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Distribution of Consumption Expenditure in East Asia

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Abstract

Using a new database of household surveys, this paper examines inequality among all individuals living in developing East Asia regardless of their country of residence. The East Asian Gini index increased from 39.0 in 1988 to 43.3 in 2012. Inequality increased during the initial decade, regardless of the choice of inequality measure. The trend appears to have reversed in the mid-2000s. Regional inequality is now almost entirely explained by within-country differences, while gaps in average income across countries have become unimportant. This reversal has been driven by rising national inequality especially in populous countries, counteracted by catch-up growth in average incomes, particularly in China. Interpersonal differences in income at the regional level have thus become internalized within national boundaries.

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Distribution of Consumption Expenditure in East Asia

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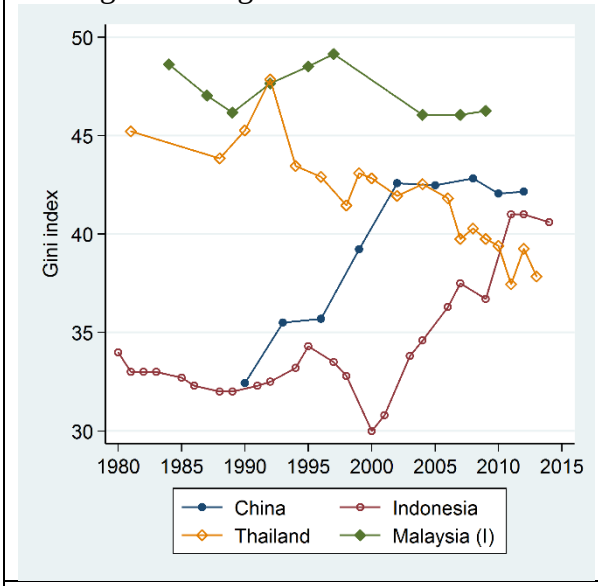
I. INTRODUCTION

East Asia is home to a number of populous countries that have seen steep increases in national inequality over the last quarter century. Figure 1a shows long-run changes in the national Gini index for a number of countries in the region for which long-run data are available. China's Gini index increased sharply by some 10 points between 1990 and the early 2000s. Indonesia experienced an increase of a similar magnitude, beginning a decade later. However, inequality did not increase in all countries; Thailand has managed a continued reduction in the Gini index, which has also been observed in Malaysia (albeit at a slower pace). For the average country in the region, the national Gini fluctuated considerably, as shown by the solid blue line in Figure 1b. In the latest period, however, there appears to be evidence of falling national inequality in the average country. Furthermore, the Gini index fell by more than 1 point in five out of seven countries with comparable surveys between 2008 and 2013.[2]

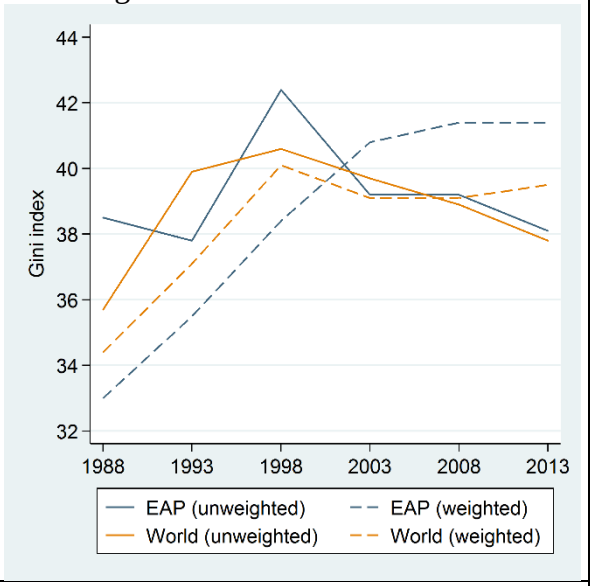
Figure 1: National inequality in East Asia

a. Long-run changes in national Gini index



Note: The welfare aggregate in Malaysia is income; in all other countries it is consumption expenditure.

b. Average national Gini index



Note: Averages for the unbalanced sample of countries. Global averages shown for comparison.

Source: Calculations based on World Bank (2016) and PovcalNet.

In this paper, we adopt a different perspective for studying inequality in East Asia. We ignore national boundaries and examine the *East Asia-wide* distribution of consumption expenditure among individuals, and how it changed between 1988 and 2012. By combining national household surveys from as many East Asian countries as possible, we can measure the inequality among all East Asian citizens regardless of their country of residence. Our analysis puts the disparities in living standards that exist among persons in East Asia into context with the disparities that exist within and between East Asian countries.

[2] In China, the Gini changed by less than 1 point, which is unlikely to be significant, while inequality increased in the Lao People's Democratic Republic. For comparison, between 1993 and 2008, the Gini index increased (fell) by more than 1 point in five (three) out of nine countries. See World Bank (2016) for more detailed results.

Implicit in our analysis is an East Asian social welfare function which treats persons irrespective of national borders. It is closely related to analyses of the global income distribution, which presumes a cosmopolitan social welfare function.[3] In opinion surveys, East Asia shows some of the highest levels of concern over inequality being too high (Ruggeri Laderchi et al., 2017). Similarly, an informal survey of policy makers in Asia shows a rising concern with inequality (Kanbur and Zhuang, 2012). This appears to be inconsistent with the within-country results presented in Figure 1, which showed a stable Gini index for the average country. However, as Alvaredo and Piketty (2014) argue in their analysis of inequality in the Middle East, inequality at the regional level could be important for explaining these growing concerns. This paper aims to provide the latest evidence on this regional inequality for East Asia.

Over the 25-year period, the East Asia and Pacific Gini index increased by approximately 4.2 points (or 10.8%), reaching 43.3 in 2012. On the one hand, the strong growth in average consumption in China had an equalizing effect on (between-country) East Asian inequality. On the other hand, the increasing region-wide inequality trend is explained mainly by rising within-country inequality in the two most populous countries, China and Indonesia. This is consistent with the trend in the population-weighted average Gini index in Figure 1b (dotted blue line), which captures national inequality for the average person in East Asia. In other words, while inequality has been approximately flat for the average country, it has increased strongly for the average person and, as this paper shows, for the region as a whole. Considering how growth was shared along the distribution, we find that the growth incidence was broadly pro-rich – in line with the observed increase in inequality. The pattern of growth was such that the richest 5% of East Asians received more than 20% of the gain in regional income, compared with less than 1% for the poorest 5%. In the most recent period, however, the upward trend in regional inequality appears to have reversed, as within-country inequality has stopped increasing.

The paper is structured as follows. First, we explain the construction of our database from household surveys. Second, we study the regional distribution, its inequality and the contributions of within- and between-country differences. Third, we examine both relative and absolute gains along the distribution using growth incidence curves. Fourth, we analyze relative movements of specific country groups in the regional distribution, and the resulting changes in the regional composition. The Appendix includes further methodological details, and robustness checks.

[3] The literature on global inequality is reviewed in Milanovic (2005), Atkinson and Brandolini (2010), Anand and Segal (2015) and Milanovic (2016). Similar to our paper, Ravallion (2014a) estimates inequality in the developing world.

II. DATA CONSTRUCTION

The analysis focuses throughout on the developing countries in East Asia and the Pacific (EAP, or "East Asia" for brevity), as defined by the World Bank.[4] The starting point of our data set is a set of harmonized household survey data by the World Bank, which we supplement with additional data from PovcalNet.[5] In total, we use 60 surveys, with 31 surveys directly from the microdata and the remainder from PovcalNet. Because most countries do not conduct annual surveys, we match these surveys to a number of benchmark years – 1988, 1992, 1997, 2002, 2007, and 2012.[6] Due to limited availability of microdata, all information for the first two benchmark years is entirely based on PovcalNet. For China, no microdata are available, so all data come from PovcalNet.

Our database includes around 10 surveys per benchmark year out of a total of 19 EAP countries, and 92% of the surveys are consumption surveys (Table 1).[7] Given our interest in estimating the EAP distribution of consumption expenditure, it is of course important that the surveys included in our database cover as much of the region as possible. On average, we cover about 98% of regional GDP, and at 97% a slightly lower share of the regional population (Table 1).[8] While we have a good coverage of EAP as a whole, our coverage of Pacific countries is relatively low and unstable.[9] The Appendix includes a robustness check using only those countries that are available in all benchmark years.

Each national distribution is approximated by the average consumption of the 100 percentile groups. For the microdata, percentile groups are computed directly from the household survey. PovcalNet also reports percentile groups whenever it has access to micro data. However, in some cases it only has access to grouped data, such as 10 or 20 coordinates of the Lorenz curve. The reliance on grouped data has diminished over time, but for some countries, such as China,

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[4] That is, our analysis includes Cambodia, China, Fiji, Indonesia, Kiribati, Lao PDR, Malaysia, Marshall Islands, Myanmar, Micronesia, Mongolia, Palau, Papua New Guinea, the Philippines, American Samoa, Solomon Island, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, and Vietnam. High-income countries in the region, such as Japan; the Republic of Korea; or Taiwan, China, are not included in the analysis (see p. 49 of World Bank (2016) for the full list of high-income countries).

