The Changing Educational Distribution and its Impact on the Evolution of Wages in Thailand, 1987-2006 (Draft Paper)

Dilaka Lathapipat*
Australian National University and EABER

April ,17 , 2008

Abstract

This paper uses data from Thailand's Labour Force Surveys (LFS) from 1987 to 2006 to analyse the impact of the changing educational composition, as well as the changing returns to different education levels on male wage distribution. The Firpo, Fortin, and Lemieux decomposition method is employed in the study to untangle the components of dynamic wage structure and composition effects. Contrary to widely held beliefs, the study finds the observed increase in education to be a major factor enhancing wage inequality in the higher portion of the wage distribution. The study also reveals deteriorating returns to secondary education, and the recent surge in returns to higher education to exert the greatest influence on the observed evolution of wages.

JEL Classification: I21, J24, J31

Keywords: Wage inequality, Wage distribution, Returns to education, Unconditional quantile regression, Decomposition, Thailand

1 Introduction

The composition of educational attainments of full-time male wage-earners in Thailand has changed dramatically over the last two decades. Average years of schooling has increased by almost two years to 9.6 years in 2006, with the biggest jump seen during the period of economic crisis that started in 1997. Overall inequality in hourly earnings, as measured by the Gini and the Generalised Entropy indices[1], has generally declined since 1988. Most of the reduction in earnings inequality occurred during the crisis, and looks to be stabilising from the year 2000 onwards. Even though these summary measures of wage inequality indicate an overall decline in wage dispersion, a closer

*The author is a visiting scholar at the Center for Labor Economics at the University of California, Berkeley. I would like to thank Professor David Card for helpful comments and suggestions, and the Center for Labor Economics for sponsoring my visit. Any errors are my own responsibility. E-mail: dilaka.lathapipat@anu.edu.au

[1] Author's calculations

look at changes at various points on the wage distribution over time reveals a different story. While wage inequality has been reducing at the low end of the distribution, its dispersion in the upper end has been steadily increasing over the last two decades. This study sets out to unravel the complex structure of wages and to understand the factors behind the observed wage pattern. The focus of the paper is primarily on identifying the contribution of changes in educational distribution of the workforce, and the corresponding changes in the returns to different levels of education[2] on the dynamics of wage distribution.

Much of previous literatures on inequality in Thailand have been centred on popular summary measures mentioned above (see (Israngkura 2003) for a survey study). Recent studies that employ regression based decomposition approach include (Fofack and Zeufack 1999) and (Motonishi 2006). (Fofack and Zeufack 1999), using pseudo-panel household data from the Socioeconomic Surveys (SES) from 1986 to 1996, decompose the cohort Theil index and find that increasing the level of education in Thailand could lead to a reduction in income inequality. (Motonishi 2006), also using household SES data from 1978 to 1998, decomposes the Mean Log Deviation and the Gini indices and finds that reducing education disparity leads to a reduction in income inequality. These studies share the same weakness in that they focus on summary measures of inequality, which obscures potentially important distributional information. Note also that these studies base their analyses on income data that include income from entrepreneurial activities. With our emphasis on the wage dynamics, efforts were made to extract hourly real wage data of full-time male employees only. Using hourly wage rates avoids biases occurring from differing hours of work among the observed workers, and this is the main reason why we use data from Thailand's National Labour Force Surveys (LFS), which contain information on hours of work.

Recent developments emphasise studying changes in the entire wage distribution based on performing counterfactual exercises to identify the sources (changes in productive characteristics or returns to these characteristics) of changes in wage inequality (see for example (José and José 2005), (Melly 2005), (Melly 2006) for a conditional quantile regression approach and (DiNardo, Fortin, and Lemieux 1996) for a reweighted kernel density estimation approach). In this study we adopt a novel two-stage decomposition technique proposed by (Firpo, Fortin, and Lemieux 2007). Using reweighting, the first stage of the method separates a change in a distributional statistic into a "wage structure" and a "composition" component. In the second stage, the method allows us to further decompose the two components into the contribution of each covariate using "Unconditional Quantile Regression" proposed by (Firpo, Fortin, and Lemieux 2006). To serve our particular objectives, the distributional statistics analysed in this paper are the various quantiles of the marginal distribution of hourly wages. Specifically, the technique enables us to track the impact of changes in the educational composition, as well as changes in the returns to each education level on the evolution of the wage distribution over time. Obviously, the influence of other covariates can also be analysed in the same manner. In effect, this method is a generalisation of the Oaxaca-Blinder decomposition ((Oaxaca 1973), (Blinder 1973)) that goes beyond the mean.

The rest of the paper proceeds as follows. Section 2 presents the methodology used to analyse the evolution of the wage pattern. Section 3 and 4 describe the data and provide preliminary

[2](Hawley 2004) analyses changes in returns to education in Thailand by ordinary least squares and uses the LFS data from 1985 to 1998 (the study uses monthly wage rates)

analyses. Section 5 presents the results and discusses the findings. Section 6 concludes the paper.

2 Methodology

This section elaborates on the methods used in decomposing changes in the wage distribution over time. A novel two-stage procedure proposed by (Firpo, Fortin, and Lemieux 2007) (FFL from here on) is used for this very purpose. Before delving into the procedure itself, we first describe the setup of the problem at hand. Our focus is on analysing changes in the wage distribution between any two time periods $T = 0, 1$. Assume that the wage structure functions depend on some observed and unobserved attributes $(\mathbf{X}_i, \varepsilon_i)$ of individual i indexed by $i \in \{1, ...N\}$, where $N = N_0 + N_1$ is the total number of the combined observations for both time periods and $\mathbf{X} \in \mathbb{X} \subset \mathbb{R}^K$.

$$Y_{Ti} = g_T(\mathbf{X}_i, \varepsilon_i) \text{ for } T = 0, 1 \text{ and } i = 1, ..., N \tag{1}$$

Define the observed wage for individual i as $Y_i = Y_{1i}T_i + Y_{0i}(1 - T_i)$. An individual cannot be observed in both dates and we only observe either Y_0 or Y_1. In effect, we are faced with a problem of missing data. Denote the distributional measure of interest by ν (in our case quantiles), whose change over time we seek to decompose. In the first stage of the FFL decomposition, the overall change in ν, $\triangle_O^\nu$ from date 0 to 1 is divided into the "wage structure effect" $\triangle_S^\nu$ and the "composition effect" $\triangle_X^\nu$.

$$\triangle_O^\nu = \triangle_S^\nu + \triangle_X^\nu = (\nu(F_1) - \nu(F_C)) + (\nu(F_C) - \nu(F_0)) \tag{2}$$

Note that ν is a functional which operates on distribution functions, and $F_0(y)$ and $F_1(y)$ are wage distribution functions for each respective date. The counterfactual wage distribution function $F_C(y)$ is the distribution that would have prevailed under the wage structure function of year 0, but with the observed and unobserved worker attributes $(\mathbf{X}, \varepsilon)$ jointly distributed as in year 1.

In the framework of the familiar treatment effect literature, assume that (i) the distribution of the unobserved characteristics $(\varepsilon_0, \varepsilon_1)$ is independent of T after conditioning on observed covariates $\mathbf{X}$, and (ii) $0 < P(T = 1|\mathbf{x}) < 1$ for all $\mathbf{x} \in \mathbb{X}$. Assumption (i) is called the "ignorability of treatment" assumption and is written as $(\varepsilon_0, \varepsilon_1) \perp T|\mathbf{x}$ for all $\mathbf{x} \in \mathbb{X}$. Assumption (ii) is called the "overlapping support" assumption. Together, these two assumptions can be called the "strongly ignorable treatment assignment" assumptions, and are sufficient for the identification of $F_C(y)$ and ensure that the composition effect $\triangle_X^\nu$ only reflect changes in the distribution of observable covariates $\mathbf{X}$ (Theorem 2 in (Firpo, Fortin, and Lemieux 2007)). We maintain these assumptions throughout this paper.

The first stage of the FFL procedure comprises estimating the wage structure effect and the composition effect. In the second stage these effects are further decomposed into the contribution of each observed covariate using an ingenious "Recentred Influence Function Regression" approach proposed by (Firpo, Fortin, and Lemieux 2006). The approach is effectively a generalisation of the classical Oaxaca-Blinder decomposition method to any distributional statistic of interest, including the mean. The two-stage procedure is summarised below.

2.1 First Stage of the FFL Decomposition

There are several methods such as the one proposed by (José and José 2005) that can be used to divide the overall wage change into the wage structure and composition effects. In this paper, we use the reweighting procedure proposed by (DiNardo, Fortin, and Lemieux 1996) to perform the decomposition. Specifically, the wage distribution functions for each date is non-parametrically identified from observed wage data, and their empirical distribution counterparts based on a random sample $\{Y_1, ..., Y_{N_T}\}$ of size N_T are given by

$$\widehat{F}_T(y) = \frac{1}{N_T} \sum_{i \in S_T} \mathbf{1}(Y_i \leqslant y), \text{ for } T = 0, 1 \tag{3}$$

where S_T is the index set for observations at date T and $\mathbf{1}(.)$ is an indicator function. Note also that $F_T(y)$ can be written as

$$F_T(y; T_{\mathbf{X}} = T) = \int_{\mathbb{X}} F_{T,Y|\mathbf{X}}(y|\mathbf{x}) dF_{\mathbf{X}|T}(\mathbf{x}|T_{\mathbf{X}} = T) \tag{4}$$

where $\mathbb{X} \subset \mathbb{R}^K$ is the support of $\mathbf{X}$. We explicitly index the date $T_{\mathbf{X}}$ in order to easily keep track of the distribution of observed covariates $\mathbf{X}$. Assuming the "strongly ignorable treatment assignment" assumptions discussed above, and using equation (4) the counterfactual distribution function is well-defined and can be constructed as

$$\begin{aligned} F_C(y) &= \int_{\mathbb{X}} F_{0,Y|\mathbf{X}}(y|\mathbf{x}) dF_{\mathbf{X}|T}(\mathbf{x}|T_{\mathbf{X}} = 1) \\ &= \int_{\mathbb{X}} F_{0,Y|\mathbf{X}}(y|\mathbf{x}) \frac{dF_{\mathbf{X}|T}(\mathbf{x}|T_{\mathbf{X}} = 1)}{dF_{\mathbf{X}|T}(\mathbf{x}|T_{\mathbf{X}} = 0)} dF_{\mathbf{X}|T}(\mathbf{x}|T_{\mathbf{X}} = 0) \\ &= \int_{\mathbb{X}} F_{0,Y|\mathbf{X}}(y|\mathbf{x}) \psi_{\mathbf{x}}(\mathbf{x}) dF_{\mathbf{X}|T}(\mathbf{x}|T_{\mathbf{X}} = 0) \\ &= F_0(y; T_{\mathbf{X}} = 1) \end{aligned} \tag{5}$$

where $\psi_{\mathbf{x}}(\mathbf{x})$ is the reweighting function. Applying Baye's rule to the function in the same fashion as (DiNardo, Fortin, and Lemieux 1996), the "inverse probability weighting function" or IPW is expressed as (Theorem 1 in (Firpo, Fortin, and Lemieux 2007))

$$\begin{aligned} \psi_{\mathbf{x}}(\mathbf{x}) &= \frac{P(T = 1|\mathbf{x}) P(T = 0)}{P(T = 0|\mathbf{x}) P(T = 1)} \\ &= \left(\frac{p(\mathbf{x})}{1 - p(\mathbf{x})}\right) \left(\frac{1 - p}{p}\right) \end{aligned}$$

where $p(\mathbf{x}) = P(T = 1|\mathbf{x})$ is the propensity score and can be estimated parametrically or nonparametrically, and $p = P(T = 1)$. The empirical IPW is normalised to sum to one for convenience

$$\widehat{\omega}(\mathbf{x}_i) = \frac{\widehat{\psi}_{\mathbf{x}}(\mathbf{x}_i)}{\sum_{i \in S_0} \widehat{\psi}_{\mathbf{x}}(\mathbf{x}_i)}, \text{ for } i \in S_0 \tag{6}$$

and the empirical counterfactual wage distribution is thus

$$\widehat{F}_C(y) = \sum_{i \in S_0} \widehat{\omega}(\mathbf{x}_i)\mathbf{1}(Y_i \leqslant y) \tag{7}$$

Using equations (3) and (7), we can estimate the sample distributional statistics of interest, $\nu(\widehat{F}_0)$,$\nu(\widehat{F}_1)$, and $\nu(\widehat{F}_C)$, as well as compute the estimated wage structure and composition effects, $\widehat{\triangle}^{\nu}_{S}$ and $\widehat{\triangle}^{\nu}_{X}$ as in (2).

2.2 Second Stage of the FFL Decomposition

In the second stage, the wage structure and composition effects are divided into the contribution of each covariate in the Oaxaca-Blinder fashion. The "Recentred Influence Function (RIF) Regression" approach can be used to study the effect on a distributional statistic ν when the distribution of the wage variable Y changes in response to changes in the distribution of observed covariates $\mathbf{X}$. We briefly summarise the method here and interested readers are referred to (Firpo, Fortin, and Lemieux 2006) for more detail on the RIF regression method.

Consider a statistical functional $\nu(F)$, where F is the underlying distribution function upon which ν is defined. The influence function $IF_F(.)$ introduced by (Hampel 1974) is a widely used tool in studies on local robustness properties of functionals at some distribution, and is defined as

$$IF_F(y;\nu) = \lim_{\epsilon \downarrow 0} \frac{\nu(F + \epsilon(\delta_y - F)) - \nu(F)}{\epsilon}, \text{ for } \epsilon \in (0,1) \tag{8}$$

if this limit is defined for every point $y \in \mathbb{R}$, and δ_y denotes the probability measure that puts a mass 1 at the value y. If a statistical functional (von Mises functional due to (Mises 1947)) is Gâteaux differentiable at F, a first order von Mises expansion for some distribution function G close to F is given by

$$\nu(G) = \nu(F) + \int a(y)d(G - F)(y) + r \tag{9}$$

where $a(.)$ is a real kernel function and r is a remainder term. Standardise (9) by replacing kernel $a(.)$ with the influence function (8) and noting that $\int IF_F(y;\nu)dF(y) = 0$ by definition, we have $\nu(G) = \nu(F) + \int IF_F(y;\nu)d(G)(y) + r$. For a particular case that $G = \delta_y$, (Firpo, Fortin, and Lemieux 2006) call this first order approximation term the "Recentred Influence Function", denoted by $RIF_F(y;\nu)$.

$$RIF_F(y;\nu) = \nu(F) + \int IF_F(y;\nu)d\delta_y(y) = \nu(F) + IF_F(y;\nu) \tag{10}$$

The great insight of (Firpo, Fortin, and Lemieux 2006) was to recognise several interesting properties of the $RIF_F(y;\nu)$, the most important of which is that the $RIF_F(y;\nu)$ integrates up to the functional of interest $\nu(F)$; that is $\int RIF_F(y;\nu)dF(y) = \nu(F)$. Applying the law of iterated expectation (LIE) to the expression yields

$$E_{\mathbb{X}}[E[RIF_F(y;\nu)|\mathbf{x}]] = E_{\mathbb{X}}[m^{\nu}(\mathbf{x})] = \nu(F) \tag{11}$$

where $E_{\mathbb{X}}[.]$ explicitly denotes that the expectation is taken over the support of $\mathbf{X}$, while $m^{\nu}(\mathbf{X})$ denotes the RIF regression model with regard to the statistical functional ν. To be notationally consistent with section 2.1, we define the following identities for our regression models

$$\begin{aligned} m^{\nu}_T(\mathbf{x}) &\equiv E[RIF_{F_T}(y_T;\nu_T)|\mathbf{x}, T_{\mathbf{X}} = T], \text{ for } T = 0,1 \text{ and} \\ m^{\nu}_C(\mathbf{x}) &\equiv E[RIF_{F_C}(y_0;\nu_C)|\mathbf{x}, T_{\mathbf{X}} = 1] \end{aligned}$$

where ν_T and ν_C are shorthands for $\nu(F_T)$ and $\nu(F_C)$ respectively. In this paper, we consider the linear projections of the recentred influence functions onto the column space of the observed covariates. This has the advantage of being simple to compute and makes the estimation directly comparable with the traditional Oaxaca-Blinder decomposition. It follows that

$$\begin{aligned} E[m^{\nu}_T(\mathbf{x})|T_{\mathbf{X}} &= T] = E[\mathbf{x}'|T_{\mathbf{X}} = T]\beta^{\nu}_T = \nu(F_T), \text{ for } T = 0,1 \text{ and} \\ E[m^{\nu}_C(\mathbf{x})|T_{\mathbf{X}} &= 1] = E[\mathbf{x}'|T_{\mathbf{X}} = 1]\beta^{\nu}_C = \nu(F_C) \end{aligned} \tag{12}$$

where

$$\begin{aligned} \beta^{\nu}_T &= (E[\mathbf{x}\mathbf{x}'|T_{\mathbf{X}} = T])^{-1}E[\mathbf{x}.RIF_{F_T}(y_T;\nu_T)|T_{\mathbf{X}} = T], \text{ for } T = 0,1 \text{ and} \\ \beta^{\nu}_C &= (E[\mathbf{x}\mathbf{x}'|T_{\mathbf{X}} = 1])^{-1}E[\mathbf{x}.RIF_{F_C}(y_0;\nu_C)|T_{\mathbf{X}} = 1] \end{aligned} \tag{13}$$

Using equations (12) and (13), the relationship shown in (2) is further broken down into

$$\begin{aligned} \triangle^{\nu}_O &= \triangle^{\nu}_S + \triangle^{\nu}_X = (\nu(F_1) - \nu(F_C)) + (\nu(F_C) - \nu(F_0)) \\ &= E[\mathbf{x}'|T_{\mathbf{X}} = 1](\beta^{\nu}_1 - \beta^{\nu}_C) + (E[\mathbf{x}'|T_{\mathbf{X}} = 1]\beta^{\nu}_C - E[\mathbf{x}'|T_{\mathbf{X}} = 0]\beta^{\nu}_0) \end{aligned} \tag{14}$$

and we are ready to compute the generalised Oaxaca-Blinder decomposition for any distributional statistic. Particularly, in this paper we apply the FFL decomposition to study the important drivers for the observed changes in the wage distribution over time across the unconditional quantiles of wages (to distinguish from the conditional quantile regression in (Koenker and Bassett 1978)).

