Why Has Income Inequality in Thailand Increased?
An Analysis Using 1975-1998 Surveys

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Foreword

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This paper analyses the determinants of income inequality in Thailand, which experienced income inequality increases in 1975-1998. The effects of agricultural factors and other sectoral factors are stressed. Regression results strongly suggest the significance of agricultural factors although some limited evidence is obtained that other sectoral factors namely financial development and education level disparity also play an important role in explaining Thailand’s inequality changes.
I. INTRODUCTION

The purpose of this paper is to identify the determinants of the changes in income inequality in Thailand. Figure 1 shows that per capita gross national product (GNP) in Thailand has increased from $625 in 1975 to $1831 in 1998 (both figures are in 2000 constant dollars), and Thailand has reached the more developed country status. This means that Thailand can be a precedent for other developing countries. On the other hand, we can see from Figure 2 that income inequality in Thailand has increased significantly in these 24 years. This is significant because “income inequality is relatively stable within countries” and “it varies significantly among countries” (Li et al. 1998, 26).

Figure 1: Per Capita GNP

Note: Figures on the right hand side of the chart is per capita GNP in 2000.
Source: Asian Development Bank Key Indicators (various years).
While Thailand’s poverty incidence has decreased due to its economic growth (Deolalikar 2002, Kakwani and Krongkaew 2000), the inequality increase can still be problematic from the perspective of fairness. In addition, there are studies that found significant effect of inequality on economic growth.\(^1\) Therefore, it is meaningful to clarify the determinants of the inequality increase in Thailand.

Existing studies on income distribution in Thailand stress the importance of the role of the agricultural sector (Deaton 1989, Ikemoto 1991, and Krongkaew et al. 1996). While the share of the agricultural sector in total gross domestic product (GDP) decreased (27 percent in 1974 and 12 percent in 1998), the labor force in the agricultural sector still accounted for 51 percent of the total labor force in 1998. Generally speaking, income levels in the agricultural sector are lower than that of other sectors. Moreover, income level is very volatile because farm prices and harvest directly affect the value of agricultural output. Kuznets (1955) points out the importance of the agricultural sector in understanding changes in income distribution in the process of economic development. His insight is all the more important for understanding changes in Thailand’s income distribution.

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\(^1\) See for example Deininger and Squire (1998) and Forbes (2000).
This paper uses Thailand’s longitudinal data (24 years, 9 national surveys) for 13 regions from the Household Socioeconomic Survey (HSES). For developing and more developed countries, it is not easy to obtain detailed regional data to identify the determinants of income inequality in their development process. Thailand’s HSES is one of the few exceptions. The regression results strongly suggest the significance of agricultural factors although some limited evidence also show that other sectoral factors, financial development, and education level disparity are responsible for Thailand’s inequality changes. The effect of financial development is of interest because consolidation of financial markets is on the policy agendas of many developing countries. Note that the effect of financial development on distribution is theoretically indeterminate. The regression results suggest that financial development in Thailand may have contributed to alleviate its inequality increase.

Deolalikar (2002) analyzed poverty in Thailand, focusing on “poverty incidence”. Deolalikar regressed poverty incidence on distribution and other determinants using provincial data, and found that inequality has a negative effect on poverty incidence both directly and through low growth rates. Deaton (1989) showed, using a nonparametric approach, that higher rice prices benefit rural households in all income brackets. This study, however, does not take into account other determinants of inequality. Ikemoto (1991) is a detailed and elaborate analysis of Thailand’s income distribution in the 1960s to the 1980s. The focus of this study is more on the precise description of the changes in income distribution than in clarifying the determinants of these changes by econometric investigation.

The insight by Kuznets (1955) has provoked a substantial number of cross-country empirical studies on growth and income inequality. Many of these studies utilize per capita GDP as the proxy of inequality between the agricultural and nonagricultural sectors (Papanek and Kyn 1986, Anand and Kanbur 1993, Jha 1996, and Osaka 2000). Others utilize relative variables of the agricultural and nonagricultural sectors (Ahluwalia 1976 and Bourguignon and Morrisson 1998). Li et al. (1998) do not directly test the Kuznets’ hypothesis, but try to identify the determinants of inequalities by focusing on factors related to political economy and capital market imperfection.

It should be noted, however, that these cross-country analyses have their own set of problems. First, Kuznets’ inverted U hypothesis deals with intertemporal relationships. It is not apparent if this cross-country evidence applies to a country’s course of development. Second, inequality data are not strictly comparable across countries due, for example, to differences in the definitions (income or expenditure, and household or individual). The “secondary” datasets (the Deininger and Squire 1996 data set, for example) used in most of the cross-country analyses have the same problem. Third, country specific determinants of inequalities such as the degree of civil liberty (Li et al. 1998) or trade protection (Bourguignon and Morrisson 1990) are very difficult to measure and likely to be contaminated with measurement errors. The advantage of this present study’s within-country analysis is that it does not need to take cognisance of the possible difference in data definitions or other problems of secondary data sets that are used in those cross-country analyses.