[5] Harmonized household survey data: EAPPOV created by the World Bank's EAP Team for Statistical Development, accessed on 18 January 2016. PovcalNet: online tool developed by the World Bank's research department, http://iresearch.worldbank.org/PovcalNet/, accessed on 25 November 2016.

[6] Similar to Lakner and Milanovic (2016), surveys need to be within two years of a benchmark year, and surveys in consecutive benchmark years must be at least three and no more than seven years apart from each other. Because of poor availability of surveys in earlier years, we cannot start before 1988.

[7] Throughout the analysis, income surveys are used for Malaysia, while all other countries use consumption. Similar to Lakner and Milanovic (2016), we mix income and consumption surveys across countries and make no adjustment. While we are fully aware of the important differences between the two concepts, income and consumption surveys cannot reliably be inferred from one another (Anand and Segal, 2015). Also, in an abuse of terminology, we refer to income and consumption interchangeably in this paper.

[8] We use the World Bank's income groups from 1 July 2015. Countries are classified according to their GNI per capita in 2014 using exchange rates based on the Atlas method.

[9] There are no surveys available for Pacific countries prior to 1997, and the coverage for 2012 is particularly low. Between 1997 and 2007, on average, our surveys cover about 60% of both the population and the total GDP of Pacific countries.

PovcalNet continues to rely on such data.[10] To obtain a consistent number of observations per country-year, we fit a parametric Lorenz curve to the quantile groups and build a data set of percentile groups throughout.[11] The Appendix includes a robustness check which uses the raw quantile data without fitting a parametric Lorenz curve.

Each percentile group is population-weighted in the analysis, so every person is assigned the average consumption expenditure of her percentile in the country-year distribution. Welfare is measured using per capita consumption expenditure (or income), expressed in 2011 PPP-adjusted USD (see methodological details in the Appendix). Because we compare consumption levels across countries it is important to account for differences in purchasing power across countries using purchasing power parity (PPP) exchange rates. For the same reason, welfare aggregates could also be adjusted for spatial price differences within countries, as recently discussed by Ferreira et al. (2016) in the context of estimating global poverty. In the baseline results, we follow the approach adopted in PovcalNet (Chen and Ravallion, 2010) and adjust for spatial price differences within China and Indonesia (see Appendix), but not in other countries in the region.[12] In the Appendix, we present robustness checks with further within-country spatial price adjustments between 2002 and 2012, as well as using the older set of 2005 PPP exchange rates.

[10] The number of quantiles per country-year ranges from 9 to 200, with an average of 71 across all years (and 36 on average in 1988).

[11] We fit a log-normal Lorenz curve to the quantiles and use it to generate a distribution of 10,000 points. We use the 'ungroup' Stata routine (Abdelkrim and Duclos, 2007) which implements the Shorrocks and Wan (2008) method. As described in more detail in Lakner et al. (2014), this is very similar to the approach used by PovcalNet in the measurement of global poverty. Fitting a parametric Lorenz curve is more robust than fitting a kernel density (Minoiu and Reddy, 2014).

[12] We thus have a consistent spatial price adjustment over time. One reason why PovcalNet adjusts for spatial price differences in China is that rural and urban surveys were conducted separately until recently.

Table 1: East Asia and Pacific sample summary statistics							
	Benchmark year						Total
	1988	1992	1997	2002	2007	2012	
Number of surveys	5	8	9	11	16	11	60
Years between survey year and benchmark year (%, by benchmark year)							
-2	0.00	0.00	0.00	0.00	6.25	0.00	
-1	20.00	12.50	22.22	9.09	12.50	22.22	
0	40.00	37.50	33.33	63.64	31.25	33.33	
1	20.00	37.50	33.33	9.09	37.50	33.33	
2	20.00	12.50	11.11	18.18	12.50	11.11	
Within +/- 1 of benchmark	80.00	87.50	88.88	81.82	81.25	88.88	
Income vs. Consumption surveys (%, by benchmark year)							
Consumption	80	87.5	88.89	90.91	93.75	100.00	91.67
Income	20	12.5	11.11	9.09	6.25	0.00	8.33
GDP (in 2011 PPP-adjusted USD) (% of regional GDP represented in the database)							
EAP	95.00	99.02	99.55	99.38	99.48	96.30	98.12
East Asia	95.78	99.80	99.79	99.61	99.50	96.56	98.51
CHN, IDN, PHL only	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Other East Asia	76.92	99.00	98.79	97.19	95.83	60.71	88.07
Pacific islands	0.00	0.00	55.88	32.71	92.36	3.98	30.82
LIC	0.00	100.00	0.00	100.00	100.00	100.00	66.67
LMIC	84.08	97.82	99.66	96.49	96.73	94.43	94.87
UMIC	98.81	99.45	99.79	99.97	99.99	96.59	99.10
Population (% of regional population represented in the database)							
EAP	94.39	99.47	99.21	96.92	97.30	95.31	97.10
East Asia	94.75	99.86	99.32	97.28	97.31	95.81	97.39
CHN, IDN, PHL only	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Other East Asia	48.10	98.61	93.49	79.28	79.69	68.68	77.97
Pacific islands	0.00	0.00	72.53	20.06	95.73	3.41	31.95
LIC	0.00	100.00	0.00	100.00	100.00	100.00	66.67
LMIC	76.25	98.42	99.74	87.23	89.10	87.64	89.73
UMIC	99.75	99.75	99.93	99.99	99.99	97.91	99.55

Notes: The last column is the (unweighted) average over the benchmark years 1988 to 2012.

III. EAST ASIAN DISTRIBUTION AND ITS INEQUALITY

Figure 2 shows the EAP distribution of consumption expenditure and how it evolved over time. It moves towards a unimodal distribution which looks approximately log-normal although it has a long right-hand tail. The (almost) twin peaks observed in the earlier benchmark years smoothed out over time. As shown by the rightward movement of the distribution, there was particularly strong growth since 2002, which is also illustrated by the positive Growth Incidence Curves (GIC) in Section IV (Figure 7). At the same time as the distribution moved rightwards, it also stretched out suggesting an increase in inequality.

As a first step towards explaining these changes in the overall distribution, we split up the overall density by country and sub-region (Figure 3).[13] It is immediately apparent, that China dominates the regional distribution, accounting for around 70% of the regional population. It is also clear that China has seen very fast growth, followed by the rest of East Asia – excluding Indonesia and the Philippines. While in 1988 the modal Chinese income was below the EAP mode, in 2012 it was clearly above. These compositional changes are analyzed in more detail in Section V (see Figure 10).

Compared with within-country inequality in the region, the Gini index of the EAP-wide distribution of consumption expenditure is high, at between 39 and 45 across the benchmark years (Table 2, Panel A). For example, in benchmark year 2012, the (unweighted) average within-country Gini is around 38 (Table 2, Panel I), and none of the included EAP countries have a Gini greater than the EAP-wide Gini.[14] It is important to note that the trend of the average within-country Gini changes from declining to increasing, once population weights are used, implying an increasing Gini in populous countries (also see Figure 1 in the introduction). Over the entire period of analysis, the EAP-wide Gini index has increased by almost 11%. By contrast, the (unweighted) average within-country Gini has fallen somewhat by around 2%. In other words, within-country inequality for the average EAP country declined slightly, while the region-wide inequality increased.

The Lorenz curve for 1997 is uniformly to the right of the 1988 curve without crossing (Figure 4), so inequality increased between 1988 and 1997 irrespective of the choice of inequality measure (Atkinson, 1970). This appears to have reversed in the most recent period (2007-2012) when the Lorenz curves moved inwards. Between 1997 and 2012, however, there is no unambiguous ranking of Lorenz curves, so the direction of change in inequality depends on the choice of inequality measure. Similarly, when looking at the entire period between 1988 and 2012, the ranking in terms of inequality depends on the choice of inequality measure. That is, the Lorenz curve for 2012 crosses to the left of the 1988 curve at around the 95th percentile – suggesting that inequality increased at the bottom. This is also confirmed by the alternative GE inequality measures in Table 2, Panel A. The bottom-sensitive GE(0) measure increases by 26% between 1988 and 2012, while the top-sensitive GE(2) declines by around 36%. At

[13] Lakner and Milanovic (2016, fn. 31) explain in detail how these stacked densities are created.

[14] For the earlier benchmark years, there are only a few countries with a Gini higher than the EAP-wide Gini: Malaysia (although it uses income surveys), the Philippines and Thailand before the 1997 financial crisis, Papua New Guinea in 1997 and Solomon Islands in 2007.

the same time, the Gini index, which is sensitive around the middle of the distribution, increased by almost 11%, as already discussed.

