002	0.33		
2008	0.35		
2012		0.39	

Notes: [a] Unit of analysis: household.

[b] Percentage difference is relative to income inequality.

[c] The expenditure Gini for 1999 is inexplicably low (WIID2b 2007).

Source: WIID3.3 (2015)

Table 2 *Shares in total population by household category (%)*

Household category	1960	1975	1980	1985	1990	1993	1999	2005	2008
Agriculture									
Employee	14	12	11	7	9	11	15	13	13
Operator, landowner									
0 - 0.5 ha	25	22	20	23	27	27	19	18	
>0.5 - <1 ha	14	12	11	8	6	6	6	7	28
>1 ha	14	14	14	10	7	6	5	5	
Non-agriculture									
Lower-level rural	17	16	15	13	9	9	15	16	16
Higher-level rural	2	3	4	8	12	12	7	5	5
Non-labour-force rural	2	3	4	5	2	3	5	7	7
Lower-level urban	8	11	12	13	13	12	14	16	17
Higher-level urban	3	5	6	9	12	11	9	5	5
Non-labour-force urban	1	2	3	4	3	3	5	9	9
Total	100	100	100	100	100	100	100	100	100
Total population (million)	95.3	130.5	147.5	164	179.2	188.4	207.4	224.5	234.2

Source: BPS, *Sistem neraca social ekonomi Indonesia* (Social Accounting Matrix), Various issues.

Note: 1960 is backward extrapolated with the growth trend from the later period.

Note: The data in the sources not always sum up exactly to 100%. Therefore we rescaled all categories in such a way that they exactly make up 100%. Also, one can find a few small jumps in the data. We do not change these as a) these are borne out from the sources, b) they correspond directly to the expenditure shares from Table 4 and, c) any changes do not significantly affect the calculated Gini coefficients.

Note: the subdivision of landowners is unavailable for 2008.

Table 3 *Overview of main household expenditure surveys in Java/Indonesia, 1927-1962*

Source	Sample households		Region	Year(s)
	Number	Type		
Boeke (1927)	29	rural	Java (various parts)	1924-25
CKS (1928)	314	urban	Indonesia	1925
Rohrman (1932)	18	rural	Kraksaän (Probolinggo)	1932
CKS (1939)	95	labourers	Jakarta	1937
Huizenga (1958)	1,945	rural labourers	Java	1939-40
Sato (1994: 96)	421	farm	Tasikmadu (Malang, E. Java)	1942
Sato (1994: 102-3)	345	farm	Tumut (Bantul, C. Java)	1942
ILO (1967)*	2,639	urban	Jakarta	1957
ILO (1967)*	2,180	urban	Surabaya	1958
Sukamto (1962)	503	urban	Yogyakarta	1958-9

- *Obtained from the Ministry of Labour, Indonesia.

Table 4 *Shares in total consumption expenditure by household category (%)*

Household category	1932	1942	1953	1960	1975	1980	1985	1990	1993	1999	2005	2008
Agriculture												
Employee	5	8	5	4	6	5	4	4	4	6	6	5
Operator, landowner												
0 - 0.5 ha	8	1	4	6	13	14	14	18	16	9	9	
>0.5 - <1 ha	5	6	9	11	10	7	6	5	5	5	5	19
>1 ha	48	38	31	27	16	15	13	8	7	5	5	
Non-agriculture												
Lower-level rural	8	8	9	9	12	14	10	7	6	12	14	13
Higher-level rural	5	5	5	5	6	7	11	16	19	13	11	12
Non-lab.-force rural	12	14	12	10	3	3	4	2	2	5	5	5
Lower-level urban	1	5	8	10	15	17	16	12	10	19	18	19
Higher-level urban	6	13	15	16	17	15	17	25	28	21	20	22
Non-lab.-force urban	2	2	2	2	2	3	5	3	3	5	6	6
Total	100	100	100	100	100	100	100	100	100	100	100	100

Source: See text and Table 2; BPS, *Sistem neraca social ekonomi Indonesia* (Social Accounting Matrix), Various issues.

Note: The data in the sources not always sum up exactly to 100%. Therefore we rescaled all categories in such a way that they exactly make up 100%. Also, one can find a few small jumps in the data. We do not change these as a) these are borne out from the sources, b) they correspond directly to the population shares from Table 3 and, c) any changes do not significantly affect the calculated Gini coefficients.

