ADBI Working Paper Series

EDUCATION, GLOBALIZATION, AND INCOME INEQUALITY IN ASIA

Kang H. Park

No. 732
May 2017

Asian Development Bank Institute

Kang H. Park is professor of economics at Missouri State University, USA.

Suggested citation:

Park, K.H. 2017. Education, Globalization, and Income Inequality in Asia. ADBI Working Paper 732. Tokyo: Asian Development Bank Institute. Available: https://www.adb.org/publications/education-globalization-and-income-inequality-asia

Please contact the authors for information about this paper.

Email: khpark@semo.edu

Asian Development Bank Institute
Kasumigaseki Building, 8th Floor
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

Abstract

This study considers how education and globalization affect income inequality in Asia, with unbalanced panel data. The evidence supports the validity of Kuznets' inverted-U hypothesis for the connection between income level and income inequality. However, when more variables are integrated into the model, the consistency of the inverse U-shaped curve becomes weaker. The empirical results suggest that educational variables are highly influential in affecting income distribution. Our analysis indicates that a higher level of education achieved by the population aged 15 and over has improved income distribution in Asia, while educational inequality, measured by the education Gini index, has a negative effect on income distribution. Higher levels of globalization are correlated with higher levels of income inequality, while freedom, either political or economic, has marginal effects on the level of inequity in income distribution.

Keywords: education inequality, globalization, income inequality

JEL Classification: C21, D31, I24, N35

Contents

1. INTRODUCTION

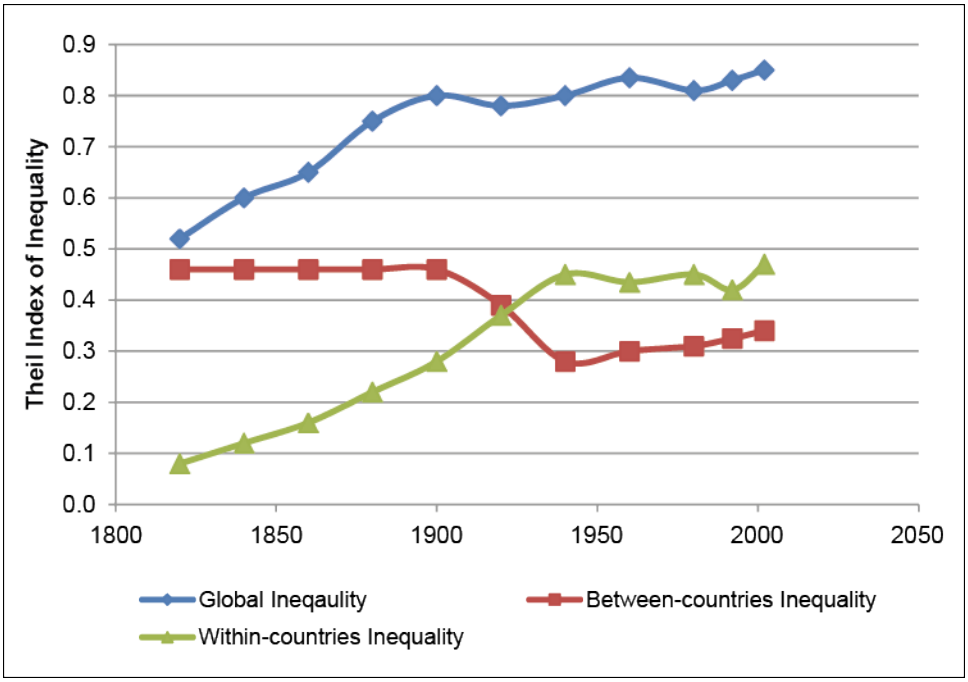
Many scholars have focused on the economic and social effects of income distribution as an enduring topic of consequence. Many studies have analyzed the relationship between income distribution and economic progress (e.g. Park 1996b, 1998). Some have further extended their analysis to the linkage of income inequality and political violence (see Park, 1986). A pioneering study by Kuznets (1955) proposed that income inequality tends to initially increase, peak, and then fall as economies develop. The economic development process involves structural changes that, along with dualism, cause this progression. Urbanization and population growth associated with the early stages of economic development initially exacerbate income inequality, but subsequent political factors and economic policies decelerate income growth in the upper income group while simultaneously improving the situation of the lower income group. The recent rise of national income inequality has prompted inquiry into the causes of the resurgence of income inequality. Recent globalization and co-occurring outsourcing and wage compression may have fostered a reversal of the increasing trend of balanced income distribution.

This widely recognized inverted-U hypothesis of Kuznets has a long history as a contentious subject in economics. The academic world witnessed a surge of research on the Kuznets hypothesis in the 1970s, principally comparative empirical studies with cross-country data (Kravis 1960; Kuznets 1963; Ahluwalia 1974; Robinson 1976; Stewart 1978; Winegarden 1979, to name a few). When updated data on distribution of income became available later in the 1990s and 2000s, there was a revival of cross-country empirical studies on the Kuznets hypothesis (Nielson and Alderson 1995; Checchi 2000; Wells 2006).

The majority of the cross-country empirical research (Kuznets 1963; Ahluwalia 1974; Papanek and Kyn 1986; De Gregorio and Lee 2002) found evidence that supports the Kuznets hypothesis while a few studies disputed this hypothesis (Saith 1983; Ravallion 2004). More recent studies have proposed the “great U-turn” hypothesis, implying that the trend again reverses further down the timeline of development for countries with very high income (Alderson and Nielsen, 2002).

Due to the variety of classifications and types of income inequality, the concepts of income inequality that are used in the literature are clarified as follows. The concept of “world income inequality (or global income inequality)” ranks all individuals in all countries and territories from the richest to the poorest, not taking into account their country of origin. The citizen of the world is the unit of analysis instead of countries. The next concept is “international income inequality (or between-countries income inequality),” which measures income inequality existing between countries resulting from contradistinction of their per capita GDP or per capita income. In this second concept, countries are the units of analysis rather than individuals. The final, most commonly studied inequality is “national income inequality (or within-countries income inequality),” which measures the variance of income distribution within a country. Yitzhaki (1994) indicated that “global income inequality” can be formulated as the sum of international income inequality, national income inequality, and the residual. The trends of these income inequalities for the period 1820 to 1992 are analyzed by Bourguignon and Morrisson (2002), relying on the data from 15 individual countries with copious data and 18 other regions composed of country clusters. Figure 1 shows the trends of the three different income inequalities. In our research, the focus is on national income inequality, also known as “within-countries income inequality.”

Figure 1: Three Income Inequalities



Source: Bourguignon and Morrisson (2002).

Although this study is an extension of abundant cross-country analyses previously performed on the Kuznets hypothesis, some particulars distinguish our research from past research. First, instead of focusing on the inverted-U hypothesis itself, the importance of education variables as significant explanatory variables for income inequality is emphasized. Second, the effect of globalization on income inequality is considered. Since the 1980s, many countries have executed financial and trade liberalization policies and the level of globalization has generally been increasing with a few exceptions. Globalization affects income inequality both directly and indirectly by impacting education levels. Finally, the present study analyzes how globalization and education affect income inequality with a focus on the Asian and Pacific regions.

Our research tries to define more accurately the connection between education and income inequality in the framework of an ever more globalized and integrated world economy, using expanded and recently updated data. The rest of the paper is organized as follows. Section 2 concisely reviews the relevant literature on the variables affecting income inequality, particularly on the connection between education and income inequality. The third section discusses educational attainment and educational inequality in the Asian and Pacific areas while Section 4 discusses income inequality in Asia and the Pacific. Section 5 presents models for estimating the influences of education and globalization on income inequality along with a description of the data and variables applied in the analysis. The regression results of the models are interpreted in Section 6. Conclusions and policy considerations are presented in the final section.