Figure 2: The EAP distribution of consumption expenditure

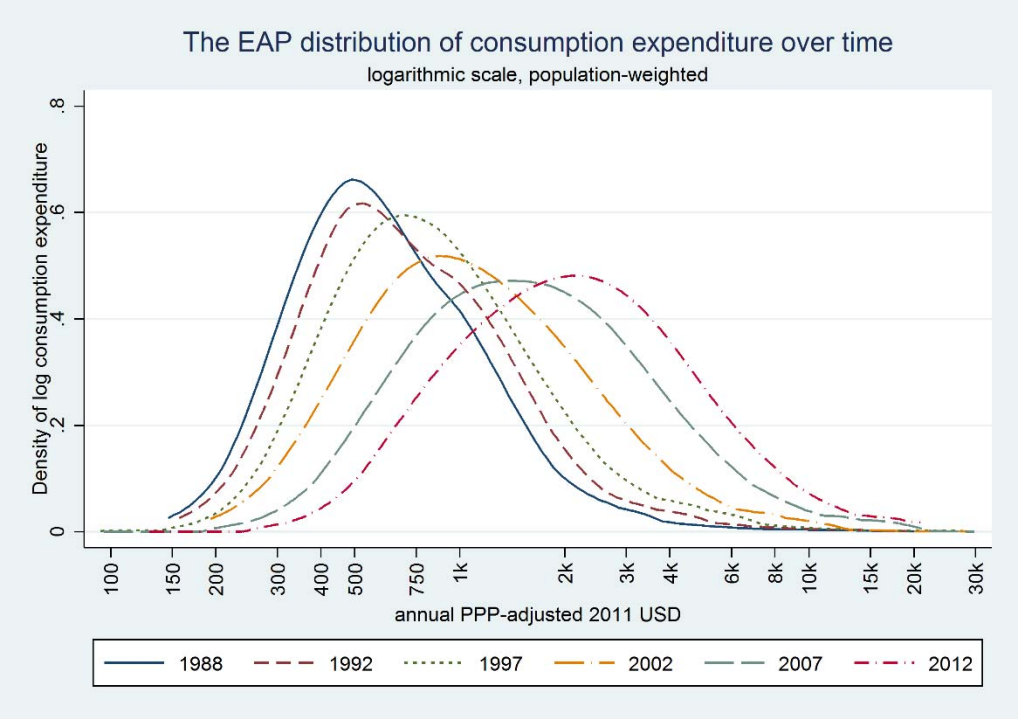
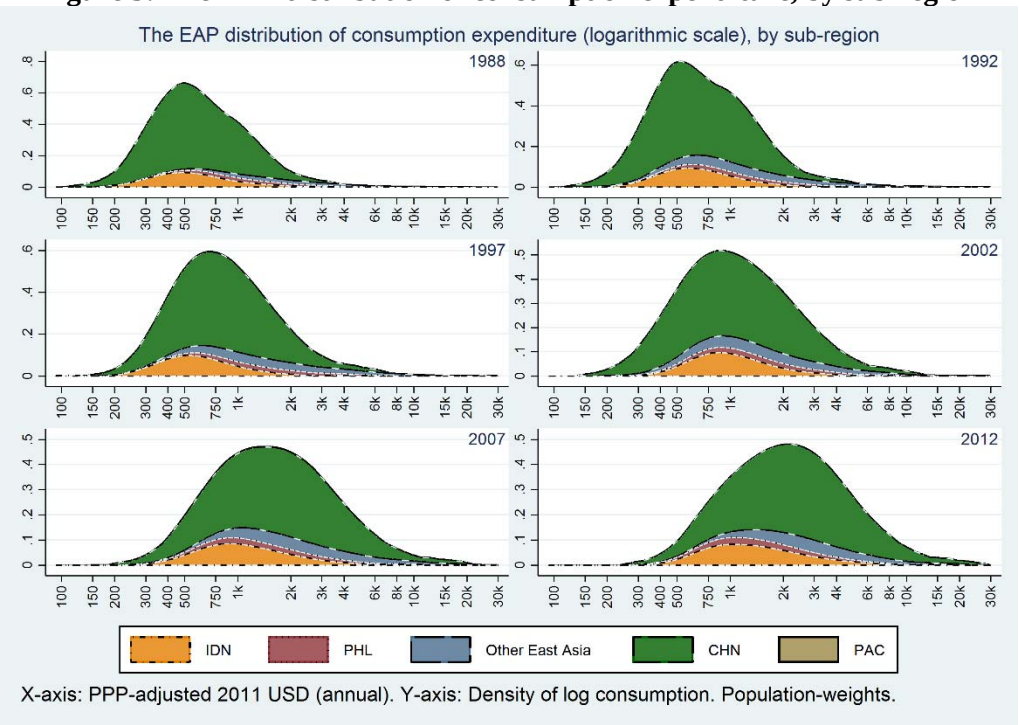


Figure 3: The EAP distribution of consumption expenditure, by sub-region



However, it is important to point out that the 1988 and 2012 Lorenz curves cross at a very high income level. It is well established that the GE(2) measure is sensitive to extreme values (Cowell and Flachaire, 2007). Hence it is important to understand whether the disagreement over the direction of change in inequality happens over a meaningful range of preferences. This can be done by examining the direction of change in the Atkinson index $A(\varepsilon)$, another inequality measure, for different values of ε, the inequality aversion parameter. The gap between the Atkinson indices in 1988 and 2012 falls with ε (not shown), i.e. with very low aversion, inequality levels are very similar in the two years. The minimum value for which ε is typically reported is around 0.25 (e.g. by the US Census Bureau, see Proctor et al., 2016). Even with $\varepsilon = 0.1$, which is a very low level of inequality aversion (and thus a low weight is attached to lower incomes), the Atkinson index increased by 5% between 1988 and 2012.[15] Therefore, while there is no strict Lorenz dominance between 1988 and 2012, the standard measures all agree that inequality increased.

Overall EAP inequality can be decomposed into two components, which arise from income differences within and between countries, respectively. Between 1988 and 2012, the between component of the GE(0) measure declined, while the within component increased both in levels and as a share (Table 2, Panel B).[16] Therefore, the increase in overall EAP inequality appears to be driven by increasing inequality within countries, in particular among those with a high population share, which is consistent with changes in the population-weighted Gini index. As a result, the contribution of consumption differences within countries to total inequality rose from 68% to 92% (Table 2, Panel C).

This evolution of within-country inequality is stronger than the results at the global level, where within-country inequality also increased but between-country differences remain the dominant source of inequality (Lakner and Milanovic, 2016). It is perhaps not surprising that between-country differences matter more at the global level compared with a regional analysis, as one might expect countries' average income or consumption levels to be more similar within a region.

A similar analysis of regional inequality in Sub-Saharan Africa (Jirasavetakul and Lakner, 2016) shows a higher level of inequality than in East Asia, with the African Gini index increasing from 52 in 1993 to 56 in 2008. In contrast to EAP, Africa's within-country component gradually declined, or put differently the increase in overall Africa inequality has been driven mainly by increasing inequality between countries (i.e. differences in growth rates

[15] Atkinson (1975) provides the following intuition in terms of a transfer between two people, one of whom has twice the other's income. For someone whose aversion parameter $\varepsilon = 0.1$, a transfer of \$1 from the rich to the poor person would only be acceptable if \$0.93 reaches the poor. With $\varepsilon = 0.25$, the requirement would be \$0.84 for every \$1 transfer.

[16] The measures of inequality in the GE-class are additively decomposable by subgroup. The decomposition of GE(0) uses population shares, while the decomposition of the GE(1) index is in terms of consumption shares. Therefore, the within-country component of GE(0) can be interpreted as the residual inequality after equalizing average consumption across EAP (Anand and Segal, 2008).

across countries).[17] But similar to EAP, within-country inequality still explains most of overall Africa-wide inequality (around 60%).

The GE(0) country-decomposition is the sum of the within and between contributions of every country, so we can analyze these contributions separately, as done in Figure 5. The total level of inequality, which has increased over time (also see Table 2, Panel A), is given by the total width of the bars. For some of the smaller countries, we have combined the contributions together. The within component is always positive, but the between component is negative when the country's mean exceeds the overall EAP-wide mean.

It is clear that within-country inequality has increased in China and Indonesia, while it is harder to tell for smaller countries. 77% (13%) of the increase in within-country inequality from 0.17 in 1988 to 0.29 in 2012 (Table 2, panel B) was driven by China (Indonesia). At the same time, due to its growth in average consumption, China's contribution to differences between countries has declined strongly (Figure 5, orange bars) – so much that it became negative in the most recent year. Both Other East Asia (Figure 5, green bars) and China have moved closer to regional average consumption, but from opposite directions – the excess of Other East Asia in terms of average consumption has declined.[18] By contrast, Indonesia's gap to the regional mean has increased (Figure 5, blue bars), because it could not keep up with the growth in the regional average.

Taken together, it is clear that the growth in average consumption in China has had an equalizing effect on EAP-wide inequality, while the accompanying increase in inequality in China had the opposite effect. Specifically, China's within-component increased from 0.13 to 0.22, while its between component declined from 0.14 to -0.04. Therefore, China's contribution to total GE(0) inequality actually declined (from 0.26 to 0.18, or from 104% to 58% of total regional inequality), which is entirely driven by its growth in the mean. This equalizing effect from China was more than counteracted by the other countries, resulting in an increasing GE(0) overall.