Note: the subdivision of landowners is unavailable for 2008.

Table 5 *Gini coefficients on inequality*

	This study			WIID3.3			Leigh and Van der Eng[a]	
	Rural	Urban	Total	Rural	Urban	Total	Pareto distribution	Log-normal distribution
1880			0.39[b]					
1920							0.23	0.42
1925			0.32[c]				0.34	0.56
1930							0.38	0.60
1932	0.52	0.57	0.56				0.44	0.70
1939[d]	0.58	0.53	0.60					
1942	0.60	0.53	0.60				0.42	0.64
1953	0.51	0.49	0.55					
1959	0.46	0.47	0.51					
1964						0.39		
1970						0.35		
1975	0.16	0.31	0.28					
1976				0.31	0.35	0.34		
1978				0.34	0.38	0.37		
1980	0.13	0.27	0.24	0.31	0.36	0.34		
1981				0.29	0.33	0.33		
1982							0.27	0.47
1984				0.28	0.32	0.33		
1985	0.19	0.20	0.24					
1987				0.26	0.32	0.32	0.28	0.50
1990	0.15	0.20	0.24	0.25	0.34	0.32	0.29	0.49
1993	0.16	0.27	0.31	0.26	0.33	0.34	0.32	0.53
1996				0.27	0.36	0.36	0.32	0.53
1999	0.17	0. 23	0.32	0.24	0.32	0.31	0.38	0.61
2002							0.34	0.56

2005	0.16	0.19	0.34
2008	0.12	0.22	0.37

[a] "Pareto distribution" and "log-normal distribution" are estimated using the income shares of the x% richest persons under the alternative assumptions of Pareto or log-normal probability distributions, respectively (Appendix A.2).
[b] Van Zanden (2003)
[c] Calculated on the basis of Booth (1988, Table 7). This figure seems to be to low compared with the previous and subsequent estimates and does not accord with the observations made by Lindert and Williamson (2003). A Gini coefficient of 0.45, derived from data in Leigh and Van der Eng (2010), which are benchmarked on the expenditure Gini of 1932, therefore seems more appropriate.
[d] 1939 (using the 1934 ratio to correct for the omission of the income share of the wealthiest 10%)

Table 6 *Share of population below poverty line*

(%)

	This study 50% of median		World Bank (2007) $1/day		Booth (1993)	
	Indonesia	(million pers.)	Indonesia	East Asia and the Pacific (average)	BPS poverty line	Esmara poverty line
1880[a]	16.8	5.5				
1925[b]	7.0	4.0				
1925[c]	20.0	11.4				
1932	26.3	16.4				
1942	27.6	20.0				
1953	25.4	21.1				
1959	23.9	22.3				
1970						47.4
1975	9.4	12.2				
1976					40.1	45.2
1980	5.4	8.0	28.2		28.6	41.9
1981				57.7		
1984				39.0	21.6	37.3
1985	5.4	8.9				
1987				28.2	17.4	34.4
1990	6.2	11.1		29.8	15.1	
1993	10.2	19.1	17.4	25.2	13.7[d]	
1996			14.1	16.1		
1999	11.7	23.9		15.5		
2005	13.3	29.8			16.0[d]	
2008	15.4	36.2			15.2[d]	

[a] Gini - coefficient based on Van Zanden (2003) for Java.

[b] Gini coefficient based on Booth (1988) for Java.

[c] Alternative estimates for 1925 based on a Gini of 0.45 (see notes to Table 5) .