2. REVIEW OF LITERATURE

Subsequent to the publication of "human capital theory" by Becker (1964), several studies have considered the influence of education variables on the distribution of income. As reported by Park (1996a), four different categories of education variables are commonly presented in literature to explain their influence on income distribution. First, a flow variable of schooling signified by institute enrollments at different levels of education is usually utilized (e.g., primary and secondary education in Ahluwalia (1976); secondary and tertiary education in Barro (2000), and Alderson and Nielsen (2002)). Second, a stock variable of schooling characterized by the average or median years of schooling of the labor force or general population is utilized (Winegarden 1979; Ram 1984; De Gregorio and Lee 2002).

A number of studies applied both the flow and stock variables, that is, enrollments at each level of schooling and the average years of education as the independent variables (e.g., Psacharopoulos and Tilak, 1991). The third and fourth types of education variables applied in regard to income inequality are education inequality derived from the distribution of educational attainment (Checchi 2000) and the rate of return to education (Tilak 1989). There has been a substantial amount of research that considers both the average years of schooling and education inequality as main explanatory variables (Ram 1984; Park 1996a; De Gregorio and Lee 2002).

We limited our literature review to empirical research that analyzes the influence of both education level and education inequality upon income inequality. Numerous findings (Tinbergen 1972; Winegarden 1979; Park 1996a) indicate that more years of schooling and a more balanced dispersion of schooling among the population promote improvement in income distribution. However, Ram (1984) reported contrary empirical results. Ram found that more advanced education exerts a mild balancing influence on income distribution, which corresponds with most findings. Yet, his inference that a larger dispersion of schooling improves income distribution conflicts with many previous studies. Furthermore, the coefficients of the education inequality variable in his findings are not statistically significant.

Barro (2000) found different consequences of schooling on income inequality, based on the different levels of education applied in his models: an inverse relationship between primary education enrollment and income inequality, but a direct relationship between tertiary education enrollment and income inequality. Alderson and Nielsen's (2002) findings indicate that income inequality has an inverse relationship with the average years of schooling in developed countries.

Other likely factors that influence income inequality have been studied by others. Li, Squire and Zou (1998) concluded that no connection exists between political freedom and income inequality while Li and Zou (2002) examined the effect of economic freedom on income inequality. Barro (2000) saw no evidence relating democracy to income inequality. Milanovic and Squire (2005) found the magnitude of liberal policies was inversely related to greater income equality in more impoverished countries and with less income equality in more affluent countries.

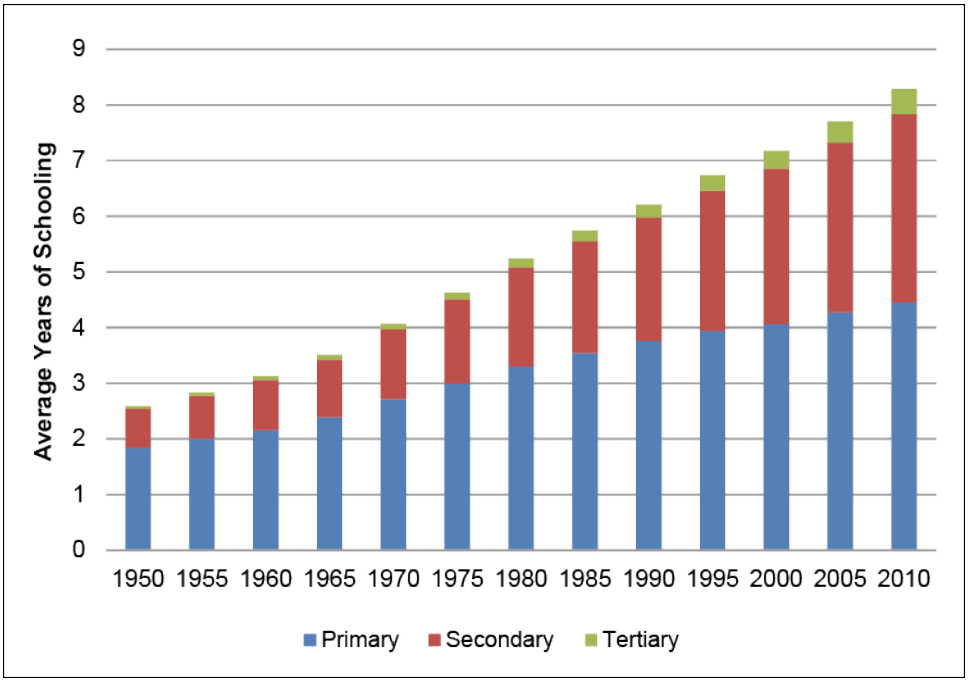
Some research concentrated on the link between globalization and income inequality. Alderson and Nielsen (2002) focused on the influences of three facets of globalization, which are migration, North-South trade, and direct foreign investment. Heshmati (2003) found that the Kearney globalization index published by the *Foreign Policy* magazine describes only 7–11 % of the variations in income inequality. Harjes (2007) suggested that general trends associated with globalization, such as technological changes and trade liberalization, may not be key drivers of income inequality. Ruffin (2009)

suggested that globalization tends to improve global income inequality since poorer countries tend to benefit more from the exchange because of cheaper living costs. Seeing the heterogeneous results of the aforementioned empirical findings, our research tries to redefine the connection between education and income inequality in the framework of an ever more globalized and integrated world economy, using expanded and updated data, with a focus on the Asian and Pacific areas.

3. EDUCATION ATTAINMENT AND EDUCATION INEQUALITY IN ASIA

Barro and Lee (2010) updated their existing panel data set of 1993 and 2001 on educational attainment for 146 countries from 1950 to 2010. This new data set includes 31 Asian and Pacific (hereafter Asian) countries. In 1950, the Asian population aged 15 and over had an average 2.59 years of schooling, increasing steadily to 5.24 years in 1980 and 8.29 years in 2010. Compared to the world population aged 15 and over, Asian countries started at a lower level than the world average of 3.2 years in 1950, but reached a higher level than the world average of 7.8 years in 2010. Figure 2 shows average years of schooling over time by education level, indicating steady growth in average years of schooling over time in all three levels of education: primary, secondary, and tertiary.

