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IS THERE A KUZNETS' PROCESS IN SOUTHEAST ASIA?

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Relatively little is known about the determinants of inequality in Southeast Asia. This paper fills this void by comprehensively testing Kuznets' hypothesis for Southeast Asia. We estimate both unconditional and conditional Kuznets' curves using panel data for 8 countries. The analysis suggests the existence of a Kuznets' curve with respect to per capita income; the path of inequality is non-linear with respect to economic development. There is no evidence of a Kuznets curve with respect to non-agricultural employment. There is some evidence in terms of urbanization, though this is not robust. There is robust evidence on the role of national governments and education in shaping the path of inequality in the region. Government involvement reduces inequality. Education appears to have a non-linear effect on inequality.

Keywords: Kuznets' hypothesis; development; inequality; Southeast Asia.

JEL Classification: O11, O15, O53

1. Introduction

In his Presidential address to the American Economic Association in 1955, Simon Kuznets postulated a relationship between economic growth and inequality, asking: "Does inequality in the distribution of income increase or decrease in the course of a country's economic growth?' (Kuznets, 1955, p. 1). Kuznets argued that inequality worsens initially as economic growth takes off but then decreases as a country develops beyond a certain threshold.

A very large literature has explored Kuznets' hypothesis. The aim of this paper is to test Kuznets' hypothesis for Southeast Asia, one of the fastest growing regions in the world.

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Table 1. Studies of the Kuznets hypothesis for Southeast Asia

Country	Author(s)	Type of Data	Time Period	Methodology	Estimate of b_1	Estimate of b_2	Kuznets' Hypothesis Supported?
Indonesia	van der Eng (2009)	Time Series	1970–1997	Descriptive	—	—	Yes
	Ritonga (2005)	Time Series	1970–1997	Descriptive	—	—	Yes
Malaysia	Anand (1983)	Cross-sectional	1970	OLS	0.0011	0.00003	No
					(0.42)	(0.20)	
	Perumal (1989)	Time Series	1957–1984				
			Model A	OLS	0.000585	−0.00000020	Yes
					(3.32)	(−2.93)	
			Model B	OLS	0.000162	−0.00000003	Yes
					(3.66)	(−3.46)	
	Randolph (1990)	Time Series	1968–1976	OLS	−0.00821	0.000866	No
					(−3.81)	(4.13)	
	Shireen (1998)	Cross-sectional	1984	OLS	−0.992	0.0619	No
					(−1.88)	(1.63)	
			1987	OLS	−36E-05	5.2E-09	No
					(−1.41)	(1.87)	
			1989	OLS	−0.028	3.4E-07	No
					(−1.64)	(92.14)	
Philippines	Estudillo (1997)	Time Series	1961–1991	Descriptive	—	—	No
Singapore	Dhamani (2008)	Time Series	1975–1997	Descriptive	—	—	No
Thailand	Ikemoto and Uehara (2000)	Time Series	1981–1998	Descriptive	—	—	No
Vietnam	Cuong *et al.* (2010)	Cross-sectional	2006	Descriptive	—	—	Yes

Notes: The specification used for econometric studies is $I = b_0 + b_1 X_1 + b_2 X_1^2$ where, I = Inequality and X_1 is Income. The Kuznets hypothesis requires b_1 to be positive and b_2 to be negative. Figures in brackets are t-statistics. The studies listed above measure X as either household income or GDP per capita. Descriptive studies use either a simple graph or describe patterns in the inequality data.

While this region has received a great deal of attention from researchers and international development institutions (Birdsall *et al.*, 1995; Booth, 1999), very little is known about the Kuznets process and the path of inequality in general, in Southeast Asia.

Analysis of Kuznets' process remains an important policy issue. Governments from numerous Southeast Asian countries have been particularly concerned to ensure that economic growth does not increase income inequality. There are several reasons behind this. Inequality can have negative effects on political stability. It can increase ethnic and class tensions and it can also result in increased crime. Deaton (2003) notes that inequality can affect social cohesion, social capital, and the provision of public goods. Inequality can also affect the path of growth itself. For example, Alesina and Perotti (1996) show that high levels of inequality have a negative effect on political stability and reduce economic growth. Birdsall *et al.* (1995, p. 481) argue that in the case of East Asia, "policies for sharing growth seem to have also stimulated growth".

This paper makes three important contributions to the literature. First, the paper analyzes the Kuznets process for Southeast Asia. While a handful of studies on Southeast Asia have focused on individual countries (see Table 1), there is currently no study of Kuznets' hypothesis for the broader Southeast Asia region. Our second contribution is to extend the analysis of the Kuznets' process. Previous studies have relied mainly on GDP per capita (or growth) and its square as the key explanatory variable. In this paper we also specifically consider the effects of urbanization and non-agricultural employment. The Kuznets process might manifest through these channels rather than the level of income. Third, we also consider the Kuznets' process *conditional* on the effects of education and government intervention on inequality. Education has been widely promoted in the region and many Southeast Asian governments have been actively involved with the development process. What effect have these factors had on the path of inequality?

The paper is set out as follows. Section 2 provides a brief review of literature testing Kuznets' hypothesis, while Section 3 focuses on prior studies of Southeast Asia. The econometric methodology and data are discussed in Section 4. The results are presented in Section 5. Section 6 concludes the paper.

2. Literature Review

Kuznets argued that a non-linear pattern in income inequality emerges from fundamental structural change, particularly the modernization and urbanization process. Income inequality is usually lower in rural areas as most people are involved in similar economic activities, predominantly in agriculture. In contrast, income in urban areas is generally based on skills and entrepreneurship and tends to increase faster than in agricultural rural areas, resulting in an overall increase in income inequality. Thus, "… the increasing weight of urban population means an increasing share for the more unequal of the two component distributions" (Kuznets, 1955, p. 8). Inequality is greater in the non-agricultural sector because of greater variation in production techniques and differences in skills; these eventually generate diversity and divergence in incomes. Therefore, when a country

develops from an agrarian economy to a more modern one, income inequality is expected to increase. Ultimately, however, inequality starts to decline as education and urbanization provide opportunities for people from lower income groups to successfully move up the social hierarchy and improve their relative economic position. This process helps to reduce the gap between upper and lower income groups.

