



Inequality in Asia: Convergence and Determinants



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ASIA-PACIFIC RESEARCH AND TRAINING NETWORK ON TRADE

Working Paper

NO. 158 | 2016

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Please cite this paper as: Prabir De and Imdadul Islam Halder (2016), "Inequality in Asia: Convergence and Determinants", ARTNeT Working Paper Series No. 158, 2016, Bangkok, ESCAP.

Available at <http://artnet.unescap.org>

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Abstract

Inequality in its different dimensions may undermine the growth process itself through a number of channels. In this paper we have investigated three major things. First, what is the present scenario of income inequality of the Asian countries? That is whether inequality in these countries is increasing, decreasing or hovers around some threshold level. Second, what is the relation between growth and inequality in context of Asian regions? Third, what are the determining factors of inequality? And finally, we examine the convergence (or divergence) in terms of inequality. Analogous to the concept of (absolute) convergence in terms of growth, a country is said to be convergent if the country has started with high (low) level of inequality but converges to a lower (higher) level gradually in the course of time. This study shows that rising inequality may have been driven by top 10 percent of people in most of countries in Asia. Barring Pacific, remaining regions of Asia show a symptom of an inverted U relationship between growth and inequality. It shows that trade and initial level per capita income are significant determinants of inequality in Asia. Rising inequality calls for better policy formulation not only for removal of within and across countries income gap but also for strengthening economic capacity in Asia.

Keywords: Inequality, Asia, Convergence, Divergence, Trade, Gini coefficient

JEL classifications: D3, F0

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1. Introduction

Asia has been witnessing a rise in income inequality over the years. A majority of Asia's population now live in countries where inequality has risen over the past few decades.¹ In the past, parts of Asia have witnessed rapid economic growth, primarily driven by trade, but this achievement also has been accompanied by rising inequality, not only at regional level but also at the national level.² Two large economies of Asia - India and China have seen a rise in inequality in recent years. Regions like South Asia and East Asia have witnessed a steep rise in inequality in the last three and half decades (Table 1). Countries are, therefore, concerned over rising inequality in Asia.

Asia's growth is unsustainable with rising inequality.³ Since the impact of growth on poverty is mediated through inequality, falling inequality, therefore, helps facilitate poverty reduction at a faster pace.⁴ Inequality in its different dimensions may undermine the growth process itself through a number of channels. Inequality is also a cause for worry because it may lead to social unrest.

Table 1. Income and inequality trends in Asian regions

Regions	GDP Per Capita (US\$)		Gini (%)	
	1980-1999	2000-2015	1980-1999	2000-2015
Central Asia	975	1,856	37	33
East Asia	599	5,141	33	37
South Asia	449	1,288	33	37
South East Asia	1,601	1,854	40	39
World	2,204	2,910	37	36

Note: Appendix 1 provides the listed countries falling in Asian regions. The unweighted average of Gini and GDP per capita are presented here.

Source: Calculated by authors based on the WDI, The World Bank

¹ Refer, for example, United Nations ESCAP (2014), Jain-Chandra et al (2016), a.o

² Empirical evidences suggest that in a supply-constrained region like Asia, prosperity through trade has also been accompanied by rise in inequality – within and across countries. Refer, for example, Kanbur et al (2014)

³ Refer, for example, Jain-Chandra et al (2016)

⁴ According to Kanbur et al (2014), had Asian growth been achieved without rising inequality, an additional 240 million people would have been lifted out of poverty over the past two decades.

In this paper we are interested to show three major things. First, what is the present scenario of income inequality of the Asian countries? That is whether inequality in these countries is increasing, decreasing or hovering around some threshold level. Second, what is the relation between growth and inequality in context of Asian regions? Third, what are the determining factors of inequality? And finally, we examine the convergence (or divergence) of countries in terms of inequality. Analogous to the concept of (absolute) convergence in terms of growth, a country is said to be convergent if the country has started with high (low) level of inequality but converges to a lower (higher) level gradually in the course of time.

Rest part of the paper is organised as follows. Section 2 provides a brief overview of the literature about the finding in sync of the objective described above. Section 3 presents a short description of the variables and data we have used in this study. Recent trends of world and Asian inequality and their comparative analysis has been discussed in the Section 4. In Section 5, we have tried to assess the determining factors of the observed inequality in Asia. Finally, conclusions are drawn in Section 6.

2. Literature review

The relation between trade and inequality within countries is not beyond controversy. Most international trade economists have a perspective of a world in which countries exchange goods, factors and ideas. Free trade in goods can equalize factor prices across countries according to the factor-price-equalization theorem. In the traditional literature on neo-classical growth model, capital and labour play the central role as two main factors of production. From the perspective of conventional one sector neo-classical growth theory (a la Solow) international linkages do not matter, but from the trade perspective they are the crucial determinants.

Trade promotes growth and growth reduces poverty (Bhagwati and Srinivasan, 2003). In the literature on international trade, the issues of income distribution, growth as well as distortions are all discussed in terms of endowments of capital and labour, their growth as well as their relative prices. Countries that initially had a more distorted trade sector experienced an increase in inequality, where trade reform, however, does not appear to

have significantly affected changes in income distribution.⁵ In the income distribution literature, it is again the functional distribution of the two major factors of production which explain the movement of inequality in income distribution over time. However, development in endogenous growth theory has introduced the possibility of a productive role of public expenditure with an associated possibility of increasing returns to scale (Barro, 1990, 1991).

Over the past decades of globalization, economies in Asia and the Pacific had grown rapidly till the ongoing global economic and financial crisis appeared in mid 2007. This acceleration of growth, in which international trade has played an important role, has helped Asia-Pacific countries make impressive strides in economic development. At the same time, empirical evidences suggest that in a supply-constrained region like Asia and the Pacific, prosperity through trade has also been accompanied by rise in inequality – within and across countries.⁶ As a matter of fact, globalization in Asia has resulted in growing social and income inequalities.⁷ Thus, free trade is not necessarily a pro-poor growth strategy.