These results, specifically on the direction of regional inequality as well as its country decomposition, are robust to a number of methodological checks. In the Appendix, we explain and estimate four robustness checks – (1) within-country price differences for a larger set of countries, (2) 2005 PPPs, (3) a balanced sample of countries, and (4) the raw data without a parametric Lorenz curve.

[17] As explained in Jirasavetakul and Lakner (2016), this comparison of the between-country contribution is robust to using the method introduced by Elbers et al. (2008), which is particularly useful in settings where the number of groups and their relative sizes vary across comparators.

[18] Of course, this does not imply that average consumption of Other East Asia has actually fallen. However, as Table 2, Panel H, shows, average consumption in Other East Asia has grown slower than the EAP-wide average – growth of 43%, compared with 265% for EAP.

Figure 4: EAP Lorenz curve

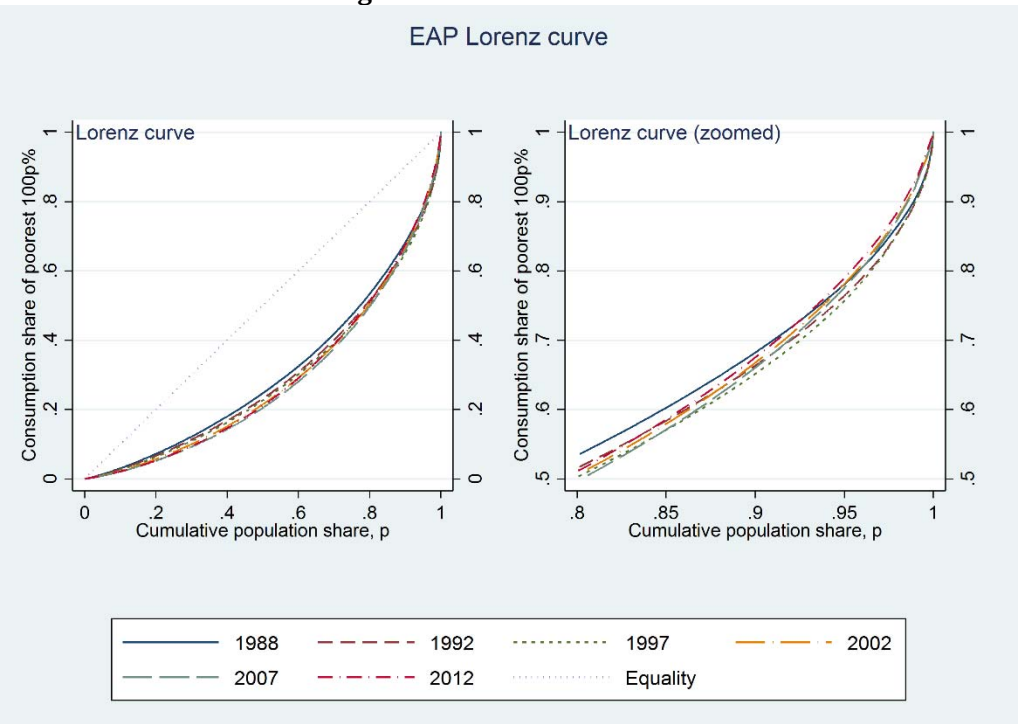


Figure 5: EAP inequality decomposition, by sub-region

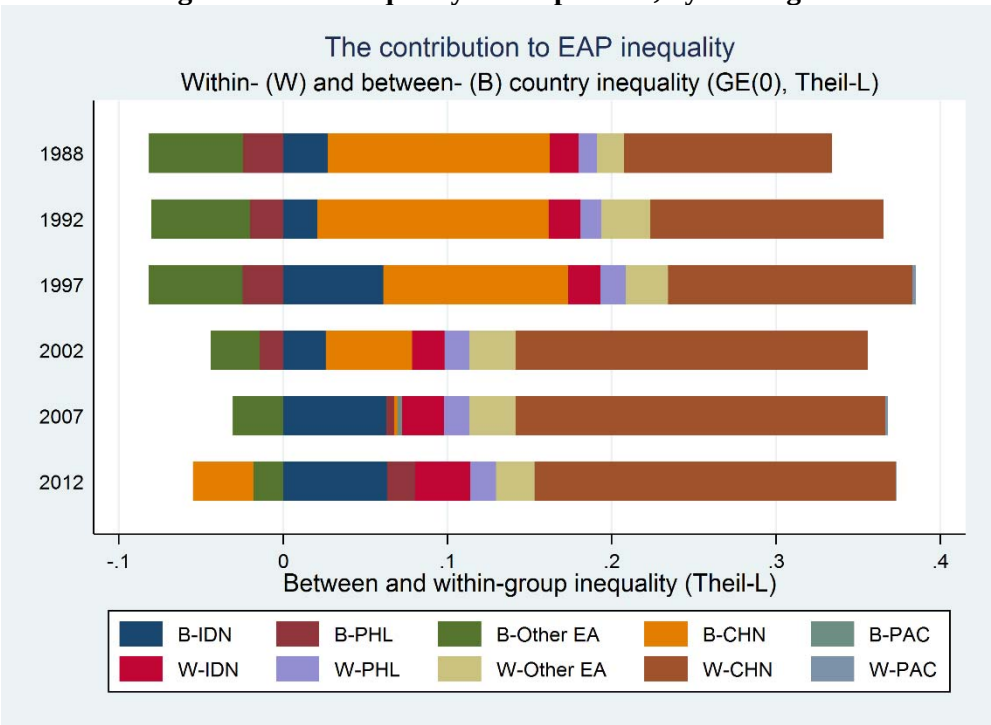


Table 2: East Asia and Pacific inequality

	1988	change (%, pp)	1992	change (%, pp)	1997	change (%, pp)	2002	change (%, pp)	2007	change (%, pp)	2012	1988-2012 change (%, pp)
A. Regional inequality												
Gini index (%)	39.04	6.19	41.46	2.99	42.70	1.17	43.19	3.34	44.64	-3.06	43.27	10.84
GE(0) (Theil-L)	0.25	13.04	0.29	6.23	0.30	2.83	0.31	8.23	0.34	-5.74	0.32	25.99
GE(1) (Theil-T)	0.32	12.81	0.37	4.90	0.38	-10.44	0.34	5.97	0.36	-8.89	0.33	2.33
GE(2)	0.75	16.01	0.87	5.12	0.91	-38.48	0.56	4.23	0.58	-17.87	0.48	-35.78
B. Country decomposition of GE(0): level of within- and between-country inequality												
GE(0) (Theil-L) (within)	0.17	18.74	0.20	3.62	0.21	31.28	0.28	6.55	0.30	-1.09	0.29	70.22
GE(0) (Theil-L) (between)	0.08	0.91	0.08	12.80	0.09	-62.67	0.03	21.84	0.04	-38.70	0.03	-68.26
C. Country decomposition of GE(0): within-country contribution in % (change is in percentage points)												
GE(0) within contribution	68.06	3.43	71.48	-1.76	69.72	19.29	89.01	-1.38	87.63	4.33	91.95	23.90
D. Absolute measures of inequality												
Absolute Gini index	312	26.12	393	25.78	495	30.25	644	55.45	1001.86	26.02	1262.58	304.79
E. Average annual consumption expenditure per capita (in 2011 PPP-adjusted USD), by percentiles												
Bottom 10%	246	8.59	267	15.90	309	11.03	343	35.31	465	31.30	610	148.27
P40-P50	538	12.37	605	21.71	736	28.10	943	48.22	1,398	35.09	1,888	250.80
P50-P60	624	16.48	727	19.84	872	31.73	1,148	50.46	1,727	33.97	2,314	270.66
P60-P70	753	17.53	885	18.78	1,051	35.73	1,427	50.71	2,150	32.47	2,849	278.30
P80-P90	1,192	18.74	1,416	23.81	1,753	40.74	2,467	52.73	3,768	29.51	4,879	309.24
P90-P95	1,581	21.83	1,926	31.93	2,541	35.59	3,445	55.54	5,358	28.54	6,887	335.72
P95-P99	2,500	28.07	3,201	33.44	4,272	37.88	5,890	44.40	8,505	23.70	10,521	320.87
Top 1%	7,712	24.87	9,630	20.52	11,606	25.15	14,525	20.51	17,505	16.32	20,361	164.01
H. Average annual consumption expenditure per capita (in 2011 PPP-adjusted USD), by region												
EAP	799	18.77	949	22.13	1,159	28.75	1,492	50.43	2,245	30.00	2,918	265.19
East Asia	799	18.77	949	22.13	1,159	28.73	1,492	50.74	2,249	29.75	2,918	265.21
CHN, IDN, PHL only	702	16.95	821	22.41	1,005	38.91	1,396	50.64	2,103	34.62	2,831	303.28
Other East Asia	2,621	-20.64	2,080	22.02	2,538	-9.81	2,289	50.33	3,441	8.75	3,742	42.77
Pacific islands	n/a	n/a	n/a	n/a	1,114	57.09	1,750	-21.37	1,376	31.10	1,804	n/a
Low income	n/a	n/a	1,238	n/a	n/a	n/a	1,428	17.30	1,675	18.03	1,977	n/a
Lower middle income	844	16.23	981	9.07	1,070	27.57	1,365	17.51	1,604	31.55	2,110	150.00
Upper middle & high income	790	18.73	938	26.23	1,184	29.05	1,528	59.55	2,438	30.35	3,178	302.28
I. Comparison with within-country inequality: Average within-country Gini index												
Avg. Gini (%)	38.55	1.76	39.23	1.67	39.89	-6.00	37.49	4.50	39.18	-3.48	37.81	-1.91
Avg. Gini (%) [pop-weighted]	32.46	8.57	35.24	1.35	35.72	13.30	40.47	2.62	41.53	-0.59	41.28	27.17

Notes: For the decompositions by country, changes between benchmark years are in percentage points. For all other rows, changes are measured in percent (not annualised). Observations are weighted using population. Using dataset of 100 percentile groups per country-year, based in part on a parametric Lorenz curve.