Like all hypotheses, the Kuznets process is an empirical matter. Inequality is a complex process, and the Kuznets hypothesis suggests only one possible determinant.[1] In practice, the path taken by inequality might very well diverge from what Kuznets speculated: the demographic changes that shift inequality which are a key feature of the Kuznets hypothesis could be mitigated by many factors. For example, the "growth with equity" literature suggests that it is possible to avoid the pattern altogether. Moran (2005, p. 228) argues that a strong agricultural sector and egalitarian land ownership can negate the Kuznets pattern. Indeed, any process that narrows urban–rural income differentials will do so. Trade can reduce wage inequality if demand for unskilled labor rises relative to skilled labor. Initial conditions might also make a difference; the initial degree of inequality might shape the subsequent path of inequality. If the initial level of inequality is relatively high, then development might result in a lowering of inequality. Similarly, the initial degree of land inequality can moderate the subsequent path of income inequality. Deininger and Squire (1998, p. 276) argue that the nature of technology (particularly the degree of divisibility of new technologies) and the extent of international capital mobility have contributed to "eliminating the historical link between growth and inequality".

An influential early study was conducted by Ahluwalia (1976), who used cross-sectional data on inequality and GNP per capita for 60 countries and found that 'inequality tends to widen in the early stages of development, with a reversal of this tendency in the later stages' (Ahluwalia, 1976, p. 309). In contrast, Wright (1978) examined Kuznets' hypothesis using cross-sectional data on personal income before tax for 56 countries in 1965 and found that the results did not support Kuznets' hypothesis.

With the availability of "high-quality" income distribution datasets (e.g., Deininger and Squire, 1996), came a generation of new studies challenging the Kuznets hypothesis.[2] The evidence from several countries, particularly for East Asia, challenges the hypothesis that the relationship between growth and inequality follows an inverted U pattern (Acemoglu and Robinson, 2002, p. 184). Several countries in East Asia including Malaysia, Indonesia and South Korea have managed to curtail inequality despite experiencing rapid economic growth (Birdsall *et al.*, 1995). In fact, The World Bank (1993, p. 29) found declining trends of inequality all over the East Asian region (Korzeniewicz and Moran, 2005, p. 285).

[1] The Kuznets hypothesis suggests only one possible determinant of income inequality. Several studies have explored other determinants of inequality in various Southeast Asian countries. For Indonesia, see Armida *et al.* (2008), Akita and Lukman (1999) and Cameron (2000); for Malaysia, see Anand (1983) and Shireen (1998); for Singapore, see Chia and Chen (2008); for Thailand Israngkura (2008); for the Philippines Balisacan and Piza (2008); and for Vietnam Huong (2008) and Molini and Wan (2008). These studies show that factors such as education, occupation, employment, and geographical factors (urban and rural) are important determinants of inequality for Southeast Asian economies.

[2] See, for example: Bruno *et al.* (1998), Deininger and Squire (1996, 1998), Kim (1997), Li *et al.* (1998) and Ram (1997).

3. Prior Studies of Southeast Asia

In contrast to other regions for which the relationship between growth and inequality has been more extensively examined, only a handful of studies explore Kuznets' hypothesis for Southeast Asia, and most of these do not actually formally test the hypothesis. The results of these are mixed (see Table 1).

Several studies test Kuznets' hypothesis for Malaysia. Anand (1983) tested the Kuznets hypothesis using state level cross-sectional data and found that the results did not support the hypothesis. Perumal (1989) used regressions on different indices of inequality, for example the ratio of mean and median of household income against per capita income; these results are consistent with Kuznets' hypothesis. Randolph (1990) used the Malaysia Lifetime Family Survey data 1977 and found that the Kuznets curve is U-shaped rather than the expected inverted U. Shireen (1998) also had similar findings to Randolph (1990). Based on data from Mukhopadhaya (2001), Dhamani (2008) plots GDP growth against growth in the Gini coefficient in Singapore and finds the result inconclusive with regard to Kuznets' hypothesis.

4. Data and Econometric Specification

Southeast Asia consists of the ten countries listed in Table 2. Data is patchy for the less developed countries in the region (Cambodia, Laos, Myanmar and Vietnam). Hence, it is not possible to evaluate Kuznets' hypothesis using time series data for these countries: Cambodia, Laos and Viet Nam can be included in a panel data analysis, but there are not enough observations to estimate country specific Kuznets' curves for these countries. Our approach here is to offer three sets of estimates. First, we combine the five countries for which data are more readily available into a pooled dataset, and use panel data

Table 2. GDP per Capita and Number of Inequality Observations in Southeast Asia

Country	GDP per capita 2008 (Constant 2000 USD)	Number of Inequality Observations	Earliest Inequality Data
Brunei Darussalam	18,150	n.a	n.a
Cambodia	511	4	1994
Indonesia	1,087	17	1964
Lao PDR	475	3	1992
Malaysia	5,151	15	1958
Myanmar	n.a	1	1958
Philippines	1,225	11	1961
Singapore	27,991	35	1966
Thailand	2,640	18	1962
Viet Nam	647	5	1993

Notes: (i) n.a denotes not available and (ii) duplicate inequality observations for each year counted once only.
Source: World Bank (2010) and UNU-WIDER (2008b).

techniques to estimate the Kuznets curve. The five countries included in this set of estimates are Indonesia, Malaysia, the Philippines, Singapore, and Thailand. These are the most developed of the Southeast Asian countries, and the necessary data for these countries are more readily available compared to other poorer countries in this region.