Figure 2: Average Years of Schooling by Education Level: Asia

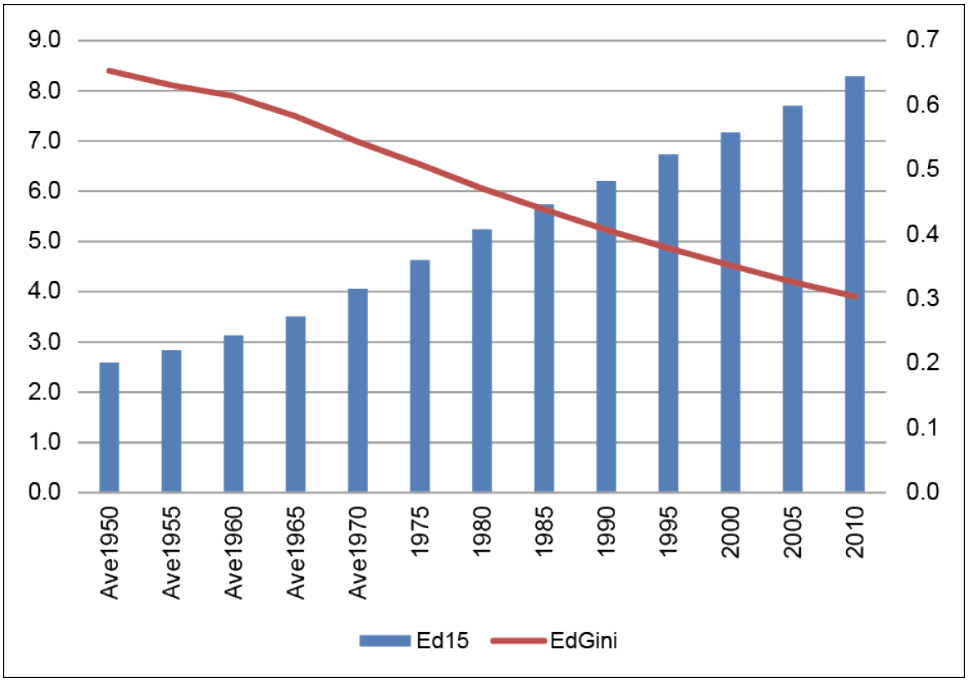


Educational inequality can be obtained by the following education Gini formula proposed by Thomas, Wang and Fan (2003) with the mutually exclusive and collectively inclusive seven categories of Barro and Lee (2010). The seven categories are nonschooling, partial primary education, complete primary education, partial secondary education, complete secondary education, partial higher education, and complete higher education.

$$EDGini = 1/\mu \sum \sum p_i \mid y_i - y_j \mid p_j$$

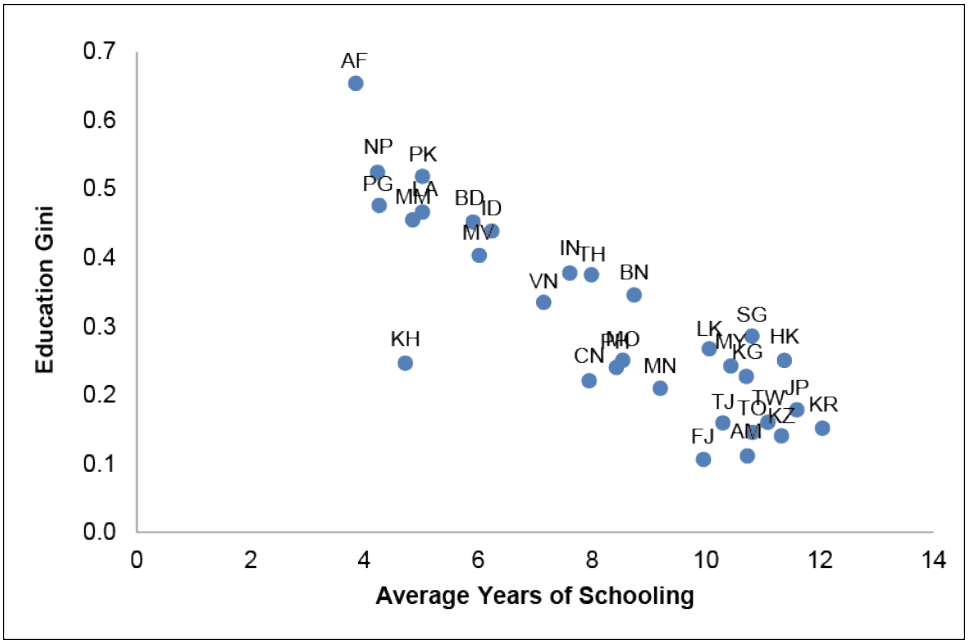
where EDGini represents the education Gini index derived from the dispersion of educational attainment, μ is the mean years of education for the relevant population, p_i and p_j represent the proportions of population with specified levels of education, y_i and y_j are the years of education at different educational attainment levels, and $n = 7$ where it indicates the number of levels/categories in education attainment data. The cross-country pattern of the distribution of education in Figure 3 shows that education Gini coefficients decline continuously as the average years of schooling increase over time.

Figure 3: Average Years of Schooling and Education Inequality: Asia



This inverse relationship between educational attainment and educational inequality is confirmed not only over time (Figure 3), but also across countries in 2010 (Figure 4). The only outlier from this pattern is Cambodia.

Figure 4: Education Gini and Average Years of Schooling, 2010

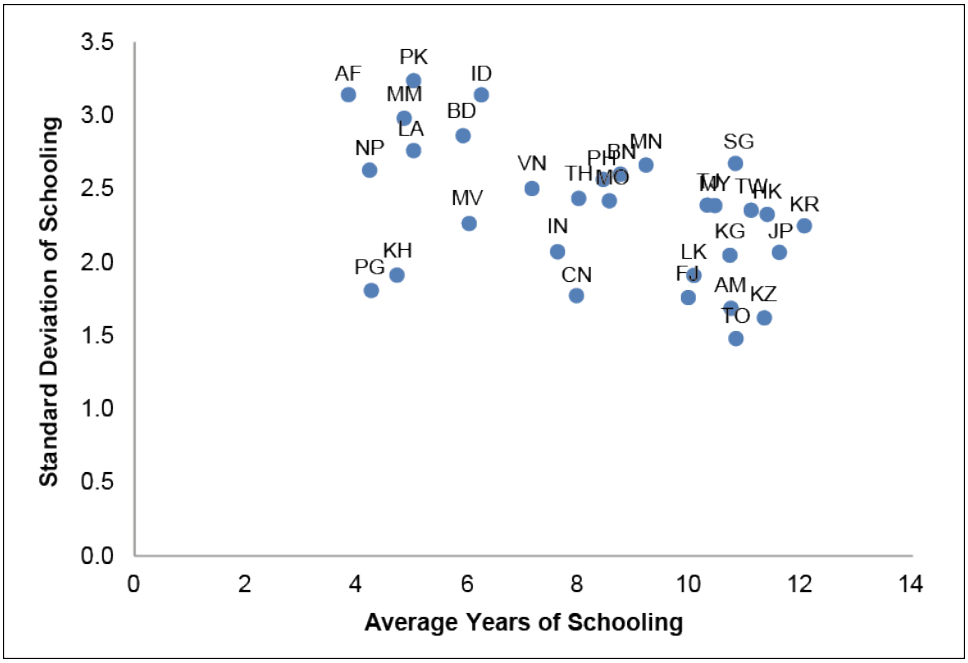


See Table 1 for country abbreviation codes.
Source: Barro and Lee (2010).

An alternative measure of educational inequality can be calculated by the standard deviation of schooling (EDSD) using the following formula.

$$EDSD = SQRT\ [\ \sum p_i\ (\ yi - \mu\ )^2\ ]$$

Figure 5: Average Years of Schooling and Standard Deviation, 2010



See Table 1 for country abbreviation codes.
Source: Barro and Lee (2010).

4. INCOME INEQUALITY IN ASIA

The World Income Inequality Database (WIID) provides the most comprehensive set of income inequality statistics available for developed, developing, and transition countries. The WIID3.3, released in 2015, covers 175 countries for the period 1950 to 2012 for most countries. However, the data set, being a collection of data from various sources, has missing years for many countries as well as many different observations for the same year. For example, in the case of the People's Republic of China (PRC), seven different Gini coefficients are reported for 2010 while no observations are reported for 1954–1963, 1965, 1969, 1971, and 1976.