2.3 Applying the FFL Decomposition to (Unconditional) Quantiles of Wages

As mentioned previously, in this paper we apply the RIF Regression method to a whole range of the wage quantiles, which are generically denoted by q_τ for any quantile $\tau \in (0,1)$ of interest. The influence function for a quantile (the proof is straight forward and is shown in Appendix A for convenience of readers) is given by

$$IF_F(y;q_\tau) = \frac{\tau - \mathbf{1}(y \leqslant q_\tau)}{f(q_\tau)} \tag{15}$$

Using the definition of RIF given in (10) for a quantile q_τ of the marginal distribution of Y, and following (Firpo, Fortin, and Lemieux 2006), we express the feasible version of the $RIF_F(y;q_\tau)$ as

$$\begin{aligned} \widehat{RIF}_{F_T}(y_T;\widehat{q}_{\tau,T}) &= \frac{\mathbf{1}(y_T > \widehat{q}_{\tau,T})}{\widehat{f}_T(\widehat{q}_{\tau,T})} + \widehat{q}_{\tau,T} - \frac{(1-\tau)}{\widehat{f}_T(\widehat{q}_{\tau,T})}, \text{ for } T=0,1 \text{ and} \\ \widehat{RIF}_{F_C}(y_0;\widehat{q}_{\tau,C}) &= \frac{\mathbf{1}(y_0 > \widehat{q}_{\tau,C})}{\widehat{f}_C(\widehat{q}_{\tau,C})} + \widehat{q}_{\tau,C} - \frac{(1-\tau)}{\widehat{f}_C(\widehat{q}_{\tau,C})} \end{aligned} \tag{16}$$

Note that the estimators of the τ^{th} population quantiles, $\widehat{q}_{\tau,T}$'s are nonparametrically identified from observed samples at dates $T=0,1$, while $\widehat{q}_{\tau,C}$ is obtained by calculating the weighted τ^{th} sample quantile from observed data at date $T=0$ using the inverse probability weights $\widehat{\omega}(\mathbf{x}_i)$ for $i \in S_0$ given in (6)[3]. Furthermore, following (DiNardo, Fortin, and Lemieux 1996) the estimates $\widehat{f}_T(\widehat{q}_{\tau,T})$'s at time $T=0,1$ and the counterfactual density $\widehat{f}_C(\widehat{q}_{\tau,C})$ are estimated using the "weighted kernel density" procedure

$$\begin{aligned} \widehat{f}_T(y) &= \frac{1}{h}\sum_{i\in S_T}\frac{1}{N_T}K\left(\frac{y-Y_i}{h}\right), \text{ for } T=0,1 \text{ and} \\ \widehat{f}_C(y) &= \frac{1}{h}\sum_{i\in S_0}\widehat{\omega}(\mathbf{x}_i)K\left(\frac{y-Y_i}{h}\right) \end{aligned} \tag{17}$$

evaluated at $\widehat{q}_{\tau,0}$, $\widehat{q}_{\tau,1}$ and $\widehat{q}_{\tau,C}$ respectively, where $K(.)$ is the kernel density function and h is the kernel bandwidth[4]. The RIF regression coefficients expressed in (13) are then estimated for our "unconditional quantile" regressions as follows[5]

[3] (Koenker and Bassett 1978) observed that the τ^{th} sample quantile, $\widehat{q}_\tau$ can be expressed as $\arg\min_q \sum_{i:y_i \geqslant q} \tau|y_i - q| + \sum_{i:y_i<q}(1-\tau)|y_i - q|$. Estimating $\widehat{q}_{\tau,C}$ requires reweighting the sample at $T=0$ by the IPW.

[4] The Gaussian kernel is used in this paper, where $K(u) = \frac{1}{\sqrt{2\pi}}e^{-u^2/2}$.

[5] Note that when using simple linear projections, the estimated coefficients are the estimators of the "unconditional quantile partial effects" or UQPE's; that is $\widehat{\beta}^{q_\tau} = \widehat{UQPE}_{RIF-OLS}(\tau)$ (see (Firpo, Fortin, and Lemieux 2006) for general discussion on UQPE and related "policy effect")

$$\widehat{\beta}_T^{q_\tau} = \left(\sum_{i\in S_T} \mathbf{x}_i\mathbf{x}_i'\right)^{-1} \sum_{i\in S_T} \mathbf{x}_i.\widehat{RIF}_{F_T}(y_i;\widehat{q}_{\tau,T}), \text{ for } T=0,1 \text{ and} \tag{18}$$

$$\widehat{\beta}_C^{q_\tau} = \left(\sum_{i\in S_0} \widehat{\omega}(\mathbf{x}_i)\mathbf{x}_i\mathbf{x}_i'\right)^{-1} \sum_{i\in S_0} \widehat{\omega}(\mathbf{x}_i)\mathbf{x}_i.\widehat{RIF}_{F_C}(y_i;\widehat{q}_{\tau,C}) \tag{19}$$

The estimated counterparts of the wage structure and composition effects in (14) for quantiles are thus given by

$$\widehat{\triangle}_S^{q_\tau} = E[\mathbf{x}'|T_{\mathbf{X}}=1](\widehat{\beta}_1^{q_\tau} - \widehat{\beta}_C^{q_\tau}) \tag{20}$$

$$\widehat{\triangle}_X^{q_\tau} = (E[\mathbf{x}'|T_{\mathbf{X}}=1]\widehat{\beta}_C^{q_\tau} - E[\mathbf{x}'|T_{\mathbf{X}}=0]\widehat{\beta}_0^{q_\tau}) \tag{21}$$

Instead of estimating the composition effect as in (21), we follow (Firpo, Fortin, and Lemieux 2007) and express the estimate as

$$\widehat{\triangle}_X^{q_\tau} = (E[\mathbf{x}'|T_{\mathbf{X}}=1] - E[\mathbf{x}'|T_{\mathbf{X}}=0])\widehat{\beta}_0^{q_\tau} + \widehat{r}^{q_\tau} \tag{22}$$

where $\widehat{r}^{q_\tau}$ is the approximation error or residual due to the specification of the model around the "strongly ignorable treatment assignment assumptions" discussed briefly above, as well as due to the fact that the RIF's are first-order von Mises approximations.

3 Data Issues

This study utilises repeated cross-section datasets from the Thai Labour Force Surveys (LFS) collected by the National Statistical Office (NSO). The period under study is from 1987 to 2006. Before 1998 the NSO conducted the surveys three times a year, but from 1998 onwards the surveys are conducted quarterly. This paper uses data from the final round of each year before 1998, and from the third quarter thereafter. The study is limited to full-time working men aged between 16 and 60, who reported 35 or more total hours of work per week. Not included in the study are those who reported themselves to be employers, self-employed, or unpaid family workers. The wage rate also includes bonus, overtime, and other money, and is calculated in "Baht per hour" unit.

The formal education system in Thailand can be summarised as follows. Primary education consists of 6 years of study. Individuals who completed 4 years at the primary level are categorised under "Lower Primary", and those who completed 6 years are grouped under "Upper Primary". Secondary education also requires 6 years of study, and those who completed 3 years at this level are categorised as "Lower Secondary". After completing lower secondary education, students can choose to study in either the academic or vocational fields. Individuals who completed upper secondary level in the academic fields are grouped under "Upper Secondary", while those who completed the level in vocational fields are grouped under the "Upper Vocational" category. Those with diploma certificates in technical education and in academic fields are categorised as "Post-Secondary Vocational" and "Post-Secondary Academic" respectively. The bachelor's degree level is similarly divided into the technical and academic fields and are defined as "Bachelor Vocational" and "Bachelor Academic". Individuals with higher qualifications are grouped under "Post Graduate". In total we divide the completed education levels into 15 groups and individuals who completed schooling in-between the mentioned levels are allocated into "Some Lower-Primary", "Some Upper-Primary", "Some Lower-Secondary", or "Some Upper-Secondary" categories. Those without any primary education are grouped under "No Schooling"[6]. The potential experience variable is constructed as: $\max(0, Age - Years\ of\ Schooling - 5)$.

Control variables in our regressions include marital status, area and region of residence, as well as occupation and industry. Note also that there is a major change in the definition of variables starting in year 2001 and judgements were used in categorising the occupation and industry variables before 2001 to match the new definitions given in the new LFS data dictionary. The manner in which our variables are defined before and from 2001 onwards is shown in the Data Appendix and the sample means from the clean datasets for selected years from 1988 to 2006 are given in Table B1.1 in Appendix B.

4 Preliminary Analyses

In order to make the analyses in this section more tractable, the 15 education categories are regrouped into seven larger groupings. The changing educational distribution for Thai men over the 1987 to 2006 period are summarised in Figure 4.1. As can be seen from the figure, the qualification distribution of the Thai labour force has undergone a remarkable transformation. The proportion of men with some upper primary qualifications or below has declined from 42% of the sample in 1987 to 20% in 2006. The largest drop is seen right after the official onset of the economic crisis in 1997, and the average rate of decline in the proportion of this category has also picked up pace relative to that of the boom decade. The proportion of men with upper primary qualifications has increased from 11.7% in 1987 to 18.4% in 2006, while those who have completed upper secondary (high school) education has more than doubled from 7.5% to 15.2% over the same period. At the other end of the qualification distribution spectrum, the proportion of men with university qualifications (college and graduate degrees) went up from 9.9% to 18.8% over the same period. There is also a discernable shift in the rising trend for the "College" group in 1998.

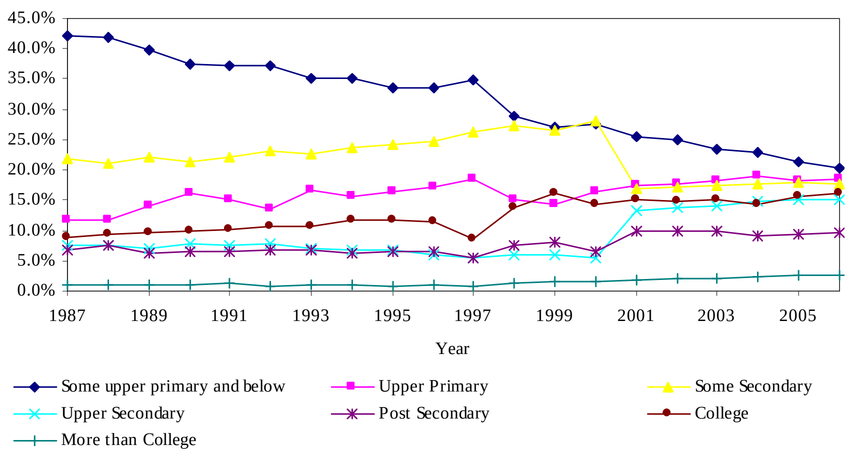
In summary, the proportion of men who have not completed upper secondary education went down from 75.7% to 56.3% over the 20-year period, and most of this 19.4 percentage point drop is absorbed by the rise of 7.7 and 7.3 percentage points for the "Upper Secondary" and "College" categories respectively. The proportion of men with post secondary qualifications also registered a modest gain of 2.8 percentage points over the 20-year period. A marked upward shift in the

[6] This study follows (Hawley 2004) in defining the schooling dummy variables. Also see (Chalamwong and Amornthum 2001) for more detail on formal education system in Thailand.

rising trend for the "Post Secondary" group occurred during 2001, together with an upward shift for "Upper Secondary" category, and a downward shift for "Some Secondary" category.

FIGURE 4.1

Composition of Highest Educational Qualification Attained for Thai Men



The movement over time of the ratios of average real wages for different groups of men (again categorised by their educational attainments) to the 20-year average real wage rate of Baht 66.09 per hour (reference wage rate from hereon) is depicted in Figure 4.2. The economic boom decade starting from 1987, that ran out of steam after 1996 saw Thailand's real GDP growing at a blistering average rate of 9.5% per annum[7]. It is clear from our crude data analyses in this section that all seven qualification categories gain relative to the reference wage rate during this prosperous period. In 1987 the average real wages of the three lowest qualification categories are all below the reference rate. These three groups make up more than 75% of the sample in that year. By 1992, the group of men with some secondary qualifications attains an average wage above the reference rate for the first time during the period under study. The wage ratio profile for this particular group stays above the reference line all the way through to 1997 before dropping back below during the height of the crisis.

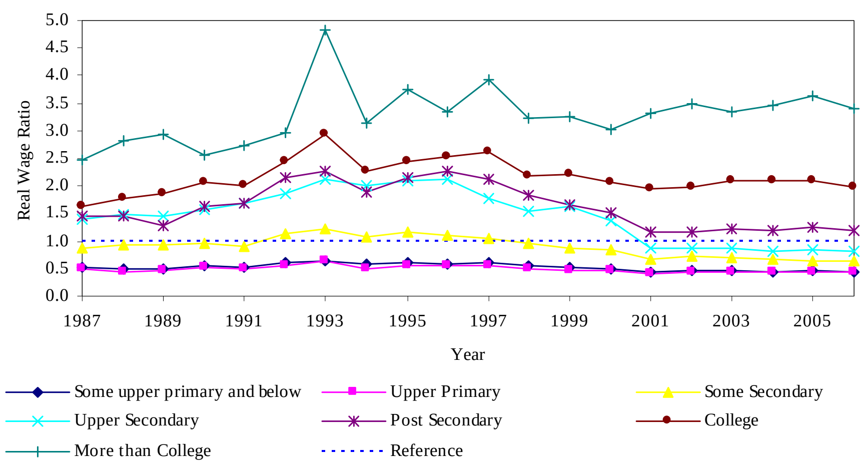
Higher up the qualification ranking, we can see clearly from Figure 4.2 that the "Upper Secondary" and "Post Secondary" groups have on average benefited significantly more from the economic expansion than the bottom three groups in terms of wage ratios. The rise in their wage ratio profiles can be seen to closely follow those of the two highest qualification categories. After 1996, however, the wage ratio profiles of the "Upper Secondary" and "Post Secondary" groups decline even more dramatically than their rise during the boom period and seem to reach rock bottom in

[7]Source: Bank of Thailand, http://www.bot.or.th/bothomepage/databank/EconData/Thai_Key/Thai_KeyE.asp

2001. From this point on, the average real wage rate for every qualification group below the "College" category are below their former levels seen in 1987. Furthermore, the four lowest qualification groups now have their wage ratio profiles well below the reference line. These four categories make up around 72% of each of the 2001 to 2006 sample. The "Post Secondary" category has only just managed to stay above the reference line.

FIGURE 4.2

Ratio of Average Real Wages to the Twenty-Year Average by Education Groups

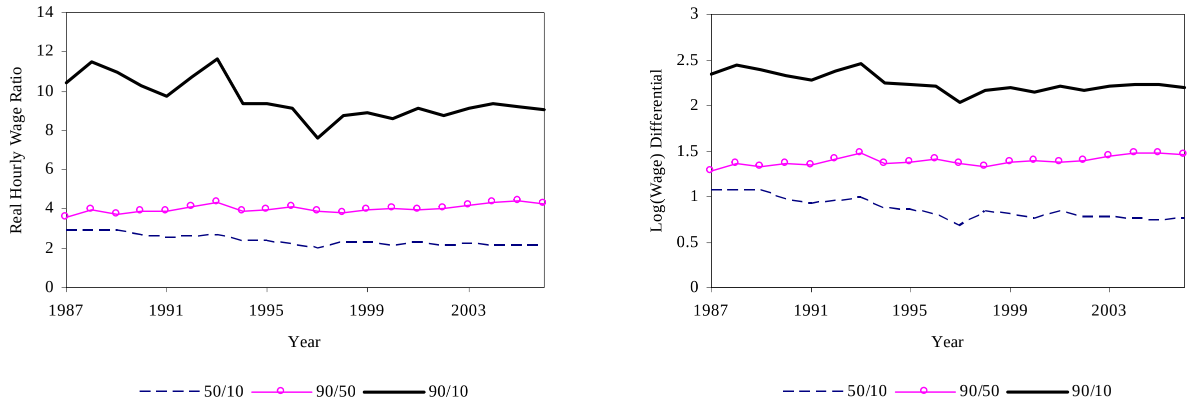


The only education group that has maintained a rising trend in terms of wage ratio profile is the group of men with post graduate qualifications. This group makes up only 2.6% of the sample in 2006. The "College" category, or the group of individuals who hold bachelor's degree qualifications also experienced a declining profile from 1997 to 2001, but the rate of decline is much less than those observed for the "Post Secondary" and "Upper Secondary" categories. The "College" wage ratio profile also plateaus after 2001 and this group makes up around 16% of the 2006 sample.

In summary, the group of individuals with post graduate degrees aside, all education categories shown in Figure 4.2 have experienced significant declines in their average real wages after 1997. The declining wage ratio profiles continued until 2001. As of 2006, only the top two education categories have their average real wages above their 1987 levels. Therefore the groups of men with university qualifications have on average significantly increased their advantages over the remaining sampled population in terms of hourly earnings. These two groups account for less than 19% of our male sample in the year 2006.

Another measure of wage inequality is shown in Figure 4.3. The left-hand panel displays the evolution of real hourly wage ratios between percentiles of interest. Specifically we compute series of 50:10, 90:50, and 90:10 ratios of wage percentiles over the 20-year period. The right-hand panel effectively displays the same information, but the series are transformed logarithmically in order to make the unit of measurement compatible with our analyses of the distribution of the logarithm of hourly wages later on in the paper.

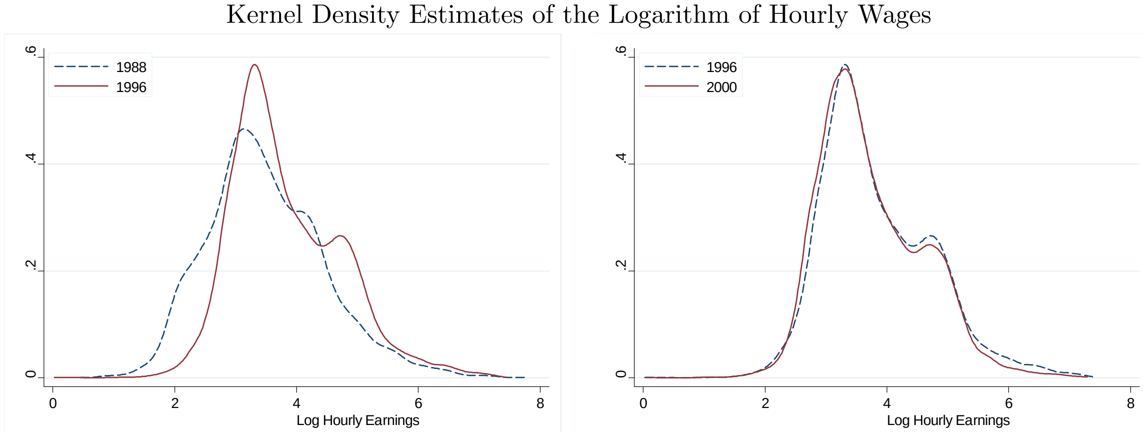
Figure 4.3
Comparison of Hourly Wages between Different Percentiles



The 90:10 ratio clearly shows a downward trend during the boom decade. This indicates that individuals at the 10th percentile were catching up to those at the 90th percentile in terms of the ratios of their hourly wages. This should not be surprising given the average ratio of more than ten during this period. A small absolute increase in wages at the 10th percentile would have had a large impact on the 90:10 wage ratio. Post-1997, this trend seems to be stabilising at a ratio of around nine.