Second, we construct a pooled dataset that includes all Southeast Asian countries, including the countries for which we have few observations. Third, we exclude Singapore from the pooled dataset. The sensitivity of the results to the exclusion of Singapore is justified on the grounds that its rural sector is minimal. In addition, we have many more observations from Singapore and, hence, wish to ensure that the results are not driven by the inclusion of this country.[3]

4.1. *The quality of data*

The quality of inequality data is an important issue which has been discussed extensively in the literature. For example Atkinson and Brandolini (2001), Barro (2000) and Fields (2001) find econometric results which vary depending on the methods used and their data choices. Most authors use secondary datasets from various sources compiled by international agencies such as The World Bank and The United Nations, as well as national statistics agencies. However, relying on readily available data has some limitations. Atkinson and Brandolini (2001, p. 772) argue that: "Within countries, consistent income distribution series over time do not necessarily exist, or there may be several different series based on different sources or different definitions. Gini coefficients of income inequality may be published for a range of countries, but there is no agreed basis of definition."

There is no consensus on the definition of inequality. The most acceptable definition is based on income; this definition was recommended by the Canberra Group on Household Income Statistics (Asian Development Bank, 2007). A definition based on consumption aggregates has been recommended by Deaton and Zaidi (2002). Both definitions have several drawbacks in terms of concepts and methodology, as well as data collection processes (Asian Development Bank, 2007, pp. 22–29).

The initiative for compiling inequality data was started by the United Nations in the 1950s. Since then there has been a continuous effort to assemble datasets by international agencies such as The World Bank, as well as individual researchers. One of the most influential datasets was developed by Deininger and Squire (1996) who assembled about 2,600 Gini index observations from different sources. Deininger and Squire's dataset has been recognized as a 'high quality' dataset. To be included in their dataset, observations must be based on household surveys which include different types of income and cover most of the population (Deininger and Squire, 1996, p. 568).

[3] The number of observations for individual countries is small, even for the more developed countries. Hence, in this paper we focus on the panel data results.

4.2. *Choice of data*

The main source of data for many recent inequality studies is UNU-WIDER. Their data — The World Income Inequality Database (WIID2) — is the most comprehensive to date (Asian Development Bank, 2007, p. 21). The WIID2 dataset covers 149 countries with over 4,600 observations. WIID2 is a compilation of inequality data from various datasets including the previous dataset from Deininger and Squire (1996). Although WIID2 has a larger coverage than previous data sets and ranks data according to quality, there are still inadequacies in its coverage, and sometimes there are several observations for the same year. For example, there are 12 observations for Malaysia in 1970. The WIID2 advises users to check carefully differences in definitions and statistical concepts. They note that some data: "are not automatically comparable since differences in survey methodology might impair the comparability" (UNU-WIDER, 2008a, p. 15). The choice of data might influence conclusions, especially when the study involves a time dimension (Atkinson and Brandolini, 2001, p. 779).

The WIID2 dataset often reports several observations for each country. In the case of overlapping observations, our approach was to choose the highest ranked estimates.[4] We also chose inequality data that covered all regions including rural and urban areas. Although the data were carefully selected, this does not mean that the data is free from error and bias, which might emerge from conceptual and definitional problems. Deininger and Squire (1998) suggested that the data on inequality: "should be based on household surveys rather than estimates drawn from national account statistics" (p. 263). However, data from household surveys also have limitations since the respondents tend to underestimate income in order to avoid high taxes. They also suggested that the data: "… should have comprehensive coverage of all sources of income or uses of expenditure, rather than covering say wages only" (p. 263).

Most of the data for Singapore are based on wage data collected by the Labor Force Survey. Inequality measures based on wages tend to be higher if the coverage of data is mixed and includes those without income. For instance, the Luxembourg Income Study found that inequality coefficients based on wage earnings are 10 to 15 points higher than coefficients based on gross income (Deininger and squire, 1996), p. 570; Atkinson *et al.*, 1995). Therefore, this might be one of the reasons why income inequality in Singapore is among the highest in Southeast Asia.

Inequality in Indonesia is measured using expenditure because of a perception that people tend to underestimate their income. However, according to Barro (2000, p. 21), the Gini value is lower by around five percentage points if the data used are derived from expenditure rather than gross income. This might be one reason why inequality in Indonesia is the lowest in Southeast Asia, with a Gini coefficient of 0.354 on average, compared to an average of 0.473 in Malaysia, the highest average inequality coefficient in Southeast Asia (Table 3).

[4] WIID2 data are ranked into four categories, from 1 to 4, with 1 being the most reliable and considered as the best quality.

Table 3. Means and Standard Deviations of Inequality and Output Variables

Country	Years	Gini	Growth	GDP per capita
Cambodia	1995–2004	0.41	5.66	330.27
		(0.03)	(3.59)	(104.37)
Indonesia	1960–2005	0.354	5.63	523.10
		(0.05)	(3.93)	(279.89)
Laos	1992–2002	0.337	3.60	303.11
		(0.03)	(3.09)	(284.87)
Malaysia	1960–2007	0.473	6.60	2,448.65
		(0.03)	(3.39)	(1,316.85)
Philippines	1960–2003	0.412	4.08	877.21
		(0.12)	(3.08)	(147.30)
Singapore	1960–2005	0.471	7.87	12,553.61
		(0.03)	(4.24)	(8,311.68)
Thailand	1960–2002	0.452	6.55	1,187.67
		(0.04)	(3.77)	(738.59)
Vietnam	1993–2004	0.36	5.03	366.44
		(0.01)	(2.06)	(152.06)

Notes: GDP per capita in US Dollar, at constant price (2000).
Source: World Bank (2010) and UNU-WIDER (2008b).