Rising inequality is a threat to aggregate demand in the global economy. Although some empirical work found a positive or non-linear effect of inequality on growth (Forbes, 2000; Banerjee and Duflo, 2003), a recent set of literature finds that inequality hampers growth. Inequality was seen as necessary to spur growth by providing incentives (Lazear and Rosen, 1981), increasing investment (Kaldor, 1957), and allowing the accumulation of a minimum of assets necessary for entrepreneurial activities and education (Barro, 2000). A group of empirical work has found a negative relationship between inequality and growth (e.g., Easterly, 2007; Berg and Ostry, 2011; Berg and others, 2012; Ostry and others, 2014; Dabla-Norris and others, 2015a). Berg and Ostry (2011) found that sustained growth spells are robustly associated with less income inequality. They find that a 10-percentile decrease in inequality increases the length of a growth spell by 50 percent. Dabla-Norris and others (2015a) found that the distribution of income itself matters for growth. If the income share of the top quintile increases, GDP growth declines over the medium term, while an increase in the income share of the bottom quintile is associated with higher growth.

⁵ There is a strong literature on trade and income distribution supporting the fact that trade liberalization not necessarily leads to equality of income in presence of trade distortion. See, for example, Edwards (1997).

⁶ Refer, for example, Zhuang et al. (2014), Milanovic (2016), a.o

⁷ See, for example, Kanbur (2014), Jain-Chandra et al (2016), etc.

Asia has witnessed rise in inequality in recent decades (Balakrishnan et al, 2013; Dabla-Norris et al, 2015a). According to Zhuang et al (2014), driven by increases in the top income shares, 12 out of 30 Asian countries have experienced an increase during the last two decades. Various other papers have analyzed the development in individual Asian countries (e.g., Chaudhuri and Ravallion, 2006; Piketty and Qian, 2009; Kim and Kim, 2014). In India, Raychaudhuri and De (2010) found growth in services exports has been associated with declining urban poverty and increasing urban income inequality. As in China, inequality in India has been rising more sharply in urban areas as the income shares of the top decile in urban areas have risen significantly more. The change in skill composition and the rising wage inequality in services sector employment offer a plausible explanation for the rise of income inequality in urban India, from where the majority, if not 100 per cent, of India's software and BPO services exports are sourced. The issue is, therefore, how far the rise in India's software and BPO exports, which together currently share about one-third of India's services exports, can be attributed as a contributory factor in delivering pro-poor growth.

There are compelling reasons why rising levels of inequality can slow down growth prospects when distortions are becoming more unequal in Asia and the Pacific (e.g. Lao PDR vs. Thailand). Among other things, high levels of inequality can have adverse consequences for social cohesion, quality of institutions and policies, and infrastructure. In turn, social divisions, low-quality institutions and policies, and lack of infrastructure can have adverse implications for growth prospects of Asia-Pacific countries. Since the increases in income inequality can have important implications for the evolution of economic well-being in the long run, it is aptly important to understand the present symptom of linkage, if any, between inequality, trade and infrastructure in developing Asia-Pacific countries. This paper contributes to this literature to describe current levels and recent trends of income inequality in Asian regions, adding additional analysis as well as examine the convergence (or divergence) in terms of inequality.

3. Data and methodology

Although there exists numerous measures of inequality, in this paper, we use mainly two measures of inequality for which data are readily available. One of the popular measures is Gini coefficient, which can also be calculated in many ways⁸. The classical definition of the Gini is: $G = \frac{\Delta}{2\mu}$, where $\Delta = \frac{1}{n(n-1)} \sum_{i=1}^n \sum_{j=1}^n |x_i - x_j|$, x_i is the income. Sometime consumption expenditure is also used as a proxy of income when income data is not available for the i^{th} unit, and n is the total number of units. 2μ is the maximum possible of Δ , which would be obtained when one unit receives all the income. Second, Decile ratio, which is defined as: $DR = \frac{Q(P_{90})}{Q(P_{10})}$, where $Q(P_{90})$ is the share of total income received by the top 10 percent of the population and $Q(P_{10})$ denote the same for bottom 10 percent of the population.

In this paper, we use single data source for our measures of inequality, which is the World Bank's World Development Indicator (WDI).⁹ The caveat of using WDI database for Gini is that the data is not available uniformly for the all the years and for the countries. The data is available sporadically. For example, the Gini coefficient data is available for Brazil for almost all years since 1981. In case of India, after 1993, the data for Gini is available only for the year 2004. A 10-year gap interpolation may lead to misleading result in spite of the fact that Gini does not change dramatically in a very short period. Nevertheless ignoring the interim period is also statistically undesirable. Moreover, we could not make a five-year average balanced panel for the countries of our interest since observations were not available uniformly for five-year period for all the countries. Being hand cuffed by this constraint, we have made an unbalanced panel for the Asian countries in this study¹⁰.

⁸ See, Yitzhaki (1997)

⁹ <http://data.worldbank.org/data-catalog/world-development-indicators>

¹⁰ Other data set such as UNU WIDER reports Gini and income distribution of different quantiles. But the dataset is having many observations for same country for same year. It is researchers' discretion to decide which observation is best for that country for that year. We mainly use WDI Gini and income distribution reported by the World Bank for our purpose and to substantiate our observation we tried to use WIDER dataset.

There exists a large number of possible explanations for cross-national differences in inequality since publication of the Kuznet's (1955) seminal paper. Here, we have attempted to explain some macroeconomic, institutional and political factors those are potential determinants of cross-country differences in inequality. It has been argued that trade openness has a negative impact on inequality, thereby meaning inequality rises as trade openness grows. Several authors had shown various channels of the unequal distribution of income. What is obvious in the recent lopsided trade where developed countries are engaged in the production of high skilled capital goods and developing countries are engaged in more labour intensive goods, the distribution of income goes in favour of the owner of the capital, which is high in percentage in developed countries. In sharp contrast, in the developing countries where very few people are able to sell what the developed countries want, and hence make the income distribution skewed in their favour.

Gross capital formation as a percentage of GDP is taken from the WDI. In a typical developing country, the capital expenditure is mostly coming from the Government and the increase in expenditure means majority of the benefit going towards the lower and middle income group (because that is the dominated proportion) than the higher income group. This may lead to the reduction of inequality. However, on the other, if we think about a country where capital expenditure is mostly incurred by the private sector then it is highly possible that their expenditure is biased in their favour and may increase inequality.

