Economics & Management Series *EMS-2013-18*

Educational Expansion and Inequality in Indonesia: Testing the Kuznets Hypothesis with Provincial Panel Data

Takahiro Akita
International University of Japan

Heryanah
Alumnus 2013, International University of Japan

September 2013

IUJ Research Institute
International University of Japan

Educational Expansion and Inequality in Indonesia: Testing the Kuznets Hypothesis with Provincial Panel Data*

Takahiro Akita

Graduate School of International Relations
International University of Japan
akita@iuj.ac.jp

and

Heryanah
Central Bureau of Statistics
Indonesia
heryanah@iuj.ac.jp

Abstract

This study analyzes the relationship between the level of educational attainment, educational inequality and expenditure inequality in Indonesia based on a provincial panel data set from 1996-2011 and attempts to test the Kuznets hypothesis for educational expansion. We found that educational inequality decreases as the average level of educational attainment increases. In contrast, expenditure inequality follows an inverted U-shaped pattern with respect to educational expansion and reaches the maximum at around 9-10 years of education. Given the current average educational level, further educational expansion would increase expenditure inequality. However, more equal distribution of education has an equalizing effect.

Keywords: educational expansion, expenditure inequality, educational inequality, Kuznets hypothesis, panel data regression, Indonesia

JEL classification: I24, I25, O15

---

* An earlier version of the paper was presented at the 23rd Pacific Conference of the Regional Science Association International in Bandung, Indonesia in July 2013. The authors would like to thank participants of the session on Poverty, Inequality and Inter-regional Disparity for their useful comments and suggestions. Takahiro Akita is grateful to the Japan Society for the Promotion of Science for its financial support (Grant-in-Aid for Scientific Research No. 24530274).

1. Introduction

Kuznets (1955) illustrated a process of inequality changes associated with the shift of population from the agricultural to the non-agricultural sector. He argued that inequality first increases, flattens, and then decreases as the population share of the higher-income, non-agricultural sector rises, i.e., inequality follows an inverted U pattern with respect to the level of economic development. Following Kuznets (1955), Robinson (1976), Knight (1976) and Anand and Kanbur (1993) delineated an inverted U curve using relative inequality measures, such as the variance of log income, the Gini coefficient, the coefficient of variation and the Theil indices, in an economy where the population shifts from the low-income, low-inequality traditional sector to the high-income, high-inequality modern sector. Anand and Kanbur (1993) termed this the Kuznets process.

Since the seminal article by Kuznets (1955), a number of empirical studies have been conducted to test the Kuznets hypothesis on the relationship between income inequality and the process of economic development.[1] But, most studies have employed cross-country or pooled cross-country data due to the lack of time-series data of sufficient duration to test the hypothesis for an individual country. Among these studies, Knight and Sabot (1983), Ram (1989, 1990), Park (1996) and De Gregorio and Lee (2002) have considered educational expansion as part of economic development and investigated the relationship between the level of educational attainment, educational inequality and income inequality. They found a significant positive relationship between educational inequality and income inequality, meaning that more equal distribution of education has an equalizing effect on the distribution of income. However, the relationship between the level of educational attainment and income inequality is ambiguous, i.e., educational expansion may or may not have an equalizing effect on income distribution.

Like many previous studies on income inequality, our study considers education as one of the main determinants of the distribution of economic well-being and analyzes the relationship between the level of educational attainment, educational

[1] For example, Ahluwaria (1976a, 1976b), Knight and Sabot (1983), Saith (1983), Papanek and Kyn (1986), Campano and Salvatore (1988), Ram (1988, 1989, 1990), Anand and Kanbur (1993), Jha (1996), Park (1996), Deininger and Squire (1997, 1998), De Gregorio and Lee (2002), and Huang (2004).

inequality and expenditure inequality in Indonesia based on a provincial panel data set constructed by using the core *Susenas* (national socio-economic survey) from 1996 to 2011. After providing a theoretical discussion on the relationship between the level of educational attainment and expenditure inequality based on the Theil index, it attempts to test the Kuznets hypothesis for educational expansion. The main features of this study are as follows. First, it focusses on an individual country, i.e., Indonesia, the world's largest archipelagic country comprising more than 17,500 islands. Second, it constructs a provincial panel data set based on a series of national socio-economic surveys over a long period of time. Third, it uses three relative inequality measures, i.e., the Gini coefficient, the coefficient of variation and the Theil index T, to examine the relationship between the level of educational attainment, educational inequality and expenditure inequality.

2. Data and Method

2.1. Data

In order to analyze the relationship between the level of educational attainment, inequality in per capita expenditure (expenditure inequality, hereafter) and educational inequality in Indonesia, this study conducts a panel regression analysis based on a provincial panel data set, which was constructed by using the core National Socio-Economic Survey (*Susenas)* from 1996 to 2011. It should be noted that the core *Susenas* has been conducted every year by the Indonesian Central Bureau of Statistics (BPS) in order to collect individual and household-level information about health, education, occupation, consumption expenditure, etc. In this study, we use household-level data to estimate the average level of educational attainment, expenditure inequality and educational inequality, where the level of educational attainment for a household is measured by the number of years of education attended by its household head.

In the data set, Maluku and Papua (two eastern provinces), are excluded due to a number of missing data, and thus there are 24 provinces. But since there are missing data for Aceh in 2000, 2001 and 2005, the number of observations is 381 (= (16 years x 24 provinces) – 3) in the panel regression analysis where educational inequality is regressed on the average level of educational attainment and the square of the average level of educational attainment. But, when expenditure inequality is used as the dependent variable, rather than educational inequality, then the number of observations is 380, since there are missing data for Aceh in 2002 in addition to 2000, 2001 and 2005.

2.2. Method

Inequality Measures

In order to estimate expenditure inequality and educational inequality for each province, this study employs the following relative inequality measures: the Gini coefficient, the coefficient of variation (CV), and the Theil index *T*. These inequality measures satisfy several desirable properties as a measure of inequality, such as anonymity, mean independence, population-size independence and the Pigue-Dalton principle of transfer (see Anand, 1983; Fields, 2001). Anonymity implies that an inequality measure does not depend on who has higher or lower per capita expenditure. Mean independence implies that an inequality measure remains unchanged when per capita expenditures are all multiplied by the same positive scalar, while population-size independence or population homogeneity means that a measure of inequality remains unchanged if the number of households at each expenditure level is changed by the same proportion. Finally, the Pigue-Dalton principle of transfer implies that any rank-preserving transfer from a richer to a poorer household reduces the value of an inequality index.

Suppose that there are n households in a population. Let

y_i = per capita expenditure of household i, and

μ = mean per capita expenditure of all households.

Then overall expenditure inequality is measured by the Theil T and the CV as follows:

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

$$CV = \frac{1}{\mu}\sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - \mu)^2} \quad (2)$$

When we measure educational inequality, y_i and μ are replaced, respectively, by e_i and ε, where

e_i = number of years of education attended by the household head of household i, and

ε = mean number of years of education of all households.