There are only a limited number of empirical studies of intertemporal inequality changes. This is largely due to the difficulty of obtaining longitudinal data on income distribution for

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2 More about the problems of secondary cross-country data-sets are given in Atkinson and Brandolini (2001)
developing countries. Estudillo (1997) analyzed data for the Philippines 1961-1991 and found a significant effect of urbanization and education. Karunaratne (2000) found age is an important determinant in Sri Lanka during the 1963-1987 period. Papanek and Kyn (1986), using a small number of longitudinal observations for 83 countries, concluded that the intertemporal Kuznets’ hypothesis is supported only partially. Deininger and Squire (1998), exploiting the longitudinal aspect of the dataset by Deininger and Squire (1996), rejected a contemporaneous link between inequality and income levels.

Section II introduces indices of income inequality and presents a broad overview of the changes in Thailand’s income distribution exploiting the decomposability of distribution index. Section III explores determinants of income inequality and details the empirical framework. Section IV shows the regression results. Section V concludes.

II. CHANGES IN INCOME INEQUALITY: AN OVERVIEW

A. Decomposability of Inequality Indices

The average household income in the Greater Bangkok Metropolitan Area is 2.6 times larger than that of the rural area of the Northeastern Region in 1975-1976. The figure had increased to 3.4 in 1998. There is a prevailing notion that this increase in interregional inequality is the driving force behind the inequality increase of the whole country. Therefore, it is meaningful to identify the role of the increase in interregional inequalities. To do this, it might be desirable to decompose the inequality of the whole country into interregional and intraregional inequalities. It is impossible, however, to decompose the Gini Index, which is the most popular among many inequality indices. In this study, the Mean Logarithmic Deviation (MLD) is used as a decomposable inequality index in addition to the Gini Index.

The Gini index is denoted by the following equation:

\[ GINI = \frac{\sum \sum |y_i - y_j|}{2N^2} \]  

(1)

This index can be expressed geometrically using the Lorenz Curve.

Lambert and Aronson (1993) decomposed the Gini Index into three parts as follows:

\[ GINI = GINI_W + \sum \frac{N_i}{N} GINI_W_i + R_i \]  

(2)

where \( N \) and \( N_i \) are the populations of the whole country and its subgroup \( i \), respectively, \( (N = \sum_i N_i) \). \( GINI_W \) denotes the Gini Index of the whole country when the income distribution in
all groups are perfectly equalized. In other words, this is the Gini Index between groups. The second term is the population weighted average of the Gini Indices of each of the groups \(( \text{GINI}_W(i) \)). This can be interpreted as the Gini Index within groups. The interpretation of the last term is not very easy. Lambert and Aronson claimed that this term is a mixture of a between group and a within group inequality and not decomposable.

Bourguignon (1979) and Shorrocks (1980) proposed a decomposable inequality index which is defined axiomatically. Let us set four axioms that inequality measures ought to satisfy. These are the weak principle of transfers, income scale independence, the principle of population, and decomposability. Weak principle of transfers means that the inequality measure increases when the Lorenz curve goes wholly outside. Income scale independence is satisfied when the inequality measure is unaffected by proportional changes of everyone’s income. The principle of population implies that the inequality measure is independent of population changes under constant income shares. Decomposability means that inequality of the whole population is a consistent function of the inequality in its subgroups. Any inequality measure that satisfies these four axioms is a generalized entropy measure.\(^3\)

MLD is one of these generalized inequality measures.

\[
\text{MLD} = \ln(y) - \frac{1}{N} \sum_{i=1}^{N} \ln(y_i)
\]  

(3)

MLD is decomposable as follows:

\[
\text{MLD} = \text{MLD}_B + \frac{N_i}{N} \text{MLD}_W
\]  

(4)

where \(\text{MLD}_B\) and \(\text{MLD}_W\) are between-groups and within-groups MLD. Between-groups MLD is the MLD of the whole population when income within groups are perfectly equalized. The advantage of MLD is in its intuitively-appealing property that it can be expressed by the sum of between-groups MLD and the population weighted average of within-groups MLD. This index is used to decompose Thailand’s income inequality into interregional and intraregional inequalities for an overview, using data from the HSES.