Comparing wages at the 90th percentile to the median, we can discern a rising trend in the 90:50 wage ratio. This indicates that wage inequality has been steadily increasing at the top end of the wage distribution. The opposite is true when we compare wages at the median to those at the 10th percentile.

Figure 4.4
Kernel Density Estimates of the Logarithm of Hourly Wages



To show this shift in the wage distribution over the boom decade, a kernel density estimate of the logarithm of real hourly earnings of men in 1996 is superimposed on that of 1988 on the left-hand panel of Figure 4.4. The shift in the wage distribution over the crisis period from 1996 to 2000 is also presented on the right-hand panel of the figure.

TABLE 4.1
Various Measures of Wage Inequality

Indices	1988	1996	2000	2001	2006
Gini	0.561	0.541	0.501	0.502	0.501
Theil	0.652	0.587	0.487	0.485	0.474
Mean Log Deviation	0.556	0.502	0.423	0.436	0.426
50:10 Ratio	2.92	2.24	2.13	2.29	2.12
90:50 Ratio	3.93	4.08	4.02	3.98	4.27
90:10 Ratio	11.46	9.14	8.57	9.13	9.04

Table 4.1 presents various measures of earnings inequality at particular years of interest. The years are chosen so as to match those that we will analyse later in the next section using the unconditional quantile regression technique and the FFL decomposition. The measures presented here include the popular Gini index, as well as two other measures belonging to the Generalised Entropy class[8]; namely the Theil and the Mean Log Deviation indices. These three measures are summary measures of wage inequality, and each one shows a marked reduction in inequality over the decade of rapid economic expansion and a stabilising trend thereafter. These summary measures share obvious weaknesses in that they overlook potentially important information regarding changes at various points in the wage distribution. As is clear from our previous discussion, wage inequality has been increasing steadily at the upper half of the distribution, even though changes at the lower tail of the distribution are dominant in their influence on the summary measures.

This paper therefore fills an important gap in the literature on earnings inequality in Thailand. In the next section we will demonstrate the use of unconditional quantile regression in evaluating the expected impact, changes in the observed attributes of workers would have on any quantile of the marginal distribution of wages at any point in time. This is comparable to the way in which ordinary least squares can be used to evaluate the impact of changes in attributes on the mean earnings. Furthermore, the FFL decomposition method will be used to analyse the contribution of changes in the distribution of various worker attributes, as well as the contribution of changes in the prices paid to these attributes over time, to the observed evolution of the wage distribution. As the name of this paper would suggest, our focus is mainly on the effects arising from changes in the distribution and prices of qualifications of the male population.

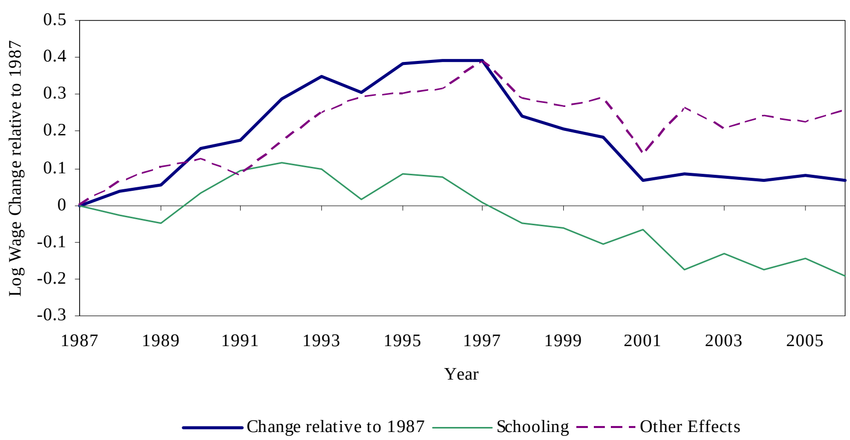
[8] See (Cowell 2000) Theorem 5, Section 3.4

5 Results

Before we go on to analyse changes at different quantiles of the wage distribution, we will first look at a special case of the FFL decomposition. In particular, we apply the traditional Oaxaca-Blinder method to study the evolution of real hourly wages from 1987 to 2006[9]. Specifically, changes in log wages over time (relative to 1987) are decomposed into the wage structure and composition effects as per equation (14), where the statistic of interest is the mean of log wages. The wage structure effects are depicted in Figure 5.1, where the average observed attributes of workers are fixed at the 2006 levels. Similarly, in Figure 5.2 changes in log wages are plotted against time, but in this counterfactual exercise we artificially keep prices of observed attributes fixed at the 2006 levels in order to keep track of changes in the average levels of all observed attributes.

FIGURE 5.1

Wage Structure Effects with Attributes distributed as in 2006

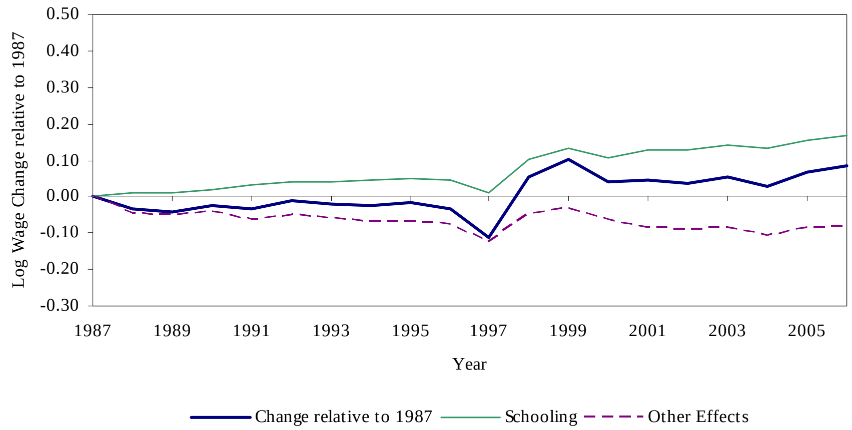


There is a striking resemblance between the overall pattern of the wage structure in Figure 5.1 and the shapes of the wage ratio profiles shown in Figure 4.2, especially for men with no university qualifications. This suggests an overarching importance of changes in the wage structure in determining the real wage patterns in Thailand over the period under study. This is indeed the case once we observe the pattern of the composition effects over time in Figure 5.2, where we have plotted the profile on the same scale as that in Figure 5.1. To emphasise our focus on the effects of education on wages, we have also further decomposed the overall wage structure and composition effects into the part due to "Schooling", and the remaining are subsumed under "Other Effects".

[9] All regression models used in this paper are based on the Mincer human capital earnings function (Mincer 1974)

FIGURE 5.2

Composition Effects with 2006 Prices of Attributes



A steady fall in the average return to education becomes apparent. After 1997, the average return to additional schooling has fallen below the level observed in 1987. This declining trend has continued throughout the decade after the onset of the economic crisis. Also apparent from Figure 5.2 is that the upward shift in the average rate of schooling accumulation among working men coincides with the decline in the average return to schooling. In terms of log-wage changes, the two effects seem to cancel each other out after 1997. Recall our analysis of the wage ratio profiles in the previous section (see Figure 4.2), the decline in the return to schooling after 1997 is expected to be much more concentrated among the groups of men with some secondary, upper secondary and post secondary qualifications. The proportion of men in these education categories averaged around 41% from 1998 to 2006. In order to confirm this speculation we will need to analyse the data more rigorously, which we now do using unconditional quantile regression and the FFL decomposition methods.

The time line for our anaysis is divided into three interesting periods; the interval from 1988 to 1996 captures changes that occurred during the boom decade, the 1996 to 2000 interval represents the period of economic crisis, and the final interval running from 2001 to 2006 shows recent developments in the Thai labour market. For each year under study, we estimate RIF regressions for 19 log wage quantiles ranging from the 5th to the 95th. The regression coefficients for the 10th, 20th, 50th, 80th, and 90th quantiles are reported along with the OLS estimates and their robust standard errors in Appendix B (see Tables B2.1 to B2.5). Also reported in Appendix B are plots of the coefficients for all nineteen quantiles (see Figures B1 to B3).The covariates used in the regressions are the 15 education categories, potential experience and its square, 9 occupation groups, as well as 15 industry categories, region and area of residence, and marital status. The key regressors that we will focus on are the education dummies. Note that the reference group is the non-married males having "Upper Primary" qualifications, working in "Elementary Occupations" in the "Public Administration and Defense" industry, and residing in urban areas in the central region outside of Bangkok.

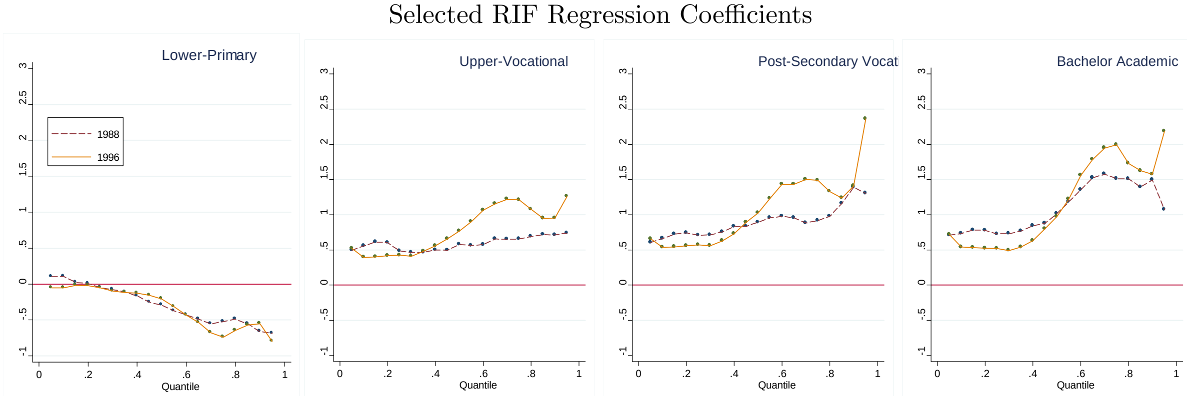
5.1 The Economic Boom (1988-1996)

During the economic expansion, Thai men have on average steadily increased their accumulation of human capital through increased investments in schooling, as is reflected in a rise in the average years of schooling from 7.9 to 8.3 years over the 1988-1996 period. Recall from Figures 5.1 and 5.2, and our discussion above that the rapid rise in the average real wage level during the boom time is driven mostly by the wage structure effects caused by an overall rise in demand for labour. To see the effects on the entire wage distribution, the full set of estimated RIF regression coefficients for the 19 quantiles for 1988 and 1996 are plotted together in Figure B1 in Appendix B.

Consider first the coefficient plots (coefficient curves from hereon) for education dummies for 1988. There is a clear pattern of negatively sloped coefficient curves for lower education levels. As we progress up the education ranking, the curves become less and less negatively sloped and is approximately horizontal around the "Lower-Secondary" level. Thereafter they become more and more positively sloped. The curves also shift upwards with higher levels of education.

Figure 5.3

Selected RIF Regression Coefficients



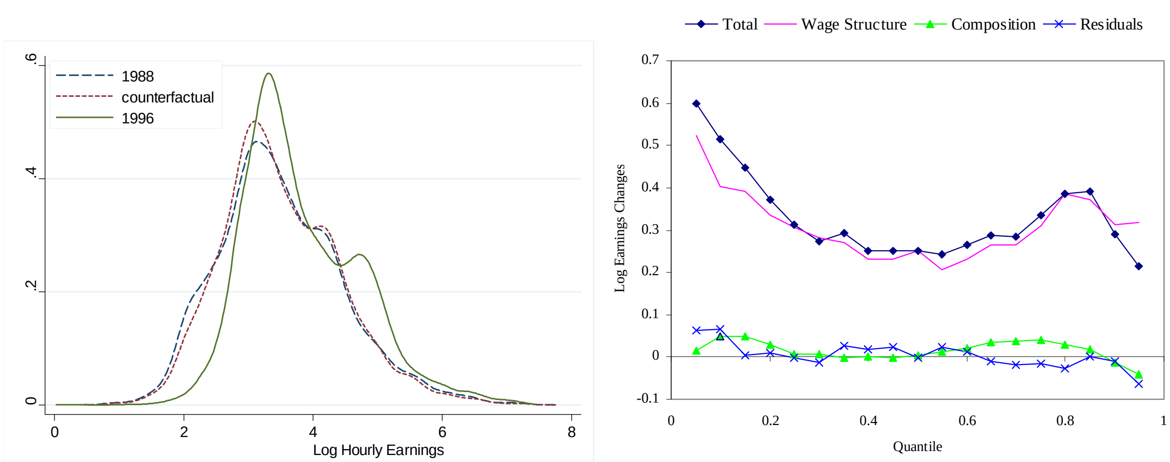
Coefficient curves for "Lower Primary", "Upper Vocational", "Post-Secondary Vocational", and "Bachelor Academic" dummies are reproduced in Figure 5.3 for exposition. Imagine a situation where we increase the proportion of the workforce with bachelor's degrees in academic fields (the reference category being "Upper Primary"), holding other factors constant. This is expected to have a larger positive impact on the higher than the lower quantiles of the marginal distribution of log wages, and hence will enhance inequality in the upper portion of the distribution. The coefficient curve for "Bachelor Academic" is significantly steeper in 1996 than in 1988, indicating a relatively large and positive contribution of this covariate to the wage structure effect. This is also true for the coefficient curves for the upper secondary and post secondary categories. In comparison, for levels of education below "Lower Secondary", there appear to be very little contribution to the overall wage structure. An exception is the "No Schooling" category, where we observe a sizeable negative wage structure effect. Therefore, the combined wage structure effects of all education categories over the economic boom period will be to enhance wage inequality everywhere, especially in the upper portion of the distribution. Other covariates such as the occupation and industry dummies can be analysed analogously.

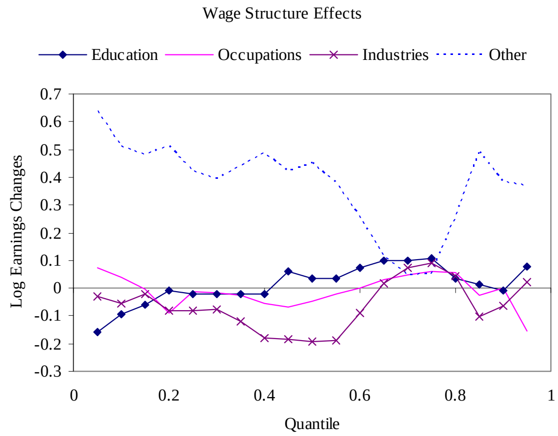
In Figure 5.4, the FFL decomposition results for the boom period are presented graphically. The top left-hand panel depicts the distribution in log wages for 1988 and 1996, together with the counterfactual density. Recall that the counterfactual density is estimated using the DFL weighted kernel density procedure given in equation (17), where the weights are the empirical IPW from equation (6). This is the density that would prevail has the wage structure function been as in 1988, but the observed and unobserved attributes are distributed as in 1996. The top right-hand panel shows total changes in log wages across the 19 quantiles, which are broken down into the estimated wage structure and composition effects as per equations (20) and (22), and the "Residuals" are the approximation errors $\widehat{r}^{q_\tau}$'s due to model miss-specification. In the bottom three panels, the "Wage Structure" and "Composition" effects, as well as their sums (or "Total" effects) are further divided into the contribution of each group of covariates.

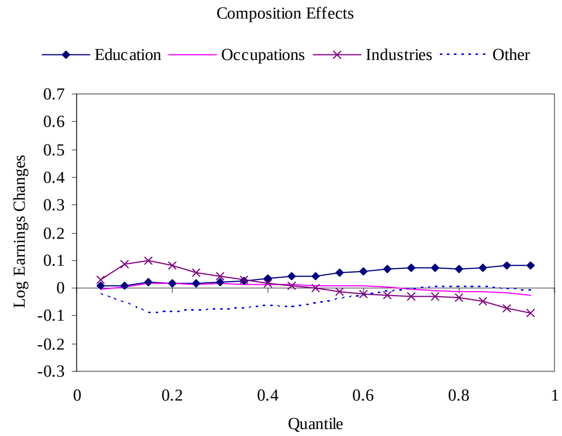
It is clear that the observed increase in real wages across the quantiles for this period are driven largely by changes in the wage structure, while changes in the workforce characteristics play a minor role. Also clear is that the wage structure effects reduce inequality in the lower portion of the log wage distribution, while increasing that in the upper portion, especially between the median and the 85th quantiles. This is why we see a double mode becoming more prominent in the 1996 density.

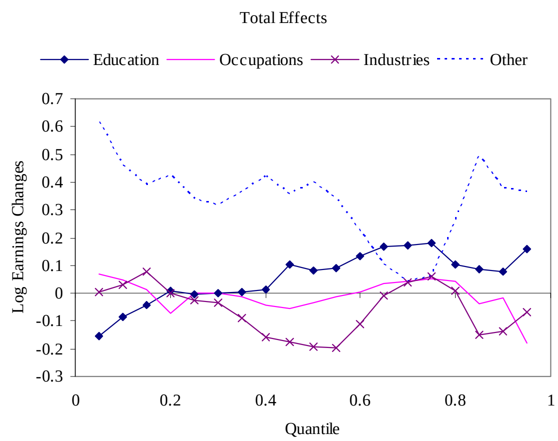
When the various effects are further broken down, we can observe the contribution of education to inequality more clearly. The "wage structure curve" for education is approximately positively sloped, especially between the 5th and 75th quantiles. Furthermore, the increase in returns to education for individuals above the 40th quantile exceed those at the other end of the distribution.

FIGURE 5.4
FFL Decomposition Results for 1988-1996





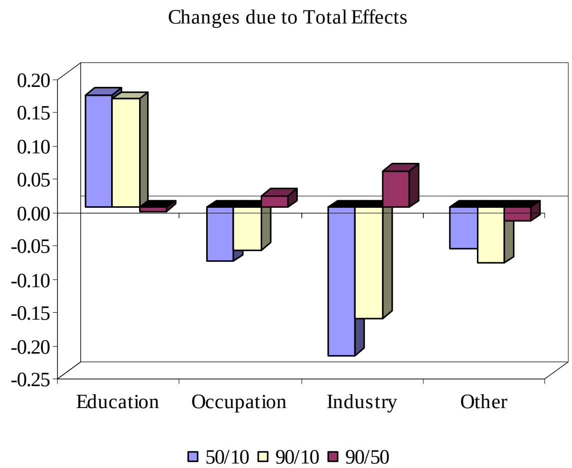




A thorough investigation of the coefficient curves for education levels reveals that individuals with upper secondary qualifications in the vocational fields, or those with post-secondary and university degrees are among the biggest gainers in terms of changes in the returns to education. Those having some secondary qualifications also see some gains, but to a lesser extent. Combining the wage structure effect with the composition effect, which is a monotonic function of quantiles, compound the inequality enhancing characteristics of education.