4.3. *Econometric specification*

The standard way to explore the Kuznets hypothesis using panel data is to estimate the following equation[5]:

$$I_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{it}^2 + u_{it}, \tag{1}$$

where I is an inequality index, GDP is GDP per capita at constant price, u is the error term, and i and t denote country and time. Panel data versions also can include either fixed or random effects. Kuznets' hypothesis is confirmed if the coefficient of explanatory variables and its square have positive and negative signs respectively. However, the estimated turning point is also important in identifying the *practical* importance of Kuznets' curve: The estimated turning point indicates the level of growth at which inequality starts to diminish. If the turning point occurs outside the observed range, then evidence in favor of the hypothesis becomes dubious.

Equation (1) represents the *unconditional* version of the Kuznets hypothesis, as it does not include any other explanatory variables. Kuznets' hypothesis is only one factor shaping the path of inequality. We argue below that inequality in Southeast Asia has also been

[5]This is the traditional specification of Kuznets' curve. Alternate specifications include replacing the income square term with the inverse of income and it is possible to alter the specification to allow for more than one turning point.

shaped by government intervention and education. Hence, we also estimate a *conditional* version of the Kuznets hypothesis:

$$I_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{it}^2 + \gamma_1 Gov_{it} + \gamma_2 Edu_{it} + \gamma_3 Pop_{it} + u_{it}. \quad (2)$$

Here the coefficients provide a test for Kuznets' hypothesis conditional on controlling for the effects of government intervention (Gov), education (Edu) and the proportion of the population that is aged below 14 and above 65 (Pop).

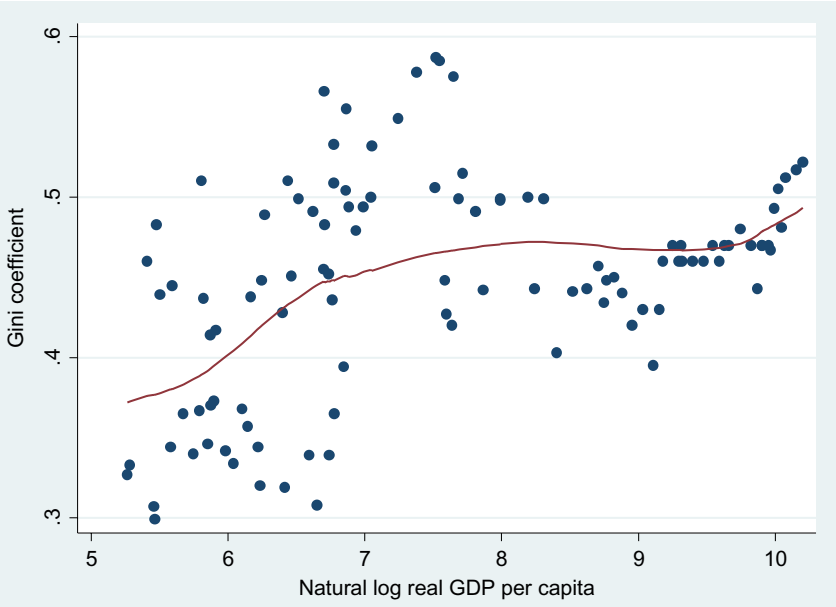
Most of the literature has focused on estimating the unconditional Kuznets's curve, Equation (1). Authors such as Ahluwalia (1976), Barro (2000) and Frazer (2006) estimate Equation (1) in natural log form. Anand and Kanbur (1993) and Fields (2001) suggest that different functional forms might influence the overall results. Deininger and Squire (1998) found that the Kuznets hypothesis was supported when they used pooled OLS but rejected when they included fixed effects. In contrast, Barro (2000, pp. 25–28) found that Kuznets' hypothesis persists in similar specifications even after considering country fixed effects and time dimensions.

Various measures of inequality are available; these include the Gini coefficient, the income share of the top 20%, the middle 40%, or the bottom 20%. In order to make the analysis more comprehensive several authors have used alternative explanatory variables, such as economic growth, non-agricultural employment, and the proportion of urban population (Ahluwalia, 1976; Angeles, 2009).

This study uses various econometric specifications in order to explore the robustness of the results. Inequality is measured using Gini coefficients. Other measures of inequality are available, however there are more observations available for the Gini coefficient. While the Gini coefficient has some limitations (e.g., it fails to capture between group changes, see Lambert and Aronson (1993) and Leigh (2007)), it remains one of the most popular inequality measures when testing Kuznets' hypothesis. For the observations that are available (all observations for all Southeast Asian countries grouped together), the correlation coefficient between Gini and the income of the top 10% is 0.82, while the correlation coefficient between Gini and the income of the bottom 10% is −0.59. Hence, the Gini coefficient offers a reasonable and representative measure of the degree of inequality for the countries under investigation.

GDP per capita is measured in US dollars at constant prices (2000 as base year). Employment in the non-agricultural sector is measured as a share of total employment. Urban population is measured in millions. As mentioned in the previous section, the data on inequality are mainly compiled from UNU-WIDER's World Income Inequality Database (WIID2). All other data, e.g., GDP per capita, economic growth, employment, urbanization, schooling and government were accessed from the World Bank's World Development Indicators.

Descriptive statistics of the inequality and output data used are presented in Table 3. Singapore has the highest GDP per capita, as well as the fastest economic growth, with Malaysia ranked second. Table 3 shows significant increases in economic growth and GDP per capita for the five countries. Figure 1 illustrates the path of inequality for all



Note: The plotted curve is a lowess locally weighted regression fitted line.