This study also uses the Gini coefficient to measure expenditure inequality and educational inequality. Suppose that all households are arranged in non-descending order of per capita expenditure, i.e., $y_1 \leq y_2 \leq \ldots \leq y_n$. Then the Gini coefficient for the distribution of per capita expenditures, $\boldsymbol{y} = (y_1, y_2, \cdots, y_n)$, is given by:

$$G = \frac{2}{n\mu}\operatorname{cov}(i(\boldsymbol{y}), \boldsymbol{y}) \tag{3}$$

where $i(\boldsymbol{y})$ is the rank of households in the distribution of per capita expenditures. When educational inequality is measured by the Gini coefficient, $\boldsymbol{y}$ and μ are replaced, respectively, by $\boldsymbol{e} = (e_1, e_2, \cdots, e_n)$ and ε in equation (3).

Kuznets Process for Educational Expansion

Before presenting panel regression models, which are used to test the Kuznets hypothesis with respect to educational expansion, this sub-section delineates the Kuznets process for educational expansion based on the Theil index T in an economy where there are two educational groups, i.e., the lower and higher educational groups and the population shifts from the lower to the higher educational group as the economy develops.

Suppose that n households in an economy are classified into the mutually exclusive and collectively exhaustive lower and higher education groups. For example, the lower educational group includes those households whose heads have attained primary education or less, while the higher educational group includes those households whose heads have attained at least junior high school education. Let

n_i = number of households in education group i,

μ_i = mean per capita expenditure of households in education group i, and

y_{ij} = per capita expenditure of household *j* in education group *i*.

Then, overall expenditure inequality is measured by the Theil *T* as follows:

$$T = \frac{1}{n}\sum_{i=1}^{2}\sum_{j=1}^{n_i}\left(\frac{y_{ij}}{\mu}\right)\log\left(\frac{y_{ij}}{\mu}\right) \tag{4}$$

The Theil index *T* belongs to the generalized entropy class of inequality measures, and thus is additively decomposable by population sub-group, i.e., overall expenditure inequality can be expressed as the sum of the within-group inequality component (T_W) and the between-group inequality component (T_B) as follows (Shorrocks, 1980; Anand, 1983):

$$\begin{aligned} T &= \sum_{i=1}^{2}\left(\frac{n_i}{n}\frac{\mu_i}{\mu}\right)T_i + \sum_{i=1}^{2}\left(\frac{n_i}{n}\frac{\mu_i}{\mu}\right)\log\left(\frac{\mu_i}{\mu}\right) \\ &= \left[\left(\frac{n_1}{n}\frac{\mu_1}{\mu}\right)T_1 + \left(\frac{n_2}{n}\frac{\mu_2}{\mu}\right)T_2\right] + \sum_{i=1}^{2}\left(\frac{n_i}{n}\frac{\mu_i}{\mu}\right)\log\left(\frac{\mu_i}{\mu}\right) = T_W + T_B \end{aligned} \tag{5}$$

where $T_i = \frac{1}{n_i}\sum_{j=1}^{n_i}\left(\frac{y_{ij}}{\mu_i}\right)\log\left(\frac{y_{ij}}{\mu_i}\right)$ is the within-group inequality of education group *i* (*i* = 1 and 2 for the higher and lower education groups, respectively).

Let $\alpha = {\mu_1}/{\mu_2}$ be the ratio in mean per capita expenditure between the higher and lower education groups and $x = {n_1}/{n}$ be the population share of the higher education group ($0 \le x \le 1$). Then the Theil *T*, as defined by equation (5), can be rewritten as

$$\begin{aligned} T &= T_W + T_B \\ &= \left[T_2 + (T_1 - T_2)\frac{\alpha x}{\alpha x + (1-x)}\right] + \left[\frac{(\alpha\log\alpha)x}{\alpha x + (1-x)} - \log(\alpha x + (1-x))\right] \end{aligned} \tag{6}$$

By holding $\alpha, T_1, \text{and } T_2$ constant, the Theil index *T* in equation (6) can be viewed as a function of *x*, i.e., the share of households whose heads have higher education. With respect to the increase in the share of households whose heads have higher education, we can obtain the following proposition (for detail, please see Akita and Miyata (2008)).

Proposition 1

Under the assumption that $1 < \alpha \le 3.5$ and $T_1 > T_2$, the Theil index T is strictly concave over $0 \le x \le 1$. Furthermore, if $0 < T_1 - T_2 < (\alpha - 1) - \log \alpha$, then the Theil index T has the global maximum at

$$x^* = \frac{\alpha(T_1 - T_2) + \alpha \log \alpha - (\alpha - 1)}{(\alpha - 1)^2} \quad \text{where} \quad 0 < x^* < 1. \qquad (7)$$

On the other hand, if $T_1 - T_2 \ge (\alpha - 1) - \log \alpha > 0$, then the Theil index T has the global maximum at $x^* = 1$. It should be noted that if α is greater than 3.6, then there is a range of x close to $x = 1$ where the Theil T is strictly convex.

According to Akita and Miyata (2008) and Akita and Alit (2010), in Indonesia, the ratio in mean per capita expenditure between the higher and lower education groups, α, is around 2, and thus $1 < \alpha \le 3.5$ is satisfied. Furthermore, the higher education group has a higher expenditure inequality than the lower education group. Under these conditions, the proposition above delineates the Kuznets process for educational expansion, which is described as follows (see Figure 1). When all households are in the lower education group, overall expenditure inequality is the same as the inequality of the lower education group. But as more households attain higher education, it increases gradually. Under certain conditions, it reaches a peak before all households are in the higher education group, and then decreases as more households move to the higher education group. When all households are in the higher education group, overall inequality becomes the inequality of the higher education group. In sum, there is an inverted U-shaped relationship between the share of the higher education group and expenditure inequality. This can be termed the Kuznets process for educational expansion.

Figure 1

Since the average level of educational attainment, as measured by the average number of years of education, rises as the share of the higher education group increases, we test an inverted U-shaped relationship using the average level of educational attainment as an independent variable.

Panel Regression Analysis

In the panel regression analysis, we estimate the following regression model:

$$INEQ_{it} = \alpha + \beta_1 Educ_{it} + \beta_2 (Educ_{it})^2 + a_i + u_{it} \quad (8)$$

where $INEQ_{it}$ is expenditure inequality or educational inequality, as measured by the Gini coefficient, the Theil *T* or the CV in province *i* in year *t*, while $Educ_{it}$ is the average level of educational attainment in province *i* in year *t*. a_i and u_{it} are, respectively, the unobserved individual-specific effect and the idiosyncratic error term. The average level of educational attainment is measured by the average number of years of education attended by the head of household, where the number of years of education for a household is determined based on: no schooling (0 year); incomplete primary school (3 years); general and Islamic primary schools (6 years); general and Islamic junior high schools (9 years); general, Islamic and vocational senior high schools (12 years); diploma I and II (13 years); diploma III (15 years); diploma IV (Bachelor's degree) (16 years); and master's or doctor's degree (18 years).