B. Household Socioeconomic Survey

The HSES has been conducted by the National Statistical Office (NSO) of Thailand since 1968, about every five years before 1987 and every two years thereafter. Its objective is to collect data on income, expenditure, and other characteristics of households. Data for five regions (the Greater Bangkok Metropolitan Area,\(^4\) Central Region, Northern Region, Northeastern Region, and Southern Region) and has become available since the 1975-1976 survey. Four out of the five regions

\(^3\) More about the generalized entropy measures and other inequality indices is given in Cowell (1995).

\(^4\) The Greater Bangkok Metropolitan Area consists of Bangkok Metropolis, Nonthaburi, Pahum Thani, and Samut Prakan.
in the HSES have three subregions. These are the municipal area, sanitary district, and villages. Only the Greater Bangkok Metropolitan Area has no subdivisions. Thus there are data for each of the 13 divisions of the whole country. Published volumes of nine full-scale surveys in the period 1975-1998 are used (1975-1976, 1981, 1986, 1988, 1990, 1992, 1994, 1996, 1998). See Appendix for more information about the HSES.

Unit record data were not used, which are otherwise obtainable from NSO for the surveys in and after 1986. This is because data of the late 1970s and early 1980s were prioritized over using a large data set. As will be seen in the next subsection, this is the period when income distribution increased rapidly.

There are four different measures of welfare depending on per capita or household, income, or expenditure. The measure used in this study is “household income,” which is the only viable option since the HSES does not consistently provide precise data on the other three measures.

C. Inequality Decomposition

This section provides an overview of the changes in income distribution by decomposing income inequality for the whole country into between-group and within-group inequalities using MLD. The whole kingdom is divided into 13 subregions to obtain interregional and intraregional inequalities.

The whole kingdom MLD is calculated using data from Ikemoto and Uehara (2000). They provided average household income by decile groups of households ordered by household income. This was estimated using tables from published volumes of the HSES, which provide average household income for households grouped according to given income brackets. Using this original data directly for calculation of MLD is avoided by the present study because occasional revisions of income brackets used in the HSES in response to overall increase in nominal income can produce errors.

Figure 3 shows regional decompositions of the whole kingdom MLD. While the interregional inequalities are much smaller than the intraregional inequalities, this does not necessarily imply that regional or occupational inequalities are not very important. Note that the shares of intergroup inequalities increase as smaller subdivisions are employed.

Total inequality increased in the 80s, and it was relatively stable in the 90s. Interregional inequality increased in the late 1980s and in the early 1990s, and decreased afterward. This is partly due to the fact that the Greater Bangkok Metropolitan Area experienced rapid growth around 1990, and other regions caught up with Bangkok. This figure does not support the prevailing notion that interregional inequality increase is the primary reason behind the inequality increase of the whole country.

It is difficult to detect econometrically the determinants behind these changes in inequality, because the present study only has nine observations. In the next section, determinants of inequalities are investigated by increasing the number of observations, focusing on inequalities within 13 regions in Thailand.
III. EMPIRICAL FRAMEWORK

In contrast to existing cross-country inequality analyses, the country analysis does not need to take into account country-specific factors like civil liberty or trade openness. Five factors are considered: relative variability of agricultural/nonagricultural sectors, income, financial services, education level disparity, and aging. Bourguignon and Morrisson (1998) introduced land distribution variables into their regressions and found that they are significant. Asset distribution is, however, not included in the regression equation. This is because asset data is not available or not complete in the HSES for most periods. To partially remedy this shortcoming, both with and without an AR(1) error term specifications are used. The estimation method of Baltagi and Wu (1999) provide a feasible GLS procedure to estimate panel regression models with AR(1) disturbances when the data set is equally spaced.

5 Financial asset data is not available in the HSES. Land distribution for farm operators is available from 1986. The available land distribution data shows no sign of large-scale variations or trends.
Regional distribution data is from the HSES tables named “average monthly income per household by per capita consumption expenditure decile groups”, which means average total current income of households of decile groups ordered by per capita consumption expenditures. $MLD'$ and $GINI'$ denote MLD and the Gini Index calculated from these tables. While it is desirable to utilize “average monthly income per household by per household monthly income decile groups” data, we could not obtain this for the whole period. The above choice is the only way to capture the movement of regional income inequalities for the period of 1975-98.

We estimate the regression of the form:

$$
(MLD' \text{ or } GINI') = \alpha + \beta_1(DUAL \text{ or } MLD_n \text{ or } GINI_n) + \beta_2 \log(Y) + \beta_3 \text{FIN} + \beta_4 \text{EDU} + \beta_5 \text{AGE} + u.
$$

where $DUAL$, $MLD_n$, and $GINI_n$ are relative variables of the agricultural/nonagricultural sectors, which are explained in the next subsection. $\log(Y)$, $\text{FIN}$, $\text{EDU}$, $\text{AGE}$, and $u$ are log household income, a financial development measure, education level disparity, average age, and error term respectively. $\beta_1$, $\beta_2$, $\beta_4$, and $\beta_5$ are expected to be positive. The sign of $\beta_3$ is theoretically indeterminate. The following subsections detail each of the inequality determinants.