Figure 1. Inequality and Development in Southeast Asia, Gini Coefficient, all Years

observations for all countries, with the natural log of GDP per capita as the measure of development. While the path appears to be non-linear, it does not follow the classic Kuznets shape.[6]

5. Is the Path of Inequality in Southeast Asia Non-Linear?

5.1. *Unconditional Kuznets' process*

Our empirical analysis commenced with estimation of the unconditional Kuznets' process, Equation (1), using alternatively GDP, non-agricultural employment and urbanization as the key explanatory variable.

5.1.1. *Inequality and GDP*

The most common specification used to test the Kuznets hypothesis involves inequality measured using the Gini coefficient, with GDP per capita as the proxy for economic development. Kuznets' hypothesis is supported if the coefficient β_1 is positive and β_2 is negative and both are statistically significant different from zero (Equation (1)). Multi-collinearity can be a problem when non-linear terms are included. Hence, we also conduct Wald tests for the joint significance of the linear and non-linear terms. We estimated

[6] Kuznets' hypothesis is a long run phenomenon. While the data for Southeast Asia span over 40 years, this might not be sufficient to reveal the long run pattern. Researchers have no option but to analyze the observations that are available, but this might only reveal short term or medium term patterns.

Table 4. Inequality and lnGDP per Capita: Pooled OLS

	Constant (1)	lnGDPpc (2)	lnGDPpc^2 (3)	Adjusted R^2	Wald Test	Support Kuznets' Hypothesis?
Five main countries	−0.396**	0.208***	−0.012***	0.200	14.148	Yes
($n = 95$)	(−2.03)	(4.12)	(−3.87)		[0.00]	
All countries	−0.370**	0.200***	−0.012***	0.253	16.90	Yes
($n = 107$)	(−2.01)	(4.13)	(−3.81)		[0.00]	
Excluding Singapore	−0.952***	0.368***	−0.024***	0.306	18.56	Yes
($n = 72$)	(−2.10)	(2.76)	(−2.43)		[0.00]	

Notes: Figures in brackets are t-statistics using robust standard errors. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. The Wald test provides a test for the joint statistical significance of the linear and non-linear terms. Figures in square brackets are prob-values. n denotes the number of observations. The first set of pooled OLS results relate to the 5 main countries (Indonesia, Malaysia, Philippines, Singapore and Thailand). The second set of results includes also Laos, Cambodia and Vietnam. The final set of results excludes Singapore.

Equation (1) using real GDP per capita, as well as the natural logarithm of real GDP per capita, as the explanatory variable.

Following Ram (1988, 1991, 1997), Thornton (2001) and Frazer (2006), Table 4 reports the results when the natural logarithm of GDP per capita is used as the explanatory variable to test Kuznets' hypothesis. These results provide support for Kuznets' curve. Kuznets' hypothesis is not supported when real GDP per capita is used.

5.1.2. *Inequality and non-agricultural employment*

Kuznets also argued that changes in inequality result from economic transformation from an agricultural based economy to a non-agricultural (industrial and services) economy. This economic transformation has occurred in all Southeast Asian countries. The contribution of the agricultural sector to both GDP and employment has declined significantly for all countries. The rapid expansion of employment in the non-agricultural sector may have led to changes in inequality as Kuznets anticipated. The available data on non-agricultural employment commence from 1980. The results reported in Table 5 do not provide empirical support for Kuznets' hypothesis.

5.1.3. *Inequality and urbanization*

Kuznets also suggested that inequality increases as the proportion of the urban population increases, before declining after it exceeds a certain threshold. All countries in Southeast Asia have recorded rapid expansion in their urban population. For example, in Malaysia, urban population has grown by 2% annually. During the 1960s, only a quarter of the population lived in urban areas; by 2008 this had risen to more than 70%. Table 6 shows that the Kuznets hypothesis is supported.

Table 5. Inequality and Non-Agricultural Employment: Pooled OLS

	Constant (1)	Nag (2)	Nag^2 (3)	Adjusted R^2	Wald Test	Support Kuznets' Hypothesis?
Five main countries	0.612***	−0.005	0.00003	0.002	1.405	No
($n = 61$)	(5.69)	(−1.52)	(1.59)		[0.25]	
All countries	0.443***	−0.00007	0.000003	−0.008	0.0005	No
($n = 65$)	(3.98)	(−0.02)	(0.15)		[0.98]	
Excluding Singapore	0.483***	−0.002	0.00002	−0.042	0.360	No
($n = 40$)	(2.81)	(−0.27)	(0.37)		[0.70]	

Notes: Figures in brackets are t-statistics using robust standard errors. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. The Wald test provides a test for the joint statistical significance of the linear and non-linear terms. Figures in square brackets are prob-values. *n* denotes the number of observations. The first set of pooled OLS results relate to the 5 main countries (Indonesia, Malaysia, Philippines, Singapore and Thailand). The second set of results includes also Laos, Cambodia and Vietnam. The final set of results excludes Singapore. The employment data used to construct this table commence in 1980.

5.1.4. *Robustness checks*

We explored the robustness of the results presented in Tables 4–6 in various ways. First, the WIID2 dataset contains two types of data, *Gini* and *reported Gini*. *Reported Gini* are the Gini coefficients from original sources, while *Gini* are adjusted by The World Bank using a parametric extrapolation to ensure all coefficients meet Lorenz curve assumptions. Using the *Reported Gini* estimates produces similar results to *Gini*. Second, we used data from the University of Texas Inequality Project (UTIP). UTIP uses Theil's measure of inequality applied to industrial pay inequality data. The results are again similar. Third, we

Table 6. Inequality and Urban Population: Pooled OLS

	Constant (1)	Urban Population (2)	Urban Population^2 (3)	Adjusted R^2	Wald Test	Support Kuznets' Hypothesis?
Five main countries	0.360***	0.004**	−0.00003**	0.065	4.07	Yes
($n = 95$)	(9.95)	(2.69)	(2.55)		[0.02]	
All countries	0.342***	0.004***	−0.00003***	0.118	11.901	Yes
($n = 107$)	(11.74)	(3.45)	(−3.11)		[0.00]	
Excluding Singapore	0.273***	0.009**	−0.00009**	0.113	6.58	Yes
($n = 72$)	(4.79)	(2.57)	(−2.20)		[0.01]	