We also estimate the following regression model to examine the relationship between expenditure inequality and educational inequality after controlling for the average level of educational attainment:

$$Exineq_{it} = \alpha + \beta_1 Edineq_{it} + \beta_2 Educ_{it} + \beta_3 (Educ_{it})^2 + a_i + u_{it} \quad (9)$$

where $Exineq_{it}$ is expenditure inequality, while $Edineq_{it}$ is educational inequality.

3. Empirical Result

3.1 Educational Expansion, Expenditure Inequality and Educational Inequality

According to Table 1, which presents the shares of the primary, secondary and tertiary education groups, it is apparent that in both urban and rural areas, there is a gradual shift in population from the primary to the secondary and tertiary groups.[2] In 1996, the primary education group encompassed 81% of rural households and 47%

[2] The primary education group includes those households whose heads have no education or have attained at most primary education. The secondary education group includes those households whose heads have attained either junior or senior high school education, while the tertiary education group encompasses those households whose heads have attained at least diploma I and II education (i.e., 13 years of education).

of urban households. However, the share has declined gradually to 68% in rural areas and 40% in urban areas in 2011. As shown in Figure 2, the average level of educational attainment, as measured by the average number of years of education, has increased gradually from 4.8 to 6.3 years in rural areas and from 8.2 to 9.2 years in urban areas in accordance with these changes.

<u>Table 1 and Figure 2</u>

In the case of expenditure inequality, no secular trend is observed in the study period (see Table 2 and Figure 3). According to the Gini coefficient, expenditure inequality was 0.38 in 1996; but it has declined gradually to 0.32 in 2000, the lowest level in the study period. From 2007, there was an increasing trend, and in 2011, expenditure inequality reached the highest at 0.4 by the Gini coefficient, which is very high by international standards. Table 3 presents the decomposition of overall expenditure inequality into the within-group and between-group inequality components. The secondary/tertiary education group has a much larger mean per capita expenditure than the primary group. The ratio in mean per capita expenditure between these two groups is around 1.7-1.8, implying that the between-group inequality accounts for around 15% of overall expenditure inequality. The secondary/tertiary education group also has a much higher within-group expenditure inequality than the primary group and accounts for 60% of overall expenditure inequality in 2011.

<u>Table 2, Table 3 and Figure 3</u>

In 1997, the ratio in mean per capita expenditure between the secondary/tertiary and primary education groups is 1.8, i.e., $\alpha = 1.8$. Since the difference in the Theil T value between the secondary/tertiary and primary education groups is 0.14, i.e., $0 < T_1 - T_2 = 0.14$, we have $0 < T_1 - T_2 < (\alpha - 1) - \log \alpha$. Therefore, by holding T_1, T_2 and α constant, we can use equation (7) to estimate the share of the secondary/tertiary education group at which expenditure inequality gets the maximum. In 1997, expenditure inequality would get the highest at the share of 76.9%, meaning that if the share is smaller than 76.9%, expenditure inequality would increase as the share of the secondary/tertiary education group increases, *ceteris paribus*. Similarly in 2011, we have $\alpha = 1.9$ and $0 < T_1 - T_2 = 0.11$; thus

$0 < T_1 - T_2 < (\alpha - 1) - \log\alpha$ is satisfied. Expenditure inequality would get the highest at the share of 67.5%, *ceteris paribus*. It should be noted however that since T_1, T_2 and α could change as the share of the secondary/tertiary education group increases, whether there is an inverted U-shaped relationship between the share of the secondary/tertiary education group and expenditure inequality is an empirical issue.

As shown in Table 4 and Figure 4, educational expansion appears to have been associated with a decline in educational inequality, whether measured by the Gini coefficient or the Theil T. According to the Gini coefficient, educational inequality was around 0.40 in 1996, but it has declined gradually to 0.33 in 2011. This indicates a success in educational policies in Indonesia, where the government has been pursuing free and universal primary and junior secondary education throughout the country. According to Table 5, the primary education group has a very high within-group educational inequality, as it includes households whose heads have no education (0 year) and incomplete primary education (3 yeas). However, the primary group has lowered its educational inequality prominently in the study period from 0.35 in 1996 to 0.26 in 2011 by the Gini coefficient, during which the share of households with no education has declined from 15% to 7%, while the share of households with incomplete primary education has fallen from 25% to 21%. A fall in the share of the primary group from 69% to 54% is due mainly to the decrease in the share of households with no education or incomplete primary education.

<u>Table 4, Table 5 and Figure 4</u>

On the other hand, the secondary/tertiary group has a very low educational inequality, though it has raised its inequality slightly, from 0.10 to 0.13 by the Gini coefficient in the study period. According to the decomposition of overall educational inequality into the within-group and between-group inequality components by the Theil index T (Table 5), the contribution of the secondary/tertiary group to overall educational inequality has increased from 3.6% to 10.1%, while the contribution of the primary group has declined from 41.3% to 27.0%. It should be noted that in the study period, the contribution of the between-group inequality (i.e., disparity between the primary and secondary/tertiary education groups) to overall educational inequality has increased from 55.0% to 62.9%.

While the secondary/tertiary education group has a much larger average number of years of education than the primary group (11.9 vs. 4.2 years in 2011), the former group has a much smaller within-group educational inequality than the latter group (0.03 vs. 0.19 by the Theil T in 2011). When per capita expenditure is replaced by the number of years of education in equation (6), we have $T_2 > T_1$ rather than $T_2 < T_1$ even though $1 < \alpha = \varepsilon_1 / \varepsilon_2$ is satisfied, where T_1 and T_2 are, respectively, the educational inequalities of the secondary/tertiary and primary education groups, while ε_1 and ε_2 are, respectively, the mean numbers of years of education in the secondary/tertiary and primary groups. Therefore, we need to modify Proposition 1 presented in the previous section as follows:

Proposition 2

Under the assumption that $1 < \alpha \leq 3.5$ and $T_1 < T_2$, if $0 < T_2 - T_1 < \dfrac{\alpha \log \alpha - (\alpha - 1)}{\alpha}$, then the Theil index T has the global maximum at

$$x^* = \frac{\alpha(T_1 - T_2) + \alpha \log \alpha - (\alpha - 1)}{(\alpha - 1)^2} \quad \text{where} \quad 0 < x^* < 1. \tag{10}$$

On the other hand, if $0 < \dfrac{\alpha \log \alpha - (\alpha - 1)}{\alpha} < T_2 - T_1$, then the Theil index T has the global maximum at $x^* = 0$.