Research and Development (R&D) expenditure as a percentage GDP is a proxy that measures the technology and the production process. A technological change in favour of the capital (capital augmented technological progress) increases the demand for capital, and hence, the return for capital. On the other, if it is labour augmenting, the demand for labour increases, and, hence, its wages. So, we expect that if R&D as a percentage of GDP increases in favour of capital, inequality increases. Otherwise, it decreases. We have obtained the data on R&D from the same source. Institution matters for inequality.

It is argued that institutional arrangement obtained from colonizer may help determine the property rights, and, hence, the discourse of developmental procedure. Researchers have argued that the colonial settlers are also responsible for unequal distribution in favour of them and their descendants (Acemoglu et al., 2002; Angeles, 2005). To capture the institution, we have used the ICOW colonial history data set. We have generated a dummy, which takes 1 if it was colonized by some other country or 0 otherwise.

Another major factor emphasized in literature is education, even though the direction of its effects on inequality is not clear. If government is concerned about the equal opportunity of education for elite and the poor and spend for higher education, we expect an equal distribution of income to happen. We have taken government expenditure in education as a percentage of GDP as a proxy for education.

Urbanization is considered as one of the influential factors of inequality. In developing country, where government expenditure is primarily in infrastructure development, business facilities and others opportunities are more concentrated in urban areas, and, hence, urban people are more equipped with capital that can generate higher income compare to rural people. This may lead to unequal distribution of income between urban and rural areas. Thus, urban population as percent of total population is taken as a proxy that measures the degree of urbanization.

We also control the initial per capita income of countries, which determines the fate of countries in per capita income (and inequality) in latter periods. Enrolments in tertiary education, as proxy of skilled labour, and, foreign direct investment, as a proxy of foreign technology, are also taken as variables of interest. Does WTO membership have any impact on inequality? To respond this, we have taken a dummy to represent WTO membership which takes 1 for WTO membership, 0 otherwise.

4. Trends in inequality: Convergence or divergence?

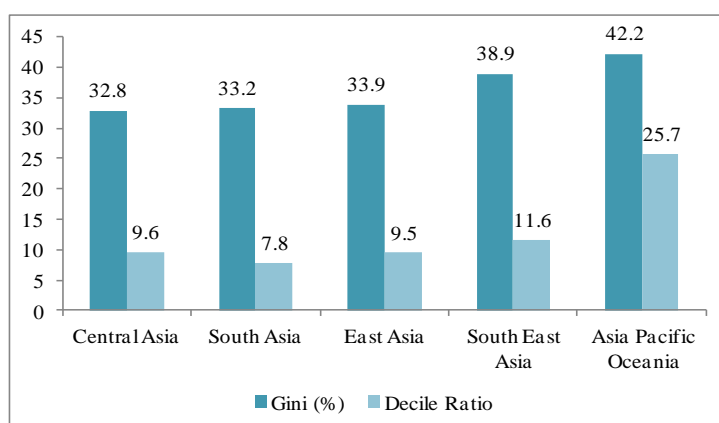
Over the past decades, some of the Asian economies had grown rapidly. At the same time, these countries have witnessed rise in inequality except Armenia or Thailand (Figure 1). China, India or Vietnam, on the other, have observed steep rise in inequality. Given the high variations in changes in inequality, it is worth exploring whether or not Asian countries show any symptom of convergence (or divergence) in inequality.

Figure 1: Inequality trends



Source: Drawn by authors

Figure 2: Inequality by Asian regions: Aggregate Gini and Decile Ratio



Source: Drawn by authors

To have a comprehensive view on the inequality, we plot the regional inequality (Gini and Decile Ratio). From the Figure 2, it is clear that Asia-Pacific region having highest inequality with Central Asia is the lowest in terms of Gini. In terms of decile, similar pattern is observed. Note that we have excluded Bhutan and Maldives for having very high inequality and treating them as outliers. Table 2 gives us a snapshot of the data and various measures of inequality in past and present of the various regions of Asia. Countries are sorted out region-wise on the basis of average Gini over the period mentioned in the Table 2. From the Table 2 (last column), we observe that Gini is not available for all the years for all countries. On top, there are high variations across countries. For some countries, 18 years of observation is available (e.g. Georgia, Thailand, etc), whereas, for some countries (e.g. Vanuatu, Kiribati, etc.) only one year observation is available for the period 1981 to 2015. Federal State of Micronesia's (FSM) inequality is the highest amongst Asia-Pacific countries. If we exclude FSM as a statistical outlier, Asia-Pacific appears as a region with highest inequality.

Some of the island countries in Pacific such as Micronesia, Papua New Guinea, Solomon Islands and Samoa have very high inequality. Countries in Southeast and East Asia viz. China, Malaysia, the Philippines and Thailand have witnessed inequality higher than their respective regional averages. Central Asian countries such as Georgia, Uzbekistan, Turkmenistan, Kyrgyz Republic and Armenia have also inequality higher than regional average. In India, inequality, as measured by the Gini coefficient, has also been on the rise.

Before we analyse the inequality situation of Asian countries as a whole and by its regions, we attempt to see first how the world inequality have been changing since 1960. Since the Gini is not observed uniformly for all countries and for all the years, we have taken the earliest and latest observations. If scatters of observations hover around the 45 degree line (solid line), it means the inequality has been stable. On the other, if the same is situated high above the 45 degree line, it implies inequality has increased for that country. From the scatter diagram (Figure 3), we can conclude that there is no systematic increase of inequality. For some countries, it has increased over time, remained stable for some other countries and it has decreased for the rest (Table 2). The dotted line is the fitted line, where latest Gini is regressed on earliest observations. Positive fitted line implies that on an average the world Gini increases in the course of time. Countries like Bhutan, Maldives and Malawi have started with very high inequality (more than 60), but inequality decreases eventually. On the other, countries such as Rwanda that have started with low Gini have ended up with high inequality. This sort of observation indicates inequality convergence (Milanovic, 2016; Benabou, 1996). We test this by regressing difference in Gini ($G_t - G_0$) on first year Gini (G_0). The equation (1) is as follows:

$$G_{it} - G_{i0} = \alpha + \beta G_{i0} + u_i \quad (1)$$

We found the coefficient β is significant at one percent level of significance, which support the convergence of inequality. See the results in Appendix 2.