Notes: Figures in brackets are t-statistics using robust standard errors. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. The Wald test provides a test for the joint statistical significance of the linear and non-linear terms. Figures in square brackets are prob-values. *n* denotes the number of observations. The first set of pooled OLS results relate to the 5 main countries (Indonesia, Malaysia, Philippines, Singapore and Thailand). The second set of results includes also Laos, Cambodia and Vietnam. The final set of results excludes Singapore.

tested whether differences in data quality affect our findings, replacing the higher ranking inequality data with the lower ranking data. The results are broadly similar, indicating that the quality of data does not drive the results presented here. Fourth, inequality estimates based on income tend to be higher by 5% points compared to those using expenditure. Using expenditure data does not alter any of the conclusions in Tables 4–6.

Finally, we also estimated models using fixed and random effects and two-way fixed effects models. For the sake of brevity, these results are not presented here. Except for the fixed effects estimates for the urban population specifications, there is no support for the Kuznets hypothesis. We prefer the pooled OLS results because of the nature of the data: we have a small number of cross-sections (8) and a small number of years. Fixed effects estimation is problematic with this dimensionality and relatively small number of observations. In such cases, pooled OLS is preferable.

5.2. *Conditional Kuznets' process: Government intervention and education*

If governments are concerned about the possibility of rising inequality as growth increases, they might implement policies that are directly aimed at reducing poverty and inequality. For example, in the case of Indonesia, Cameron (2002, p. 2) notes that: "The Indonesian government nevertheless recognised the possibility of increasing inequality when it enshrined equity as a major policy goal, alongside growth and stability, in the third Five Year Plan (1980–1984)." In Malaysia, large income disparities between Malays and Chinese in the early period after independence resulted in the May 13, 1969 riots. As a result of this, successive Malaysian governments implemented various policies to try and contain inequality. Acemoglu and Robinson (2002, p. 199) make the political economy argument that:

> "The historical and contemporary evidence suggests that the downward segment of the curve is driven by political reforms and their subsequent impact. In turn these political changes are induced by the rising social tension and political instability that arises from the increased inequality on the upward segment of the curve."

The mere threat and possibility of rising political instability and social tension might be sufficient to induce governments into action to try and prevent increasing inequality.

Birdsall *et al.* (1995) identified that policies for sharing growth included broad attempts to improve access to education and health services, investments in public housing in Singapore (and Hong Kong), and investment in rural infrastructure in Malaysia and Thailand. Jomo (2006) points to emphasis on agricultural diversification in Malaysia and Thailand.

Kuznets (1955) argued that increased inequality in the early stages of development arises because of urban and rural income differentials. Inequality will tend to be higher in urban areas. Therefore, an increase in the proportion of the population that is urbanized can increase inequality. However, as a result of government intervention, rural-urban disparity in Southeast Asia has declined with development. For instance, in Malaysia, the urban-rural disparity ratio decreased significantly from 2.14 in 1972 to 1.13 in 1995 (Mahadevan 2007). Governments in Southeast Asia have taken active steps to develop rural areas

through various development programs, such as land and infrastructure development programs. For example, the Malaysian government established the Integrated Agricultural Development Program (IADP) which was specifically designed to increase the productivity of agriculture in rural areas. The IADP provides physical infrastructure such as irrigation and roads, as well as other agricultural support services for rural communities (Ragayah, 2008, p. 180). In Indonesia, since the 1970s, Presidential Instruction (Inpres) has provided financial assistance to build infrastructure for village development (Armida *et al.*, 2008, pp. 98–99). These rural development programs increase rural productivity and thereby help to reduce the gap between rural and urban areas. Strong efforts to balance development between rural and urban areas can reduce income inequality.

5.2.1. *Education*

Education has been widely recognized as an important factor for Southeast Asian economic success. Human capital accumulation is high in Southeast Asia, with the enrolment rate for primary and secondary schools being more than 90% and 80%, respectively. Educational development has received strong support from governments, with some countries allocating a relatively high proportion of their government expenditure to education (Asian Development Bank, 2008, pp. 7–9; Lee and Francisco, 2010, pp. 9–10).

Labor income is usually determined by education and skills, thus educational expansion can increase income differentials between lower and higher income groups. On the other hand, expansion of education can reduce inequality by increasing the number of educated workers, compacting real salaries and consequently diminishing inequality (Knight and Sabot, 1983; Birdsall *et al.*, 1995). Studies of Southeast Asian countries reveal that education is an important determinant of income differentials and income inequality (Armida *et al.* (2008) for Indonesia, Israngkura (2008) for Thailand and Balisacan and Piza (2008) for The Philippines). Abdullah *et al.* (2014) find that on balance education reduces inequality after conducting a meta-analysis of the extant literature.