With a little more work, we can analyse the contributing factors to the observed changes in the wage ratios between quantiles of interest over this period. Note that a difference in log wage changes between any two quantiles, say the 90th and 50th quantiles, of 0.0382 is an approximation for the percentage change in the 90:50 wage ratio of 3.8%. We carry out such an exercise for the 50:10, 90:10, and 90:50 wage ratios, and the results are shown in Figure 5.5. To make exposition clear, a bar chart is also constructed to show the contribution of each group of covariates. Note also that the estimated differences are not exact due to approximation errors discussed earlier. For example, a combination of wage structure and composition effects, denoted "Total Effects", for education is estimated to increase the 50:10 and 90:10 ratios by more than 16% apiece over the boom period.

FIGURE 5.5
Decomposition of Changes in Wage Ratios between Quantiles, 1988-1996



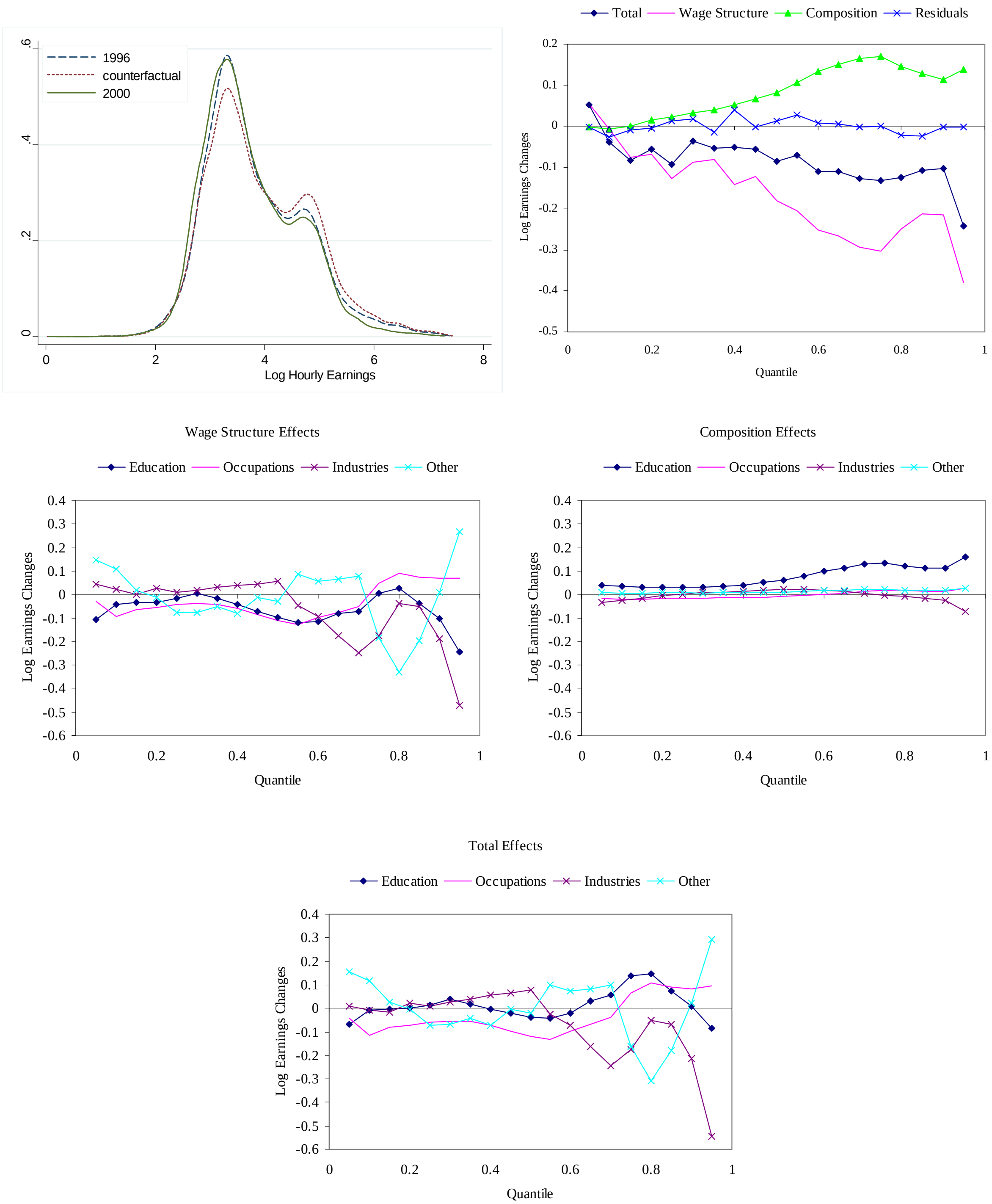
	50/10	90/10	90/50
Difference in Log Wage Changes	-0.2640	-0.2257	0.0382
Estimated Difference	-0.1955	-0.1486	0.0469
Change due to Wage Structure Effects			
Education	0.1309	0.0877	-0.0432
Occupation	-0.0837	-0.0390	0.0447
Industry	-0.1382	-0.0092	0.1290
Other	-0.0601	-0.1282	-0.0681
Change due to Composition Effects			
Education	0.0375	0.0749	0.0374
Occupation	0.0030	-0.0242	-0.0271
Industry	-0.0827	-0.1562	-0.0736
Other	-0.0022	0.0455	0.0478
Change due to Total Effects			
Education	0.1685	0.1627	-0.0058
Occupation	-0.0807	-0.0632	0.0176
Industry	-0.2208	-0.1655	0.0554
Other	-0.0624	-0.0827	-0.0203

5.2 The Crisis (1996-2000)

The rate of increase in schooling from 1988 to 1996 is dwarfed by the rate seen during the crisis, where average years of schooling went up from 8.3 to 9 years in a relatively short time span from 1996 to 2000. An inspection of the coefficient curves for education levels reveals that, other things constant, individuals with secondary and post secondary qualifications suffered significant declines in their wages over this period (compared to the reference "Upper Primary" category). Their coefficient curves in the year 2000 are much flatter and lie below those in 1996. Individuals with university degrees also suffered on average, but to a lesser extent. The adverse effects from the economic crisis on wages are summarised in Figure 5.6.

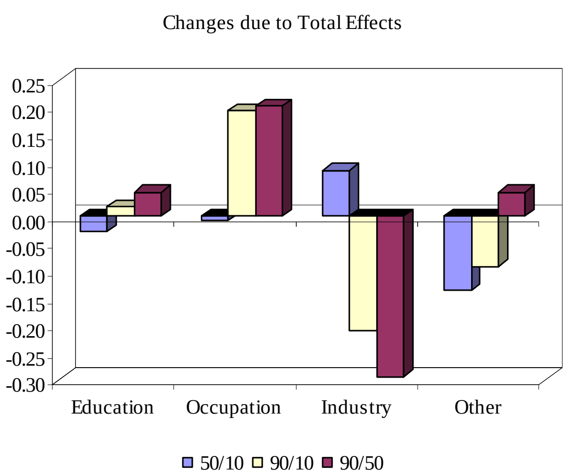
As is clear from the top two graphs, composition effects during the crisis period play a much larger role in wage determination than during the boom time. However, their effects are completely offset by the decline in the wage structure. The combined effect is to reduce wage dispersion throughout the entire distribution. When the wage structure effects are further decomposed, we can see that "Education" and "Industries" variables are the major factors pulling down wages in the middle and upper portions of the distribution. This indicates that wage premia in high-wage industries contracted significantly during the crisis. The wage structure effect from education is negative throughout most of the distribution. Further scrutiny finds that individuals with secondary and post-secondary qualifications suffer the most in terms of reduction in returns to schooling, while those with bachelor's qualifications fare slightly better.

FIGURE 5.6
FFL Decomposition Results for 1996-2000



The relatively large upward shift and steepening of the composition curve for education compared to the previous period reflect the sharp increase in schooling. The 5th and 95th quantiles aside, the combined effect of education once again enhances earnings inequality in the upper half of the wage distribution, but slightly reduces inequality in the lower half. This finding is summarised in Figure 5.7 where we decompose changes in wage ratios between selected quantiles. The accompanying bar chart shows the net effect of education to be relatively small in explaining changes in wage dispersion over this period.

FIGURE 5.7
Decomposition of Changes in Wage Ratios between Quantiles, 1996-2000

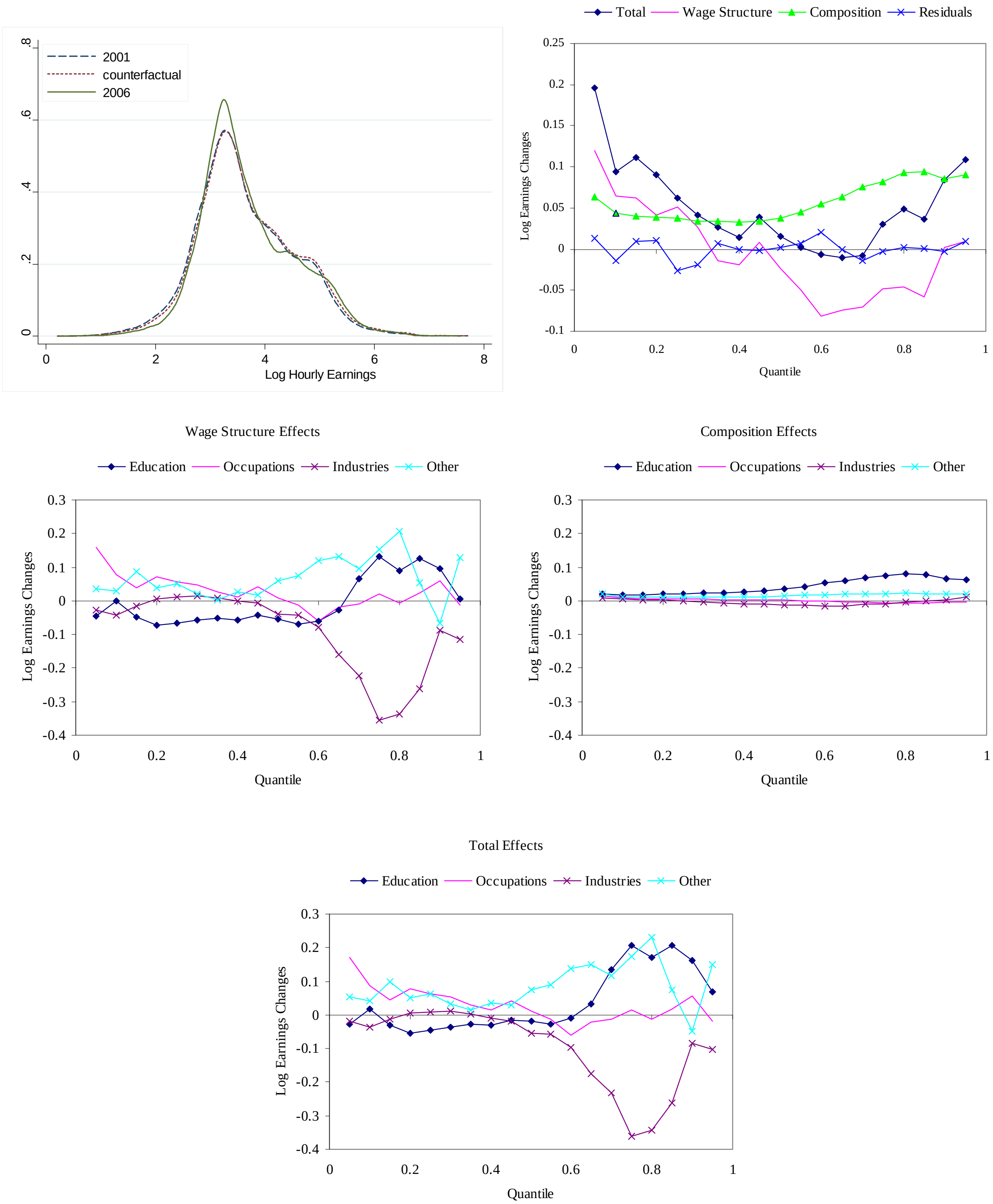


	50/10	90/10	90/50
Difference in Log Wage Changes	-0.0485	-0.0645	-0.0160
Estimated Difference	-0.0867	-0.0892	-0.0025
Change due to Wage Structure Effects			
Education	-0.0544	-0.0606	-0.0063
Occupation	-0.0186	0.1618	0.1803
Industry	0.0380	-0.2078	-0.2459
Other	-0.1409	-0.1020	0.0389
Change due to Composition Effects			
Education	0.0269	0.0781	0.0512
Occupation	0.0112	0.0323	0.0211
Industry	0.0466	-0.0007	-0.0473
Other	0.0045	0.0098	0.0053
Change due to Total Effects			
Education	-0.0275	0.0175	0.0450
Occupation	-0.0074	0.1941	0.2015
Industry	0.0846	-0.2086	-0.2932
Other	-0.1364	-0.0922	0.0442

5.3 Recent Developments (2001-2006)

More recently, Thai male workers have seen their average real hourly wage rate increasing slightly from 58.7 Baht to 61.5 Baht over a five-year period. However, from the top right-hand panel of Figure 5.8, we can see that this increase is not at all evenly distributed. This is evident from the U-shaped pattern of log wage changes as a function of quantile. In fact, individuals between the 55th and the 70th quantiles actually experience a reduction in their wages. When the total changes are separated into the wage structure and composition effects, it becomes apparent that the U-shaped pattern is largely driven by the overall wage structure. The wage structure is also seen to depress wages in the upper half of the distribution, while the overall composition effect plays an offsetting role in that region.

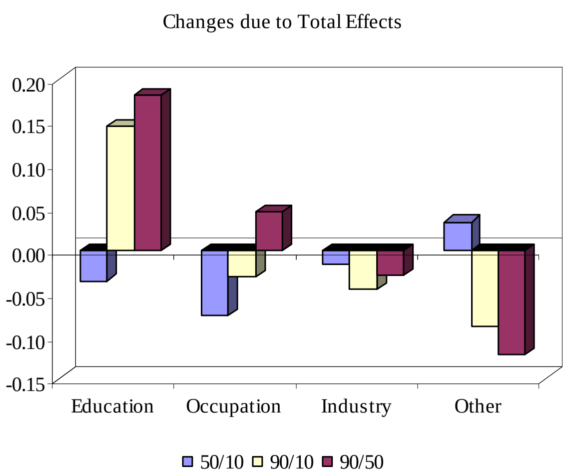
FIGURE 5.8
FFL Decomposition Results for 2001-2006



To see the effect of education on the wage distribution during this period, the wage structure and composition effects are once again divided into separate components and the graphs are presented in the bottom three panels of Figure 5.8. Once again, education has the largest share in the overall composition effect, and its influence increases with quantiles. The change in the wage structure due to education during this period is clearly favouring individuals in the top 30% of the wage distribution. From the coefficient curves in Figure B3 of Appendix B, we can confidently state that the majority of these individuals either hold post-secondary vocational qualifications or university degrees. As for the rest of the workers, returns to education have generally declined or stagnated over the period.

FIGURE 5.9

Decomposition of Changes in Wage Ratios between Quantiles, 2001-2006

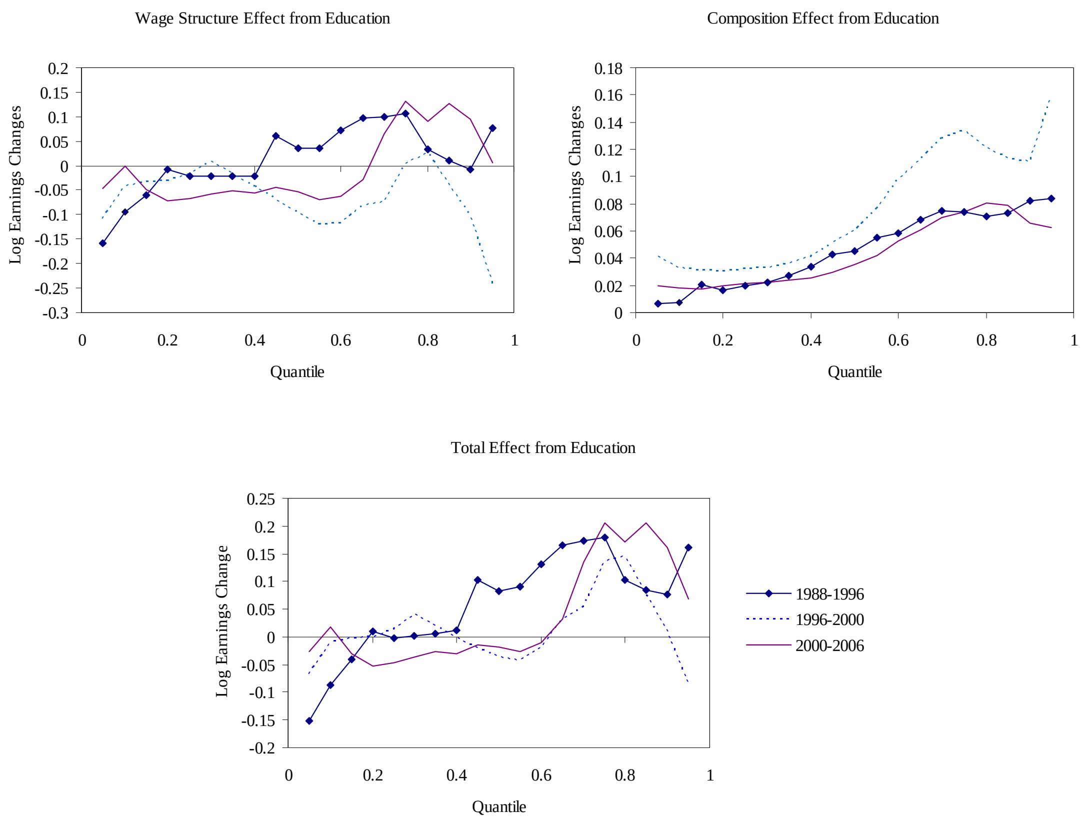


	50/10	90/10	90/50
Difference in Log Wage Changes	-0.0785	-0.0094	0.0691
Estimated Difference	-0.0949	-0.0213	0.0737
Change due to Wage Structure Effects			
Education	-0.0527	0.0968	0.1495
Occupation	-0.0695	-0.0184	0.0511
Industry	0.0012	-0.0450	-0.0462
Other	0.0323	-0.0964	-0.1286
Change due to Composition Effects			
Education	0.0174	0.0479	0.0305
Occupation	-0.0066	-0.0130	-0.0064
Industry	-0.0176	-0.0006	0.0170
Other	0.0005	0.0074	0.0069
Change due to Total Effects			
Education	-0.0353	0.1447	0.1799
Occupation	-0.0761	-0.0314	0.0447
Industry	-0.0164	-0.0456	-0.0292
Other	0.0328	-0.0889	-0.1217

The bar chart in Figure 5.9 tells the same story, but from another perspective. It indicates that education is a major factor contributing to the observed increase in wage inequality in the upper portion of the wage distribution. Furthermore, education is also seen to play a relatively important role in compressing wage dispersion in the tail-end of the distribution.