Table 1: Trends in Income Inequality in Asia

		Mid-1990s			
Country	Code	Year	Gini	Bottom 20%	Top 20%
Afghanistan	AF				
Armenia	AM	1996	48.2	4.56	55.3
Azerbaijan	AZ	1996	45.8	7.98	40.98
Bangladesh	BD	1996	38.7	5.79	47.9
Bhutan	BT				
Cambodia	KH	1997	44.7	5.96	54.16
China, People's Republic of	CN	1993	35.5	7.35	43.23
Fiji	FJ	1991	46	5.1	50.1
Georgia	GE	1998	50.3	3.44	54.5
Hong Kong, China	HK	1996	52	3.7	56.3
India	IN	1992	32	8.8	41.1
Indonesia	ID	1996	36.1	7.78	44.9
Japan	JP	1993	24.9	10.58	35.65
Kazakhstan	KZ	1996	39.4	6.68	42.33
Republic of Korea	KR	1996	32.8	5.99	38.8
Kyrgyz Republic	KG	1996	48.5	3.08	54.1
Lao PDR	LA	1997	34.9	8.02	43.28
Malaysia	MY	1995	48.5	4.21	55.26
Maldives	MV	1998	46.2	6.51	44.24
Mongolia	MN	1995	33.2	7.37	40.76
Myanmar	MM				
Nepal	NP	1996	38.8	7.59	46.97
Pakistan	PK	1996	31.2	9.45	41.09
Philippines	PH	1997	42.7	6.01	48.91
Singapore	SG	1997	44.4	3.6	48.2
Sri Lanka	LK	1996	46.6	5.03	53.88
Taipei,China	TW	1996	31.7	7.23	38.39
Tajikistan	TJ	1999	30.4	7.67	41.58
Thailand	TH	1996	42.9	5.7	50.1
Turkmenistan	TM	1993	35.8	6.7	42.76
Uzbekistan	UZ	1993	33.3	7.28	40.74
Viet Nam	VN	1998	35.4	7.38	45.46

continued on next page

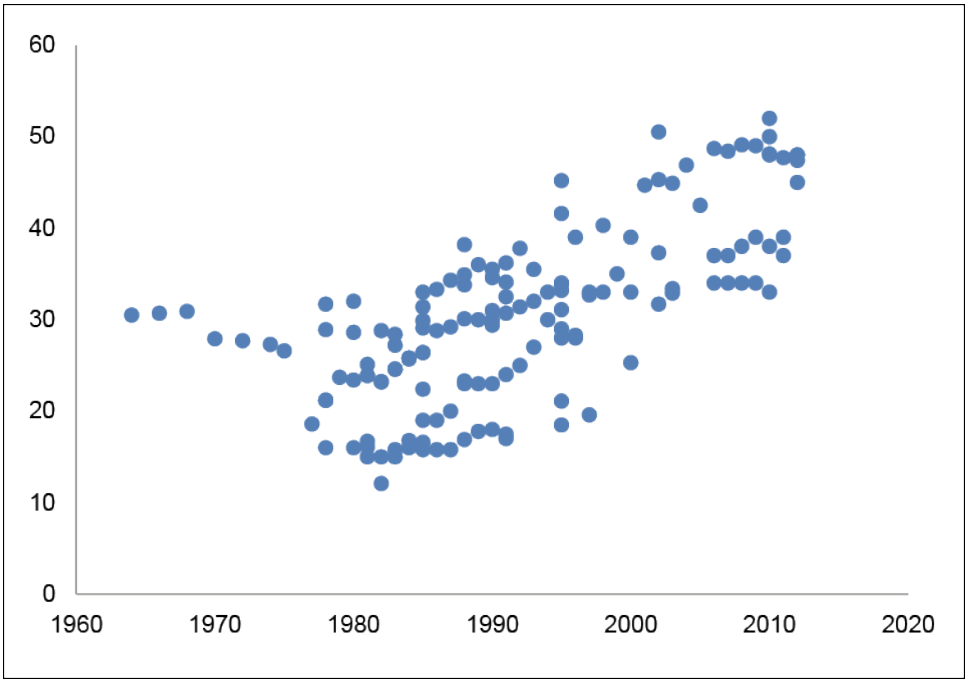
Table 1 *continued*

Country	Code	Around 2010				Δ Gini
		Year	Gini	Bottom 20%	Top 20%	
Afghanistan	AF	2008	27.4	9.4	37.48	
Armenia	AM	2010	36.2	5.00	45.00	–12
Azerbaijan	AZ	2008	33.7	7.99	42.08	–12.1
Bangladesh	BD	2010	45.8	5.22	51.79	7.1
Bhutan	BT	2012	36	7.10	43.70	
Cambodia	KH	2010	36	2.80	60.47	–8.7
China, People's Republic of	CN	2010	48.1	6.44	39.24	12.6
Fiji	FJ	2009	42.8	6.20	49.59	–3.2
Georgia	GE	2010	43	5.38	46.90	–7.3
Hong Kong, China	HK	2011	48.9	4.40	54.20	–3.1
India	IN	2010	36.8	8.12	42.46	4.8
Indonesia	ID	2010	38	7.15	45.47	1.9
Japan	JP	2009	31.1	7.54	40.89	6.2
Kazakhstan	KZ	2009	27.8	9.12	38.41	–11.6
Republic of Korea	KR	2009	34.5	6.52	38.40	1.7
Kyrgyz Republic	KG	2009	36.2	6.82	43.38	–12.3
Lao PDR	LA	2008	36.7	7.64	44.84	1.8
Malaysia	MY	2009	46.2	4.54	51.45	–2.3
Maldives	MV	2010	37	7.00	43.00	–9.2
Mongolia	MN	2008	36.5	7.10	44.04	3.3
Myanmar	MM	2010	30.3	11.98	31.97	
Nepal	NP	2010	32.8	8.27	41.46	–6
Pakistan	PK	2011	30.6	9.40	40.10	–0.6
Philippines	PH	2009	44.8	5.10	51.90	2.1
Singapore	SG	2010	47.2	5.08	43.99	2.8
Sri Lanka	LK	2007	40.3	6.94	47.79	–6.3
Taipei,China	TW	2010	34.2	6.49	40.19	2.5
Tajikistan	TJ	2009	30.8	8.29	39.37	0.4
Thailand	TH	2009	40.8	6.10	48.70	–2.1
Turkmenistan	TM	1999	35.8	6.70	42.76	0
Uzbekistan	UZ	2003	36.7	7.14	44.19	3.4
Viet Nam	VN	2008	35.6	7.42	43.41	0.2

Table 1 shows the trend of the Gini coefficient as well as the bottom 20% income share and the top 20% income share in Asian countries between the mid-1990s and around 2010. Out of the 30 countries with available data for the mid-1990s, 14 showed high income inequality with Gini coefficients greater than 40, the commonly known threshold for high inequality, while ten out of the 32 countries around 2010 showed high income inequality. A decrease in the number of countries with high income inequality might give a spurious indication of improvement in income distribution, which would be misleading.

From the last column of Table 1, half of the 32 countries listed actually experienced worsening income distribution. In particular, the Gini coefficient of the PRC jumped by 12.6 points from 35.5 in 1993 to 48.1 in 2010 while Japan's Gini coefficient jumped by 6.2 points from 24.9 in 1993 to 31.1 in 2009. Figure 5 presents all Gini coefficient estimates for the PRC collected by WIID3.3 over the period 1964 to 2013, a total of 152 estimates. A rising income inequality in the PRC over time is clearly exhibited.