A. Agricultural and Nonagricultural Sectors

Ahluwalia (1976) used the share of agriculture in GDP as an independent variable. Bourguignon and Morrisson (1998) used relative labor productivity of the agricultural sector as a more natural variable. These variables try to capture directly the effect of the agricultural sector proposed by Kuznets (1955). The relative labor productivity is, however, defective in that it does not take into account the population share of the agricultural sector at all. For example, the effect of an increase in relative labor productivity is small when the population share of the agricultural sector is away from $1/2$. Our modified independent variable that captures the dualistic nature of the economy is as follows:

$$
DUAL = (-n_a^2 + n_a) \cdot (\frac{y_{na}}{y_a} - 1)^2,
$$

where $n_a$ is the regional share of agricultural households and $y_{na}$ and $y_a$ are regional household income averages of the nonagricultural and agricultural sectors respectively. Note that $DUAL$ is larger when the population share of the economy is close to $1/2$ and the relative household income is away from 1.
The HSES provides average household incomes for nine occupational groups. Table 1 shows the occupational classification. Farm Operators (mainly owning land/mainly renting land) and Farm Workers are classified as agricultural households and others are nonagricultural households. Figure 5 shows the changes in share and relative income of agricultural households.

### TABLE 1
**OCCUPATIONAL CLASSIFICATION**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm Operators</td>
<td>Mainly owning land</td>
</tr>
<tr>
<td></td>
<td>Mainly renting land</td>
</tr>
<tr>
<td>Own Account, Nonfarm</td>
<td>Entrepreneurs, trade and industry</td>
</tr>
<tr>
<td></td>
<td>Professional, technical, and administrative workers</td>
</tr>
<tr>
<td>Employees</td>
<td>Professional, technical, and administrative workers</td>
</tr>
<tr>
<td></td>
<td>Farm workers</td>
</tr>
<tr>
<td></td>
<td>General workers</td>
</tr>
<tr>
<td></td>
<td>Clerical, sales and services workers</td>
</tr>
<tr>
<td></td>
<td>Production workers</td>
</tr>
<tr>
<td>Economically Inactive</td>
<td></td>
</tr>
</tbody>
</table>

*DUAL* can be interpreted as an intersectoral inequality measure, since *DUAL* is large under relative household income disparity and even household share of agricultural and nonagricultural sectors. This interpretation leads us to put *MLD* or the Gini coefficient between the agricultural and nonagricultural sectors denoted by *MLD_B* and *GINI_B* into the regression equation as alternatives to *DUAL*. *MLD_B* and *GINI_B* are MLD and the Gini coefficient of the regional population when income within the two sectors is equalized. Figure 4 shows the relationship between *MLD_B* and *GINI_B*.

Bourguignon and Morrisson (1998) pointed out that it is tautological to explain total income distribution by the income distribution between the agricultural and nonagricultural sectors. Therefore, one key point of our regression analysis is to clarify if income distribution between the agricultural and nonagricultural sectors can explain part of the total income distribution variation that cannot be explained by other determinants of income inequality.

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6 Occupational classification is incomplete for the 1975-76 Survey. See Appendix for the estimation procedure to make up for the missing data.
FIGURE 4
THE GINI COEFFICIENT AND MLD: A NUMERICAL EXAMPLE

FIGURE 5
SHARE AND RELATIVE INCOME OF AGRICULTURAL HOUSEHOLDS

- Share of agricultural households
- Relative household income of agricultural to nonagricultural households
B. Income

Most empirical studies of income distribution include income level or per capita GDP as an explanatory variable in their regressions and test the Kuznets’ inverted U hypothesis. As pointed out by Bourguignon and Morrisson (1998, 244), the inclusion of the variable is “only an indirect way of accounting for the dualism.” While agricultural variables are included in the regression equation, they may not be able to capture all the distributional changes caused by sectoral factors of the economy. For example, economic growth accompanied by a sectoral shift from traditional industry to high-tech or service industry can lead to increased income inequality. Therefore, household income, along with agricultural variables, is included in the regression equation.

As noted in the introduction, there are studies that found a significant effect of distribution on income. The possible interaction between income and inequality can cause the problem of endogeneity bias in regression analysis. To avoid this problem, instrumental variables are estimated for income.

\[ \log(Y) \], the logarithm of the average monthly household income, and its squares are used as determinants of income inequality in the regression analysis.