To close this section, we summarise in Figure 5.10 the effects of the changing composition of educational attainments of workers, and the changing returns to each level of education on the dynamics of the wage distribution in Thailand over the three periods.

FIGURE 5.10
The Effects of Education on Wage Inequality for the three time intervals



6 Concluding Remarks

This paper employs data from Thailand's Labour Force Surveys to analyse the impact of changes in the distribution of educational attainments of full-time male employees on the evolution of wages over the 1987 to 2006 period. The composition of skills of Thai male workers, as reflected by their educational qualifications, has undergone a sea change over the 19 years. The time line for our analyses is broken down into three interesting intervals; the 1988 to 1996 interval captures the period of rapid economic expansion, the 1996 to 2000 interval sees the Thai economy plunge into the depth of the crisis, and the final 2001 to 2006 interval represents the post-crisis era.

A decrease in wage inequality during the boom and a continued reduction, albeit at a faster rate, during the crisis is reflected in popular measures such as the Gini and the Generalised Entropy indices discussed above. The superficial improvement in terms of wage inequality reflected by these summary measures masks important changes that occurred at various points in the wage distribution. In this paper we use the FFL decomposition technique to decompose changes in the wage distribution over the specified time periods into several contributing factors. In particular, we seek to make statements about the *ceteris paribus* effects of changes in workers' educational composition on a whole range of quantiles of the marginal wage distribution, as well as analyse the impact of the changing returns to each level of education.

From the analyses given in this paper, education has emerged as an important factor enhancing wage inequality, especially in the upper portion of the wage distribution. The effects of education are found to be greatest during the economic expansion and the recent post-crisis periods. Furthermore, the average return to education has consistently declined since 1997, and for the most part, the decline is concentrated among the secondary schooling levels. This finding raises important questions regarding the quality of secondary education in Thailand, as well as the merits of heavy government subsidies given to students in public universities, which is in the order of 70% of their tuition fees[10].

As a final note, recall that the changing pattern of industry wage premia is also important in explaining the evolution of wages in Thailand and deserves thorough investigation. However, this issue is not the focus of our paper and is left for further research.

[10] see (Israngkura 2003). As of 2006, approximately 86% of all university students in Thailand attend public universities.

7 Appendix A

For a quantile $\tau \in (0,1)$ of the marginal distribution of a variable Y, the influence function is given by:

$$IF_F(Y;q_\tau) = \frac{\tau - \mathbf{1}(Y \leqslant q_\tau)}{f(q_\tau)}$$

Proof. Denote the unconditional quantile operator by $Q_\tau[.]$. This operator is a functional that operates on the distribution function F, or its empirical counterpart $\widehat{F}$ for a sample $\{Y_1, ..., Y_N\}$. From the definition of influence function given in (8), denote by F_ϵ the mixture of F and a point mass δ_y; that is $F_\epsilon = (1-\epsilon)F + \epsilon\delta_y$, and also that $Q_\tau[F] = q_\tau$, the influence function for a quantile is defined as

$$IF_F(Y;q_\tau) = \lim_{\epsilon \downarrow 0} \frac{Q_\tau[F_\epsilon] - Q_\tau[F]}{\epsilon} = \frac{\partial Q_\tau[F_\epsilon]}{\partial \epsilon}|_{\epsilon=0}, \text{ for } \epsilon \in (0,1) \tag{23}$$

If $Y \sim F_\epsilon$, it follows that

$$F_\epsilon(Q_\tau[F_\epsilon]) = (1-\epsilon)F(Q_\tau[F_\epsilon]) + \epsilon\mathbf{1}(Y \leqslant Q_\tau[F_\epsilon]) = \tau \tag{24}$$

Consider first the case where $Y > Q_\tau[F_\epsilon]$; from equation (24) we have

$$Q_\tau[F_\epsilon] = F^{-1}\left(\frac{\tau}{(1-\epsilon)}\right)$$

and from (23) we can write

$$IF_F(Y;q_\tau) = \lim_{\epsilon \downarrow 0} \frac{F^{-1}\left(\frac{\tau}{(1-\epsilon)}\right) - F^{-1}(\tau)}{\epsilon} = \frac{\partial F^{-1}\left(\frac{\tau}{(1-\epsilon)}\right)}{\partial \epsilon}|_{\epsilon=0} \tag{25}$$

Using the fact that $F\left(F^{-1}\left(\frac{\tau}{(1-\epsilon)}\right)\right) = \frac{\tau}{(1-\epsilon)}$:

$$\frac{\partial F\left(F^{-1}\left(\frac{\tau}{(1-\epsilon)}\right)\right)}{\partial \epsilon} = f\left(F^{-1}\left(\frac{\tau}{(1-\epsilon)}\right)\right)\frac{\partial F^{-1}\left(\frac{\tau}{(1-\epsilon)}\right)}{\partial \epsilon} = \frac{\tau}{(1-\epsilon)^2}$$

Rearrange the previous expression and evaluate the derivative at $\epsilon = 0$, we have

$$IF_F(Y;q_\tau) = \frac{\partial F^{-1}\left(\frac{\tau}{(1-\epsilon)}\right)}{\partial \epsilon}|_{\epsilon=0} = \frac{\tau}{f(F^{-1}(\tau))} = \frac{\tau}{f(q_\tau)}, \text{ when } Y > q_\tau \tag{26}$$

For the case where $Y \leqslant Q_\tau[F_\epsilon]$, we have $Q_\tau[F_\epsilon] = F^{-1}\left(\frac{\tau-\epsilon}{(1-\epsilon)}\right)$ from (24). Using the same sequence of reasoning as in the first case, the influence function for this case can be written as

$$IF_F(Y;q_\tau) = \frac{\tau - 1}{f(q_\tau)}, \text{ when } Y \leqslant q_\tau \tag{27}$$

Putting together (26) and (27) completes the proof. ■

8 Appendix B

Table B1.1

Sample Means for Thai Males, Selected Years from 1988-2006

	1988	1996	2000	2001	2006
Number of Observations	6,002	18,134	15,811	21,635	25,478
Earnings (2006 Thai Baht)					
Hourly Earnings	57.665	76.518	64.433	58.731	61.487
Log Hourly Earnings	3.499	3.836	3.742	3.637	3.693
Total Weekly Hours Worked (All Jobs)	49.499	49.731	48.291	48.633	49.003
Married	0.670	0.715	0.714	0.712	0.708
Years of Schooling	7.942	8.325	8.979	9.253	9.648
Education Levels					
No Schooling	0.015	0.016	0.018	0.016	0.020
Some Lower-Primary	0.024	0.014	0.013	0.011	0.010
Lower Primary	0.358	0.262	0.210	0.197	0.152
Some Upper-Primary	0.020	0.043	0.034	0.031	0.021
Upper-Primary	0.118	0.171	0.165	0.174	0.184
Some Lower-Secondary	0.014	0.008	0.008	0.007	0.008
Lower Secondary	0.150	0.173	0.181	0.159	0.167
Some Upper-Secondary	0.046	0.065	0.091	0.002	0.002
Upper Secondary	0.005	0.002	0.001	0.080	0.104
Upper Vocational	0.070	0.058	0.054	0.053	0.048
Post-Secondary Academic	0.029	0.015	0.017	0.012	0.009
Post-Secondary Vocational	0.046	0.049	0.049	0.088	0.087
Bachelor Academic	0.091	0.111	0.139	0.143	0.153
Bachelor Vocational	0.002	0.003	0.004	0.008	0.009
Post-Graduate	0.011	0.009	0.017	0.019	0.026
Age	33.594	35.212	36.145	35.951	36.825
Experience	20.652	21.887	22.166	21.698	22.177
Occupations					
Executives, Legislators and Senior Officials	0.072	0.076	0.087	0.047	0.047
Professionals	0.075	0.081	0.093	0.097	0.093
Technicians and Associated Professionals	0.058	0.073	0.078	0.101	0.101
Clerical Workers	0.112	0.090	0.068	0.062	0.059
Service and Market Sales Workers	0.084	0.074	0.085	0.094	0.092
Skilled Agricultural and Fishery Workers	0.016	0.016	0.015	0.065	0.056
Craft and Related Trades Workers	0.249	0.297	0.253	0.219	0.225
Plant and Machine Operators	0.119	0.132	0.131	0.153	0.163
Elementary Occupations	0.213	0.160	0.190	0.162	0.166

Table B1.1 (continued)

	1988	1996	2000	2001	2006
Industries					
Agriculture, Forestry and Hunting	0.113	0.060	0.090	0.093	0.082
Fishing	0.012	0.014	0.012	0.019	0.014
Mining and Quarrying	0.004	0.005	0.003	0.004	0.004
Manufacturing	0.205	0.199	0.211	0.196	0.216
Electricity, Gas and Water Supply	0.023	0.020	0.019	0.018	0.015
Construction	0.112	0.178	0.120	0.130	0.144
Wholesale and Retail Trade	0.104	0.097	0.095	0.124	0.134
Hotels and Restaurants	0.026	0.032	0.035	0.032	0.030
Transport, Storage and Communication	0.070	0.051	0.048	0.046	0.043
Financial Intermediation	0.023	0.016	0.013	0.023	0.021
Property and Business Activities	0.002	0.002	0.002	0.024	0.026
Public Administration and Defense	0.156	0.180	0.186	0.155	0.144
Education	0.085	0.091	0.104	0.086	0.076
Health and Social Work	0.023	0.019	0.023	0.025	0.024
Other Services	0.041	0.037	0.039	0.025	0.026
Area of Residency					
Urban	0.812	0.739	0.733	0.712	0.671
Rural	0.188	0.261	0.267	0.288	0.329
Region of Residency					
Bangkok	0.297	0.060	0.066	0.086	0.089
Balance of Central	0.266	0.344	0.348	0.354	0.390
Northern	0.154	0.206	0.209	0.189	0.179
Northeastern	0.158	0.221	0.210	0.196	0.181
Southern	0.126	0.169	0.166	0.175	0.161

TABLE B2.1

Ordinary Least Squares and Recentred Influence Function Regression Results using Education Levels, 1988

	OLS		RIF10		RIF20		RIF50		RIF80		RIF90	
1988	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Married	0.148	0.021	0.198	0.040	0.208	0.036	0.223	0.031	0.031	0.037	0.004	0.061
Education Levels (Upper-Primary Omitted)												
No Schooling	-0.419	0.071	-0.098	0.187	-0.067	0.139	-0.341	0.103	-0.643	0.087	-0.988	0.113
Some Lower-Primary	-0.413	0.056	0.128	0.141	-0.335	0.118	-0.424	0.082	-0.636	0.073	-0.885	0.117
Lower Primary	-0.297	0.029	0.104	0.069	0.004	0.055	-0.293	0.042	-0.488	0.044	-0.663	0.072
Some Upper-Primary	-0.091	0.050	0.223	0.124	0.044	0.104	-0.040	0.087	-0.325	0.085	-0.616	0.108
Some Lower-Secondary	-0.002	0.067	0.215	0.151	0.169	0.132	-0.047	0.104	-0.055	0.112	-0.359	0.115
Lower Secondary	0.303	0.033	0.360	0.072	0.338	0.059	0.247	0.047	0.300	0.054	0.374	0.090
Some Upper-Secondary	0.473	0.046	0.508	0.082	0.460	0.076	0.347	0.068	0.520	0.078	0.563	0.128
Upper Secondary	1.097	0.131	0.709	0.121	0.863	0.130	0.854	0.146	0.818	0.253	1.507	0.479
Upper Vocational	0.595	0.042	0.557	0.070	0.602	0.061	0.579	0.057	0.691	0.076	0.710	0.136
Post-Secondary Academic	0.808	0.058	0.712	0.082	0.742	0.076	0.802	0.082	0.829	0.119	0.895	0.191
Post-Secondary Vocational	0.907	0.050	0.662	0.078	0.742	0.065	0.893	0.066	0.979	0.094	1.392	0.175
Bachelor Academic	1.098	0.053	0.733	0.084	0.776	0.069	1.016	0.059	1.510	0.093	1.493	0.172
Bachelor Vocational	0.997	0.146	0.553	0.117	0.692	0.122	1.196	0.130	1.377	0.364	0.730	0.652
Post-Graduate	1.364	0.088	0.679	0.099	0.717	0.084	0.988	0.071	2.095	0.175	3.268	0.431
Experience	0.077	0.004	0.043	0.006	0.050	0.005	0.063	0.005	0.104	0.006	0.134	0.010
Experience-Squared/100	-0.099	0.007	-0.070	0.012	-0.069	0.010	-0.075	0.008	-0.133	0.011	-0.167	0.018
Occupations (Elementary Occupations Omitted)												
Executives, Legislators and Senior Officials	0.402	0.056	-0.247	0.097	-0.025	0.074	0.225	0.057	0.964	0.084	1.165	0.166
Professionals	0.273	0.054	-0.172	0.081	0.094	0.072	0.456	0.069	0.208	0.100	0.273	0.175
Technicians and Associated Professionals	0.113	0.042	0.124	0.059	0.262	0.066	0.205	0.073	-0.187	0.078	-0.223	0.114
Clerical Workers	0.381	0.039	0.097	0.058	0.326	0.056	0.559	0.053	0.392	0.073	0.299	0.128
Service and Market Sales Workers	-0.015	0.041	-0.097	0.085	0.009	0.077	0.103	0.057	-0.010	0.063	-0.134	0.098
Skilled Agricultural and Fishery Workers	0.313	0.095	1.133	0.194	0.659	0.216	0.193	0.165	-0.024	0.093	0.014	0.163
Craft and Related Trades Workers	0.092	0.033	0.110	0.060	0.299	0.059	0.260	0.046	-0.082	0.053	-0.214	0.090
Plant and Machine Operators	0.091	0.034	0.177	0.059	0.333	0.060	0.297	0.051	-0.112	0.056	-0.413	0.091

Note: Robust standard errors

Table B2.1 (continued)

1988	OLS Coef.	OLS Std. Err.	RIF10 Coef.	RIF10 Std. Err.	RIF20 Coef.	RIF20 Std. Err.	RIF50 Coef.	RIF50 Std. Err.	RIF80 Coef.	RIF80 Std. Err.	RIF90 Coef.	RIF90 Std. Err.
Industries (Public Administration and Defense Omitted)												
Agriculture, Forestry and Hunting	-0.334	0.039	-1.299	0.099	-1.340	0.076	-0.510	0.053	0.348	0.058	0.832	0.096
Fishing	-0.199	0.118	-1.082	0.243	-0.870	0.252	-0.524	0.182	0.458	0.141	0.918	0.260
Mining and Quarrying	0.718	0.161	-0.131	0.226	-0.057	0.179	0.209	0.202	1.582	0.295	3.194	0.642
Manufacturing	0.308	0.038	-0.104	0.046	-0.188	0.047	-0.135	0.050	0.812	0.067	1.471	0.118
Electricity, Gas and Water Supply	1.034	0.067	0.106	0.042	0.081	0.058	0.259	0.074	1.638	0.130	3.441	0.277
Construction	0.104	0.038	0.232	0.052	0.093	0.057	-0.391	0.058	0.300	0.067	0.818	0.109
Wholesale and Retail Trade	0.193	0.040	-0.108	0.061	-0.178	0.059	-0.185	0.057	0.538	0.070	1.122	0.117
Hotels and Restaurants	-0.007	0.057	-0.148	0.112	-0.144	0.098	-0.326	0.089	0.258	0.099	0.636	0.142
Transport, Storage and Communication	0.324	0.045	-0.034	0.050	-0.166	0.056	-0.088	0.060	0.702	0.080	1.563	0.152
Financial Intermediation	0.934	0.072	0.004	0.038	-0.002	0.047	0.231	0.062	1.306	0.131	3.295	0.284
Property and Business Activities	0.153	0.150	0.136	0.108	-0.013	0.220	-0.319	0.265	0.626	0.293	1.056	0.620
Education	0.061	0.038	0.205	0.043	0.200	0.052	0.127	0.059	0.056	0.083	-0.470	0.154
Health and Social Work	0.109	0.040	0.221	0.038	0.311	0.048	0.096	0.086	0.006	0.098	-0.027	0.118
Other Services	-0.019	0.050	-0.133	0.090	-0.271	0.083	-0.397	0.070	0.291	0.077	0.723	0.123
Area of Residency (Urban Omitted)												
Rural	-0.084	0.021	-0.140	0.051	-0.095	0.042	-0.084	0.031	-0.059	0.033	-0.098	0.048
Region of Residency (Balance of Central Omitted)												
Bangkok	0.235	0.024	0.085	0.037	0.270	0.033	0.316	0.034	0.175	0.042	0.241	0.073
Northern	-0.182	0.026	-0.284	0.057	-0.458	0.046	-0.170	0.034	-0.024	0.041	-0.068	0.068
Northeastern	-0.248	0.025	-0.533	0.057	-0.432	0.045	-0.161	0.035	-0.151	0.040	-0.248	0.060
Southern	-0.055	0.026	0.030	0.047	0.005	0.048	-0.072	0.039	-0.060	0.045	-0.094	0.072
Intercept	1.950	0.052	1.674	0.110	1.793	0.089	2.124	0.069	2.174	0.082	1.912	0.142
R-Squared	0.6008		0.2601		0.4021		0.4400		0.4056		0.3149	

Note: Robust standard errors

TABLE B2.2

Ordinary Least Squares and Recentred Influence Function Regression Results using Education Levels, 1996