Table 2: Trends in income inequality by Asian regions

Country Name	Gini (%)				Top/Bottom 10%		Gini (% Mean)	Top/Bottom 10 %(Mean)	Number of Years
	Initial Year	Final Year	First Period	Final Period	First Period	Final Period			
Pacific Oceania									
Australia	1981	2010	31.33	34.94	8.4	10.3	33.7	10.1	8
Timor-Leste	2001	2007	37.56	31.56	10.1	6.9	34.6	8.5	2
Vanuatu	2010	---	37.18	---	10.8	---	37.2	10.8	1
Kiribati	2006	---	37.61	---	12.8	---	37.6	12.8	1
Tonga	2009	---	38.1	---	11.2	---	38.1	11.2	1
Fiji	2002	2008	39.62	42.78	12.0	14.1	41.2	13.1	2
Samoa	2008	---	42.69	---	13.2	---	42.7	13.2	1
Solomon Islands	2005	---	46.1	---	19.3	---	46.1	19.3	1
Papua New Guinea	1996	2009	55.43	43.88	88.5	19.1	49.7	53.8	2
Micronesia, Fed. Sts.	2000	---	61.18	---	104.6	---	61.2	104.6	1
Average							42.2	25.7	
Central Asia									
Azerbaijan	1995	2005	34.65	16.64	10.0	2.9	23.4	5.3	6
Kazakhstan	1988	2013	25.74	26.35	5.0	5.1	30.2	6.9	16
Tajikistan	1999	2009	29.54	30.77	7.1	7.1	31.8	8.0	5
Armenia	1996	2013	44.42	31.54	15.3	7.2	33.6	8.4	15
Kyrgyz Republic	1988	2012	26.01	27.37	4.7	5.8	33.6	11.4	16
Turkmenistan	1988	1998	26.39	40.77	4.7	12.3	34.2	8.8	3
Uzbekistan	1988	2003	24.95	35.27	4.2	9.8	34.8	12.7	5
Georgia	1996	2013	37.13	40.03	12.0	14.3	40.4	15.8	18
Average							32.8	9.6	

Country Name	Initial Year	Final Year	Gini (%)		Top/Bottom 10%		Gini (% Mean)	Top/Bottom 10 % (Mean)	Number of Years
			First Period	Final Period	First Period	Final Period			
East Asia									
Japan	2008	---	32.11	---	9.2	---	32.1	9.2	1
Mongolia	1995	2012	33.2	33.75	8.2	8.3	33.3	8.2	7
China	1981	2010	29.11	42.06	6.1	17.7	36.3	10.9	11
Average							33.9	9.5	
South Asia									
Bangladesh	1983	2010	25.88	31.98	5.3	6.9	30.0	6.4	8
Pakistan	1987	2010	33.32	29.59	7.9	6.1	31.7	7.0	9
India	1983	2009	31.11	33.9	6.8	7.8	32.2	7.1	5
Nepal	1984	2010	30.06	32.75	6.2	7.5	35.3	9.0	4
Sri Lanka	1985	2012	32.47	38.58	7.4	10.5	36.5	9.4	7
Maldives	1998	2009	62.68	36.78	126.7	11.1	45.6	49.4	3
Bhutan	2003	2012	69.47	38.65	1846.3	11.1	48.7	622.7	3
Average							37.2	101.6	
South East Asia									
Indonesia	1984	2010	30.47	35.57	6.7	8.4	31.2	6.7	10
Cambodia	1994	2012	38.15	30.76	9.5	6.4	35.1	8.5	8
Lao PDR	1992	2012	34.31	37.89	8.1	10.2	35.7	9.0	5
Vietnam	1992	2012	35.65	38.7	8.8	11.6	37.8	10.6	8
Thailand	1981	2012	45.22	39.26	15.5	11.0	42.1	12.9	18
Philippines	1985	2012	41.04	43.04	11.8	13.6	43.0	13.7	10
Malaysia	1984	2009	48.62	46.26	21.0	19.8	47.3	19.7	9
Average							38.9	11.6	

Source: WDI, The World Bank

Let us now see whether Asian countries behave in the same way that we observed above. We have taken 45 Asian countries as listed in the Appendix 1. We have removed those countries for which we did not have data for Gini for at least two observations with time difference at least five years, and therefore, we have ended up with 26 countries only. Figure 4 presents trends in inequality for Asian countries.