This Kuznets process for educational expansion is depicted in Figure 5. In 1996, the ratio in the mean number of years of education between the secondary/tertiary and primary groups is 3.2, i.e., $\alpha = 3.2$. Since the difference in the Theil T value between the primary and secondary/tertiary groups is 0.28, i.e. $0 < T_2 - T_1 = 0.28$, we have $0 < T_2 - T_1 < \dfrac{\alpha \log \alpha - (\alpha - 1)}{\alpha}$. Therefore, by holding T_1, T_2 and α constant we can use equation (10) to calculate the share of the secondary/tertiary group at which educational inequality gets the maximum. In 1996, educational inequality would reach the highest at the share of 12.7%, i.e., at a very early stage of educational expansion. This implies that if the share is larger than 12.7%, educational inequality would decrease as the share of the secondary/tertiary education group increases, *ceteris paribus*. Similarly, in 2011, we have $\alpha = 2.9$ and $0 < T_2 - T_1 = 0.16$; thus $0 < T_2 - T_1 < \dfrac{\alpha \log \alpha - (\alpha - 1)}{\alpha}$ is satisfied. Educational inequality would reach the highest at the share of 20.2% in 2011, *ceteris paribus*. It should be noted however that since T_1 , T_2 and α could change as the share of the secondary/tertiary education group increases, whether educational inequality decreases with educational expansion is an empirical issue.

Figure 5

3.2 Results of Panel Regression Analyses

We now estimate equation (8) based on the provincial panel data set. As suggested by Proposition 1, we expect an inverted U-shaped relationship between the level of educational attainment and expenditure inequality. Since the primary education group has a much smaller expenditure inequality than the secondary/tertiary group, it is expected that expenditure inequality increases in the early and middle stages of educational expansion and then reaches the peak in the latter stages. Table 6 presents the estimates of fixed effects and random effects models for expenditure inequality as the dependent variable. According to the Hausman test, we can reject the null hypothesis that individual-specific effects are uncorrelated with independent variables, and thus we explain the result based on the fixed effects model. Both the coefficients of *Educ* and $Educ^2$ have an expected sign and are significant at the 5 or 10% significance level whether the CV, the Gini or the Theil *T* is used (except for the coefficient of $Educ^2$ when the Gini coefficient is used as the dependent variable). In other words, expenditure inequality follows an inverted U-shaped pattern with respect to educational expansion. According to the result when the Theil *T* is employed as the dependent variable, the peak expenditure inequality is attained when the average number of years of education is about 9 years, i.e., 3rd year of junior high school. Since the current average number of years of education is 7.7 years, further educational expansion would increase expenditure inequality.

Table 6

We also expect an inverted U-shaped relationship between the level of educational attainment and educational inequality, as suggested by Proposition 2. However, since the primary education group has a much larger educational inequality than the secondary/tertiary group, educational inequality would reach the peak in the very early stages of educational expansion. Based on Proposition 2 above, in 1996, educational inequality would reach the peak at the share of the secondary/tertiary group of 12.7%, *ceteris paribus*, while in 2011, the peak would be attained at the share of 20.2%. According to the 1996-2012 *Susenas*, the share of the secondary/tertiary group has already exceeded the share for the peak educational inequality in all provinces. Therefore, with the provincial panel data from the 1996-2012 *Susenas*, we expect that the coefficient of *Educ* is negative, i.e., educational inequality would decrease with educational expansion.

Table 7 presents the estimates of fixed effects and random effects models for educational inequality as the dependent variable. We explain the result based on the fixed effects model, for the same reason as in the case of expenditure inequality. The coefficient of *Educ* is negative as expected and is significant at the 1% significance level whether the CV, the Gini or the Theil *T* is employed as a measure of educational inequality. In other words, educational inequality decreases with educational expansion. Since the average level of educational attainment in 2011 is about 7.7, further educational expansion would reduce educational inequality. However, the coefficient of $Educ^2$ is positive and significant at the 1% significance level, indicating that there is a level of educational attainment where educational inequality reaches the minimum. Based on the estimated coefficients of the independent variables, the minimum inequality level is reached at a very high level of educational attainment (at around 12 years of education, i.e., 3rd year of senior high school level).

Table 7

Finally, to examine the relationship between expenditure inequality and educational inequality, we estimate the regression model presented in (9) above. The result is shown in Table 8. We explain the result based on the fixed effects model for the same reason as in the previous models. All the coefficients are significant at the

1% significance level, whether the CV, the Gini coefficient or the Theil T is used as a measure of inequality. There is a positive relationship between expenditure inequality and educational inequality after controlling for the average level of educational attainment. In other words, with the average level of educational attainment kept constant, smaller educational inequality has an equalizing effect on the distribution of per capita expenditures among households. Adding educational inequality as an explanatory variable does not alter the signs of the coefficients of the average level of educational attainment and its square, meaning that there is an inverted U-shaped relationship between the average level of educational attainment and expenditure inequality, *ceteris paribus*. In other words, a higher average level of educational attainment has a disequalizing effect on the distribution of per capita expenditures among households. But this is up to around 9-10 years of education.

Table 8

4. Conclusion

It is widely known that education is one of the main determinants of the distribution of economic well-being. Thus policymakers argue that educational policies are essential to reduce income inequality and poverty. This study has attempted to shed some light on the relationship between education and the distribution of economic well-being by using household-level national survey data on education and expenditure in Indonesia. Specifically, it has analyzed the relationship between the level of educational attainment, educational inequality and expenditure inequality in Indonesia based on a provincial panel data set constructed by using the core *Susenas* (national socio-economic survey) from 1996 to 2011

Main findings are summarized as follows. In both rural and urban areas, the level of educational attainment, as measured by the average number of years of education, has increased gradually over the study period. This expansion of education has been associated with a decline in educational inequality. But, expenditure inequality has been fluctuating and not shown any secular trend over the study period. According to the decomposition of expenditure inequality by educational group, the secondary/tertiary education group has not only a larger mean per capita expenditure but also a higher within-group expenditure inequality than the primary education group. Inequality within the secondary/tertiary group has been playing a more important role; in 2011, its contribution to overall expenditure inequality amounts to 60% by the Theil *T*. Unlike expenditure inequality, the secondary/tertiary group has a much smaller educational inequality than the primary group, though the gap between these two groups has been narrowing gradually with educational expansion.

The regression results based on Indonesia's provincial panel data set seem to have conformed to theoretical arguments for the relationship between the level of educational attainment, educational inequality and expenditure inequality. Educational inequality decreases as the average level of educational attainment increases, but there is a turning point at a very high level of educational attainment. In contrast, expenditure inequality follows an inverted U-shaped pattern with respect to educational expansion. It reaches the maximum at around 9-10 years of education. Thus, given the current average educational attainment level of 7.7 years, further educational expansion would increase expenditure inequality. However, more equal distribution of education would have an ameliorating effect on the distribution of per capita expenditures among households.