Table 7 reports estimates of the conditional Kuznets' curve (Equation (2)). Column 1 adds the share of government in GDP (*Govern*), which has a statistically significantly negative coefficient. This is consistent with the political economy argument made above that the larger is the share of government the more equal are incomes. In columns 2 and 3 we add inequality in education (*EduGini*, measured by an education Gini coefficient) using data from Castelló and Doménech (2002). For all countries included in their dataset, Castelló and Doménech (2002) find a low correlation between education inequality and income inequality (correlation = 0.27). However, for Southeast Asia, they find that the correlation is rather stronger, though negative (correlation = −0.50). Table 7 shows that education inequality has a statistically significant negative coefficient, indicating that the more unequal is education the more equal are incomes. This is not statistically significant in column 3, where the government variable is removed. There are few observations on educational inequality, so there is a very large reduction in the number of observations compared to column 1 (down from 107 to 38). In column 4 we replaced inequality in education with land inequality (*LandGini*, measured by a Gini coefficient for land). These

Table 7. Conditional Kuznets' Curve, Southeast Asia, lnGDP per Capita as the Explanatory Variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	−0.239	**−0.661**	**−0.818**	**−1.475**	**−0.354**	**−0.382**	**−0.603**	**−0.381**	**−0.361**
	(−1.31)	(−2.03)	(−2.18)	**(−2.14)**	(−2.30)	(−2.60)	(−2.84)	(−2.51)	(−2.33)
lnGDPpc	**0.185**	**0.342**	**0.345**	**0.449**	**0.151**	**0.129**	**0.225**	**0.167**	**0.160**
	(3.91)	(3.93)	(3.73)	**(1.98)**	(3.25)	(2.59)	(3.62)	(3.72)	(3.78)
$lnGDPpc^2$	**−0.011**	**−0.022**	**−0.021**	**−0.027**	**−0.009**	**−0.007**	**−0.013**	**−0.009**	**−0.009**
	(−3.76)	(−3.82)	(−3.59)	**(−1.65)**	(−2.75)	(−2.15)	(−3.11)	(−3.05)	(−3.64)
Govern	**−0.003**	**−0.006**	—	—	**−0.004**	**−0.004**	**−0.003**	**−0.003**	**−0.004**
	(−2.81)	(−2.11)	—	—	(−3.81)	(−3.70)	(−2.46)	(−3.24)	(−3.66)
EduGini	—	**−0.208**	−0.200	—	—	—	—	—	—
	—	(−1.87)	(−1.61)	—	—	—	—	—	—
LandGini	—	—	—	**0.345**	—	—	—	—	—
	—	—	—	**(1.92)**	—	—	—	—	
School	—	—	—	—	**0.011**	**0.040**	—	—	—
	—	—	—	—	(2.93)	(1.79)	—	—	
$School^2$	—	—	—	—	—	−0.002	—	—	—
	—	—	—	—	—	(−1.30)	—	—	
Second	—	—	—	—	—	—	−0.001	—	—
	—	—	—	—	—	—	(−1.62)	—	
Tertiary	—	—	—	—	—	—	—	**0.004**	**0.015**
	—	—	—	—	—	—	—	(4.27)	(3.90)

Table 7. (*Continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tertiary^2	—	—	—	—	—	—	—	—	**−0.001**
	—	—	—	—	—	—	—	—	(−3.27)
Pop1465	—	—	—	—	**0.004**	**0.005**	**0.004**	**0.004**	**0.004**
	—	—	—	—	(2.62)	(2.95)	(2.59)	(2.52)	(2.96)
Wald test	0.0004	0.0014	0.0006	0.0002	0.0002	0.0013	0.0000	0.0000	0.0000
Support Kuznets' Hypothesis?	YES	YES	YES	YES	YES	YES	YES	YES	YES
	[4,488]	[2,375]	[3,693]	[4,084]	[5,798]	[7,433]	[7,471]	[7,531]	[5,550]
n	107	38	38	14	107	107	107	107	107
Adjusted R^2	0.28	0.47	0.43	0.61	0.37	0.37	0.34	0.40	0.44

Notes: Estimation using pooled OLS. Figures in brackets are t-statistics using robust standard errors. Bold cells denote statistical significance at least at the 10% level. Figures in square brackets are the estimated values of GDPpc at which inequality starts to fall. *n* denotes the number of observations. Countries included: Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam, Cambodia and Laos. School, Second and Tertiary denote average years of schooling, years of secondary schooling, and years of tertiary schooling, respectively. The Wald test reports p-values for the joint statistical significance of the linear and non-linear GDP terms.

Table 8. Conditional Kuznets' Curve, Southeast Asia, Urban Population or Non-Agricultural Employment as the Explanatory Variable

	Urban Population					Non-Agricultural Employment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	**0.362**	**0.224**	**0.381**	**0.449**	**0.370**	**0.519**	**0.409**	**0.542**
	(4.37)	(2.42)	(5.45)	(5.97)	(4.95)	(4.11)	(2.60)	(4.08)
Urban	0.019	−0.021	**0.738**	0.180	0.155	—	—	—
	(0.14)	(−0.14)	(3.14)	(1.31)	(1.18)			
Urban^2	**−0.009**	−0.001	**−0.006**	−0.002	−0.001	—	—	—
	(−0.47)	(−0.16)	(−3.18)	(−1.54)	(−3.64)			
Govern	**−0.007**	**−0.007**	**−0.006**	**−0.007**	**−0.007**	−0.008	**−0.011**	−0.003
	(−4.59)	(−4.40)	(−4.19)	(−4.59)	(−4.91)	(−1.62)	(−2.10)	(−0.39)
School	**0.017**	**0.058**	—	—	—	**0.026**	—	—
	(3.51)	(2.64)				(3.77)		
School^2	—	**−0.003**	—	—	—	—	—	—
		(−1.97)						
Second	—	—	**−0.003**	—	—	—	−0.001	—
			(−2.21)				(−0.28)	
Tertiary	—	—	—	**0.004**	**0.017**	—	—	**0.006**
				(3.02)	(4.57)			(2.88)
Tertiary^2	—	—	—	—	**−0.001**	—	—	—
					(−4.29)			
Pop1465	0.002	**0.003**	0.005	0.001	**0.002**	−0.001	0.002	−0.002
	(1.63)	(2.22)	(0.36)	(0.77)	(1.91)	(−0.13)	(0.86)	(−0.75)
Nag	—	—	—	—	—	−0.265	0.434	−0.022
						(−0.53)	(0.84)	(−0.05)
Nag^2	—	—	—	—	—	0.001	−0.004	0.001
						(0.24)	(−0.94)	(0.01)
Wald test	0.414	0.455	0.008	0.251	0.347	0.134	0.565	0.957
Support Kuznets' Hypothesis?	NO	NO	YES [62.24]	NO	NO	NO	NO	NO
n	107	107	107	107	107	65	65	65
Adjusted R^2	0.31	0.33	0.27	0.30	0.36	0.21	0.04	0.15