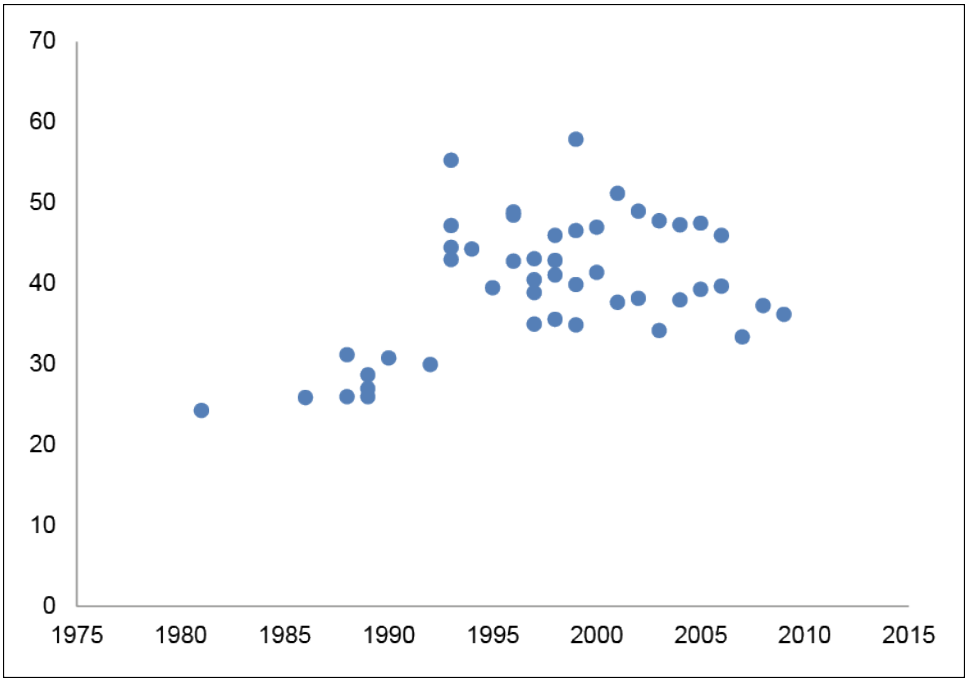
Figure 6: Gini Trend in the People's Republic of China



Source: WIDER, World Income Inequality Database 3.3.

The countries that recorded an improvement in their Gini coefficients are mainly from Central Asia. They include Armenia, Azerbaijan, Georgia, Kazakhstan, and the Kyrgyz Republic. When they experienced drastic changes in their social and economic structures in the process of transition from a command economy to a market economy in the 1980s and 1990s, their Gini coefficient initially surged. As their economies have stabilized and more income opportunities have become available, their Gini coefficients have also steadily declined. For example, Armenia's Gini coefficient fluctuated from 26.9 in 1986 to 48.2 in 1996 to 36.2 in 2010. Other former Soviet Union countries such as Georgia, Kazakhstan, and the Kyrgyz Republic show a similar pattern. Cambodia also experienced a similar trend with its regime changes in 1975 and 1997. The trend of Gini coefficients in the Kyrgyz Republic is presented in Figure 7 with a total of 47 Gini coefficient estimates between 1981 and 2009, and the graph clearly indicates the presence of the Kuznets Curve, an inverted U-curve.

Figure 7: Gini Trend in Kyrgyz Republic

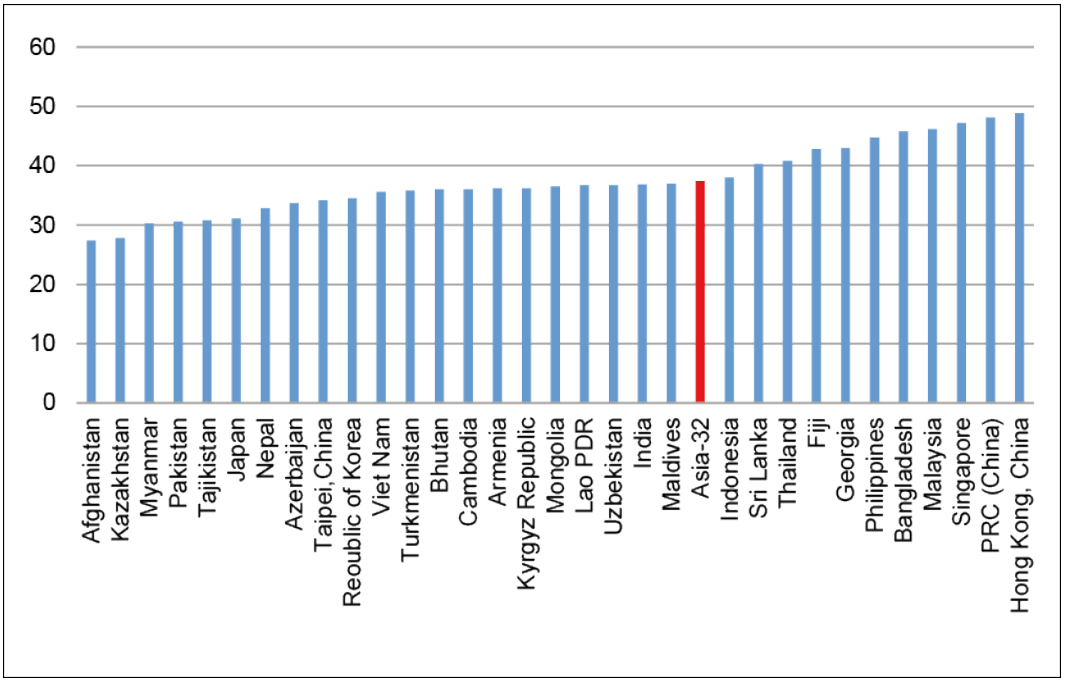


Source: WIDER, World Income Inequality Database 3.3.

Most Asian countries, except for some Central Asian countries, Cambodia, and a few small countries, experienced rising income inequality. Zhang, Kanbur and Rhee (2014) pointed to technological progress, globalization, and market-oriented reform as the key driving factors. These factors helped the rapid growth of developing Asian countries in the last two decades. However, they also had negative effects on income distribution in the region. Technological progress combined with capital-intensive technology tends to favor skilled labor over unskilled labor, increasing skill premiums and causing income inequality. Globalization could favor particular regions (for example, coastline over inland in the PRC) or particular industries (industries with comparative advantage), thereby causing more income inequality. On the other hand, the Stopler-Samuelson theorem and "growth with equity" experiences in the Republic of Korea, Taipei,China, and Singapore suggest improvement in income distribution. Therefore, whether globalization has a positive or negative effect on income distribution in the Asia and Pacific areas will be empirically tested in this study.