C. Financial Service

The effect of financial service development on income distribution is not straightforward. Developed financial services enable the poor to borrow from the rich and this leads to a decrease in income inequality. The development also locks in inequality because all the agents can increase their financial assets at the same rate.\(^7\) On the other hand, developed financial services are often unavailable for the poor, due, for example, to credit constraints arising from information asymmetries or transaction costs. In this case, financial development can accelerate income inequality. One of the aims of this study is to examine the effect of financial service development in Thailand’s development process.

Li et al. (1998) employed \( M2/GDP \) as a measure of financial development in their regression analysis and show that the variable has a negative effect on the inequality measure. Their measure is not appropriate for the within-country analysis, and other good financial asset data are unavailable. The proxy for financial development is the ratio of insurance and interest expenditures to income which is denoted by \( FIN \).

D. Education Level Disparity

We introduce education level disparity as a determinant of income inequality on the assumption that more education leads to more income. The HSES provides the education level distribution of household male members 25 years old or more. We digitize the education levels following Table 2 and employ its standard deviation denoted by \( EDU \) as the proxy for education level disparity. Since most of the HSES tables do not show the education level distribution of each subregion, we often need to estimate it from the education level distribution of each occupation.

\(^7\) See Motonishi (2000) for a theoretical analysis of the effect of financial development in a stratified economy.
The Appendix gives the estimation method.

### TABLE 2
**NUMERICAL EXPRESSION OF EDUCATION LEVELS**

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Numerical Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindergarten or None</td>
<td>1</td>
</tr>
<tr>
<td>Elementary</td>
<td>2</td>
</tr>
<tr>
<td>Secondary</td>
<td>3</td>
</tr>
<tr>
<td>University or Bachelor Degree</td>
<td>4</td>
</tr>
<tr>
<td>Vocational or Technical</td>
<td>4</td>
</tr>
<tr>
<td>Higher Education</td>
<td>5</td>
</tr>
</tbody>
</table>

Estudillo (1997) found the presence of household heads with a college degree decrease inequality in the Philippines. Akita et al. (1999) found education level difference is significant in Indonesia for 1987-1993. Bourguignon and Morrisson (1998) used secondary school enrolments as a proxy for the share of skilled workers but the significance of the variable is not robust over time. Li et al. (1998) also used secondary schooling as a determinant, on the assumption that a more educated population can restrain the richest segment of society, and they obtained a significant result.

### E. Aging

Deaton and Paxson (1994) pointed out that inequality should grow with age. As people get older, the cumulative effect of luck diversifies their income distribution. In this case, income distribution of an aging economy deteriorates. Note here that this deterioration of distribution does not reflect the diversification of people’s lifetime welfare. Therefore, it is important to distinguish this aging effect from other effects.

Ohtake and Saito (1998) showed, using Japanese household survey data, that half of the increase in the economywide consumption inequality during the 1980s could be explained by population aging. Karunaratne (2000) also found significant effect of aging in Sri Lanka. Estudillo (1997), however, conclude that the contribution of aging is limited in the Philippines.

Figure 6 shows that Thailand’s population is aging. We use the average age of household heads denoted by \( \text{AGE} \) as an explanatory variable to take into account the relationship between aging and distribution.
IV. REGRESSION RESULTS

Table 3 reports descriptive statistics for variables in the regressions. Tables 4-6 show the regression results. We use data from nine surveys from 1975 to 1998. The number of observations is 116. This is (13 regions) x (9 surveys) minus one, since we lost one observation due to a defective survey report. For more about our dataset, see Appendix.

We employ two types of inequality measures, MLD and the Gini index. Tables 4a and 5 employ MLD as the dependent variable and Table 4b the Gini index. In Table 4a, sectoral factors are captured by $DUAL$ or $MLD_b$. Two types of econometric model are employed: the fixed effect model (FE) and the random effect model (RE). In all the regressions in Tables 4a and 4b, the p-values of the Hausman test are less than 1 percent and strongly reject the validity of the random effect model. The $DUAL$ variable is significant in regressions 1-4. In equation 3 we can see that the coefficients of $\log(Y)$ and $EDU$ are significant and have the expected sign. The effect of $FIN$ is negative, which implies that financial development leads to a decrease in income inequality.