With the implementation of key educational policies and programs, Indonesia has been quite successful in raising the average level of education. In 1984, primary education (6 years of schooling) was made compulsory, and this was extended to junior secondary education (9 years of schooling) in 1994. By 2010, Indonesia had achieved net enrolment rates of 95% and 68%, respectively, at the primary and junior secondary school levels. However, there are still very large differences in the level of education between regions. At the provincial level, the average number of years of education ranged from 6.6 years in West Nusa Tenggara to 10.7 years in Jakarta in 2011. In order to realize a more equitable distribution of economic well-being, it is thus imperative to narrow regional disparities in the level of education in Indonesia.

References

Ahluwaria, M. S. 1976a. Inequality, poverty and development. *Journal of Development Economics* 3(4): 307–42.

Ahluwaria, M. S. 1976b. Income distribution and development: Some stylized facts. *American Economic Review* 66(2): 128–35.

Akita, T., & Miyata, S. 2008. Urbanization, educational expansion, and expenditure inequality in Indonesia in 1996, 1999, and 2002. *Journal of the Asia Pacific Economy* 13: 147–67.

Akita, T. & Alit Pirmansah. 2012. Urban inequality in Indonesia. In: *Regional Development and Finances: Challenges for Expanding and Financing Public Services* (eds. Handra, H., Resosudarmo, B.P., Yusuf, A.A., Elfindri and Yonnedi, E.), 103–117. IRSA Book Series on Regional Development No.10, Padang: Andalas University Press.

Anand, S. 1983. *Inequality and Poverty in Malaysia: Measurement and Decomposition*. World Bank Research Publication, New York: Oxford University Press.

Anand, S. & Kanbur, S.M.R. 1993. The Kuznets process and the inequality-development relationship. *Journal of Development Economics* 40(1): 25-52.

Campano, F. & Salvatore, D. 1988). Economic development, income inequality and Kuznets' U-shaped hypothesis. *Journal of Policy Modeling* 10(2): 265–80.

Deininger, K. & Squire, L. 1997. Economic growth and income inequality: Reexamining the links. *Finance and Development* March, 38-41.

Deininger, K. & Squire, L. 1998. New ways of looking at old issues: inequality and growth. *Journal of Development Economics* 57(2): 259-287

Fields, G. S. 1979. Decomposing LDC inequality. *Oxford Economic Papers* 31(3): 437-459.

Fields, G. S. 2001. *Distribution and Development*. MIT Press, Cambridge, MA.

De Gregorio, J., & Lee, J. W. 2002. Education and income inequality: new evidence from cross - country data. *Review of Income and Wealth* 48(3): 395-416.

Huang, H. C. R. 2004. A flexible nonlinear inference to the Kuznets hypothesis. *Economics Letters* 84: 289–296.

Jha, S. K. 1996. The Kuznets curve: A reassessment. *World Development* 24(4): 773–80.

Knight, J.B. 1976. Explaining income distribution in less developed countries: a framework and an agenda. *Oxford Bulletin of Economics & Statistics* 38(3):

161-77.

Knight, J. B. & Sabot, R. H. 1983. Educational expansion and the Kuznets effect. The *American Economic Review* 73(5): 1132-1136.

Kuznets, S. S. 1955. Economic growth and income inequality. *American Economic Review* 45(1): 1–28.

Papanek, G. F., & Kyn O. 1986. The effect on income distribution of development, the growth rate and economic strategy. *Journal of Development Economics* 23(1): 55–65.

Park, K. H. 1996. Educational expansion and educational inequality on income distribution. *Economics of Education Review* 15(1): 51-58.

Ram, R. 1988. Economic development and income inequality: Further evidence on the U-curve hypothesis. *World Development* 16(11): 1371–76.

Ram, R. 1989. Can educational expansion reduce income inequality in less-developed countries?. *Economics of Education Review* 8(2): 185-195.

Ram, R. 1990. Educational expansion and schooling inequality: International evidence and some implications. *The Review of Economics and Statistics* 72(2): 266-274.

Robinson, S. 1976. A note on the U hypothesis relating income inequality and economic development. *American Economic Review* 66(3): 437-40.

Saith, A. 1983. Development and distribution: A critique of the cross-country U-hypothesis. *Journal of Development Economics* 13(3): 367–82.

Shorrocks, A. 1980. The class of additively decomposable inequality measures. *Econometrica* 48(3): 613–25.

Table 1
Shares of Primary, Secondary and Tertiary Educational Groups in Rural and Urban Sectors (%)
1996-2011

	Rural			Urban		
Year	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
1996	81.3	17.1	1.6	47.1	41.9	11.0
1997	79.6	18.8	1.7	44.3	45.1	10.7
1998	79.1	18.9	2.0	44.3	44.2	11.5
1999	81.1	17.6	1.3	48.2	43.7	8.1
2000	78.4	19.8	1.8	45.3	44.2	10.5
2001	78.8	19.4	1.8	44.8	43.7	11.5
2002	77.2	20.8	2.1	42.8	45.0	12.2
2003	76.0	21.9	2.0	42.7	46.2	11.1
2004	73.3	24.6	2.1	41.7	47.5	10.8
2005	74.3	23.3	2.4	42.0	45.8	12.2
2006	73.4	24.2	2.4	41.1	46.7	12.2
2007	73.4	23.5	3.0	41.0	45.5	13.4
2008	72.5	24.4	3.1	41.9	45.2	12.8
2009	70.0	25.7	4.3	40.3	46.3	13.4
2010	69.9	26.6	3.5	38.2	47.2	14.5
2011	68.5	28.1	3.4	39.9	46.6	13.5

Table 2
Expenditure Inequality by Gini Coefficient and Theil T
Point Estimate and 95% Confidence Interval
1996-2011

	Gini			Theil T			
		95% Conf. Interval			95% Conf. Interval		
Year	Estimate	Lower	Upper	Estimate	Lower	Upper	Sample Size
1996	0.377	0.374	0.380	0.286	0.279	0.293	206,597
1997	0.353	0.350	0.356	0.260	0.252	0.268	206,311
1998	0.345	0.342	0.349	0.243	0.229	0.256	207,625
1999	0.337	0.331	0.343	0.263	0.233	0.292	205,747
2000	0.319	0.316	0.322	0.200	0.192	0.209	189,339
2001	0.326	0.324	0.328	0.207	0.202	0.211	218,568
2002	0.348	0.344	0.351	0.237	0.228	0.247	64,422
2003	0.328	0.326	0.331	0.216	0.206	0.226	222,791
2004	0.338	0.335	0.341	0.233	0.221	0.245	252,913
2005	0.383	0.379	0.387	0.292	0.280	0.304	62,029
2006	0.354	0.352	0.357	0.248	0.238	0.258	263,464
2007	0.327	0.326	0.329	0.195	0.192	0.198	258,661
2008	0.368	0.366	0.370	0.264	0.258	0.269	261,283
2009	0.353	0.351	0.355	0.238	0.233	0.242	267,059
2010	0.367	0.364	0.370	0.266	0.259	0.274	264,848
2011	0.400	0.397	0.404	0.322	0.310	0.334	268,522