IV. EAST ASIAN GROWTH INCIDENCE CURVE

Over the past two decades and a half, average consumption in EAP as a whole increased by more than three times (or about 5.5% per annum). The EAP GIC over the period 1988 to 2012 (Figure 6) shows how this growth was distributed along the distribution.[19] For example, it shows how the average consumption of the bottom 5% in 1988 compares with the average consumption of the bottom 5% in 2012. With the exception of the very top ventile group, the growth incidence was pro-rich. More specifically, the annual growth of the bottom half was lower than the growth in the mean, while the annual growth rates were relatively high among the 12th to 19th ventile (60th to 95th percentile) groups.

Growth dropped significantly for the top ventile group. This is largely explained by its relatively low growth during the Asian financial crisis period, as shown by the GICs for the separate 5-year periods between benchmark years (Figure 7). The GICs are upward sloping for almost all periods. However, it is interesting that in the most recent period, which spans the global financial crisis, growth appears to have been slightly pro-poor.

It is important to stress that the discussion so far has focused on growth rates, or relative gains, which can imply very different absolute gains in expenditures. Figure 8 shows the EAP GIC but with absolute gains (per year) in expenditure on the vertical axis. It is thus equivalent to the difference between the Pen's Parades (or quantile functions) in 2012 and 1988.[20] The mean expenditure of the richest 5% of East Asians rose by nearly PPP-2011 $400 per annum between 1988 and 2012 (or more than PPP-2011 $7,000 over the entire period), compared with less than PPP-2011 $30 for the bottom 20% and around PPP-2011 $60 for the median group.

Figure 9 shows the same information somewhat differently – it shows how the total increase in consumption between 1988 and 2012 was distributed among the different ventile groups. For example, the top 5% received more than 20% of the gain, compared with less than 1% for the bottom 5%. It is striking, that the drop observed at the very top in the standard GIC (Figure 6) disappears completely when we consider absolute gains. In other words, the distribution of absolute gains has been strongly pro-rich.

The important distinction between absolute gains and growth rates can also be illustrated with a numerical example. The eleventh ventile (between 50th and 55th percentile) grew by 5.55% per year between 1988 and 2012, slightly faster than the top 5% (5.45%) (Figure 6). But the initial income of the eleventh ventile in 1988 was only PPP$601 compared with PPP$3,507 for the top 5%. By 2012, these two groups received PPP$2,196 and PPP$12,537 respectively. In other words, while both groups tripled their expenditures, one group gained PPP$1,595 while the other gained PPP$9,030, leading to very different improvements in livelihoods.

[19] Our definition of the GIC follows Lakner and Milanovic (2016) but is slightly different from the original definition by Ravallion and Chen (2003) who plot the growth rate of consumption of a particular fractile (e.g. the 5th percentile) not the fractile group (e.g. the poorest 5%).

[20] The Pen's Parade is the inverse cdf, i.e. it plots income on the vertical axis for various quantiles along the horizontal axis (Ravallion, 2014b). Instead of fractile incomes, we show the average incomes of a fractile group.