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$^8$ Since we have at most nine observations for each region, we have not taken a unit root approach.
### TABLE 3
DESCRIPTIVE STATISTICS FOR VARIABLES IN THE ANALYSIS

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>MEAN</th>
<th>S.D.</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>$MLD$</td>
<td>0.093</td>
<td>0.035</td>
<td>0.029</td>
<td>0.197</td>
</tr>
<tr>
<td>$MLD_B$ ($MLD$ between agricultural and nonagricultural sectors)</td>
<td>0.014</td>
<td>0.015</td>
<td>0.000</td>
<td>0.079</td>
</tr>
<tr>
<td>$GINI$</td>
<td>0.230</td>
<td>0.045</td>
<td>0.132</td>
<td>0.342</td>
</tr>
<tr>
<td>$GINI_B$ ($GINI$ between agricultural and nonagricultural sectors)</td>
<td>0.054</td>
<td>0.043</td>
<td>0.000</td>
<td>0.141</td>
</tr>
<tr>
<td>$DUAL$ (relative household income adjusted by share)</td>
<td>0.059</td>
<td>0.089</td>
<td>0.000</td>
<td>0.596</td>
</tr>
<tr>
<td>Log(Y) (Log Monthly Household Income)</td>
<td>8.760</td>
<td>0.423</td>
<td>7.841</td>
<td>9.703</td>
</tr>
<tr>
<td>$FIN$ (financial development)</td>
<td>0.026</td>
<td>0.014</td>
<td>0.004</td>
<td>0.066</td>
</tr>
<tr>
<td>$EDU$ (Education Level std. dev.)</td>
<td>0.738</td>
<td>0.129</td>
<td>0.432</td>
<td>0.971</td>
</tr>
<tr>
<td>$AGE$ (Average age of head)</td>
<td>45.9</td>
<td>2.7</td>
<td>39.7</td>
<td>51.1</td>
</tr>
<tr>
<td>INDEPENDENT VARIABLES</td>
<td>MODELS</td>
<td>1 FE</td>
<td>2 RE</td>
<td>3 FE</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>DUAL (relative household income adjusted by share)</td>
<td>**</td>
<td>0.129 (0.038)</td>
<td>**</td>
<td>0.167 (0.033)</td>
</tr>
<tr>
<td>MLDp (MLD between agricultural and nonagricultural sectors)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(Y) (Log Monthly Household Income)</td>
<td>**</td>
<td>0.082 (0.017)</td>
<td>**</td>
<td>0.035 (0.013)</td>
</tr>
<tr>
<td>FIN (financial development)</td>
<td>**</td>
<td>-0.790 (0.317)</td>
<td>**</td>
<td>-0.112 (0.263)</td>
</tr>
<tr>
<td>EDU (Education Level std. dev.)</td>
<td>**</td>
<td>0.162 (0.050)</td>
<td>*</td>
<td>0.070 (0.039)</td>
</tr>
<tr>
<td>AGE (Average age of head)</td>
<td>-0.001 (0.002)</td>
<td>0.001 (0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Const.</td>
<td>**</td>
<td>-0.303 (0.127)</td>
<td>**</td>
<td>-0.269 (0.096)</td>
</tr>
<tr>
<td>Durbin-Watson</td>
<td>1.823</td>
<td>1.186</td>
<td>1.821</td>
<td>1.175</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.621</td>
<td>0.390</td>
<td>0.620</td>
<td>0.386</td>
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**TABLE 4B**

REGRESSION RESULTS (DEPENDENT VARIABLE: GINI COEFFICIENT)

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<th>MODELS</th>
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<td>**</td>
<td>**</td>
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</tr>
<tr>
<td>DUAL (relative household income adjusted by share)</td>
<td>0.154</td>
<td>0.203</td>
<td>0.148</td>
<td>0.206</td>
<td>0.417</td>
<td>0.610</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.050)</td>
<td>(0.044)</td>
<td>(0.049)</td>
<td>(0.044)</td>
<td>(0.141)</td>
<td>(0.118)</td>
<td></td>
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<tr>
<td>GINI&lt;sub&gt;B&lt;/sub&gt; (GINI between agricultural and nonagricultural sectors)</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
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<tr>
<td></td>
<td>0.100</td>
<td>0.040</td>
<td>0.099</td>
<td>0.040</td>
<td>0.110</td>
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<tr>
<td></td>
<td>(0.022)</td>
<td>(0.017)</td>
<td>(0.022)</td>
<td>(0.017)</td>
<td>(0.022)</td>
<td>(0.019)</td>
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<tr>
<td>Log(Y) (Log Monthly Household Income)</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
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<tr>
<td></td>
<td>-0.794</td>
<td>0.033</td>
<td>-0.892</td>
<td>0.106</td>
<td>-0.934</td>
<td>-0.104</td>
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<tr>
<td></td>
<td>(0.416)</td>
<td>(0.346)</td>
<td>(0.390)</td>
<td>(0.308)</td>
<td>(0.390)</td>
<td>(0.317)</td>
<td></td>
</tr>
<tr>
<td>FIN (financial development)</td>
<td>*</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
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<tr>
<td></td>
<td>0.206</td>
<td>0.086</td>
<td>0.214</td>
<td>0.076</td>
<td>0.200</td>
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<td></td>
<td>(0.066)</td>
<td>(0.052)</td>
<td>(0.065)</td>
<td>(0.048)</td>
<td>(0.065)</td>
<td>(0.048)</td>
<td></td>
</tr>
<tr>
<td>EDU (Education Level std. dev.)</td>
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<td>*</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
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<tr>
<td></td>
<td>-0.002</td>
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<td>0.001</td>
<td>0.002</td>
<td>0.001</td>
<td>0.002</td>
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<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td></td>
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<tr>
<td>AGE (Average age of head)</td>
<td>**</td>
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<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
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<tr>
<td></td>
<td>-0.245</td>
<td>-0.245</td>
<td>-0.194</td>
<td>-0.194</td>
<td>-0.194</td>
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<tr>
<td></td>
<td>(0.168)</td>
<td>(0.168)</td>
<td>(0.128)</td>
<td>(0.128)</td>
<td>(0.128)</td>
<td>(0.128)</td>
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<tr>
<td>Const.</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
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<tr>
<td></td>
<td>1.790</td>
<td>1.116</td>
<td>1.783</td>
<td>1.100</td>
<td>1.747</td>
<td>1.091</td>
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<tr>
<td></td>
<td>(0.608)</td>
<td>(0.357)</td>
<td>(0.606)</td>
<td>(0.350)</td>
<td>(0.605)</td>
<td>(0.375)</td>
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</tr>
</tbody>
</table>