Table 3
Expenditure Inequality by Education Group
According to Gini Coefficient and Theil T
In Selected Years

			Theil T			
Year	Group	Gini	Value	Contribution	Exp. Share	Mean Exp.
1997	Primary	0.277	0.149	30.2%	52.6%	54.0
	Second/Tertiary	0.378	0.288	52.7%	47.4%	98.9
2000	Primary	0.263	0.127	33.7%	53.1%	115.0
	Second/Tertiary	0.339	0.225	52.7%	46.9%	185.0
2003	Primary	0.264	0.131	30.3%	49.8%	179.0
	Second/Tertiary	0.346	0.237	55.0%	50.2%	296.0
2006	Primary	0.281	0.149	27.4%	45.7%	245.0
	Second/Tertiary	0.368	0.262	57.2%	54.3%	427.0
2009	Primary	0.279	0.145	25.5%	41.9%	364.0
	Second/Tertiary	0.362	0.242	59.1%	58.1%	628.0
2011	Primary	0.325	0.210	25.5%	39.0%	455.0
	Second/Tertiary	0.402	0.317	60.1%	61.0%	841.0

(Note) Contribution is the % contribution of expenditure inequality within each educational group to overall expenditure inequality

Table 4
Educational Inequality by Gini Coefficient and Theil T
Point Estimate and 95% Confidence Interval
1996-2011

	Gini			Theil T			
		95% Conf. Interval			95% Conf. Interval		
Year	Estimate	Lower	Upper	Estimate	Lower	Upper	Sample Size
1996	0.395	0.394	0.397	0.299	0.297	0.302	206,597
1997	0.378	0.377	0.380	0.275	0.272	0.277	207,351
1998	0.375	0.373	0.376	0.268	0.266	0.270	207,531
1999	0.375	0.374	0.377	0.274	0.271	0.276	205,709
2000	0.371	0.369	0.372	0.264	0.261	0.266	189,323
2001	0.372	0.370	0.373	0.266	0.263	0.268	218,568
2002	0.352	0.351	0.353	0.238	0.236	0.240	212,646
2003	0.350	0.349	0.351	0.237	0.235	0.239	222,791
2004	0.342	0.340	0.343	0.225	0.223	0.227	252,897
2005	0.343	0.342	0.344	0.226	0.224	0.228	257,076
2006	0.340	0.339	0.341	0.221	0.219	0.223	263,464
2007	0.340	0.339	0.341	0.220	0.218	0.222	258,661
2008	0.341	0.340	0.343	0.220	0.218	0.221	261,283
2009	0.332	0.331	0.333	0.207	0.206	0.209	267,059
2010	0.329	0.328	0.331	0.203	0.201	0.205	264,848
2011	0.330	0.329	0.332	0.201	0.199	0.202	268,522

Table 5
Educational Inequality by Education Group
According to Gini Coefficient and Theil T
1996-2011

			Theil T			Mean No.
Year	Group	Gini	Value	Contribution	Pop. Share	Years of Education
1996	Primary	0.345	0.300	41.3%	69.1%	3.6
	Second/Tertiary	0.102	0.019	3.6%	30.9%	11.4
1997	Primary	0.328	0.277	40.3%	67.0%	3.7
	Second/Tertiary	0.099	0.018	3.9%	33.0%	11.3
1998	Primary	0.321	0.267	38.9%	66.2%	3.8
	Second/Tertiary	0.102	0.019	4.3%	33.8%	11.5
1999	Primary	0.329	0.281	42.9%	68.2%	3.7
	Second/Tertiary	0.098	0.018	3.7%	31.8%	11.1
2000	Primary	0.324	0.272	38.7%	64.5%	3.8
	Second/Tertiary	0.101	0.019	4.4%	35.5%	11.4
2001	Primary	0.325	0.277	38.5%	64.1%	3.8
	Second/Tertiary	0.103	0.019	4.5%	35.9%	11.5
2002	Primary	0.300	0.245	36.9%	61.7%	4.0
	Second/Tertiary	0.104	0.019	5.2%	38.3%	11.5
2003	Primary	0.300	0.246	37.9%	62.2%	4.0
	Second/Tertiary	0.102	0.019	5.1%	37.8%	11.4
2004	Primary	0.295	0.237	36.2%	59.8%	4.0
	Second/Tertiary	0.101	0.019	5.4%	40.2%	11.3
2005	Primary	0.290	0.232	35.8%	60.3%	4.0
	Second/Tertiary	0.104	0.020	5.6%	39.7%	11.5
2006	Primary	0.286	0.226	34.9%	59.4%	4.0
	Second/Tertiary	0.104	0.019	5.8%	40.6%	11.5
2007	Primary	0.282	0.223	34.2%	59.3%	4.1
	Second/Tertiary	0.107	0.020	6.1%	40.7%	11.6
2008	Primary	0.288	0.223	32.1%	57.5%	4.0
	Second/Tertiary	0.106	0.020	6.3%	42.5%	11.6
2009	Primary	0.277	0.210	30.7%	55.4%	4.1
	Second/Tertiary	0.108	0.021	7.0%	44.6%	11.7
2010	Primary	0.260	0.199	28.6%	53.9%	4.2
	Second/Tertiary	0.127	0.029	10.1%	46.1%	12.0
2011	Primary	0.258	0.185	27.0%	54.2%	4.2
	Second/Tertiary	0.126	0.029	10.1%	45.8%	11.9

(Note) Contribution is the % contribution of educational inequality within each educational group to overall educational inequality

Table 6
Expenditure Inequality vs. Level of educational attainment
Estimates of Fixed Effects and Random Effects Models

		Fixed Effects			Random Effects		
		Coef.	Std. Err.		Coef.	Std. Err.	
Coefficient of Variation							
Educ		0.358	0.143	**	-0.128	0.110	
Educ2		-0.020	0.010	**	0.013	0.007	
_cons		-0.705	0.517		1.025	0.403	**
Hausman Test	Chi2		24.7				
Gini							
Educ		0.039	0.020	**	0.025	0.019	
Educ2		-0.001	0.001		0.000	0.001	
_cons		0.106	0.072		0.160	0.068	**
Hausman Test	Chi2		5.8				
Theil T							
Educ		0.089	0.036	**	0.025	0.032	
Educ2		-0.005	0.002	*	0.000	0.002	
_cons		-0.206	0.129		0.024	0.116	
Hausman Test	Chi2		13.7				

(Note) * 10% significance level; ** 5% significance level; *** 1% significance level

Table 7
Educational Inequality vs. Level of educational attainment
Estimates of Fixed Effects and Random Effects Models