	OLS		RIF10		RIF20		RIF50		RIF80		RIF90	
1996	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Married	0.092	0.011	0.129	0.018	0.130	0.015	0.115	0.017	-0.014	0.021	-0.040	0.023
Education Levels (Upper-Primary Omitted)												
No Schooling	-0.607	0.033	-0.537	0.085	-0.471	0.056	-0.430	0.042	-0.693	0.043	-0.655	0.038
Some Lower-Primary	-0.456	0.029	-0.224	0.080	-0.220	0.060	-0.417	0.044	-0.687	0.040	-0.619	0.037
Lower Primary	-0.324	0.017	-0.052	0.028	-0.025	0.023	-0.207	0.024	-0.649	0.027	-0.553	0.028
Some Upper-Primary	-0.161	0.022	0.098	0.038	0.082	0.033	-0.051	0.038	-0.447	0.035	-0.360	0.032
Some Lower-Secondary	0.036	0.043	0.070	0.087	0.114	0.072	-0.091	0.068	0.047	0.058	0.105	0.064
Lower Secondary	0.313	0.016	0.256	0.026	0.248	0.022	0.344	0.024	0.326	0.028	0.209	0.027
Some Upper-Secondary	0.514	0.022	0.430	0.031	0.405	0.026	0.498	0.033	0.593	0.043	0.597	0.045
Upper Secondary	0.574	0.081	0.328	0.114	0.263	0.113	0.514	0.119	0.777	0.222	0.338	0.224
Upper Vocational	0.777	0.026	0.393	0.028	0.417	0.024	0.770	0.033	1.078	0.053	0.953	0.062
Post-Secondary Academic	0.840	0.038	0.474	0.031	0.444	0.030	0.780	0.046	1.240	0.102	0.980	0.104
Post-Secondary Vocational	1.038	0.029	0.535	0.028	0.558	0.023	1.027	0.033	1.330	0.059	1.409	0.076
Bachelor Academic	1.152	0.030	0.540	0.034	0.522	0.026	0.976	0.033	1.730	0.059	1.573	0.072
Bachelor Vocational	1.147	0.079	0.570	0.045	0.517	0.054	0.956	0.076	1.604	0.232	1.034	0.216
Post-Graduate	1.415	0.047	0.545	0.040	0.515	0.033	0.956	0.040	2.402	0.103	2.655	0.192
Experience	0.051	0.002	0.027	0.003	0.021	0.002	0.035	0.002	0.089	0.003	0.069	0.004
Experience-Squared/100	-0.053	0.003	-0.040	0.005	-0.027	0.004	-0.034	0.004	-0.095	0.006	-0.062	0.006
Occupations (Elementary Occupations Omitted)												
Executives, Legislators and Senior Officials	0.387	0.034	-0.140	0.043	-0.031	0.032	0.160	0.037	1.104	0.057	0.929	0.070
Professionals	0.327	0.033	-0.007	0.037	0.088	0.029	0.340	0.041	0.633	0.066	-0.038	0.081
Technicians and Associated Professionals	0.270	0.023	0.149	0.032	0.213	0.026	0.427	0.036	0.136	0.049	-0.061	0.045
Clerical Workers	0.319	0.024	0.246	0.031	0.298	0.025	0.513	0.031	0.280	0.045	0.170	0.051
Service and Market Sales Workers	-0.006	0.023	-0.009	0.042	0.024	0.032	0.013	0.034	0.049	0.035	-0.027	0.035
Skilled Agricultural and Fishery Workers	0.078	0.047	0.260	0.093	0.141	0.075	-0.056	0.089	0.152	0.044	0.208	0.049
Craft and Related Trades Workers	0.061	0.015	0.301	0.031	0.291	0.024	0.122	0.022	-0.050	0.023	-0.156	0.026
Plant and Machine Operators	0.142	0.018	0.336	0.031	0.304	0.025	0.293	0.028	-0.004	0.029	-0.086	0.030

Note: Robust standard errors

Table B2.2 (continued)

1996	OLS Coef.	OLS Std. Err.	RIF10 Coef.	RIF10 Std. Err.	RIF20 Coef.	RIF20 Std. Err.	RIF50 Coef.	RIF50 Std. Err.	RIF80 Coef.	RIF80 Std. Err.	RIF90 Coef.	RIF90 Std. Err.
Industries (Public Administration and Defense Omitted)												
Agriculture, Forestry and Hunting	-0.325	0.024	-0.967	0.052	-0.758	0.036	-0.816	0.034	0.307	0.035	0.562	0.038
Fishing	-0.245	0.053	-0.720	0.103	-0.582	0.082	-0.659	0.093	0.321	0.057	0.575	0.066
Mining and Quarrying	0.048	0.079	-0.188	0.104	-0.440	0.096	-0.632	0.106	0.480	0.101	0.975	0.139
Manufacturing	0.189	0.021	-0.144	0.022	-0.235	0.019	-0.371	0.029	0.764	0.040	0.998	0.045
Electricity, Gas and Water Supply	1.020	0.048	-0.051	0.023	-0.043	0.021	0.000	0.042	1.838	0.083	2.833	0.118
Construction	-0.098	0.020	-0.034	0.026	-0.326	0.022	-0.845	0.029	0.366	0.036	0.708	0.040
Wholesale and Retail Trade	-0.002	0.022	-0.265	0.029	-0.349	0.024	-0.518	0.032	0.494	0.040	0.743	0.043
Hotels and Restaurants	-0.133	0.030	-0.300	0.051	-0.335	0.040	-0.613	0.046	0.252	0.053	0.535	0.051
Transport, Storage and Communication	0.200	0.031	-0.249	0.032	-0.254	0.027	-0.359	0.038	0.753	0.054	1.120	0.065
Financial Intermediation	0.878	0.057	-0.051	0.029	-0.070	0.024	-0.074	0.040	1.398	0.097	2.254	0.134
Property and Business Activities	0.014	0.101	-0.008	0.167	-0.275	0.134	-0.586	0.133	0.552	0.197	0.905	0.287
Education	-0.052	0.022	0.078	0.018	0.058	0.017	-0.026	0.030	0.185	0.051	-0.134	0.075
Health and Social Work	-0.006	0.027	0.062	0.029	0.026	0.026	-0.085	0.050	-0.043	0.065	0.191	0.070
Other Services	-0.184	0.026	-0.274	0.044	-0.327	0.036	-0.686	0.042	0.144	0.041	0.506	0.046
Area of Residency (Urban Omitted)												
Rural	-0.032	0.010	-0.035	0.017	-0.012	0.014	-0.062	0.015	-0.027	0.018	-0.014	0.019
Region of Residency (Balance of Central Omitted)												
Bangkok	0.313	0.022	0.139	0.017	0.193	0.016	0.453	0.030	0.282	0.046	0.245	0.054
Northern	-0.232	0.012	-0.233	0.020	-0.292	0.016	-0.264	0.017	-0.159	0.022	-0.167	0.025
Northeastern	-0.274	0.012	-0.317	0.020	-0.347	0.016	-0.279	0.017	-0.207	0.023	-0.198	0.025
Southern	-0.214	0.013	-0.066	0.019	-0.139	0.016	-0.219	0.019	-0.283	0.024	-0.307	0.025
Intercept	2.721	0.029	2.313	0.046	2.709	0.036	3.107	0.041	2.584	0.051	3.195	0.056
R-Squared	0.5980		0.2121		0.2733		0.4837		0.4552		0.3434	

Note: Robust standard errors

TABLE B2.3

Ordinary Least Squares and Recentred Influence Function Regression Results using Education Levels, 2000

	OLS		RIF10		RIF20		RIF50		RIF80		RIF90	
2000	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Married	0.073	0.010	0.112	0.017	0.097	0.015	0.138	0.016	-0.008	0.023	-0.062	0.019
Education Levels (Upper-Primary Omitted)												
No Schooling	-0.537	0.031	-0.424	0.082	-0.370	0.059	-0.340	0.039	-0.796	0.043	-0.581	0.034
Some Lower-Primary	-0.295	0.032	0.011	0.079	-0.149	0.066	-0.212	0.051	-0.638	0.054	-0.439	0.041
Lower Primary	-0.302	0.016	-0.010	0.029	-0.022	0.024	-0.151	0.024	-0.775	0.031	-0.545	0.025
Some Upper-Primary	-0.192	0.024	-0.011	0.044	0.014	0.037	-0.060	0.040	-0.589	0.040	-0.340	0.033
Some Lower-Secondary	0.186	0.039	0.260	0.080	0.076	0.074	0.167	0.066	0.289	0.078	0.186	0.055
Lower Secondary	0.249	0.015	0.169	0.025	0.210	0.021	0.274	0.023	0.334	0.029	0.129	0.021
Some Upper-Secondary	0.427	0.020	0.261	0.030	0.331	0.026	0.442	0.030	0.561	0.043	0.403	0.031
Upper Secondary	0.333	0.135	0.275	0.139	0.318	0.121	0.276	0.144	0.621	0.397	-0.155	0.340
Upper Vocational	0.577	0.025	0.294	0.027	0.360	0.025	0.584	0.034	0.811	0.059	0.548	0.050
Post-Secondary Academic	0.699	0.038	0.374	0.035	0.429	0.034	0.660	0.049	1.150	0.103	0.718	0.102
Post-Secondary Vocational	0.798	0.027	0.361	0.029	0.453	0.025	0.832	0.035	1.173	0.065	0.842	0.059
Bachelor Academic	1.015	0.029	0.408	0.031	0.497	0.027	0.854	0.032	1.764	0.065	1.249	0.060
Bachelor Vocational	0.987	0.058	0.422	0.042	0.500	0.048	0.984	0.064	1.404	0.213	1.005	0.204
Post-Graduate	1.358	0.040	0.433	0.034	0.514	0.031	0.864	0.037	2.559	0.094	2.552	0.131
Experience	0.045	0.002	0.013	0.003	0.016	0.002	0.031	0.002	0.102	0.004	0.063	0.003
Experience-Squared/100	-0.042	0.003	-0.016	0.005	-0.017	0.004	-0.030	0.004	-0.099	0.007	-0.052	0.005
Occupations (Elementary Occupations Omitted)												
Executives, Legislators and Senior Officials	0.403	0.033	-0.101	0.036	-0.025	0.031	0.236	0.036	1.240	0.068	0.860	0.065
Professionals	0.345	0.032	-0.057	0.035	0.034	0.030	0.318	0.038	0.903	0.073	0.181	0.070
Technicians and Associated Professionals	0.347	0.022	0.076	0.028	0.176	0.025	0.478	0.034	0.351	0.059	0.044	0.042
Clerical Workers	0.270	0.025	0.165	0.028	0.282	0.026	0.420	0.035	0.288	0.057	0.103	0.049
Service and Market Sales Workers	-0.041	0.020	-0.076	0.037	-0.051	0.032	-0.024	0.031	0.034	0.034	-0.014	0.025
Skilled Agricultural and Fishery Workers	-0.014	0.046	-0.118	0.092	0.031	0.077	-0.043	0.085	0.036	0.052	0.145	0.037
Craft and Related Trades Workers	0.056	0.015	0.181	0.027	0.279	0.025	0.085	0.024	-0.078	0.029	-0.088	0.023
Plant and Machine Operators	0.089	0.017	0.151	0.028	0.226	0.026	0.242	0.027	-0.084	0.034	-0.126	0.025

Note: Robust standard errors

Table B2.3 (continued)

2000	OLS Coef.	OLS Std. Err.	RIF10 Coef.	RIF10 Std. Err.	RIF20 Coef.	RIF20 Std. Err.	RIF50 Coef.	RIF50 Std. Err.	RIF80 Coef.	RIF80 Std. Err.	RIF90 Coef.	RIF90 Std. Err.
Industries (Public Administration and Defense Omitted)												
Agriculture, Forestry and Hunting	-0.395	0.021	-0.805	0.043	-0.918	0.032	-0.772	0.031	0.235	0.041	0.420	0.034
Fishing	-0.340	0.057	-0.706	0.112	-0.709	0.091	-0.595	0.095	0.250	0.069	0.322	0.048
Mining and Quarrying	0.059	0.085	-0.028	0.075	-0.172	0.094	-0.450	0.123	0.481	0.146	0.789	0.161
Manufacturing	0.068	0.020	-0.160	0.020	-0.214	0.019	-0.335	0.029	0.657	0.045	0.679	0.038
Electricity, Gas and Water Supply	0.790	0.051	-0.077	0.025	-0.075	0.025	0.148	0.045	1.730	0.104	2.039	0.116
Construction	-0.160	0.020	-0.052	0.026	-0.265	0.025	-0.681	0.032	0.262	0.043	0.474	0.036
Wholesale and Retail Trade	-0.109	0.021	-0.268	0.028	-0.322	0.026	-0.499	0.032	0.324	0.044	0.505	0.037
Hotels and Restaurants	-0.181	0.030	-0.346	0.049	-0.370	0.040	-0.439	0.046	0.173	0.057	0.372	0.040
Transport, Storage and Communication	0.211	0.033	-0.162	0.028	-0.192	0.027	-0.180	0.038	0.767	0.066	0.890	0.063
Financial Intermediation	0.489	0.060	-0.048	0.027	-0.069	0.030	-0.020	0.051	0.879	0.120	1.296	0.128
Property and Business Activities	-0.014	0.067	-0.067	0.117	0.012	0.099	-0.237	0.146	0.138	0.162	0.335	0.144
Education	0.015	0.022	0.029	0.016	0.027	0.017	0.022	0.028	0.292	0.056	0.251	0.067
Health and Social Work	-0.022	0.025	0.005	0.024	0.008	0.023	-0.137	0.044	0.003	0.075	0.105	0.063
Other Services	-0.269	0.026	-0.212	0.040	-0.308	0.036	-0.658	0.040	0.041	0.050	0.302	0.039
Area of Residency (Urban Omitted)												
Rural	-0.038	0.010	-0.020	0.016	-0.008	0.014	-0.070	0.015	-0.012	0.021	-0.026	0.018
Region of Residency (Balance of Central Omitted)												
Bangkok	0.252	0.020	0.088	0.017	0.173	0.017	0.356	0.029	0.162	0.048	0.183	0.044
Northern	-0.206	0.011	-0.264	0.019	-0.266	0.016	-0.230	0.016	-0.134	0.025	-0.049	0.024
Northeastern	-0.219	0.012	-0.308	0.019	-0.322	0.016	-0.218	0.016	-0.075	0.027	-0.088	0.025
Southern	-0.141	0.012	-0.078	0.017	-0.083	0.016	-0.129	0.019	-0.204	0.028	-0.140	0.025
Intercept	2.705	0.029	2.617	0.042	2.751	0.037	2.954	0.042	2.085	0.063	3.228	0.053
R-Squared	0.6286		0.2053		0.3325		0.4840		0.4900		0.3445	

Note: Robust standard errors

TABLE B2.4

Ordinary Least Squares and Recentred Influence Function Regression Results using Education Levels, 2001

	OLS		RIF10		RIF20		RIF50		RIF80		RIF90	
2001	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Married	0.062	0.009	0.135	0.019	0.158	0.015	0.097	0.013	-0.036	0.019	-0.097	0.017
Education Levels (Upper-Primary Omitted)												
No Schooling	-0.502	0.030	-0.495	0.094	-0.454	0.063	-0.369	0.031	-0.739	0.034	-0.602	0.030
Some Lower-Primary	-0.359	0.037	-0.310	0.101	-0.152	0.069	-0.246	0.044	-0.588	0.047	-0.495	0.034
Lower Primary	-0.300	0.015	-0.107	0.033	-0.073	0.025	-0.181	0.020	-0.691	0.025	-0.603	0.023
Some Upper-Primary	-0.156	0.022	0.075	0.049	0.028	0.040	-0.104	0.033	-0.504	0.030	-0.353	0.026
Some Lower-Secondary	0.082	0.042	-0.179	0.113	-0.147	0.085	0.119	0.058	0.326	0.066	0.229	0.054
Lower Secondary	0.263	0.013	0.194	0.027	0.224	0.022	0.286	0.019	0.374	0.023	0.184	0.018
Some Upper-Secondary	0.311	0.072	-0.007	0.187	0.202	0.141	0.315	0.100	0.869	0.145	0.521	0.127
Upper Secondary	0.443	0.016	0.337	0.030	0.411	0.025	0.520	0.025	0.543	0.033	0.313	0.025
Upper Vocational	0.621	0.019	0.357	0.029	0.488	0.024	0.749	0.028	0.818	0.046	0.559	0.042
Post-Secondary Academic	0.792	0.030	0.486	0.037	0.590	0.032	0.818	0.045	1.343	0.101	0.720	0.104
Post-Secondary Vocational	0.808	0.018	0.454	0.028	0.573	0.023	0.944	0.024	0.950	0.046	0.628	0.038
Bachelor Academic	1.079	0.022	0.490	0.033	0.592	0.026	1.015	0.025	1.762	0.055	1.323	0.054
Bachelor Vocational	1.105	0.040	0.557	0.041	0.656	0.037	1.109	0.039	1.904	0.141	0.861	0.147
Post-Graduate	1.464	0.035	0.504	0.039	0.593	0.031	1.026	0.030	2.548	0.076	2.427	0.113
Experience	0.044	0.001	0.020	0.003	0.021	0.002	0.031	0.002	0.097	0.003	0.071	0.003
Experience-Squared/100	-0.040	0.003	-0.028	0.006	-0.030	0.004	-0.026	0.004	-0.089	0.006	-0.058	0.005
Occupations (Elementary Occupations Omitted)												
Executives, Legislators and Senior Officials	0.510	0.035	-0.178	0.048	-0.118	0.036	0.139	0.033	1.359	0.065	1.665	0.076
Professionals	0.416	0.024	0.018	0.032	0.059	0.027	0.302	0.028	1.249	0.064	0.741	0.067
Technicians and Associated Professionals	0.387	0.018	0.179	0.029	0.226	0.024	0.507	0.024	0.638	0.047	0.251	0.040
Clerical Workers	0.308	0.019	0.216	0.030	0.284	0.025	0.445	0.027	0.493	0.050	0.098	0.042
Service and Market Sales Workers	0.135	0.016	0.131	0.035	0.134	0.029	0.220	0.024	0.098	0.033	0.013	0.023
Skilled Agricultural and Fishery Workers	-0.186	0.022	-0.485	0.060	-0.221	0.038	-0.083	0.022	0.010	0.026	0.031	0.020
Craft and Related Trades Workers	0.102	0.013	0.230	0.031	0.234	0.025	0.161	0.019	0.058	0.022	-0.043	0.018
Plant and Machine Operators	0.190	0.013	0.369	0.028	0.388	0.023	0.334	0.021	-0.023	0.024	-0.108	0.018

Note: Robust standard errors

Table B2.4 (continued)