Notes: Dependent variable: Gini coefficient.
Number of observations: 116.
Standard errors are in parentheses.
*:**, Significant at the 10 and 5 percent levels, respectively.
In regressions 5 and 6, DUAL is replaced with MLD. We also include AGE in these regressions and find that they are insignificant. The results in regressions 5 and 6 are very similar to those obtained in regressions 3 and 4. Regressions 1-6 in Table 4a are re-estimated using the Gini coefficient instead of MLD and the results presented in Table 4b are very similar to the results obtained in Table 4a.

The insignificance of AGE is partly due to the fact that Thailand’s aging process is just getting started. In Asia, the effect of aging seems to be more important for more developed countries like Japan, Korea, and Singapore. To capture Kuznets’ U-shape, we also put the square of Log(Y) into all specifications and find that it is insignificant. This implies that Thailand’s data show no signs of the “U-shape” that is often found in cross-country analyses.

In order to account for the possible endogeneity bias due to interactions between income and distribution, we also estimate using instrumental variables (average age of head, standard deviation of the age of head, and average education level) for household income. While the coefficient of income increases slightly, the overall result does not change significantly and is omitted.

Durbin-Watson statistics of fixed effect estimations in Tables 4a and 4b suggest the existence of a weak positive autocorrelation of residuals. Note that asset accumulation can lead to autocorrelation in residuals, because asset accumulation can transmit temporary income inequality to later periods through asset accumulation of households. Since we have no complete asset data, assuming AR(1) disturbances is our second best policy. We set the length of the eight intervals of the nine unequally spaced surveys as follows: 3, 3, 1, 1, 1, 1, 1, and 1. The estimation results by Baltagi and Wu (1999) procedure are presented in Table 5. While MLD stays significant in the table, FIN and EDU are not significant. This result, however, could be immaterial because the autocorrelation of residuals is not very strong.

Table 6 shows the standardized coefficients of regressions of Tables 4a and 4b. The effect of household income is the largest. The effect of variables capturing sectoral factors (agricultural factor and income) is larger than the effect of FIN and EDU.

---

9 More information about the aging process in Asian countries can be obtained from Asian Development Bank (2002).
10 These Durbin Watson statistics are conservative because there are gaps in our dataset.
11 The standardized coefficient is the standard deviation change in the dependent variable caused by one standard deviation change in each independent variable.
In summary, the effects of the agricultural variable is very robust. The effects of income, financial development, and education level standard deviation are somewhat sensitive to the model specification about the error term. If we adopt panel regression without AR(1) disturbances on the grounds of the weak autocorrelation of residuals, the standardized coefficients show that the effects of variables capturing sectoral factors dominate the effects of the other determinants. The coefficient of $FIN$ is negative, which suggests that financial development decreases income inequality.
V. CONCLUSIONS

Kuznets (1955, 12) asks: “What about the trend toward greater inequality due to the shift from the agricultural to the nonagricultural sectors? In view of the importance of industrialization and urbanization in the process of economic growth, their implications for trends in the income distribution should be explored—even though we have neither the necessary data nor a reasonably complete theoretical model.” Even though we now have the necessary data and this study reconfirms the importance of sectoral factors, a theoretical model capturing sectoral factors of the developing economy still seems to be not fully developed.