		Fixed Effects			Random Effects		
		Coef.	Std. Err.		Coef.	Std. Err.	
Coefficient of Variation							
Educ		-0.140	0.012	***	-0.143	0.012	***
Educ2		0.005	0.001	***	0.006	0.001	***
_cons		1.329	0.045	***	1.340	0.047	***
Hausman Test	Chi2		9.3				
Gini							
Educ		-0.063	0.007	***	-0.064	0.007	***
Educ2		0.002	0.000	***	0.002	0.000	***
_cons		0.682	0.025	***	0.687	0.026	***
Hausman Test	Chi2		7.6				
Theil T							
Educ		-0.143	0.009	***	-0.145	0.009	***
Educ2		0.007	0.001	***	0.007	0.001	***
_cons		0.906	0.033	***	0.913	0.034	***
Hausman Test	Chi2		6.2				

(Note) * 10% significance level; ** 5% significance level; *** 1% significance level

Table 8

Expenditure Inequality vs. Educational Inequality and Level of educational attainment

Estimates of Fixed Effects and Random Effects Models

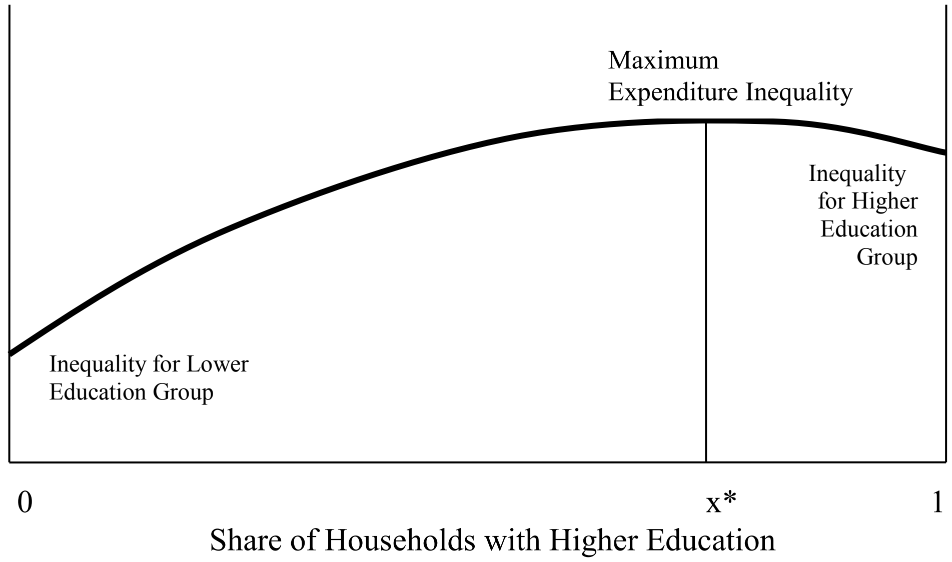
	Fixed Effects			Random Effects		
	Coef.	Std. Err.		Coef.	Std. Err.	
Coefficient of Variation						
Edineq	1.834	0.531	***	0.770	0.254	***
Educ	0.683	0.169	***	0.051	0.123	
Educ2	-0.035	0.011	***	0.005	0.008	
_cons	-3.362	0.922	***	-0.301	0.586	
Hausman Test Chi2		27.8				
Gini						
Edineq	0.748	0.129	***	0.602	0.086	***
Educ	0.099	0.022	***	0.073	0.019	***
Educ2	-0.004	0.001	***	-0.002	0.001	*
_cons	-0.448	0.118	***	-0.295	0.093	***
Hausman Test Chi2		5.9				
Theil T						
Edineq	0.500	0.181	***	0.412	0.097	***
Educ	0.171	0.046	***	0.096	0.036	***
Educ2	-0.009	0.003	***	-0.004	0.002	
_cons	-0.692	0.218	***	-0.401	0.156	**
Hausman Test Chi2		11.7				

(Note) * 10% significance level; ** 5% significance level; *** 1% significance level

Figure 1

(a) Kuznets Process for Educational Expansion based on Expenditure Inequality as Measured by Theil Index T

When $T_1 - T_2 < (\alpha - 1) - \log \alpha$



(b) Kuznets Process for Educational Expansion based on Theil Index T

When $T_1 - T_2 \geq (\alpha - 1) - \log \alpha$

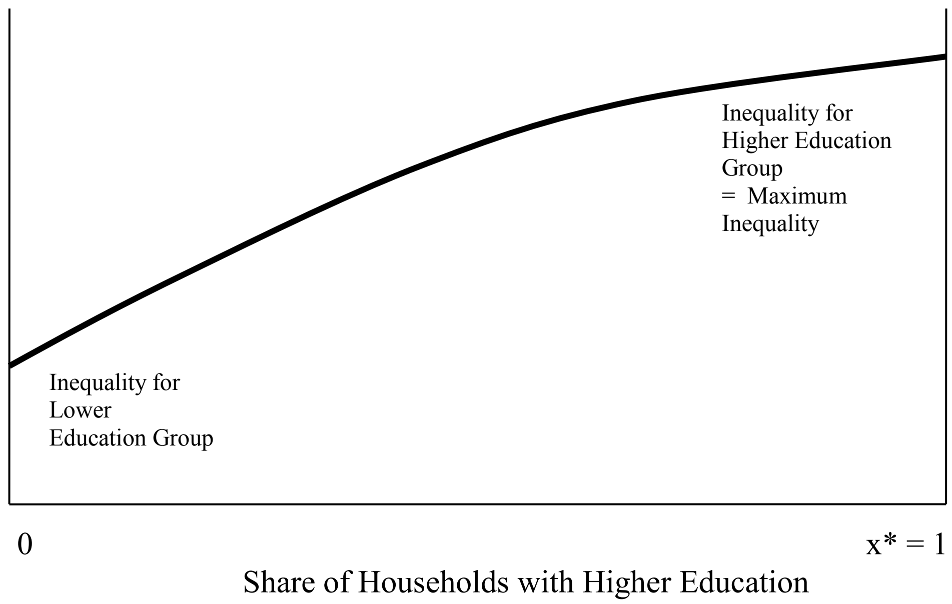


Figure 2
Average Number of Years of Education in Rural and Urban Sectors
1996-2011