Figure 3: World inequality

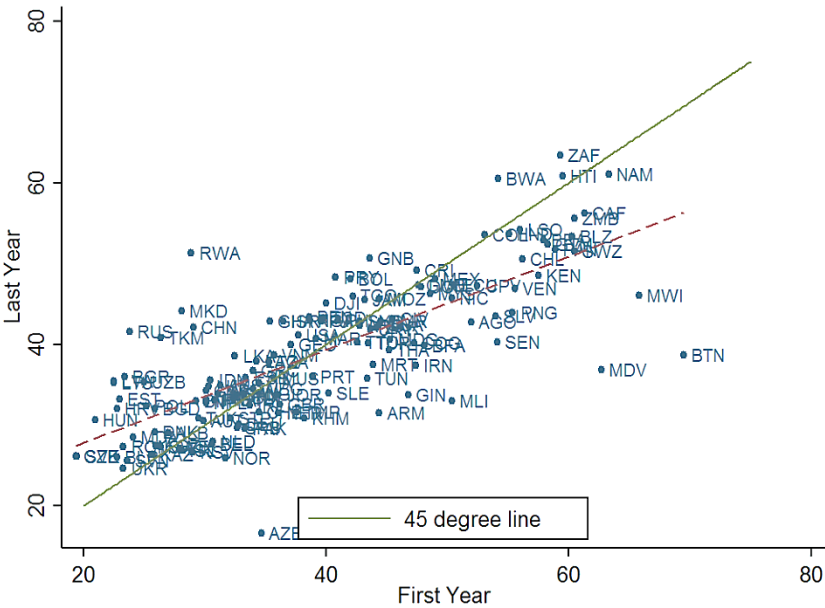
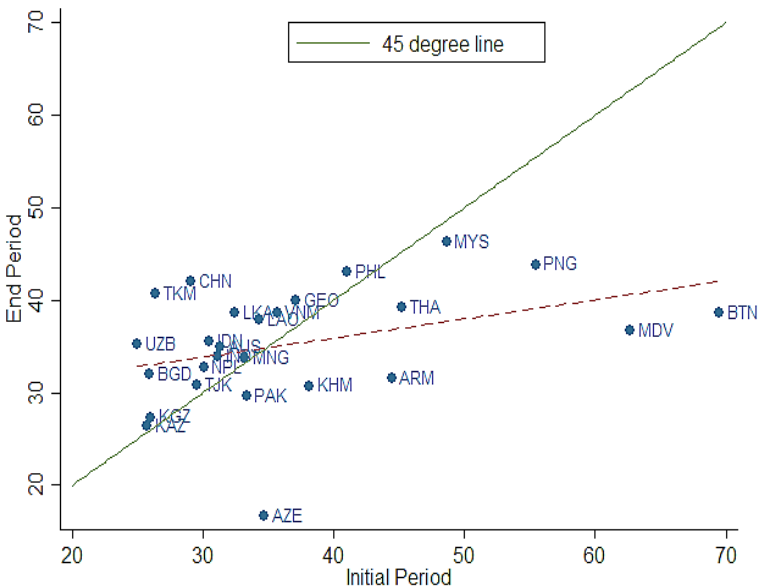


Figure 4: Inequality of Asian countries



We observe from the Figure 4 that countries like Maldives, Bhutan, Papua New Guinea, etc. have started with high Gini but decreased eventually. On the other, China, Turkmenistan, etc. have started with low Gini, but increased in later years. The upward fitted line implies that on an average the Gini of all Asian countries has increased over time. This observation may be biased by the extreme values. We overcome this problem by taking average of the Gini before and after the median period of the each country. Figure 5 plots this, which resembles Figure 4. Therefore, we conclude that our finding is not modified by the extreme values.

Figure 5: Inequality (Gini) for Asian countries

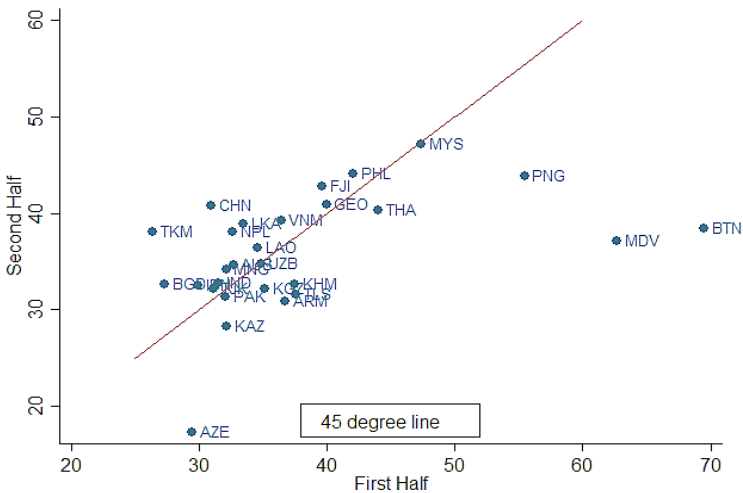
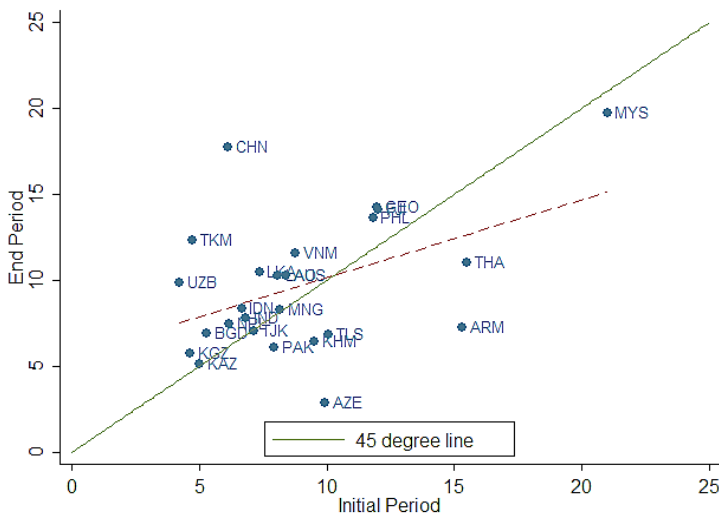


Figure 6: Inequality (Decile Ratio) for Asian countries



The Gini coefficient presents an aggregate measure of inequality in a distribution, and it may hide detailed patterns of differences across different levels of income. To substantiate our findings, we use WDI's share of income (income share held by highest and lowest 10 percent) distribution to calculate decile ratio (DR), which we have defined earlier in Table 2. We have dropped Maldives, Bhutan, Papua New Guinea, etc. because of very high initial value. Figure 6 plots the decile ratio, showing the same result as in the case of Gini (Figure 5). Figure 6 also indicates that the inequality when measured by the decile ratio instead by the Gini suggests that rising inequality may have been driven by top 10 percent of people in most of countries in Asia. In particular, inequality in China is now higher than in most other countries in Asia. Cross-country variability in the inequality is very important when we attempt to understand its economic and social consequences. Therefore, combating this rising inequality should be one of the policy priorities of the Asian countries.