This study shows that inequality between the agricultural and nonagricultural sectors plays a significant role in determining the income distribution of Thailand. The effect of agriculture/nonagriculture disparity is very robust. The impact of variables related to sectoral shifts in the economy, i.e., agriculture/nonagriculture disparity and household income, is larger than that of other determinants (financial development, education level disparity, and aging). Therefore, these sectoral factors are largely responsible for the inequality increase in Thailand. We also find some limited evidence that financial development alleviates the inequality increase.

### TABLE 6
STANDARDIZED COEFFICIENTS

<table>
<thead>
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<th>INDEPENDENT VARIABLES</th>
<th>TABLE 2(A)</th>
<th>TABLE 2(B)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
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<tr>
<td>DUAL (relative household income adjusted by share)</td>
<td>0.316</td>
<td></td>
</tr>
<tr>
<td>MLD (MLD between agricultural and nonagricultural sectors)</td>
<td></td>
<td>0.377</td>
</tr>
<tr>
<td>GINI (GINI between agricultural and nonagricultural sectors)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(Y) (log monthly household income)</td>
<td>0.984</td>
<td>1.018</td>
</tr>
<tr>
<td>FIN (financial development)</td>
<td>-0.356</td>
<td>-0.360</td>
</tr>
<tr>
<td>EDU (education level std. dev.)</td>
<td>0.616</td>
<td>0.597</td>
</tr>
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</table>

Note: Standardized coefficient denotes standard deviation change in the dependent variable caused by one standard deviation change in independent variable.
APPENDIX


Income data is based on “total current income”, which is before-tax, after-transfer income minus “other monetary receipts” (insurance proceeds, lottery winnings, and other receipts).

Three subregions (municipal area, sanitary district, and villages) are formed by the administration according to the degree of urbanization. The subdivision is simplified to two (municipal area and villages) from the 2000 Survey. For more about the definition of these subregions, see Ikemoto (1991, 31-2).

The HSES volumes for 1975-1976 do not show the percentage of Farm Workers. By comparing data from 1975-1976 with that of 1981, it can be assumed that this is due to the fact that Farm Workers are included with General Workers. The HSES volumes of the 1975-1976 survey available from the Economic Statistic Division of NSO include some handwritten corrections. The writing on Table 5.2 for the 1975-1976 survey Northern Region volume also shows that Farm Workers are included with General Workers. Therefore, household ratio and income of Farm Workers in the 1975 survey was calculated by dividing the data for General Workers according to the Farm Workers/General Workers ratio of the 1981 survey.

The HSES volume for the Greater Bangkok Metropolitan Area in 1986 is different from other volumes for the same region. It provide tables for three subregions (City Core, Suburbs, and Fringe Areas). However, it does not provide data for the whole region or for the household ratio which is necessary to sum these data. Therefore, data could not be obtained for income distributions and others for the Greater Bangkok Metropolitan Area in 1986.

The HSES volumes for four regions other than the Greater Bangkok Metropolitan Area in 1986 do not provide education level distribution data for three subregions (Municipal Area, Sanitary District, and Village), while they provide it for six occupational groups. The education level distribution for each subregion is estimated from the weighted average of education level distribution for these occupational groups, using occupational distribution in each subregions as its weight.

The education level classification in 1975-1976 volumes shown in the Appendix Table is different from that of Table 2. The “No Formal Education” class in the 1975-1976 volumes is expressed as “Kindergarten or None.” There is no distinction between University Education and Higher Education in the 1975-1976 volumes. This is not a big problem because the number of people with “Higher Education” in 1981 is less than 1 percent in all the regions and subregions. People with “University or Higher” education are assigned as 4.
Household head is defined as “the person recognized as such by other members, whether he or she was responsible for financial support or welfare of the household members or not” (HSES 1998).

Unit record HSES data in and after 1986 are available on CD-ROM from the NSO of Thailand. While there are studies that used data from surveys before 1986 “on tape” (Ikemoto 1991, for example), there is no announcement about the availability of unit record data of these old surveys.

More detailed information about the survey and its design can be found in each of the volumes of the survey published by NSO (both in Thai and in English; see also http://www.nso.go.th/eng/stat/socio/socio.htm).

### APPENDIX TABLE

**CLASSIFICATION OF EDUCATION LEVELS IN THE 1975-1976 SURVEY**

<table>
<thead>
<tr>
<th>EDUCATIONAL ATTAINMENT</th>
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<tr>
<td>No formal education</td>
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<tr>
<td>Elementary or less</td>
</tr>
<tr>
<td>Secondary</td>
</tr>
<tr>
<td>University or Higher</td>
</tr>
<tr>
<td>Vocational or Technical</td>
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