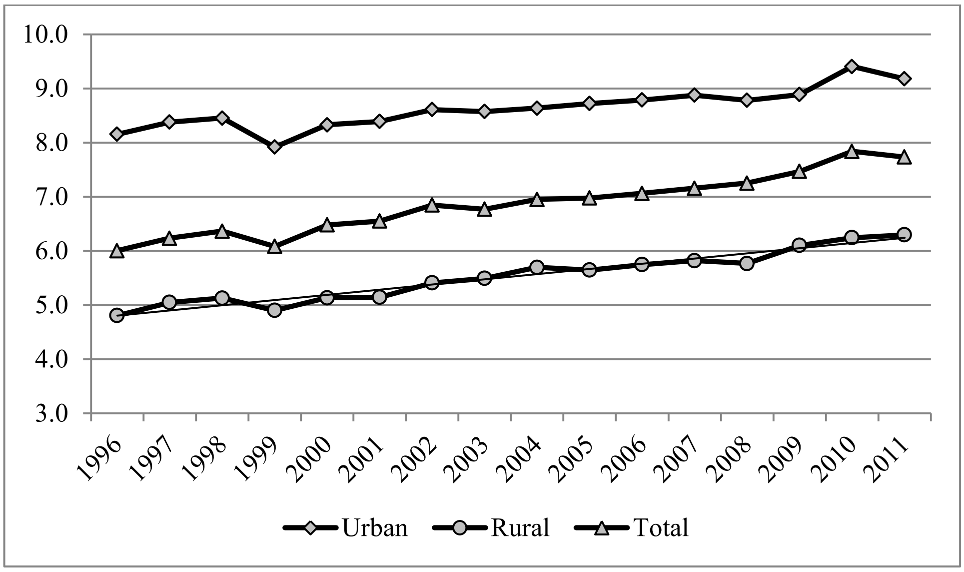


Figure 3
Expenditure Inequality by Gini Coefficient and Theil Indices
1996-2011

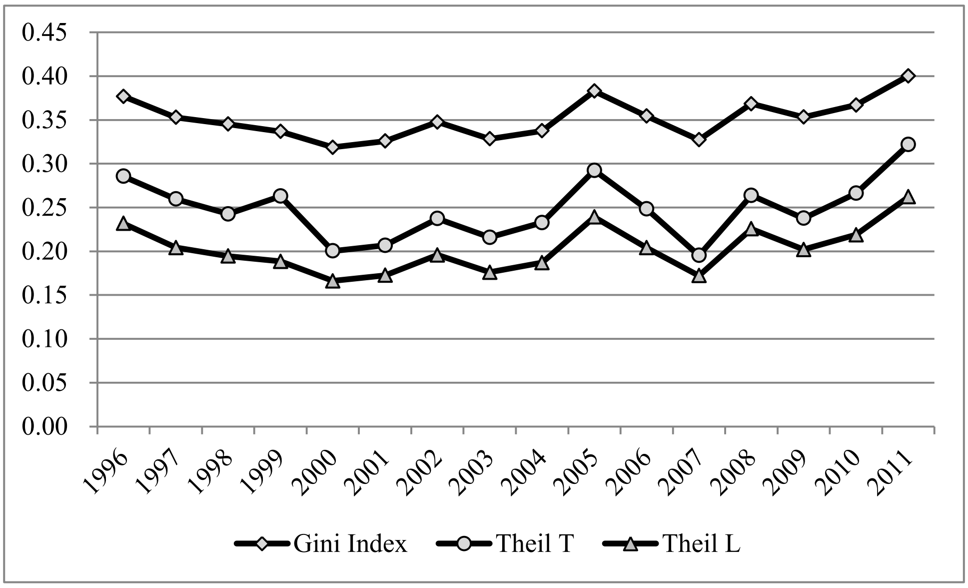


Figure 4
Educational Inequality by Gini Coefficient and Theil T
1996-2011

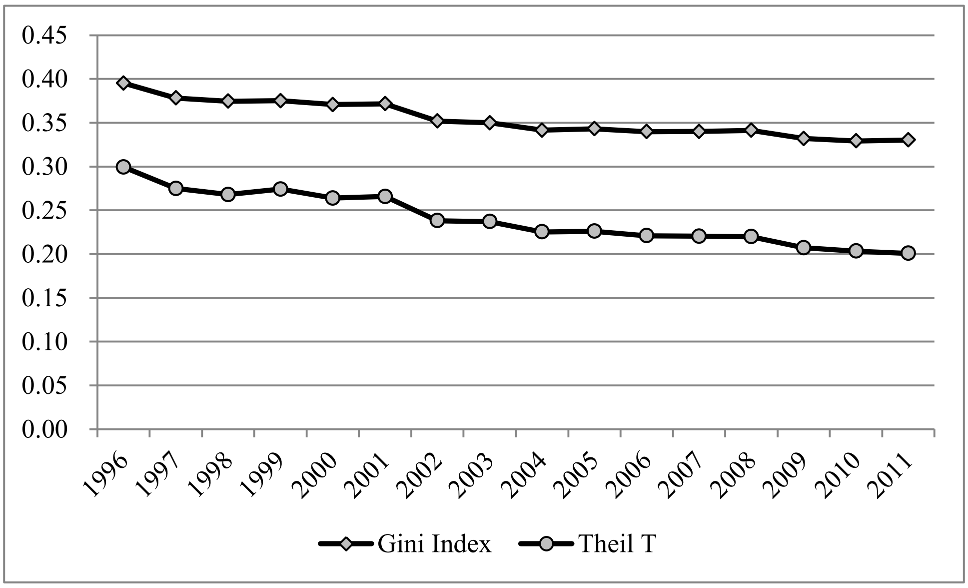
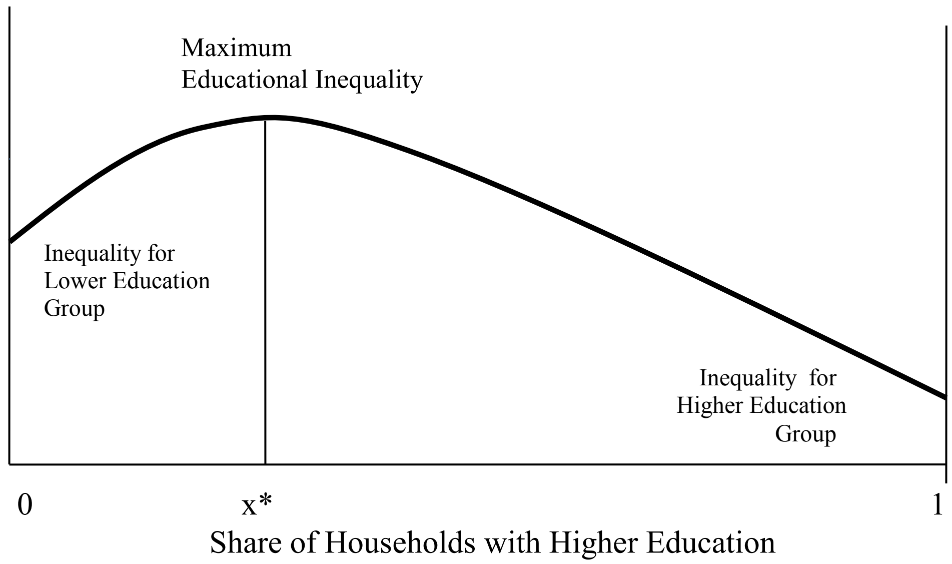


Figure 5

(a) Kuznets Process for Educational Expansion based on Educational Inequality as Measured by Theil Index T

When $0 < T_2 - T_1 < \dfrac{\alpha \log \alpha - (\alpha - 1)}{\alpha}$



(b) Kuznets Process for Educational Expansion based on Educational Inequality as Measured by Theil Index T

When $0 < \dfrac{\alpha \log \alpha - (\alpha - 1)}{\alpha} < T_2 - T_1$