[d] Priebe (2014) Table 1

Figure 1 *Poverty rates, 1880-2008*

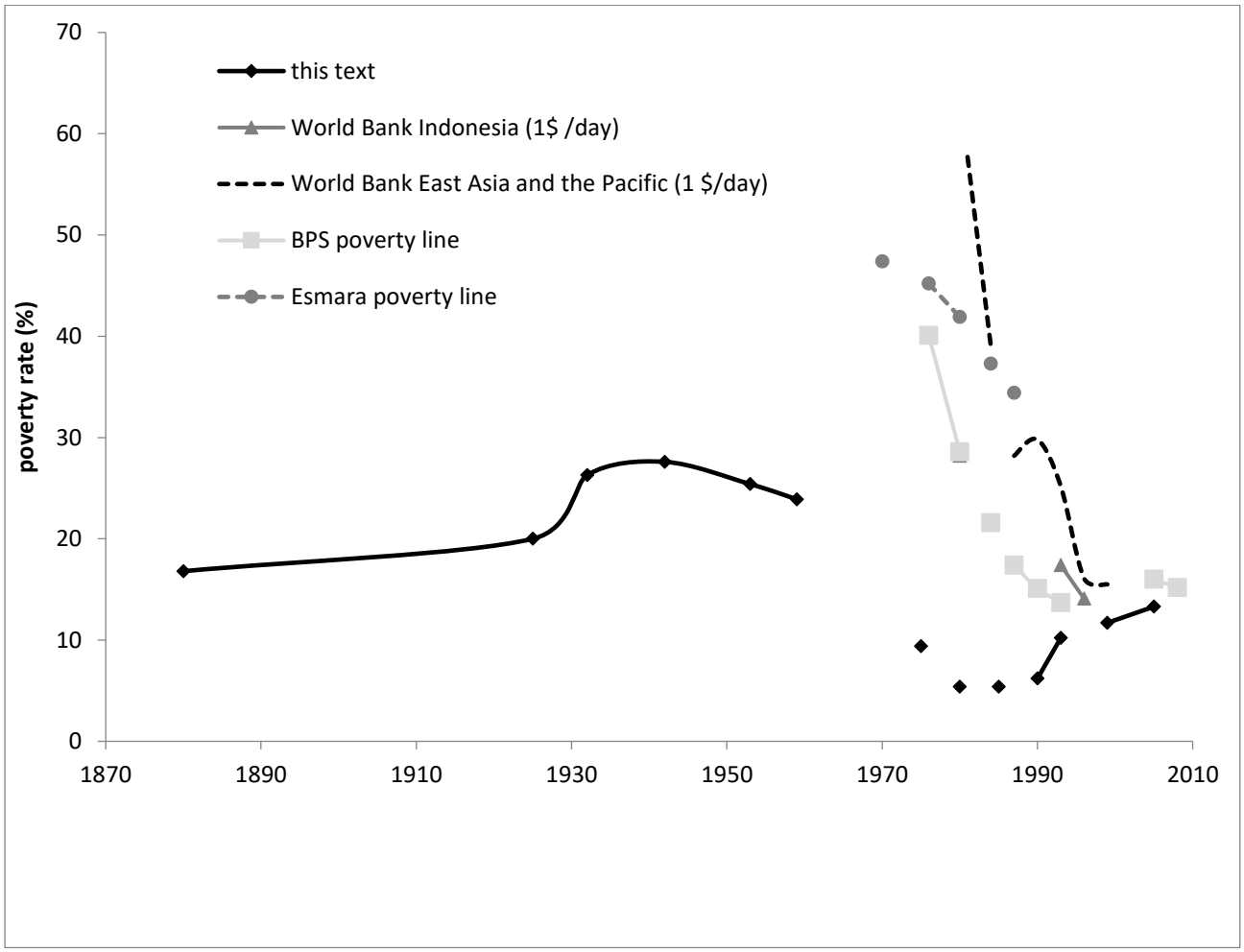

Table 7 *Annual distribution of growth and distributional changes to poverty (percentage point)*

	change in poverty	distribution effect	growth effect	residual
1880-1925	3.2	20.3	-10.7	-6.4
1925-1932	6.3	6.9	-0.8	0.1
1932-1942	1.3	0.1	1.3	-0.1
1942-1953	-2.2	-3.8	1.5	0.1
1953-1959	-1.5	0.4	-1.8	-0.1
1959-1975	-14.5	6.0	-11.1	-9.4
1975-1980	-3.9	4.2	-5.2	-3.0
1980-1985	0.0	1.5	-1.2	-0.3
1985-1990	0.8	10.5	-3.9	-5.8
1990-1993	4.0	10.5	-3.4	-3.1
1993-1999	1.6	3.7	-1.8	-0.3
1999-2008	1.5	8.9	-5.1	-2.3

Note: Changes in poverty calculated on the basis of the Ginis from Table 5.

Figure A1: Gini Coefficients in Indonesia, 1880-2010