Figure 6: EAP Growth Incidence Curve (GIC), 1988-2012

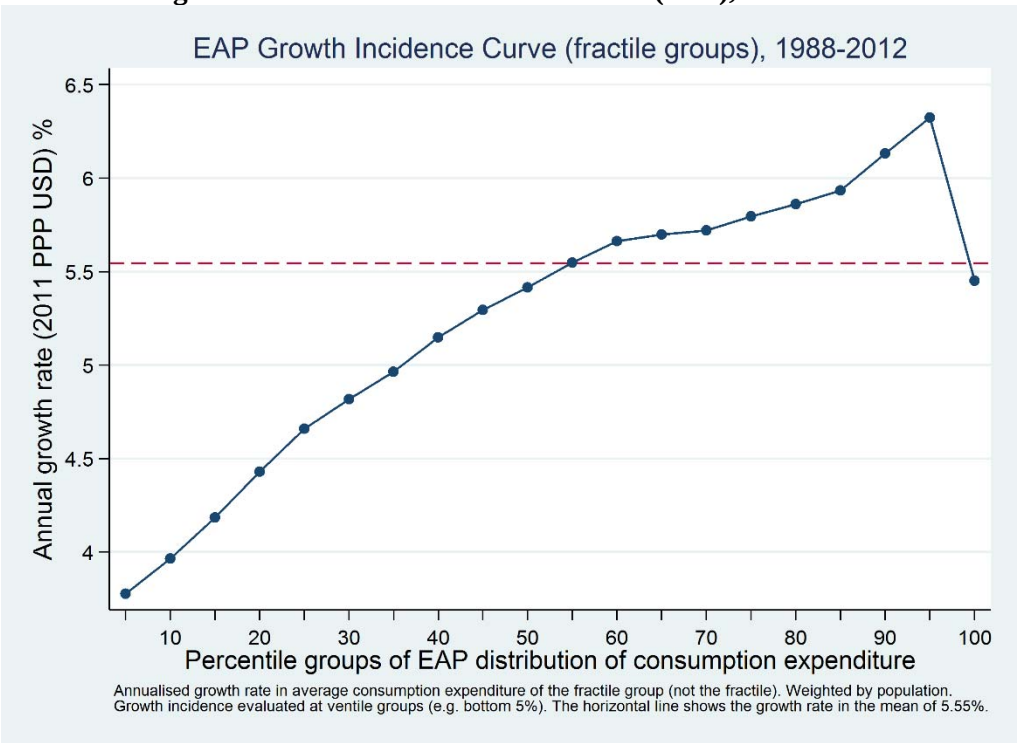


Figure 7: EAP GICs, between six benchmark years

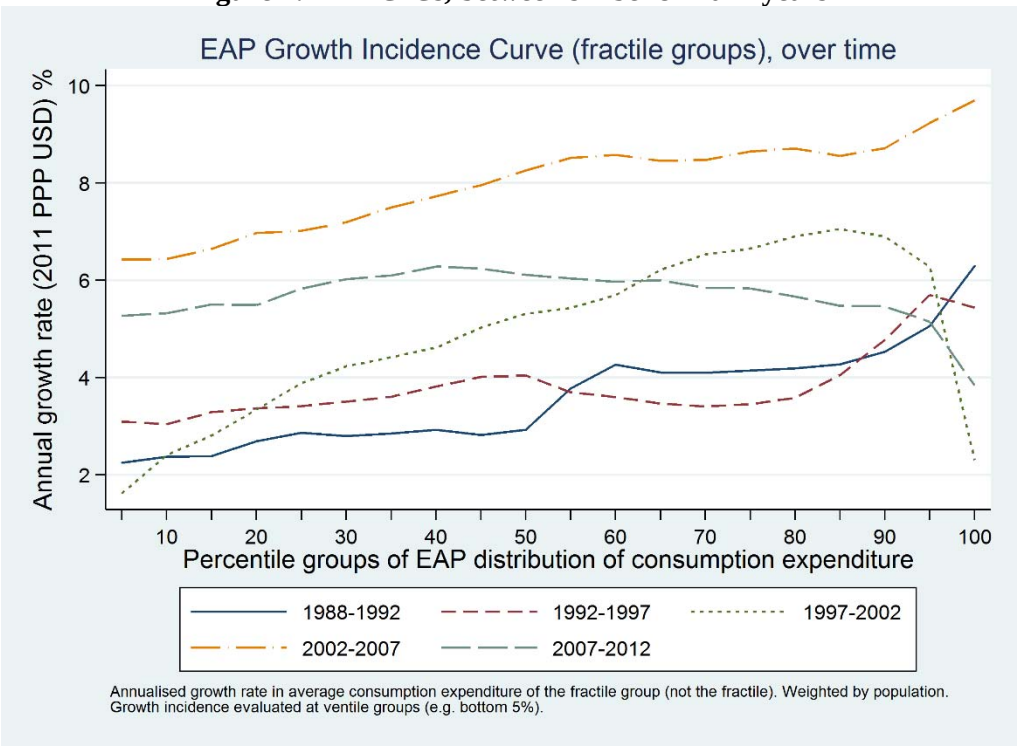


Figure 8: EAP absolute gains, 1988-2012

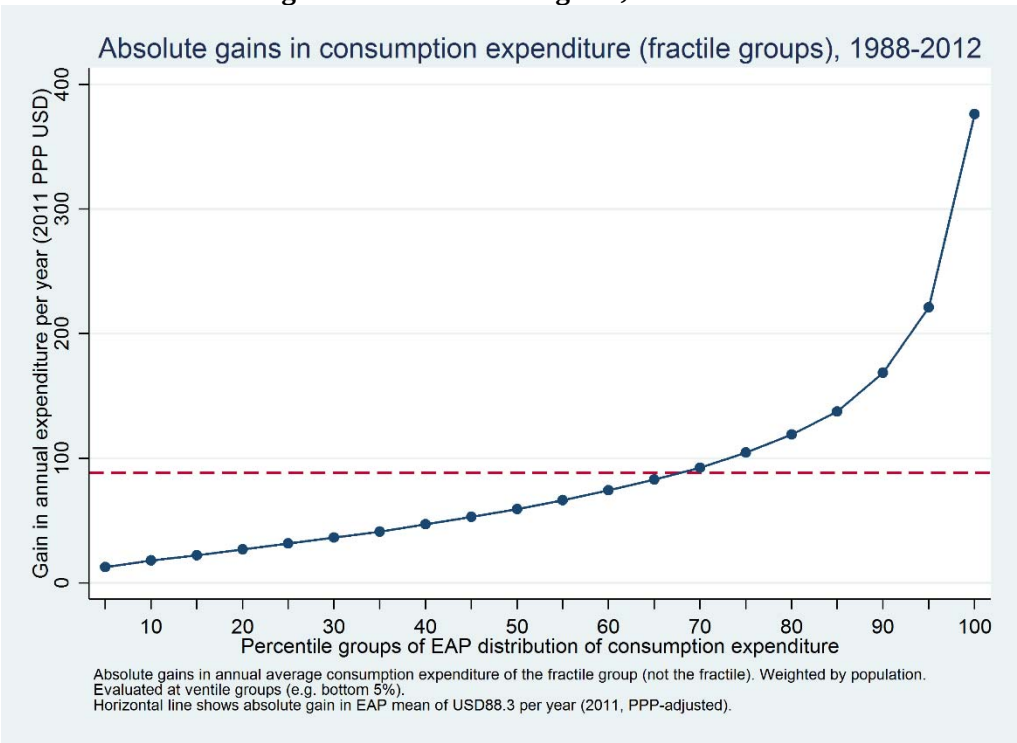


Figure 9: Beneficiaries of the gains in total consumption

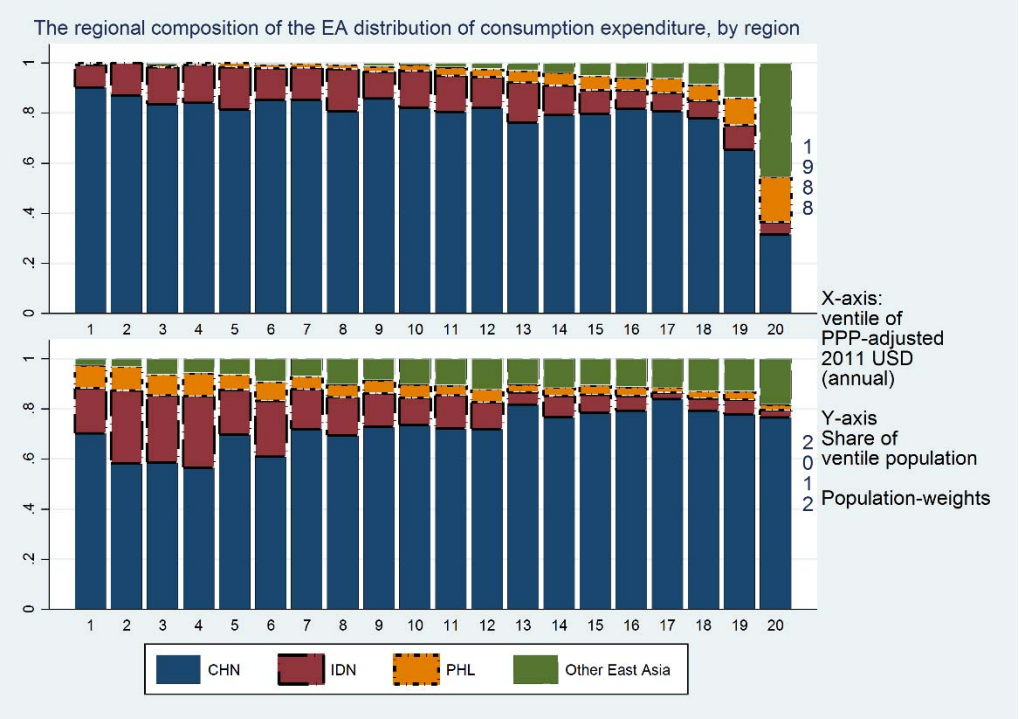
The discussion of absolute gains also has direct implications for the choice of inequality measure. The standard measures of inequality (e.g. Table 2, panel A) are relative measures, with the corresponding GIC in terms of relative gains (Figure 6). Relative measures are invariant to a proportional transformation, such as a doubling of all incomes, while an absolute measure is invariant to an additive change, such as adding $100 to all incomes (Kolm, 1976). Panel D of Table 2 reports the absolute Gini index, defined as $AbsGini(X) = Gini(X) \times \bar{X}$, where $Gini(X)$ is the relative Gini and $\bar{X}$ is the mean. This absolute inequality measure rose fourfold between 1988 and 2012, consistent with Figure 8. In sum, depending on one's view of inequality in relative or absolute terms, one would conclude that inequality rose moderately (e.g. Gini rose by 11%) or very strongly (e.g. absolute Gini increased by 305%).[21]

[21] With a relative view, you might even conclude that inequality has fallen, since there is no (relative) Lorenz dominance. The empirical evidence as to whether people perceive inequality as absolute or relative is mixed (Amiel and Cowell, 1999). In experimental studies, university students in Germany, Israel, the United Kingdom, and the United States are approximately evenly split between relative and absolute views of inequality (Ravallion, 2016).

V. CHANGING REGIONAL COMPOSITION

The GICs analyzed thus far are fully anonymous, i.e. they compare the average consumption of EAP-ventiles which could be composed of quite different country-percentiles. Figure 10 breaks the EA-wide distributions in 1988 and 2012 into 20 ventile groups, each accounting for 5% of the regional population.[22] The height of the bars indicates the population composition for each of these ventiles, e.g. in 2012 77% of the richest 5% of East Asians are Chinese, while 3% are from Indonesia and 2% from the Philippines. The composition of the top ventiles changed substantially over the 24-year period, with China moving up. It is these compositional changes which underlie the EAP-wide GIC (Figure 6). From the chart, it is also clear that China has grown faster than Indonesia and the Philippines, whose relative share at the bottom increased.

Figure 10: Regional composition of the EAP distribution of consumption expenditure



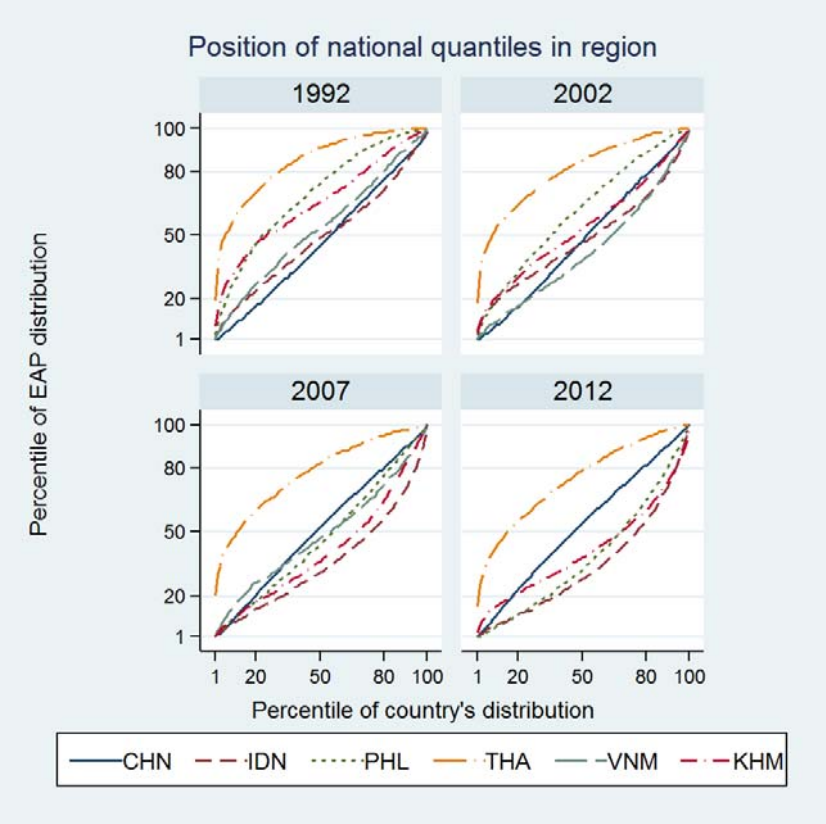
We can also directly evaluate the relative success of different country-percentiles by comparing their position in the EAP-wide distribution and how it changed over time. In Figure 11 the within-country position is shown on the horizontal axis, while the vertical axis plots the position in the regional distribution. For example, in 2012 the 20th percentile group in Thailand is around the median in the regional distribution. We have shown this for a number of countries and years, while this can obviously be repeated for every country-year. The China line shows