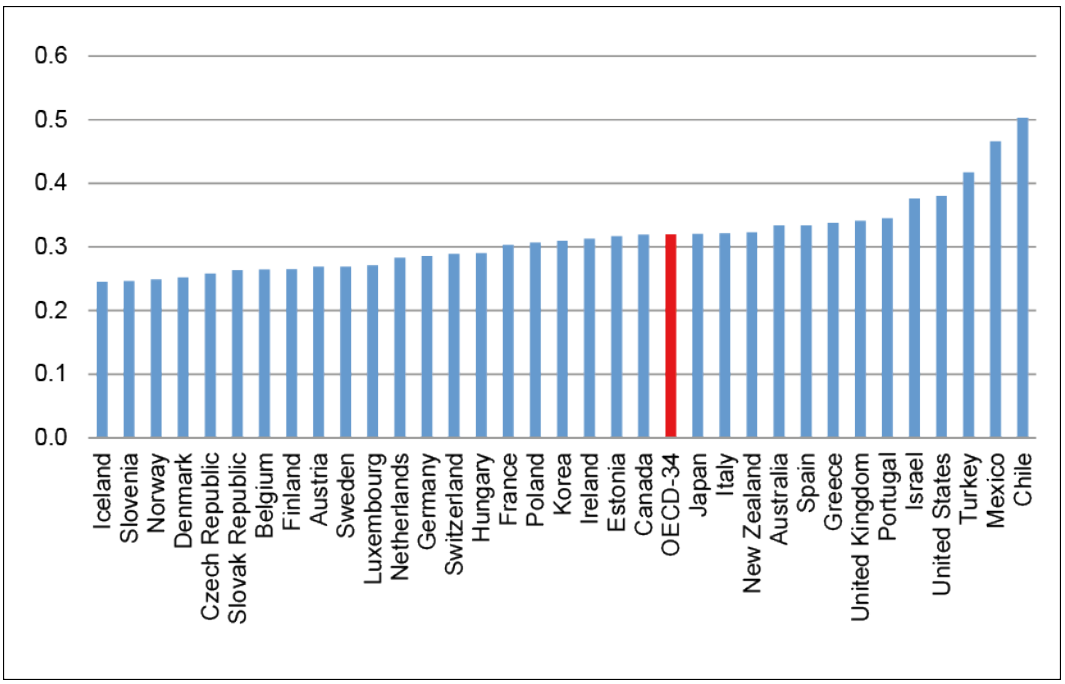
Compared with OECD countries, Asia's income inequality is higher by 5.46 points on average. The average Gini coefficient of Asia's 32 countries around 2010 was 37.46 as shown in Figure 8 while the average Gini coefficient of 34 OECD countries was 32 as shown in Figure 9. While changes in the Gini coefficients in the OECD countries over time tend to be mild, many Asian countries experienced drastic surges or drops in their Gini coefficients between the 1990s and 2010.

Figure 8: Asia Gini Coefficients, 2010



Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.
Source: WIDER, World Income Inequality Database 3.3.

Figure 9: OECD Gini Cofficients, 2011



OECD = Organisation for Economic Co-operation and Development.
Source: OECD Database on Household Income Distribution and Poverty.

5. MODEL AND VARIABLES

There are different ways to structure models to formulate the Kuznets inverted-U hypothesis. A characteristic model that numerous authors (Park 1996a for one) have utilized may be presented as follows:

$$\text{Gini} = a_0 + a_1 \ln Y + a_2 (\ln Y)^2 + u \quad (1)$$

where Gini is the Gini index, an indication of income inequality, ln Y is shorthand for the logarithm of income of per capita GDP, which generally represents the level of economic development, and u is the residual. We expect a positive sign for a_1 while a negative sign is predicted for a_2.

Several other independent variables that have been incorporated into cross-sectional studies are included along with the income variables to better analyze income inequality. Two education variables are added to the model on the basis of human capital theory as follows:

$$\text{Gini} = b_0 + b_1 \ln Y + b_2 (\ln Y)^2 + b_3 \text{ED} + b_4 \text{EDGini} + u \quad (2)$$

where ED represents the level of schooling or educational attainment and EDGini stands for the dispersion of schooling or educational attainment.

The human capital theory proposes that the income level of an individual is determined by years of education and the rate of return to education. The human capital model as expressed by De Gregorio and Lee (2002) is given below:

$$\ln Y_s = \ln Y_0 + \Sigma \ln (1+ r_i) + \varepsilon \quad (3)$$

where Y_s is the income level with s years of schooling, r_i is the rate of return to the ith year of schooling, Σ is the summation from i=1 to s years, and ε is the residual. Equation (3) can be approximated as $\ln Y_s = \ln Y_0 + r S + \varepsilon$. After making variance transformation on both sides, the reformulated equation is shown below:

$$\text{Var} (\ln Y_s) = r^2 \text{Var} (S) + S_\mu^2 \text{Var} (r) + 2 r S_\mu \text{Cov} (r,S) + \text{Var} (\varepsilon) \quad (4)$$

where S_μ is the average schooling years.

This formula obviously indicates the existence of a direct correlation between education inequality and income inequality. However, the years of schooling has an inconclusive influence on income inequality. If the level of education (s) and the rate of return (r) are independent, an increase in the years of schooling will make income inequality rise. Yet, if the covariance between the years of schooling (s) and the rate of return (r) is negative, a rise in the average years of schooling can reduce income inequality. So, the sign of b_3 is ambiguous while a positive sign is predicted for b_4.

A country's globalization level and its degree of freedom, either political or economic, may influence the distribution of income, especially in the progressively integrated and globalized world. Relevant significant control variables are added to equation (2) as shown below:

$$\text{Gini} = c_0 + c_1 \ln Y + c_2 (\ln Y)^2 + c_3 \text{ED} + c_4 \text{EDGini} + c_5 \text{FREEDOM} + c_6 \text{GLOBAL} + u \quad (5)$$

where FREEDOM represents either a country's degree of economic freedom or degree of political freedom, and GLOBAL indicates the degree of globalization of a country.

There are various measures of income inequality and Park (1984) compared their similarities and differences. The best-known and most widely used measure of income inequality is the Gini coefficient. The WIID (World Income Inequality Database) 3.3 by UNU-WIDER (2015) has the most extensive data collection on the Gini coefficient, covering a large number of countries in the world for a long period of time. Additionally, the income share of the top 20% of the population (TOP20) and the income share of the bottom 40% of the population (BOTTOM40) are utilized as alternative measures of the income inequality variable. As a proxy variable for the income level (or economic development), the logarithm of per capita GDP is used and the data are from the World Bank's World Development Indicators (WDI). One education variable, the mean years of schooling (ED), is acquired from the new data set of educational attainment in the world 1950–2010 by Barro and Lee (2010), and the second education variable, the dispersion of schooling (EDGini), is calculated by the author according to the formula given in Section 3, using Barro and Lee's (2010) data.

Two different measures of freedom are used to estimate the variable FREEDOM. First, the economic freedom of a country is determined by the degree of freedom of businesses and individuals from government restrictions on their economic activities. How well legal and institutional systems are structured to preserve economic freedom is also considered. Since 1994, the index of economic freedom has been published annually by the Heritage Foundation. Its publication, *Economic Freedom*, rates countries in the world based on 50 independent variables that are organized into ten broad categories of economic freedom.

Second, political freedom is a fundamental factor of democracy. A country's political freedom is rated by estimating the degree to which people are unrestricted in the areas of political rights and civil rights. Since 1978, the index of political freedom has been published annually by Freedom House, a New York-based nonprofit organization that monitors political rights and civil liberties around the world. Its publication, *Freedom in the World*, lists country rankings by the level of political freedom derived from their data on such rights and liberties.

Among the various indices indicating the level of globalization of individual nations, the KOF globalization index is utilized as a proxy variable for globalization. This index is available for 208 countries for the period 1970 to 2016 and is most suitable for our research because it covers many countries for a long period of time. The KOF globalization index is based on economic, political, and cultural integration of a country in the world and the degree of personal contact across national borders. The metrics for economic integration include convergence of domestic and international prices, movements of goods and services, and outward- and inward-directed foreign investment as well as portfolio capital flows. On the other hand, the metrics for the degree of personal contact across national borders include international travel, memberships of international organizations, cross-border remittances, Internet users and servers, and international phone calls.