5. Growth - Inequality relationship

Some of the Asian countries have witnessed high growth in the last few decades and also absolute rise in inequality over time. Inequality and growth are interrelated.¹¹ Growth incidences provide more detail on distributional changes of income. Here, we want to see the growth and inequality pattern in the Asian countries by regions. To see the whether an inverted "U" relationship prevailing in the Asian regions, we estimate the following pooled OLS and panel fixed effect (country) equations:

$$Y_{it} = \alpha + \beta_1 X_{it} + \beta_2 X_{it}^2 + u_{it} \quad (2)$$

where Y_{it} is the Gini (taken in percent) in country in region i in the time period t . X_{it} and X_{it}^2 are the GDP per capita and GDP per capita square, respectively. If the coefficient β_1 is positive, β_2 is negative and significant, it means that as GDP per capita rises, Gini (inequality) increases at a decreasing rate that is a concave relationship holds. The maximum of the concave point is that GDP after which inequality start falling.

¹¹ The existence of a relationship between inequality and growth was first proposed by Kuznets (1955, 1963), who postulated "inverted U" hypothesis, according to which inequality increases in the first levels of growth to decrease later on after a certain "point of return".

Table 3: Inequality – Growth relationship: Estimated results

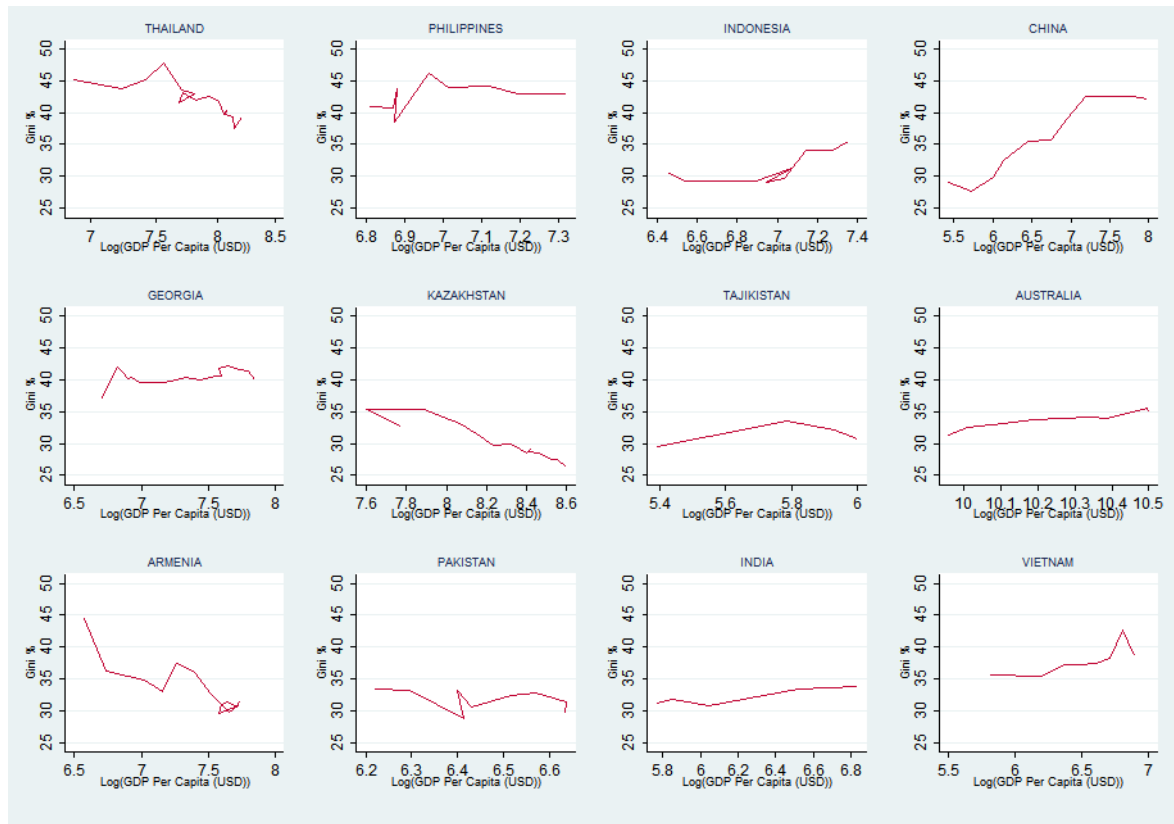
	Pacific	Central Asia	East Asia	South Asia	South East Asia	World
GDP per capita	-0.860*** (2.98)	1.844 (1.15)	5.762*** (6.52)	12.120** (2.50)	4.653*** (5.12)	0.639* (1.95)
GDP per capita square	0.000** (2.58)	-0.000** (2.14)	-0.000*** (6.57)	-0.000** (2.19)	-0.000*** (3.23)	-0.000** (2.21)
Constant	44.145*** (14.86)	33.404*** (20.15)	28.956*** (28.10)	27.211*** (12.77)	33.620*** (32.05)	35.313*** (57.11)
Observations	20	83	19	38	68	228
Adjusted R^2	0.250	0.058	0.581	0.193	0.351	0.012

Absolute t statistics calculated from robust standard error are in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$

The estimated results are summarized in Table 3. Figure 7 graphically presents the association between inequality and growth in selected Asian countries. The estimated coefficients of GDP per capita square have appeared to be very small, indicating we have very high threshold value of GDP per capita after which it had start falling¹². Barring Pacific, remaining regions show a symptom of inverted U relationship between growth and inequality, of which East Asia and South East Asia show relatively higher robustness and better fit.

¹² In Appendix 3 we have used log of GDP per capita and log of GDP per capita square to see strength of non-linear relationship, we found East Asia and World are significant even after taking logarithmic form.

Figure 7: Inequality and growth



6. Potential determinants of inequality

As explained earlier, we have used some economic, institutional and political factors to analyse how they influence in determining inequality across countries. The equation that we have estimated is as follows:

$$y_{it} = \alpha_i + \delta_t + \sum_{i=1}^n \beta_i X_{it} + U_{it} \quad (3)$$

where y_{it} is the dependent variable (either Gini or Decile ratio in normal form and logarithmic form) for country i at time t , α_i is the country specific fixed effect, δ_t time dummy and X_{it} are the potential determinants of inequality. We have estimated a pooled OLS form of the above equation where time dummy and country fixed effect is applicable.