[22] For ease of interpretation, the figure does not show Pacific countries as a separate group due to the low population coverage although they are still included in the calculations. Furthermore, the chart does not account for changes in country-coverage of the sample. For example, another reason for the increasing share of Other East Asia at the bottom is the higher survey coverage of low- and lower-middle income countries in 2012.

up as an almost straight line, i.e. the national percentiles are almost identical to the regional percentiles. This is because China dominates the regional percentiles given its population size.

The percentile groups from Thailand have maintained their positions at the top of the regional distribution. By contrast, the Philippines, Indonesia and Cambodia have all lost out relative to the rest of the region (and relative to China, as we already saw in Figure 10). For example, in 1992 all percentile groups in Cambodia were richer than the corresponding Chinese groups. By 2012, this has changed completely, e.g. the Cambodian median is around the 30th regional percentile. On the other hand, Figure 11 shows a remarkable success story for Vietnam during the period 1992-2007.[23] In 1992 it was in a similar, or even slightly worse position than Cambodia. But with every year it appears to have moved towards the upper left corner (while Cambodia moved in the opposite direction during 2002 and 2007), so much so that in 2007 the bottom quintile in Vietnam seem better off than their Chinese comparators.

Figure 11: Regional composition of the East Asia distribution of consumption expenditure



[23] Due to a different welfare aggregate (applied after 2010), we do not show the 2012 results for Vietnam although they are still included in the aggregate results.

VI. CONCLUSION

By combining as many national household surveys as possible, this paper has studied the distribution of consumption expenditure among all individuals in (developing) East Asia. It thus complements analyses of inequality that are typically focused on inequality among individuals within the same country. The East Asian Gini index increased by more than 4 points (or almost 11%) between 1988 and 2012. The increase in inequality has been most pronounced during the initial decade (between 1988 and 1997).

Regional inequality can be decomposed into differences among individuals residing in the same country, and differences between countries. The within-country component has increased over this period, driven by increasing national inequality in some populous countries – China initially and Indonesia a decade later. On the other hand, differences between countries have declined, i.e. average incomes have converged across countries. This can be explained by the rapid growth in China closing the gap with the regional average income, which counteracted the inequality-increasing effects of some lagging countries such as the Philippines. China thus had both equalizing and disequalizing effects on East Asian inequality, through its growth in average consumption and national inequality, respectively. But the rapid growth in average income dominated, thus leading to a net equalizing effect.

As a result of these changes, the share of regional inequality that is explained by within-country inequality increased from two-thirds to close to 90%. At the global level, there has also been an increase in the within-country share, but at a much lower level – it increased from 20% to 35% over the same period (World Bank, 2016). Therefore, the situation within East Asia is already very close to an internalization of regional inequality within countries, in contrast to the global level.[24]

However, in the most recent period (2007-2012), which spans the Great Recession, regional inequality appears to have fallen slightly, consistently across different inequality measures. For the first time, the level of within-country inequality has stopped increasing, or might have even fallen slightly. But it is important to point out that there are at least two reasons why our data might be underestimating levels and increases in within-country inequality.[25] First, household surveys tend to underestimate top incomes. The limited evidence that is available for the region suggests that top incomes might be rising quickly in recent years (Lakner and Ruggeri Laderchi, 2017). Second, our use of consumption expenditure might underestimate living standards at the top. The rising national savings rate in China (Ma and Yi, 2010) suggests that inequality in incomes would have increased faster than in terms of consumption. Therefore, while our results are robust to a number of methodological checks, we leave (at least) two important issues for future research and caution that the recent trend reversal should be interpreted carefully.

[24] Bourguignon (2015) and Milanovic (2016) write that if the trends of falling between-country and increasing within-country inequality continue, one could get a situation where within-country inequality accounts for global inequality entirely, i.e. global inequality becomes "internalized" within countries. This would resemble the pattern of global inequality in the early 19th century (Bourguignon and Morrisson, 2002).

[25] The effect on between-country inequality is a priori ambiguous.

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APPENDIX

A. Methodological Details

PovcalNet reports incomes in 2011 PPP-adjusted USD. For the microdata, which reports consumption expenditure in local currency units, we apply the same method as PovcalNet: We use the local consumer price index (CPI) to deflate consumption to 2011 domestic prices, and the 2011 PPP conversion factors for private consumption to convert into 2011 PPP-adjusted USD. We obtain the CPI from EAPPOV created by the World Bank's EAP Team for Statistical Development, and the PPP exchange rate from the World Development Indicators.

Adjustment for spatial price differences

For China and Indonesia, PovcalNet reports rural and urban distributions separately, and we fit separate log-normal Lorenz curves to each. We create percentiles for the national distribution by combining these Lorenz curves, weighting by the appropriate rural/urban populations, and using PPP exchange rates which adjust for spatial price differences. For China we follow this procedure for all years, while for Indonesia we directly use the microdata (with spatial adjustment) in the last three benchmark years.

Lakner et al. (2015) describe how to derive urban and rural PPP exchange rates in general. We use the following 2011 PPP exchange rates, which are implicit in the World Bank's poverty monitoring (Ferreira et al., 2016) (national PPP exchange rates are shown for comparison): China: rural: 3.04, urban: 3.90, national: 3.70; Indonesia: rural: 3,666.16, urban: 4,360.48, national: 4,091.94. The corresponding 2005 PPP exchange rates, which are used in the robustness check below, are as follows: China: rural: 2.98, urban and national: 4.09; Indonesia: rural: 3399.68, urban: 4795.88, national: 4192.83.

In some years, PovcalNet also reports national distributions for China and Indonesia (using 2011 PPP), which are constructed using a similar approach. We do not use these distributions because (1) they are not available in all years, and (2) we present results for both 2005 PPP (robustness check) and 2011 PPP (baseline) so we need to adopt a flexible approach. Comparing our results with PovcalNet's national distributions, we obtain somewhat lower within-country inequality in China, and larger inequality in Indonesia: In China, across the first five benchmark years for which PovcalNet reports national distributions, our Gini is on average 0.5 points smaller. In Indonesia, between 1988 and 1992 our Gini is on average 1.9 points greater. These differences could be explained by the different functional forms for the Lorenz curve. PovcalNet chooses between a General Quadratic and Beta Lorenz depending on the goodness of fit. Instead, we use a lognormal Lorenz curve, which Shorrocks and Wan (2008) have shown to fit better.

Estimates using 2005 PPP exchange rates

The conversion from 2005 to 2011 PPP-adjusted USD is given by Lakner and Milanovic (2016) and Jolliffe and Prydz (2015) as

$$PPP11exp_t = PPP05exp_t \times \frac{CPI_{2011}}{CPI_{2005}} \times \frac{PPP05}{PPP11} \qquad (1)$$

, where $PPP11exp_t$ ($PPP05exp_t$) is consumption expenditure in 2011 (2005) PPP-adjusted USD. CPI_{2011} is the CPI in 2011, $PPP11$ is the PPP conversion factor in 2011, and the 2005 terms are defined accordingly. The observations from PovcalNet, which are reported in 2011 PPPs, can be converted into 2005 PPPs by rearranging Equation (1).

For Micronesia, Mongolia and Tuvalu, 2005 PPP exchange rates are unavailable. Therefore, we have extrapolated the 2011 PPPs backwards to 2005 as follows

$$\widetilde{PPP2005} = \frac{CPI_{2011}^{US}}{CPI_{2005}^{US}} \times \frac{CPI_{2005}}{CPI_{2011}} \times PPP2011 \qquad (3)$$

, where CPI_t^{US} is the US CPI.

B. Results of Robustness Checks

We include four robustness checks on our main estimates of East Asian inequality. First, we allow for within-country price differences for a larger set of countries. Second, we check for the robustness to using the older set of PPP exchange rates for 2005. Third, we use a balanced sample of countries, i.e. those countries that are present throughout the period. Fourth, we use the raw data without assuming a parametric Lorenz curve.