6. EMPIRICAL RESULTS

The data for income inequality are obtained from WIID3.3. Despite the improvements of WIID data over time, some observations of the Gini index are missing in the data set. In some instances, there are discrepancies in estimates for the same country in the same year. One possible method to analyze such data with many missing observations is to do an unbalanced panel data analysis. Therefore, an unbalanced panel data analysis, with 1990, 2000, and 2010 data, is carried out in this study. The sample size is inevitably reduced due to many missing Gini index observations.

To eliminate the possibility of reverse causality, we used lagged independent variables. While 1990, 2000, and 2010 data points are used for independent variables, the dependent variables, Gini, TOP20, and BOTTOM40, are from data of a few years later (at least 2–3 years) than 1990, 2000, and 2010, respectively.

Table 2 shows the regression results of estimating equation (1). The empirical results supported the Kuznets hypothesis. We observe an inverse U-shaped curve relationship for Gini and TOP20, while BOTTOM40 exhibits a U-shaped curve relationship. We obtained the predicted signs for all coefficients, and most of them are statistically significant at the 5% level, regardless of whether Gini, TOP20 or BOTTOM40 is used as the dependent variable. Due to the nature of the panel data, the sizes of the adjusted R^2 statistic tend to be small.

Table 2: Regression of Income Inequality on Income

	GINI	TOP 20%	BOTTOM 40%
Constant	–22.78	–11.57	32.49
	(31.65)	(12.63)	(25.18)
ln Y	23.29**	18.82**	–10.62**
	(10.08)	(7.87)	(3.75)
$(\ln Y)^2$	–2.14**	–1.66**	1.19**
	(0.81)	(0.74)	(0.57)
N	78	78	78
Adj. R^2	.264	.329	.243

The first entry for each predictor is the coefficient estimate, and the second in parentheses is the standard error of the coefficient estimate. * indicates significance at the 10% level and ** at the 5% level.

Table 3 shows the regression results of estimating equation (2) with two more variables added. These two added explanatory variables are the mean years of schooling and dispersion of schooling (or inequality in education). The mean years of schooling of the labor force (ED) is used as a proxy variable for the educational attainment level. As a proxy variable for the dispersion of educational attainment, EDGini is calculated by the author from Barro and Lee's (2010) data of educational attainment.

The regression results in Table 3, which include these additional education variables, ED and EDGini, are quite different from the results in Table 2. First, inclusion of the additional variables raised the adjusted R^2 statistic, thereby contributing to improvement in the explanatory power of the model. Second, both education variables have significant effects on income inequality while the magnitude and significance of the income variables declined, as can be seen from the smaller and less significant coefficients of both ln Y and $(\ln Y)^2$. A negative and significant coefficient of ED on Gini and TOP20 indicates that a higher level of schooling reduces overall income inequality (lower Gini index and lower TOP 20% income share) while a positive and significant

coefficient of ED on BOTTOM40 indicates that a higher level of schooling improves the income share of the poor (higher BOTTOM 40% income share). On the other hand, a positive effect of EDGini on GINI and TOP20 and a negative effect of EDGini on BOTTOM40 indicate that the larger the dispersion of schooling, the more unequal the distribution of income.

Table 3: Regression of Income Inequality on Income and Education Variables

	GINI	TOP 20%	BOTTOM 40%
Constant	14.85 (22.75)	4.36 (7.27)	22.73 (30.34)
ln Y	14.68* (8.02)	13.90* (7.71)	–6.14 (4.68)
$(\ln Y)^2$	–1.32 (1.67)	–1.05 (0.81)	0.64 (0.42)
ED	–2.39** (0.67)	–1.47** (0.59)	1.02** (0.43)
EDGini	6.18** (1.98)	5.97** (2.17)	–3.92** (1.64)
N	72	72	72
Adj. R^2	.397	.425	.353

The first entry for each predictor is the coefficient estimate, and the second in parentheses is the standard error of the coefficient estimate. * indicates significance at the 10% level and ** at the 5% level.

Table 4 shows the regression results of estimating equation (5), which includes two control variables in addition to two income variables and two education variables. These two control variables signify a country's degree of freedom and the degree of globalization. To measure a country's freedom, the economic freedom index published by the Heritage Foundation as well as the political freedom index published by Freedom House are utilized. To measure the effect of globalization of a country on its income inequality, the KOF globalization index is utilized. A moderate improvement in the adjusted R^2 statistic is obtained. The significance of the two education variables remains unchanged while the two income variables become less significant, though they exhibit predicted signs.

Economic freedom, though not significant, is positively related to income inequality. Our results do not indicate a meaningful association between political freedom and income inequality. This study also confirms that some variations in income inequality can be explained by globalization, thereby sustaining the great U-turn hypothesis proposed by Alderson and Nielson (2002). So, the longitudinal tendency toward rising income inequality may be partially explained by globalization trends. Globalization may influence income inequality through technical changes favoring highly educated and skilled workers with bias against unskilled workers, causing wider wage differentials.

Table 4: Regression of Income Inequality on Income, Education, and Globalization

	GINI	TOP 20%	BOTTOM 40%
Constant	10.56	3.28	16.34
	(12.84)	(5.26)	(10.74)
ln Y	13.21	12.63*	–4.26
	(7.68)	(7.14)	(2.94)
$(\ln Y)^2$	–1.55	–1.13	0.73
	(1.17)	(0.72)	(0.58)
ED	–1.72*	–2.17**	0.98**
	(0.96)	(0.66)	(0.44)
EDGini	5.94**	6.94**	–4.76**
	(2.37)	(1.13)	(1.91)
ln ECONOMIC FREEDOM INDEX	1.73	2.184	–1.31*
	(2.05)	(2.12)	(0.71)
POLITICAL FREEDOM RATING	–0.15	0.28	–0.09
	(0.29)	(0.63)	(0.11)
ln GLOBALIZATION INDEX	2.95**	3.01**	–1.01*
	(1.13)	(0.97)	(0.54)
N	69	69	69
Adj. R^2	.445	.489	.394

The first entry for each predictor is the coefficient estimate, and the second in parentheses is the standard error of the coefficient estimate. * indicates significance at the 10% level and ** at the 5% level.

7. CONCLUSION AND IMPLICATIONS

Education has been a crucial factor in economic and social policies because of its potential to promote economic and social progress for the individual as well as the country as a whole. Historically, education as human capital investment and its effect on economic growth have been major subjects of concern for scholars as well as policymakers. Lately, the importance of establishing the relationship between education and income and between education and income distribution has gained prominence.

In our paper, we deliver evidence on how the education level and education inequality influence income inequality in the Asian and Pacific areas, based on the panel data of 1990, 2000, and 2010. Results from the panel data analysis indicate that a higher level of schooling of the population has reduced income inequality while a greater dispersion of schooling among the population has increased income inequality. We support the presence of the inverted-U curve when only the income variables are included in the model as independent variables. Then again, the effect of the income variables becomes weaker and statistically less significant when two additional educational variables, specifically the average years of schooling and the dispersion of schooling, are incorporated into the model.

We also studied the effects of freedom and globalization on income distribution. Our analysis demonstrates that an increasing degree of globalization results in increasing inequality in income distribution. However, freedom, either political or economic, has only limited impacts on the distribution of income. With the adjusted R^2 ranging between 0.4 and 0.5, a substantial proportion of the changes in income inequality across countries still remain unexplained. To identify additional determinants of income inequality, further study is warranted.