Notes: The dependent variable in columns 1 to 5 is urban population and for columns 6 to 9 it is non-agricultural employment. Estimation using pooled OLS. Figures in brackets are *t*-statistics using robust standard errors. Bold cells denote statistical significance at least at the 10% level. Figures in square brackets are the estimated values of the explanatory variable at which inequality starts to fall. *n* denotes the number of observations. Countries included: Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam, Cambodia and Laos. School, Second and Tertiary denote average years of schooling, years of secondary schooling, and years of tertiary schooling, respectively. The Wald test reports *p*-values for the joint statistical significance of the linear and non-linear urbanization and non-agricultural employment terms. Coefficients for Urban, Urban^2, Nag and Nag2 are multiplied by 100.

data come from Frankema (2006). Unfortunately, data on land inequality are even scarcer and, hence, we have very few observations for this variable: only 14 observations. In columns 5 and 6 we use the average years of schooling as a control variable (*School*). This is the level of human capital rather than the degree of inequality in education. The dependency ratio — the percent of population that is aged 14 or less or 65 or more — is also included as a control variable (*Pop1465*). These results show that inequality increases as the number of years of schooling rises, though the effect appears to be non-linear.[7] Inequality appears to increase with schooling until a peak of 8 years and then starts to decline. The results also show that, as expected, an increase in the dependency ratio increases inequality.

To tease out the effects of schooling further, we replace average years of schooling with years of secondary schooling (in column 7) and years of tertiary schooling (in column 8).[8] It appears that secondary schooling reduces inequality (though this is estimated with less precision and is not statistically significant), while tertiary schooling increases inequality. The secondary schooling result is consistent with the meta-analysis of Abdullah *et al.* (2014). Column 9 shows that the effect of tertiary schooling is non-linear.

Table 8 repeats this analysis replacing GDP with urbanization (columns 1 to 5) and non-agricultural employment (columns 6 to 8). The unconditional estimates using urbanization (Table 6) support Kuznets' hypothesis. However, these results do not hold when we condition for government, education and dependency. The results for non-agricultural employment are consistent with those presented in Table 5.

The findings regarding government and education are robust. Government intervention and education are not deterministic factors affecting the Kuznets' process. Rather, they are parallel processes that affect inequality.

6. Conclusion

Kuznets hypothesized that inequality and development exhibit a systematic pattern: inequality increases in the earlier stages of development before declining at a later stage as a result of subsequent development. Kuznets' hypothesis has been tested for a wide range of countries and time periods. There is, however, little analysis of inequality for Southeast Asia, despite its rapid growth, and the concern of governments within this region to prevent rising inequality as their countries grow. This study investigates Kuznets' hypothesis for Southeast Asia using various econometric specifications, estimators, and alternative datasets. We can draw two conclusions from the analysis.

First, we find that the strongest support for the hypothesis emerges when the natural logarithm of GDP per capita is used as the explanatory variable. Some of the results also show a Kuznets pattern with respect to urbanization, though this finding is not robust to conditioning variables. We find no evidence of a Kuznets pattern with respect to non-agricultural employment. The analysis presented here lends support to concerns expressed

[7] The two years of schooling variables in column 6 are jointly statistically significant; p-value = 0.005.
[8] In unreported regressions we found that primary schooling is not statistically significant.

by Southeast Asian countries regarding inequality. It appears that for this region at least, inequality rises with development before it subsequently falls. The turning point at which inequality falls varies from USD5550 to USD7471, depending on the econometric specification. Most of the countries in the region have not reached the lower conservative estimate per capita GDP threshold: they are still within the rising portion of the Kuznets process and, hence, they will continue to face growing pressure to limit the rise in inequality. Our second finding is that education and the dependency ratio increase inequality, whereas government intervention decreases inequality. The effect of education appears to be non-linear, at first increasing inequality but subsequently resulting in reduced inequality.

One conclusion from these findings is that "pro-growth strategies" might be effective in curtailing inequality. Our results also lend some support in favor of government intervention to moderate inequality. However, this needs to be balanced with other effects of government intervention. Some authors argue that such intervention has a contractionary effect on the economy (e.g., through the distortionary effects of taxes and regulations) whereas others argue that it has an expansionary effect (e.g., by reducing inequality and through endogenous growth channels). There is some tension here between policy objectives. Increasing education has been an important policy objective throughout Southeast Asia, as has reducing inequality. Ironically, increasing education is seen as one tool to combat development generated inequality, yet, it is evident that increasing education increases inequality, at least initially.

One can take the view that governments need not worry about inequality. Since inequality will naturally ebb and flow with development, one can argue that all governments should do is to focus on getting the institutional environment correct to facilitate development and creation of employment opportunities. On the other hand, political reality suggests that governments might not be able to withstand the political and social pressures that emerge as a result of widening income differentials.

Our analysis focused on the path of inequality as measured by the Gini coefficient. An important extension would be to explore the path of income shares, such as the share of income of the top 10%, the bottom 40% and the share of the middle class. This is consistent with recent drive by the World Bank regarding "shared prosperity", meaning the income share of the bottom 40% (Narayan *et al.*, 2013). Other important policy issues include whether incomes have diverged or converged between these countries over time and also the path of inequality among the various regions and provinces of Southeast Asian nations, as well as the income share of certain ethnic and other groups. These are also important areas for further research.

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