2001	OLS Coef.	OLS Std. Err.	RIF10 Coef.	RIF10 Std. Err.	RIF20 Coef.	RIF20 Std. Err.	RIF50 Coef.	RIF50 Std. Err.	RIF80 Coef.	RIF80 Std. Err.	RIF90 Coef.	RIF90 Std. Err.
Industries (Public Administration and Defense Omitted)												
Agriculture, Forestry and Hunting	-0.389	0.022	-0.940	0.049	-0.833	0.035	-0.507	0.026	0.220	0.043	0.441	0.039
Fishing	-0.167	0.033	-0.430	0.091	-0.526	0.064	-0.421	0.044	0.184	0.056	0.447	0.046
Mining and Quarrying	-0.085	0.054	0.038	0.082	-0.156	0.104	-0.506	0.095	0.142	0.100	0.438	0.075
Manufacturing	-0.045	0.016	-0.117	0.022	-0.127	0.019	-0.369	0.021	0.270	0.040	0.526	0.036
Electricity, Gas and Water Supply	0.556	0.036	0.007	0.029	-0.002	0.028	-0.052	0.034	1.440	0.087	1.762	0.106
Construction	-0.188	0.018	-0.156	0.030	-0.277	0.025	-0.579	0.023	0.095	0.042	0.438	0.037
Wholesale and Retail Trade	-0.163	0.016	-0.215	0.027	-0.328	0.023	-0.486	0.022	0.128	0.038	0.445	0.033
Hotels and Restaurants	-0.145	0.023	-0.045	0.043	-0.219	0.039	-0.452	0.037	0.069	0.049	0.385	0.039
Transport, Storage and Communication	0.056	0.023	-0.059	0.027	-0.160	0.026	-0.222	0.030	0.388	0.055	0.658	0.054
Financial Intermediation	0.248	0.027	-0.018	0.021	-0.043	0.019	-0.039	0.027	0.773	0.082	0.776	0.093
Property and Business Activities	-0.155	0.026	-0.085	0.047	-0.135	0.038	-0.456	0.036	0.035	0.063	0.299	0.059
Education	0.049	0.017	0.148	0.017	0.130	0.015	0.048	0.020	0.214	0.050	0.212	0.060
Health and Social Work	0.036	0.023	0.083	0.028	0.082	0.024	0.028	0.033	0.072	0.069	0.095	0.058
Other Services	-0.179	0.026	-0.086	0.053	-0.112	0.042	-0.453	0.039	-0.064	0.051	0.289	0.041
Area of Residency (Urban Omitted)												
Rural	-0.053	0.009	-0.043	0.018	-0.034	0.014	-0.058	0.012	-0.066	0.017	-0.052	0.016
Region of Residency (Balance of Central Omitted)												
Bangkok	0.200	0.014	0.036	0.016	0.166	0.015	0.256	0.021	0.144	0.034	0.093	0.033
Northern	-0.255	0.010	-0.400	0.022	-0.371	0.017	-0.254	0.013	-0.095	0.022	-0.077	0.022
Northeastern	-0.306	0.011	-0.507	0.022	-0.422	0.017	-0.238	0.014	-0.114	0.023	-0.124	0.023
Southern	-0.123	0.010	-0.130	0.020	-0.116	0.017	-0.121	0.015	-0.078	0.023	-0.094	0.022
Intercept	2.603	0.025	2.362	0.047	2.515	0.037	2.767	0.033	2.049	0.056	3.017	0.051
R-Squared	0.6635		0.2490		0.3288		0.5053		0.5260		0.4070	

Note: Robust standard errors

Table B2.5

Ordinary Least Squares and Recentred Influence Function Regression Results using Education Levels, 2006

	OLS		RIF10		RIF20		RIF50		RIF80		RIF90	
2006	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Married	0.085	0.008	0.126	0.016	0.094	0.011	0.107	0.011	0.093	0.017	-0.013	0.018
Education Levels (Upper-Primary Omitted)												
No Schooling	-0.370	0.025	-0.493	0.072	-0.337	0.042	-0.290	0.027	-0.349	0.030	-0.370	0.030
Some Lower-Primary	-0.236	0.029	0.026	0.084	-0.174	0.056	-0.177	0.043	-0.409	0.036	-0.427	0.033
Lower Primary	-0.247	0.014	-0.021	0.032	-0.088	0.021	-0.132	0.020	-0.546	0.024	-0.621	0.026
Some Upper-Primary	-0.113	0.023	0.065	0.055	-0.004	0.038	-0.022	0.036	-0.406	0.037	-0.449	0.031
Some Lower-Secondary	0.114	0.033	-0.206	0.100	-0.177	0.063	0.032	0.044	0.472	0.054	0.429	0.052
Lower Secondary	0.261	0.011	0.213	0.023	0.186	0.016	0.257	0.017	0.387	0.020	0.291	0.019
Some Upper-Secondary	0.281	0.058	0.046	0.183	-0.009	0.119	0.212	0.096	0.588	0.082	0.548	0.074
Upper Secondary	0.370	0.013	0.275	0.026	0.253	0.019	0.437	0.021	0.453	0.027	0.368	0.024
Upper Vocational	0.549	0.018	0.332	0.026	0.334	0.020	0.648	0.027	0.703	0.044	0.502	0.043
Post-Secondary Academic	0.682	0.037	0.396	0.039	0.388	0.032	0.830	0.046	0.926	0.116	0.659	0.119
Post-Secondary Vocational	0.755	0.015	0.373	0.024	0.417	0.017	0.907	0.022	1.078	0.042	0.634	0.039
Bachelor Academic	1.004	0.019	0.399	0.026	0.435	0.018	0.985	0.023	1.743	0.049	1.390	0.054
Bachelor Vocational	1.099	0.039	0.401	0.032	0.438	0.026	1.058	0.036	2.072	0.126	1.150	0.170
Post-Graduate	1.407	0.028	0.382	0.031	0.407	0.022	0.952	0.027	2.727	0.064	2.932	0.108
Experience	0.037	0.001	0.010	0.002	0.011	0.002	0.027	0.002	0.083	0.003	0.072	0.003
Experience-Squared /100	-0.033	0.003	-0.016	0.005	-0.012	0.003	-0.025	0.003	-0.079	0.005	-0.056	0.005
Occupations (Elementary Occupations Omitted)												
Executives, Legislators and Senior Officials	0.556	0.027	0.145	0.035	0.168	0.025	0.265	0.029	1.014	0.062	1.503	0.077
Professionals	0.517	0.022	0.161	0.029	0.194	0.020	0.362	0.025	1.306	0.059	1.147	0.074
Technicians and Associated Professionals	0.494	0.016	0.291	0.025	0.336	0.018	0.575	0.021	0.881	0.046	0.314	0.045
Clerical Workers	0.355	0.017	0.320	0.026	0.368	0.019	0.458	0.026	0.444	0.047	0.122	0.044
Service and Market Sales Workers	0.221	0.015	0.163	0.031	0.198	0.022	0.242	0.022	0.380	0.033	0.144	0.029
Skilled Agricultural and Fishery Workers	0.081	0.022	0.134	0.055	0.171	0.032	0.121	0.027	-0.026	0.026	0.043	0.021
Craft and Related Trades Workers	0.137	0.011	0.267	0.027	0.297	0.018	0.179	0.016	0.035	0.018	-0.002	0.017
Plant and Machine Operators	0.216	0.012	0.393	0.025	0.405	0.018	0.341	0.019	-0.010	0.021	-0.070	0.018

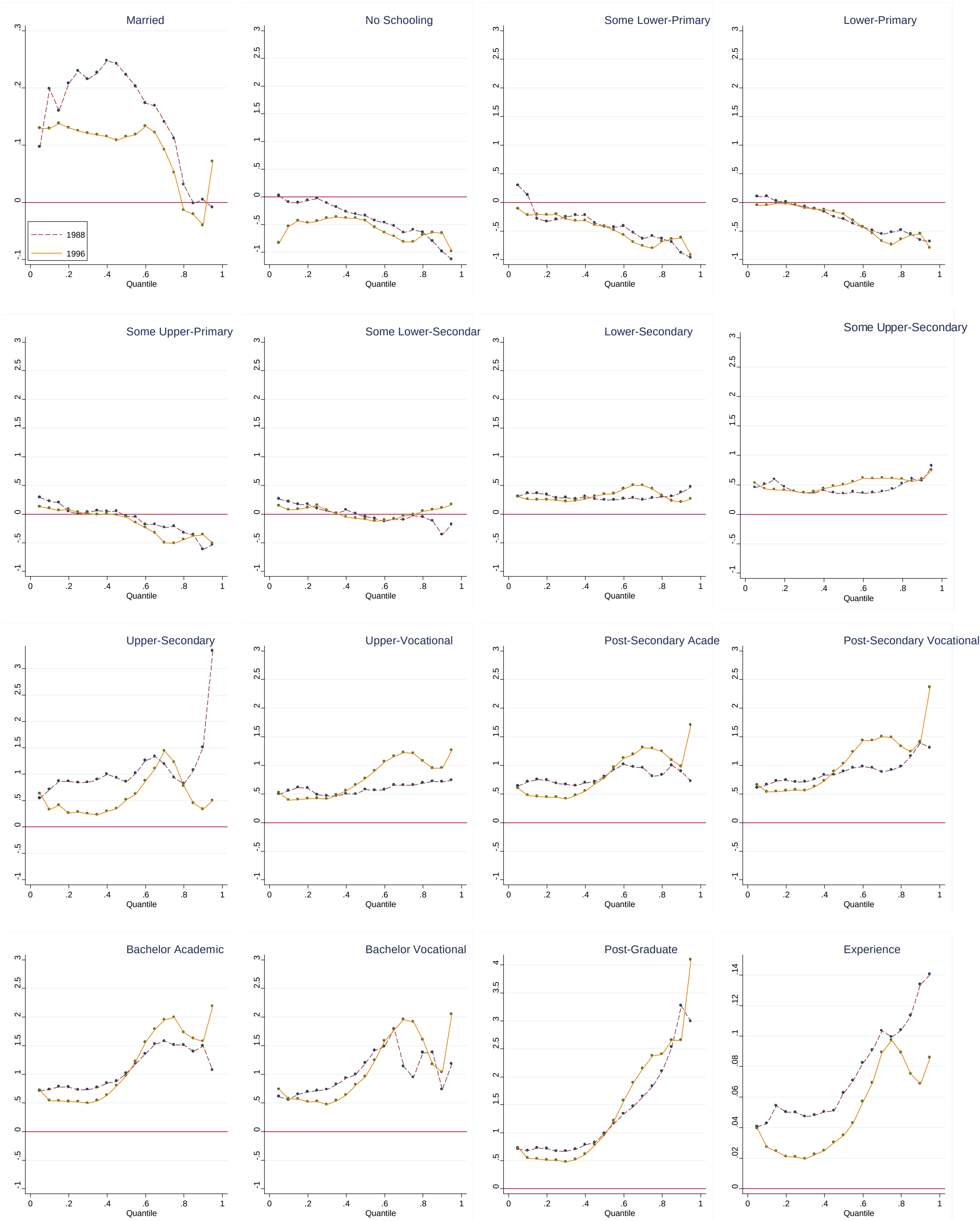
Note: Robust standard errors

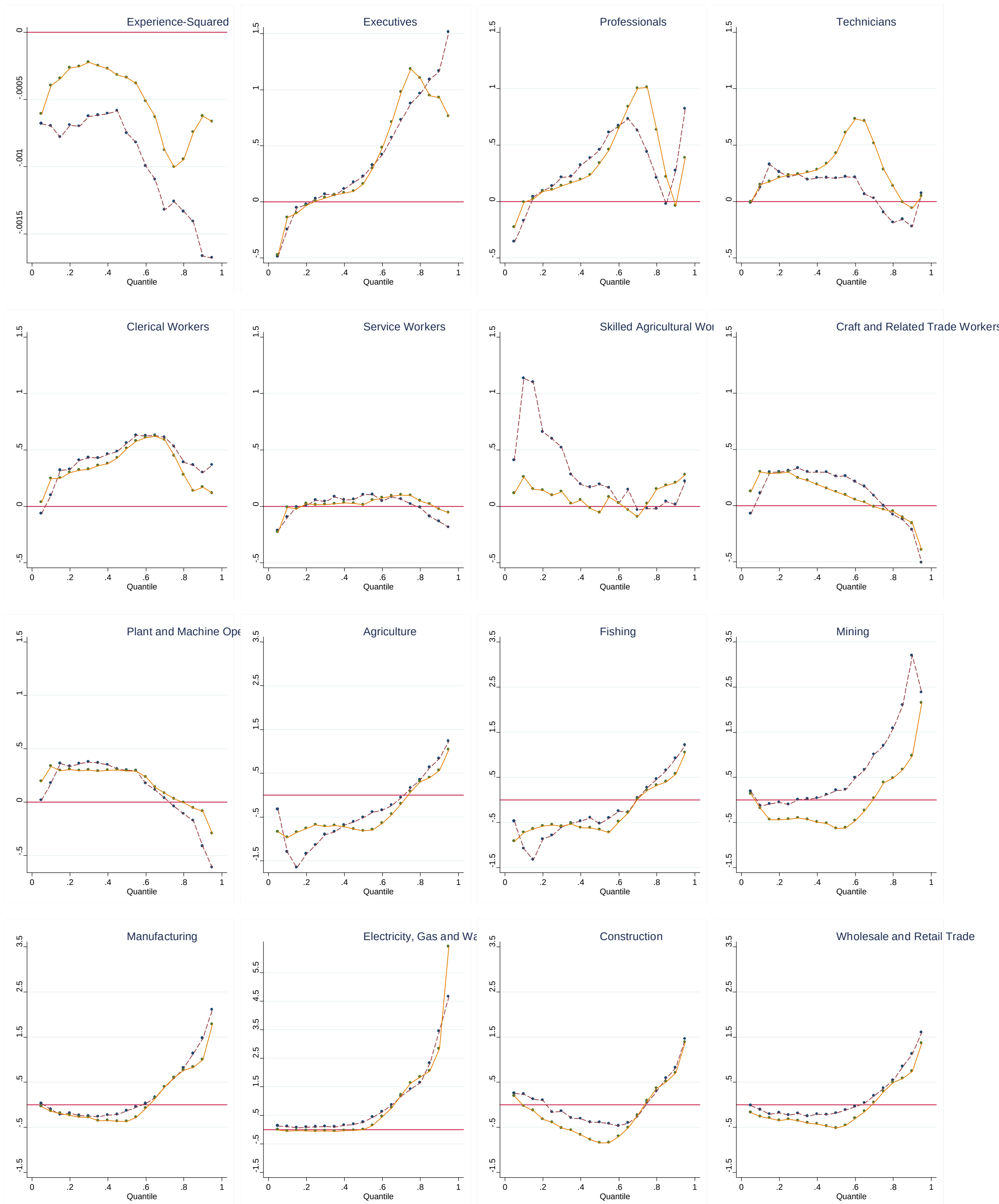
Table B2.5 (continued)

2006	OLS Coef.	OLS Std. Err.	RIF10 Coef.	RIF10 Std. Err.	RIF20 Coef.	RIF20 Std. Err.	RIF50 Coef.	RIF50 Std. Err.	RIF80 Coef.	RIF80 Std. Err.	RIF90 Coef.	RIF90 Std. Err.
Industries (Public Administration and Defense Omitted)												
Agriculture, Forestry and Hunting	-0.445	0.021	-0.916	0.044	-0.603	0.026	-0.443	0.025	-0.156	0.043	0.276	0.042
Fishing	-0.480	0.032	-1.024	0.095	-0.732	0.056	-0.643	0.042	-0.177	0.055	0.293	0.048
Mining and Quarrying	-0.190	0.044	-0.049	0.080	-0.117	0.070	-0.395	0.087	-0.137	0.115	0.155	0.090
Manufacturing	-0.214	0.014	-0.151	0.018	-0.188	0.014	-0.416	0.019	-0.205	0.039	0.331	0.040
Electricity, Gas and Water Supply	0.402	0.035	-0.024	0.027	-0.006	0.020	-0.023	0.033	0.996	0.085	1.738	0.127
Construction	-0.304	0.015	-0.221	0.025	-0.287	0.018	-0.560	0.020	-0.274	0.040	0.278	0.040
Wholesale and Retail Trade	-0.284	0.014	-0.217	0.021	-0.253	0.016	-0.472	0.019	-0.312	0.039	0.275	0.038
Hotels and Restaurants	-0.314	0.021	-0.224	0.040	-0.230	0.029	-0.442	0.034	-0.468	0.051	0.198	0.047
Transport, Storage and Communication	-0.071	0.021	-0.142	0.025	-0.150	0.020	-0.208	0.028	-0.010	0.055	0.479	0.061
Financial Intermediation	0.120	0.029	-0.055	0.019	-0.072	0.017	-0.094	0.027	0.387	0.082	0.774	0.106
Property and Business Activities	-0.282	0.023	-0.078	0.032	-0.138	0.026	-0.484	0.032	-0.427	0.058	0.106	0.063
Education	0.021	0.017	0.096	0.015	0.095	0.012	0.018	0.019	-0.224	0.049	0.471	0.069
Health and Social Work	-0.023	0.022	0.080	0.021	0.097	0.017	-0.025	0.032	-0.300	0.068	-0.036	0.072
Other Services	-0.292	0.025	-0.182	0.044	-0.106	0.031	-0.359	0.036	-0.448	0.052	0.089	0.053
Area of Residency (Urban Omitted)												
Rural	-0.067	0.007	-0.027	0.015	-0.035	0.010	-0.077	0.011	-0.091	0.016	-0.058	0.017
Region of Residency (Balance of Central Omitted)												
Bangkok	0.200	0.012	0.073	0.013	0.159	0.011	0.274	0.019	0.157	0.031	0.084	0.036
Northern	-0.237	0.009	-0.429	0.020	-0.352	0.013	-0.247	0.012	-0.046	0.021	-0.094	0.024
Northeastern	-0.242	0.010	-0.433	0.020	-0.351	0.013	-0.207	0.013	-0.069	0.023	-0.120	0.026
Southern	-0.053	0.010	-0.016	0.018	-0.024	0.013	-0.094	0.014	-0.037	0.022	-0.091	0.025
Intercept	2.745	0.022	2.514	0.040	2.691	0.029	2.793	0.030	2.433	0.055	2.915	0.056
R-Squared	0.6597		0.2045		0.2926		0.4753		0.5257		0.4113	

Note: Robust standard errors

Figure B1: Recentred Influence Function Regression Coefficients 1988/1996




Experience-Squared
Executives
Professionals
Technicians
Clerical Workers
Service Workers
Skilled Agricultural Wor
Craft and Related Trade Workers
Plant and Machine Ope
Agriculture
Fishing
Mining
Manufacturing
Electricity, Gas and Wa
Construction
Wholesale and Retail Trade
Quantile