This study offers policy implications on how to improve income distribution. The chief finding of this study is that education plays a significant role in reducing income inequality. If a government plans to improve the distribution of income, it is suggested that government policymakers focus on education policies that promote educational expansion while affording individuals equal and greater access to educational opportunities. Educational expansion with less dispersion of schooling is also identified by Park (1998) as a major factor contributing to economic growth. Government policymakers need to monitor the dispersion of educational attainment because education expansion under certain circumstances may produce an increase in education inequality.

At the same time, as changes in educational attainment and dispersion of schooling take longer, this indirect and long-term education policy needs to be supplemented by a more direct and short-term government policy focusing on a progressive income tax structure and transferring benefits to the poor. Some argue that redistributive policies have a tendency to have a negative impact on economic growth. However, equitable distribution may not necessarily be detrimental to economic growth as Japan; Taipei,China; and Republic of Korea represent a few cases of achieving both equity and economic growth with their emphasis on education in their economic development process. Equity and growth can be achieved through an optimal mix of long-term education policies and short-term redistributive government policies.

This study also confirms the important role played by globalization in determining income inequality. The difficulty in establishing relationships comes from the complexity of globalization measurements. The globalization index is comprised of numerous elements of globalization, such as movements of goods and services, inward and outward foreign direct investment as well as portfolio capital flows, convergence of domestic and international prices, international travel, etc. To discover which elements play important roles in determining income inequality, further research on different components of globalization would be required.

REFERENCES

Ahluwalia, M., "Income Inequality, Some Dimensions of the Problem," in: H. Chenery et al. (eds.), *Redistribution with Growth* (New York: Oxford University Press, 1974), 3–37.

Ahluwalia, M., "Inequality, Poverty and Development," *Journal of Development Economics* 3 (1976), 307–342.

Alderson, A. & F. Nielsen, "Globalization and the Great U-turn: Income Inequality Trends in 16 OECD Countries," *American Journal of Sociology* 107 (2002), 1244–1299.

Barro, R., "Inequality and Growth in a Panel of Countries," *Journal of Economic Growth* 5 (2000), 5–32.

Barro, R & J. Lee, *A New Data Set of Educational Attainment in the World, 1950–2010*, Working Paper No.15902 (Cambridge, MA: National Bureau of Economic Research, 2010).

Becker, G., *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education* (New York: Columbia Univ. Press, 1964).

Bourguignon, F. & C. Morrisson, "Inequality among World Citizens: 1820–1992," *American Economic Review 92* (2002), 727–744.

Checchi, D., *Does Educational Achievement Help to Explain Income Inequality?* Working Paper No. 208 (Helsinki: United Nations University, World Institute for Development Economics Research, 2000).

De Gregorio, J. & J. Lee, "Education and Income Inequality: New Evidence from Cross-country Data," *The Review of Income and Wealth* 48 (2002), 395–416.

Harjes, T., *Globalization and Income Inequality: A European Perspective*. IMF Working Paper (Washington, D.C.: IMF, 2007).

Heshmati, A., *The Relationship between Income Inequality and Globalization*. WIDER Working Paper (Helsinki: The United Nations University, 2003).

Kravis, I.G., "International Differences in the Distribution of Income," *Review of Economics and Statistics* 42 (1960), 408–416.

Kuznets, S., "Economic Growth and Income Inequality," *American Economic Review* 45 (1955), 1–28.

Kuznets, S., "Quantitative Aspects of the Economic Growth of Nations VIII: Distribution of Income by Size," *Economic Development and Cultural Change* 11 (1963), 1–80.

Li, H., Squire, L., & H. Zou, "Explaining International and Intertemporal Variations in Income Inequality," *Economic Journal*, 108 (1998), 26-43.

Li, H., & H. Zou, "Inflation, Growth, and Income Distribution: A Cross-country Study," *Annals of Economics and Finance* 3 (2002), 85–101.

Milanovic, B., & L. Squire, *Does Tariff Liberalization Increase Wage Inequality? Some Empirical Evidence.* World Bank Policy Research Working Paper No. 3571 (Washington DC: World Bank, 2005).

Nielsen, F., & A. Alderson, “Income Inequality, Development, and Dualism: Results from an Unbalanced Cross-national Panel. *American Sociological Review* 60 (1995), 674–701.

Papanek, G. and O. Kyn, “The Effect on Income Distribution of Development, the Growth Rate and Economic Strategy,” *Journal of Development Economics* 23 (1986), 55–65.

Park, K., “Comparison of Income Inequality Measures,” *Studies in Economics and Finance* 8 (1984), 35–58.

Park, K., “Re-examination of the Linkage between Income Inequality and Political Violence,” *Journal of Political and Military Sociology* 14 (1986), 185–197.

Park, K., “Educational Expansion and Educational Inequality on Income Distribution,” *Economics of Education Review* 15 (1996a), 51–58.

Park, K., Income Inequality and Economic Progress,” *American Journal of Economics and Sociology* 55 (1996b), 87–96.

Park, K., “Distribution and Growth: Cross-country Evidence,” *Applied Economics* 30 (1998), 943–949.

Psacharopoulos, G. & J.B.G. Tilak, “Schooling and Equity,” in: G. Psacharopoulos (ed.), *Essays on Poverty, Equity and Growth* (Oxford: Pergamon Press, 1991), 53–78.

Ram, R., “Population Increase, Economic Growth, Educational Inequality and Income Distribution,” *Journal of Development Economics* 14 (1984), 419–428.

Ravallion, M., *Competing Concepts of Inequality in the Globalization Debate*. World Bank Policy Research Working Paper No. 3038 (Washington DC: World Bank, 2004).

Robinson, S., “A Note on the U-hypothesis Relating Income Inequality and Economic Development,” *American Economic Review* 66 (1976), 437–440.

Ruffin, R., “Globalization and Income Inequality,” *Trade and Development Review* 2 (2009), 56–69.

Saith, A., “Development and Distribution: A Critique of the Cross-country U-hypothesis, *Journal of Development Economics* 13 (1983), 367–382.

Stewart, F., “Inequality, Technology and Payment System,” *World Development 6* (1978), 275–293.

Thomas, V., Wang, Y., & X. Fan, “Measuring Education Inequality: Gini Coefficients of Education for 140 countries, 1960–2000,” *Journal of Education Planning and Administration* 17 (2003), 5–33.

Tilak, J.B.G, “Rates of Return to Education and Income Distribution,” *De Economist* 137 (1989), 454–465.

Tinbergen, J., “The Impact of Education and Income Distribution,” *Review of Income and Wealth* 19 (1972), 255–265.

Wells, R., “Education’s Effect on Income Inequality: an Economic Globalisation Perspective,” *Globalisation, Societies and Education* 4 (2006), 371–391.

Winegarden, C.R., “Schooling and Income Distribution: Evidence from International Data,” *Economica* 46 (1979), 83–87.

World Institute for Development Economics Research (WIDER), *World Income Inequality Database 3.3* (United Nations University, 2015).

Yitzhaki, S. “Economic Distance and Overlapping of Distributions,” *Journal of Econometrics* 61 (1994), 147–159.

Zhang, J., Kanbur, R., & C. Rhee, “What Drives Asia’s Rising Inequality,” in: Zhang, J., Kanbur, R., and C. Rhee eds. *Inequality in Asia and the Pacific: Trends, Drivers and Policy Implications* (Asia Development Bank, 2014).