In the main text, we follow PovcalNet and adjust for spatial price differences only within China and Indonesia. While this approach produces a consistent time series, it is arguably inconsistent to spatially adjust in some but not other countries. In Table A1 panel A, we control for within-country price differences in additional country-years, using the consumption aggregate that is used by the World Bank in its regional poverty monitoring. We can only do this for the micro-data which become available in 2002 and hence there is a break in the time-series. In other words, for (say) the Philippines the first three benchmark years are drawn from PovcalNet and unadjusted, while the last three benchmark years stem from micro-data and can thus be adjusted for spatial price differences. Some countries are never adjusted, either because no spatial adjustment is available or because they are always drawn from PovcalNet. For Thailand, Solomon Islands and Papua New Guinea (in 1997), no spatially deflated consumption aggregate is available. The most important countries used from PovcalNet (without an adjustment) are Malaysia (all years) and Mongolia (all years except the last year which is taken from micro-data).

The effects of the additional spatial adjustment are very small. As explained above, the first three benchmark years are identical since no additional adjustments are available.[26] In 2012, the EAP Gini index falls from 43.3 to 43.2 when using the additional spatial price adjustment. As expected, the level of within-country GE(0) inequality falls. But all the results regarding the direction of regional inequality, as well as its country decomposition, remain robust.

New PPP exchange rates become available periodically, reflecting new collections of international price data. Recently, the World Bank adopted the 2011 PPP exchange rates for its measurement of global poverty. Ferreira et al. (2016) provide a detailed explanation of how

[26] For these years, almost all surveys come from PovcalNet. The only country with micro-data is Papua New Guinea in 1997, but no spatial adjustment is available.

the World Bank adopted these new PPP exchange rates, and in particular how the international poverty line was updated. Panel C provides a robustness check of our regional inequality results when we use the older set of 2005 PPP exchange rates.

Using the 2005 PPPs has quite a large (predominantly downward) effect on the level of regional inequality, especially in the initial years.[27] The EAP Gini index drops by around 2 points during the first three benchmark years. In contrast, the EAP Gini actually *increases* in the last year. Taken together, its increase between 1988 and 2012 becomes even stronger at around 20%. The within-country component (of GE(0) inequality) falls very slightly due to the change in the relative urban-rural price levels for China and Indonesia.[28] But as expected the change in PPP exchange rates mostly affects the between-component. It falls strongly in the first three benchmark years but remains unchanged in 2007 and even increases in 2012. As a result the within-contribution is higher in the first three years but increases at a slower pace.

We obtain similar results when we use the balanced samples – regional inequality is lower especially in the earlier years, so the increase over time becomes even stronger. We present results for two balanced samples. Panel D only uses countries that are present in every year during the entire period 1988-2012 which includes China, Indonesia, the Philippines and Thailand. Panel E lowers this requirement to the period 1992-2012, which adds Lao PDR and Vietnam to the sample. In sum, these results suggest that these sets of countries explain a substantial part of overall inequality, or that the omitted countries are not systematically different.

In the final robustness check (panel F), we use the raw PovcalNet data of quantile groups without fitting a parametric Lorenz curve. Some national distributions are now represented by (say) ventile groups instead of percentiles in the baseline. This would tend to reduce within-country, and thus regional, inequality. Using the raw data, the regional Gini is lower by around 1 point in 1988 and 1992, and around 0.1 points after that. The effect is largest in the earlier years, because PovcalNet contributes a larger number of countries.[29] Given that the two series are converging, the increase in the Gini index is larger in the raw data. In the baseline, the Gini increases by 10.8% between 2012 and 1988, while in the raw data it increases by 13.1%. The shape of the growth incidence curve (not shown) is also very similar in the two versions of the database.

[27] It is interesting to note that the 2005 PPP have the opposite effect on the global Gini index (Lakner and Milanovic, 2016), i.e. the global Gini using 2005 PPPs exceeds the one using 2011 PPPs. This difference can be explained by how the change in the PPPs affects the between-country component regionally and globally. In other words, the regional effect depends on how (say) China's price level moves relative to other East Asian countries, while the global effect depends on how it moves compared with the global mean price level.

[28] Using the PPP exchange rates given above, it is clear that the relative urban-rural price level has fallen between 2005 and 2011 (from 1.37 to 1.29 for China and 1.41 to 1.19 for Indonesia), i.e. prices increased faster in rural than urban areas. Without a change in the relative urban-rural price levels, within-country inequality would have remained unchanged. This is because in China and Indonesia urban and rural incomes would have been multiplied by the same factor, leaving a scale-invariant measure such as GE(0) unchanged.

[29] In addition, the number of fractile groups reported in PovcalNet increased over time. The average number of groups was 36 in 1988 compared with 71 across all years.

Table A1: East Asia and Pacific inequality - robustness checks												
	1988	change (%, pp)	1992	change (%, pp)	1997	change (%, pp)	2002	change (%, pp)	2007	change (%, pp)	2012	1988-2012 change (%, pp)
A. Regional inequality (from Table 3)												
Gini index (%)	39.0	6.2	41.5	3.0	42.7	1.2	43.2	3.3	44.6	-3.1	43.3	10.8
GE(0) (Theil-L)	0.25	13.0	0.29	6.2	0.30	2.8	0.31	8.2	0.34	-5.7	0.32	26.0
GE(0) within level	0.17	18.7	0.20	3.6	0.21	31.3	0.28	6.6	0.30	-1.1	0.29	70.2
GE(0) within contribution (%)	68.1	3.4	71.5	-1.8	69.7	19.3	89.0	-1.4	87.6	4.3	92.0	23.9
B. Regional inequality - Additional adjustment for within-country spatial price differences												
Gini index (%)	39.0	6.2	41.5	3.0	42.7	0.7	43.0	3.8	44.6	-3.5	43.1	10.4
GE(0) (Theil-L)	0.25	13.0	0.29	6.2	0.30	1.9	0.31	9.1	0.34	-6.5	0.32	24.9
GE(0) within level	0.17	18.7	0.20	3.6	0.21	30.1	0.28	6.7	0.29	-1.3	0.29	68.6
GE(0) within contribution (%)	68.1	3.4	71.5	-1.8	69.7	19.3	89.0	-2.0	87.0	4.8	91.8	23.8
C. Regional inequality - 2005 PPP-adjusted USD												
Gini index (%)	36.4	6.8	38.9	4.6	40.7	3.5	42.1	5.2	44.3	-1.7	43.6	19.6
GE(0) (Theil-L)	0.22	14.0	0.25	10.3	0.28	6.9	0.29	13.2	0.33	-2.5	0.32	48.5
GE(0) within level	0.17	18.1	0.20	4.5	0.20	30.6	0.27	6.9	0.29	-0.9	0.28	70.8
GE(0) within contribution (%)	75.7	2.7	78.4	-4.2	74.3	16.5	90.8	-5.1	85.7	1.4	87.1	11.4
D. Regional inequality - Balanced sample (1988 to 2012)												
Gini index (%)	36.3	8.4	39.3	2.3	40.2	6.1	42.7	2.7	43.9	-0.8	43.5	19.9
GE(0) (Theil-L)	0.22	18.2	0.26	4.4	0.27	14.2	0.30	6.9	0.33	-1.1	0.32	49.0
GE(0) within level	0.17	18.8	0.20	3.1	0.21	34.8	0.28	6.8	0.30	-0.9	0.30	74.6
GE(0) within contribution (%)	78.4	0.4	78.8	-1.0	77.8	14.0	91.8	-0.1	91.7	0.2	91.9	13.5
E. Regional inequality - Balanced sample (1992 to 2012)												
Gini index (%)			39.2	2.2	40.0	6.4	42.6	2.4	43.6	-0.7	43.3	10.6
GE(0) (Theil-L)			0.25	4.1	0.26	14.7	0.30	6.3	0.32	-0.7	0.32	25.9
GE(0) within level			0.20	2.9	0.21	33.6	0.28	6.5	0.29	-0.4	0.29	45.8
GE(0) within contribution (%)			79.6	-0.9	78.6	13.0	91.6	0.2	91.8	0.3	92.1	12.5
F. Regional inequality - Raw data without parametric Lorenz curve												
Gini index (%)	38.1	5.9	40.4	5.5	42.6	1.1	43.1	3.3	44.5	-3.0	43.1	13.1
GE(0) (Theil-L)	0.24	12.9	0.28	9.2	0.30	2.6	0.31	8.0	0.33	-5.6	0.32	29.0
GE(0) within level	0.16	18.9	0.19	7.8	0.21	31.1	0.28	6.2	0.29	-0.6	0.29	77.1
GE(0) within contribution (%)	67.0	3.5	70.5	-1.0	69.6	19.3	88.9	-1.5	87.4	4.6	92.0	25.0

Notes: For the decompositions by country, changes between benchmark years are in percentage points. For all other rows, changes are measured in percent (not annualised). Observations are weighted using population. Using dataset of 100 percentile groups per country-year, based in part on a parametric Lorenz curve, except in panel F. In panel E, the last column refers to changes between 1992 and