Table 4 presents the estimated results of inequality on some potential determinants. Here, we first report the estimated results using pooled OLS for countries listed in Appendix. Table 5 presents the estimated results of Fixed Effect models as robustness checks¹³. Since countries which we have considered here are very different from each other, hence to capture the heterogeneity across countries, we use country fixed effect and time fixed effect. To show that the result is robust we use different specification in columns 4, 6 and 7 in Table 4 and in columns 4 and 6 in Table 5. Instead of simple Gini or Decile ratio, we have used natural logarithm of Gini and Decile ratio. Secondly, we also consider the Decile ratio as a measure of inequality, which is presented in columns 3, 4, and 7. Following observations are worth noting.

¹³ Note that to test whether Fixed effect is better than Pooled OLS we have conducted an F test for all $i, u_i = 0$, and for every case it is rejected which implies Fixed effect is appropriate. But since we know under fixed effect the time invariant variables dropped out which is not case for pooled OLS we reported both Fixed effect and Pooled OLS as we have used dummy variable e.g. colonization status which is time invariant in this context.

Table 4: Potential determinants of inequality: OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Trade Openness	11.163*** (5.77)		2.645 (1.22)	0.307*** (5.65)	8.437*** (5.40)	0.776*** (5.45)	
GCF (%GDP)	-0.006 (0.08)	-0.109* (1.73)	-0.072 (1.01)	-0.000 (0.02)	-0.013 (0.18)	-0.001 (0.13)	-0.007 (1.21)
R&D Exp.(%GDP)	-1.535 (0.97)	-3.348** (2.58)	-0.726 (0.39)	-0.038 (0.83)	-0.066 (0.07)	-0.004 (0.04)	-0.327 (0.98)
WTO member Dummy			8.706 (1.65)				
Initial Per Capita Income	0.001*** (2.84)	0.001** (2.26)	-0.000 (0.02)	0.000** (2.66)	0.001*** (2.71)	0.000*** (2.74)	0.000 (1.35)
Govt. Exp. Educ. (% of GDP)	-1.206 (1.58)	0.161 (0.48)	-0.285 (0.54)	-0.036* (1.68)	-1.079 (1.61)	-0.119* (1.97)	-0.005 (0.19)
Urban Pop.(%)	0.081 (1.55)	0.051 (1.49)	0.031 (0.90)	0.002 (1.39)	0.041 (0.92)	0.003 (0.70)	0.002 (0.92)
Colony	-4.109** (2.63)	-2.012 (1.58)	-0.873 (0.76)	-0.115** (2.66)	-0.800 (0.68)	-0.143 (1.30)	-0.022 (0.21)
FDI (% of GDP)	-0.205** (2.25)	0.170** (2.47)	-0.116 (0.75)	-0.005** (2.17)	-0.157* (1.76)	-0.013* (1.77)	0.012* (1.98)
Tertiary Enrolment	-0.176*** (3.09)	-0.075* (1.85)		-0.005*** (3.00)	-0.101* (1.96)	-0.009* (1.90)	-0.004 (1.36)
Export Skill Int. (%)		0.255*** (5.61)	0.208*** (4.03)				0.016*** (3.31)
R&D × Skill Int. (%)							0.005 (0.53)
Constant	37.013*** (15.56)	35.633*** (14.98)	24.585*** (4.45)	3.614*** (55.43)	9.725*** (4.34)	2.328*** (12.54)	2.212*** (10.82)
Observations	66	68	78	66	66	66	68
Adjusted R²	0.404	0.517	0.600	0.390	0.202	0.239	0.360

Notes: Absolute *t* statistics are calculated from robust standard error and presented in parentheses, * *p*<.10, ** *p*<.05, *** *p*<.01. Gini is dependent variable in first column to third column, log of Gini is dependent variable in fourth column, decile ratio is dependent variable in fifth column, whereas log of decile is dependent variable in sixth and seventh columns.

Table 5: Potential determinants of inequality: Fixed effect model

	(1)	(2)	(3)	(4)	(5)	(6)
Trade Openness	11.470*** (4.55)		11.928*** (5.87)	0.273*** (3.68)	1.852 (1.06)	0.325 (1.59)
GCF	-0.253** (2.87)	-0.281*** (3.42)	-0.246** (2.44)	-0.004* (1.83)	-0.083 (1.36)	-0.010 (1.54)
R&D Exp. (% of GDP)	10.087** (2.18)	11.350 (1.62)	9.254 (1.73)	0.401*** (2.98)	6.573** (2.83)	0.735** (2.65)
WTO member Dummy	4.608*** (3.42)	4.435** (2.41)	4.447** (2.89)	0.016 (0.51)	-0.320 (0.40)	-0.017 (0.20)
Govt. Exp. Educ. (% of GDP)	0.644 (0.59)	0.843 (0.57)	0.628 (0.57)	-0.030** (2.47)	-0.446 (1.36)	-0.060* (1.82)
Urban Pop. (%)	-0.256 (1.48)	0.491 (1.04)	-0.294 (1.72)	-0.013** (2.40)	-0.201 (1.67)	-0.021 (1.52)
FDI (% of GDP)	-0.062 (0.66)	0.148 (1.07)	-0.070 (0.71)	0.000 (0.32)	0.052 (1.70)	0.005 (1.49)
Export Skill (%)		0.142 (1.56)	-0.077 (0.58)			
Tertiary Enrolment				-0.003* (1.91)	-0.085* (2.07)	-0.008* (1.96)
Constant	43.369*** (4.76)	15.506 (0.65)	45.573*** (4.91)	4.162*** (18.58)	22.236*** (4.31)	3.486*** (5.69)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Observations	78	80	78	66	66	66
Adjusted R²	0.519	0.220	0.512	0.731	0.854	0.745

Absolute *t* statistics are calculated from robust standard error and presented in parentheses * $p < .10$, ** $p < .05$, *** $p < .01$. Gini is dependent variable in first column to third column, log of Gini is dependent variable in fourth column, decile ratio is dependent variable in fifth column, whereas log of decile is dependent variable in sixth column. Note that we have conducted Hausman test to see whether FE or RE is more appropriate. For each specification RE is rejected in favour of FE.

One, across all specification and all measures, we find the coefficients are significant and in right direction that expected earlier. In particular, trade coefficient in almost for all specification (columns 1 to 7) is positive and significant, thereby implying inequality is driven by the trade.

Two, in column 3, we add percentage of skilled intensive export.¹⁴ We have found that the coefficient is significant but trade openness becomes insignificant. This interesting fact signals that inequality is mostly driven by skill intensive factors.¹⁵

Three, from the history of development we see that the countries having higher initial per capita co-exist with higher inequality because most of the wealth of the nation was possessed by the so-called bourgeois. The positive and significant coefficient of initial per capita reflects the fact that higher per capita income in the beginning leads to higher inequality.

Four, since R&D expenditure in the developing countries are mostly incurred by the governments, the benefits of that may spillover to all, and, hence, we expect a negative impact. Other than in column 3, we found it has insignificant effect.

Five, urbanization (most of the time defined in terms of population within a region) leads to concentration of power and wealth in an agglomerated urban area. The effect urbanization on inequality is not obvious. Because of urbanization, more and more people come under the umbrella of all kinds of benefits and facilities available by the urban people which may decrease the inequality. On the other, if rural people migrate and cannot find any means of production in urban area then inequality may increase. The effect of urbanization within a country on inequality is more compelling compare to across countries. In our estimation (Table 4), we did not find its significance. However, when we considered the fixed effect model, we have found that urbanization within a country affects the level of inequality.

Six, theory indicates that the wage inequality is driven by the difference in productivity by the skilled and unskilled labor. The tertiary enrolment as a percentage of total enrolment is a proxy of of skilled labor supply in our model. Higher enrolment generates more skilled labor, and, hence, reduces the overall inequality in the country.

Seven, WTO membership has also influenced the rise in inequality as estimated coefficients in columns 1 to 3 suggest (Table 5).

Eight, the colony dummy has come out with correct sign, but it became significant only in columns 1 and 4. European countries used to colonize Asian (and also African) countries.

¹⁴ The data for skilled intensive export and unskilled labour intensive export collected from UNCTAD Stat.

¹⁵ When we use unskilled labour intensive export we found that it is insignificant. This is not reported here.

They indeed built up their institutions, which eventually helped in the process of democratization, business and trade by giving property rights. As a result, countries having the history of colonization have built up a good foundation for the business and trade.

7. Concluding remarks

As Asia continues to expand its economy, the challenge is the rising inequality gap. This study shows that trade and initial level per capita income are significant determinants of inequality in Asia. Trade may tend to aggravate inequalities in the absence of policies and programmes for guaranteeing 'inclusive' economic growth. By effective pro-poor targeting, Asian countries can make trade better for the poor and reduce the divide between them and the richer segments of society.

The empirical estimations do not raise any doubt that countries have witnessed inequality from the growth and openness. This study indicates a straightforward relation between trade and inequality. The knowledge and skill-intensive nature of exports leads to faster growth and rising income levels, but disproportionately favours the skilled workforce more than the unskilled workforce. Hence, the growth of trade has alleviated inequality through the expansion of income.

Rising inequality calls for better policy formulation not only for removal of within- and across countries income gap but also for strengthening economic capacity in Asia.

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Appendix 1: Country list and the region

Country Name	ISO -3	Country Name	ISO-3	Country Name	ISO-3
Asia Pacific Oceania		East Asia		South Asia	East Asia
Fiji	FJI	China	CHN	Singapore	SGP
Kiribati	KIR	Hong Kong, China	HKG	Thailand	THA
Marshall Islands	MHL	Japan	JPN	Vietnam	VNM
Micronesia, Fed. Sts.	FSM	Korea, Rep.	KOR		
Palau	PLW	Mongolia	MNG		
Papua New Guinea	PNG				
Samoa	WSM	South Asia			
Solomon Islands	SLB	Afghanistan	AFG		
Timor-Leste	TMP	Bangladesh	BGD		
Tonga	TON	Bhutan	BTN		
Tuvalu	TUV	India	IND		
Vanuatu	VUT	Maldives	MDV		
New Zealand	NZL	Nepal	NPL		
Australia	AUS	Pakistan	PAK		
Central Asia		Sri Lanka	LKA		
Armenia	ARM	South East Asia			
Azerbaijan	AZE	Brunei Darussalam	BRN		
Georgia	GEO	Cambodia	KHM		
Kazakhstan	KAZ	Indonesia	IDN		
Kyrgyz Republic	KGZ	Lao PDR	LAO		
Tajikistan	TJK	Malaysia	MYS		
Turkmenistan	TKM	Myanmar	MMR		
Uzbekistan	UZB	Philippines	PHL		

Appendix 2: Convergence

	(1)	(2)
G_0	-0.788*** (7.57)	
D_0		-0.546*** (2.92)
Constant	27.591*** (6.88)	5.619*** (3.09)
Observations	28	25
Adjusted R^2	0.676	0.238

In column 1 the dependent variable is difference of Gini ($G_t - G_0$) on the other hand in column 2 the dependent variable is difference of decile ratio ($D_t - D_0$). The negative and significant coefficients suggest convergence of inequality in terms of both Gini and Decile ratio.

Appendix 3: Inequality – Growth relationship: Estimated results

	Pacific	Central Asia	East Asia	South Asia	South East Asia	World
Ln(GDP per capita)	3.312 (0.93)	-0.404 (0.47)	4.669*** (4.93)	3.790*** (3.54)	3.947*** (6.99)	2.673*** (5.23)
Ln(GDP per capita square)	-1.749 (1.66)	-2.127** (2.45)	-1.550*** (4.90)	-0.968 (0.72)	0.582 (0.88)	-1.074*** (5.96)
Constant	42.416*** (16.94)	35.285*** (32.24)	36.227*** (39.65)	36.548*** (18.27)	38.140*** (46.14)	36.740*** (73.11)
Observations	20	83	19	38	68	228
Adjusted R^2	0.283	0.043	0.540	0.136	0.355	0.085

Absolute t statistics calculated from robust standard error are in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$

In the above appendix, we have reported the estimation result of equation with slight modification. Instead of GDP per capita or GDP per capita square, we have used log of GDP per capita and square of log of GDP per capita.



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