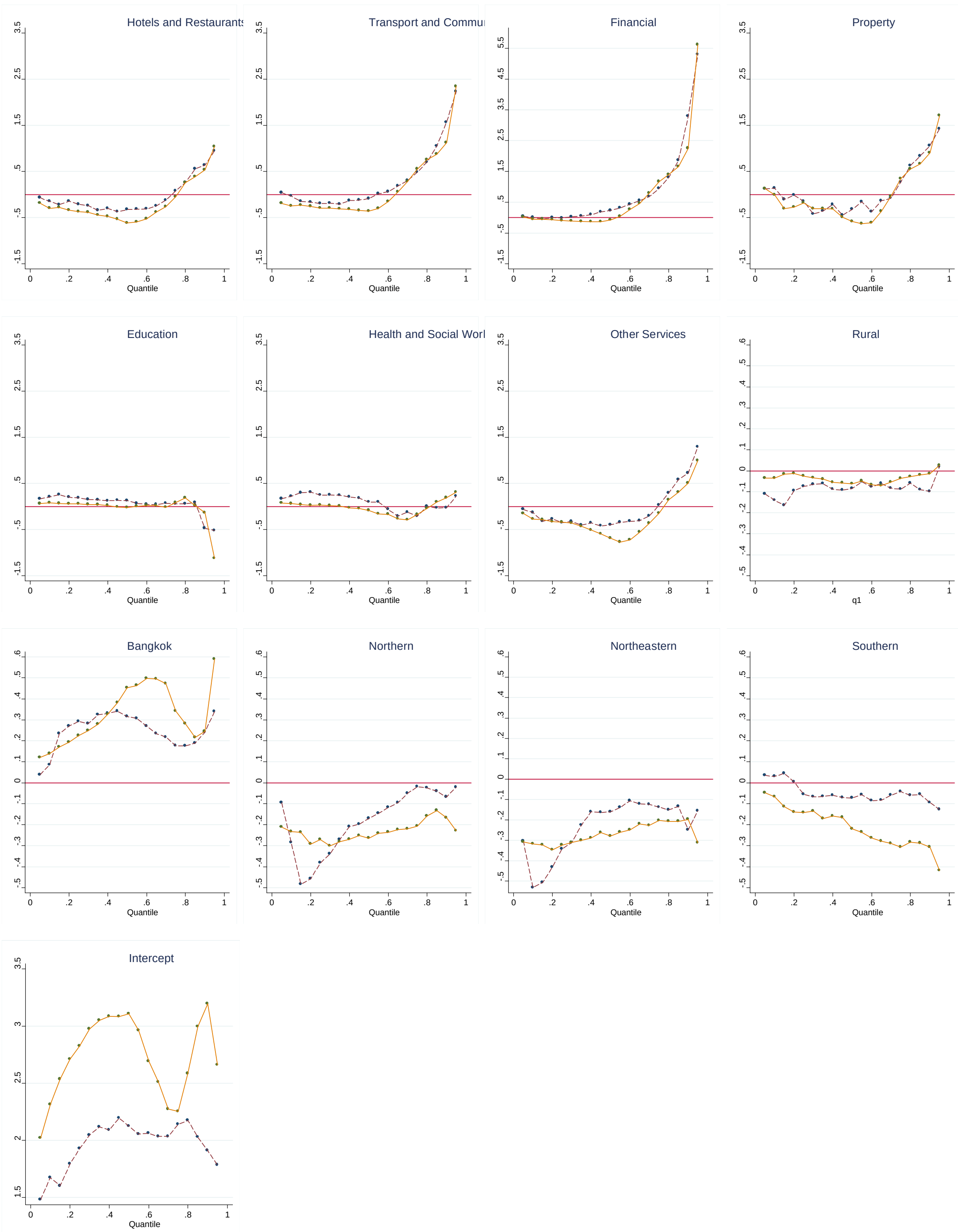
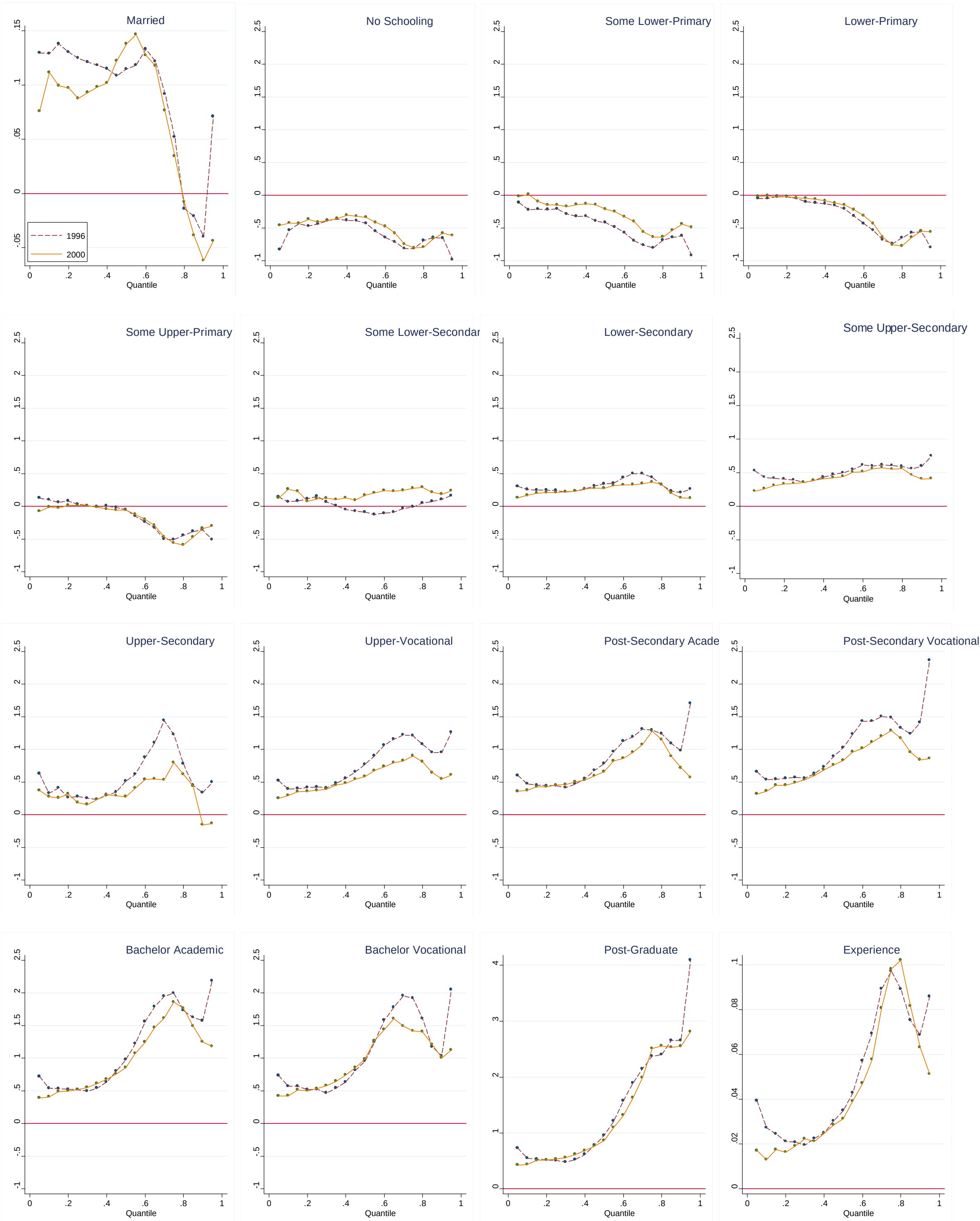
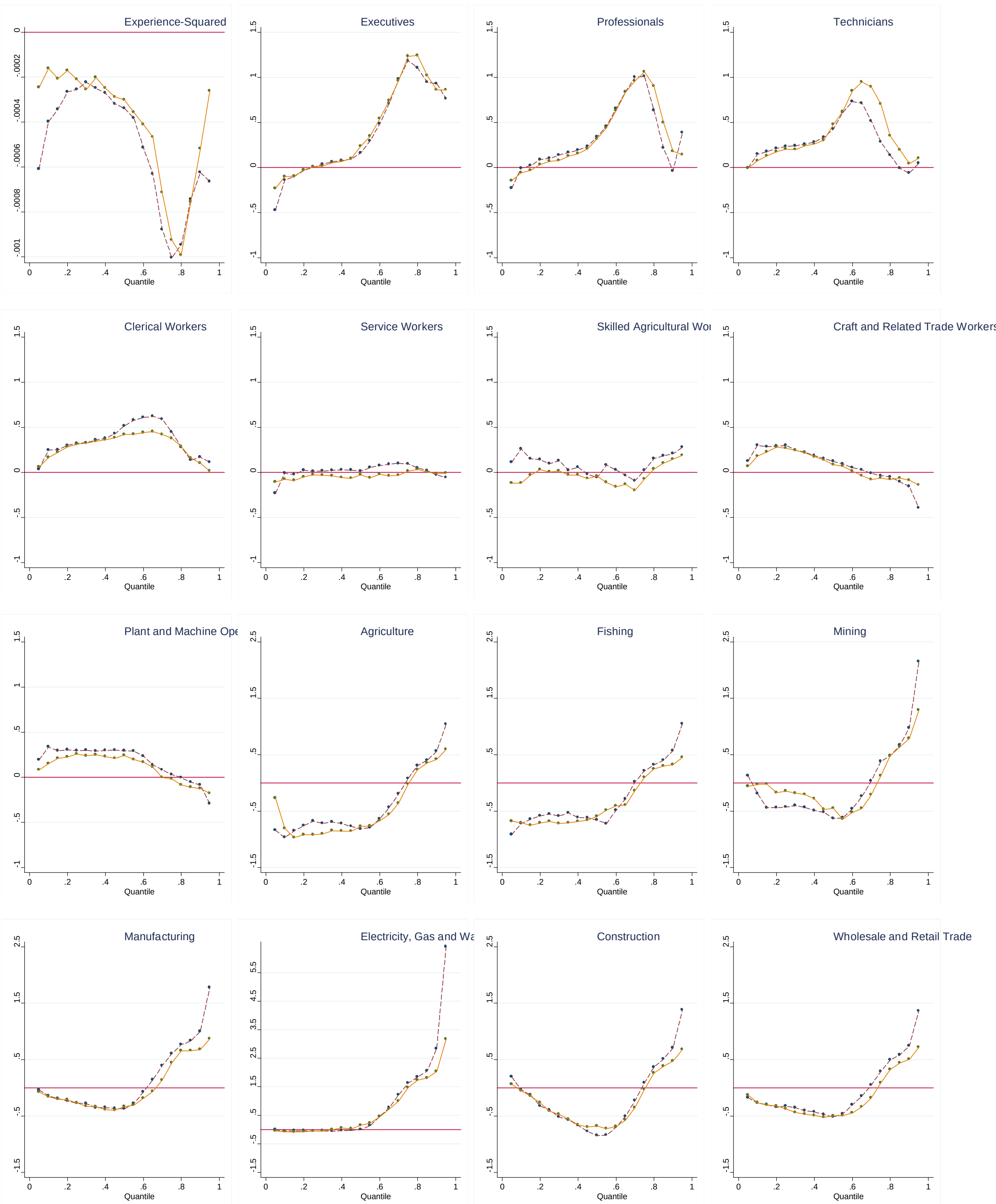

Hotels and Restaurants
Transport and Commu
Financial
Property
Education
Health and Social Wor
Other Services
Rural
Bangkok
Northern
Northeastern
Southern
Intercept
Quantile
q1

Figure B2: Recentred Influence Function Regression Coefficients 1996/2000




Experience-Squared
Executives
Professionals
Technicians
Clerical Workers
Service Workers
Skilled Agricultural Wor
Craft and Related Trade Workers
Plant and Machine Ope
Agriculture
Fishing
Mining
Manufacturing
Electricity, Gas and Wa
Construction
Wholesale and Retail Trade
Quantile

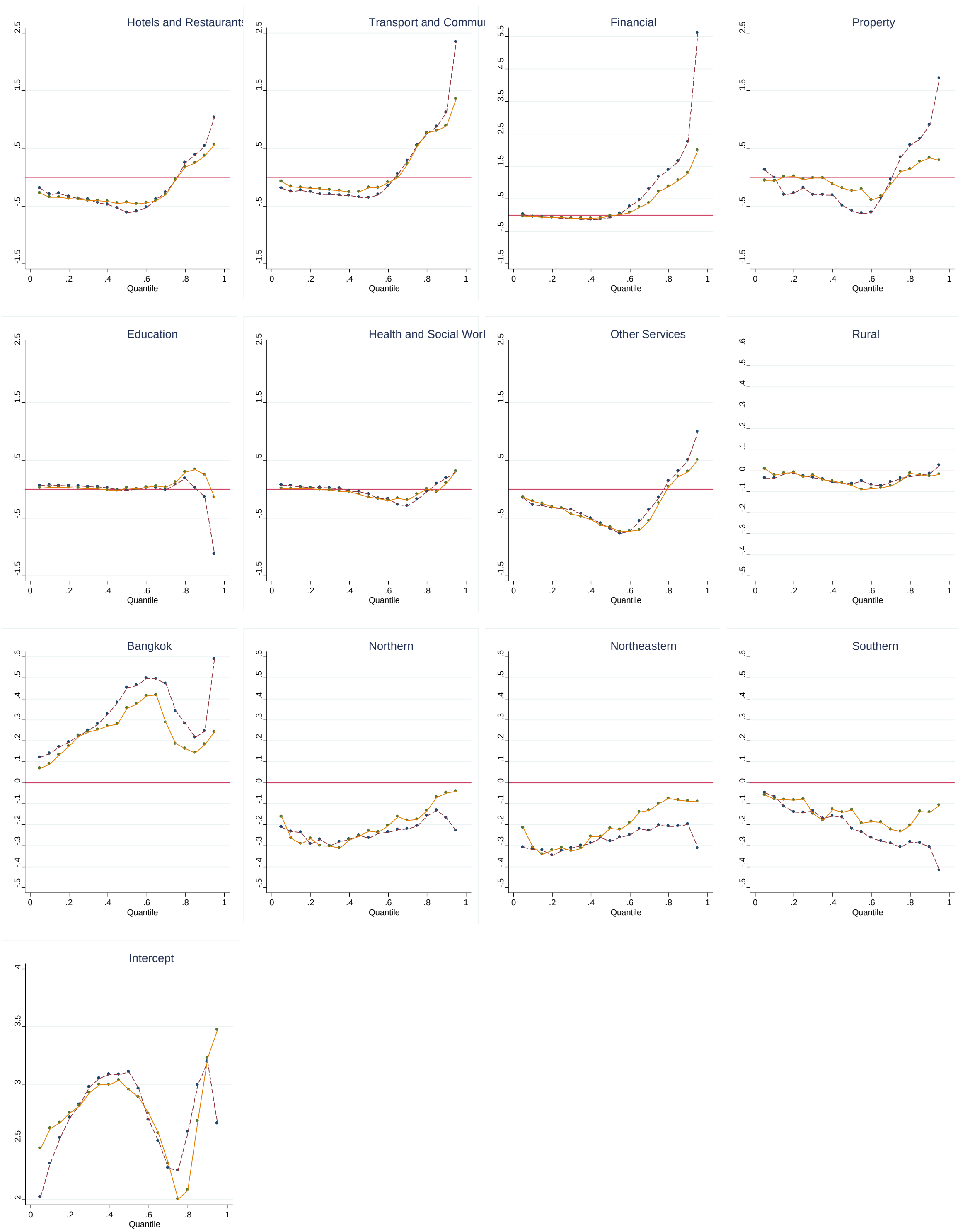
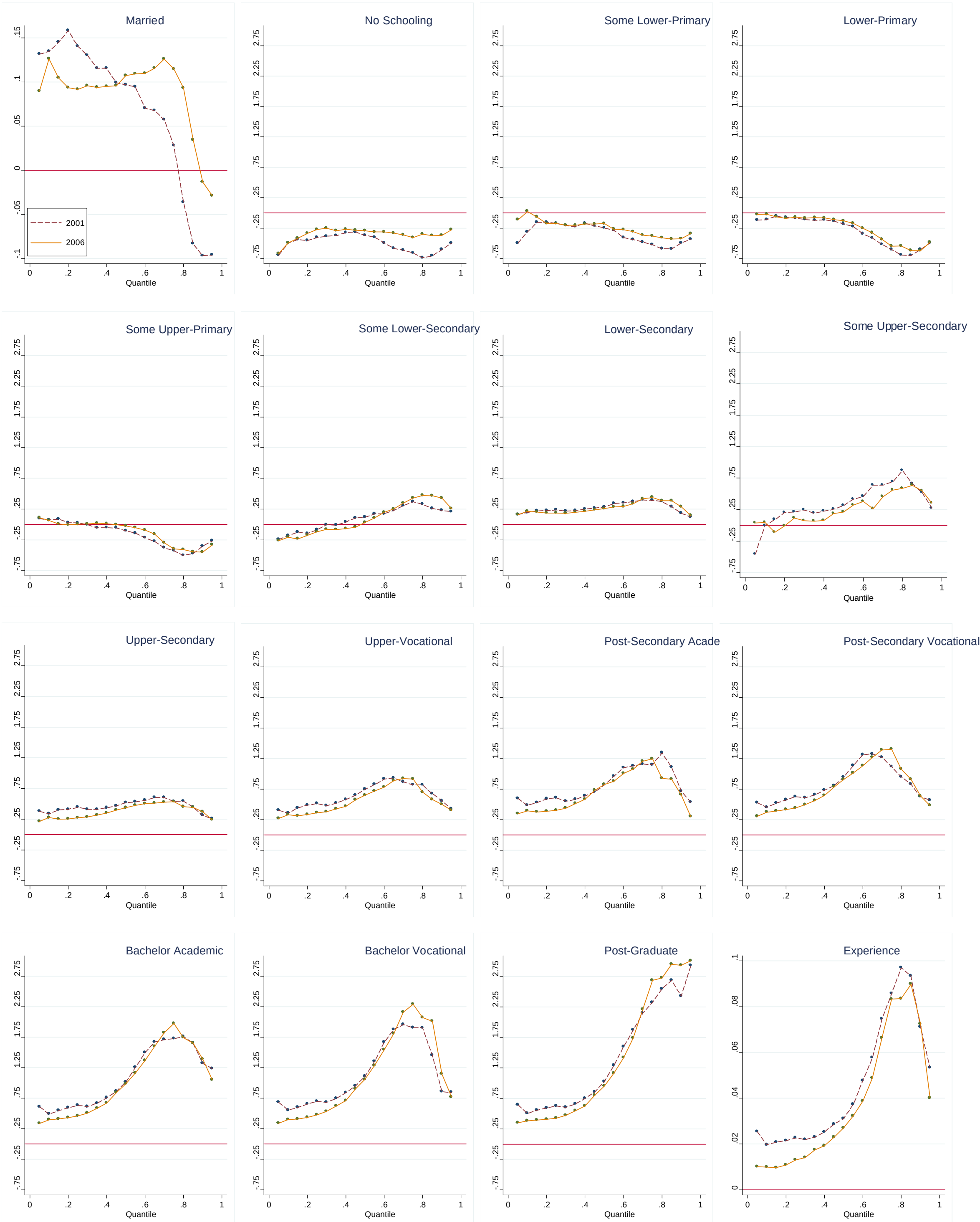
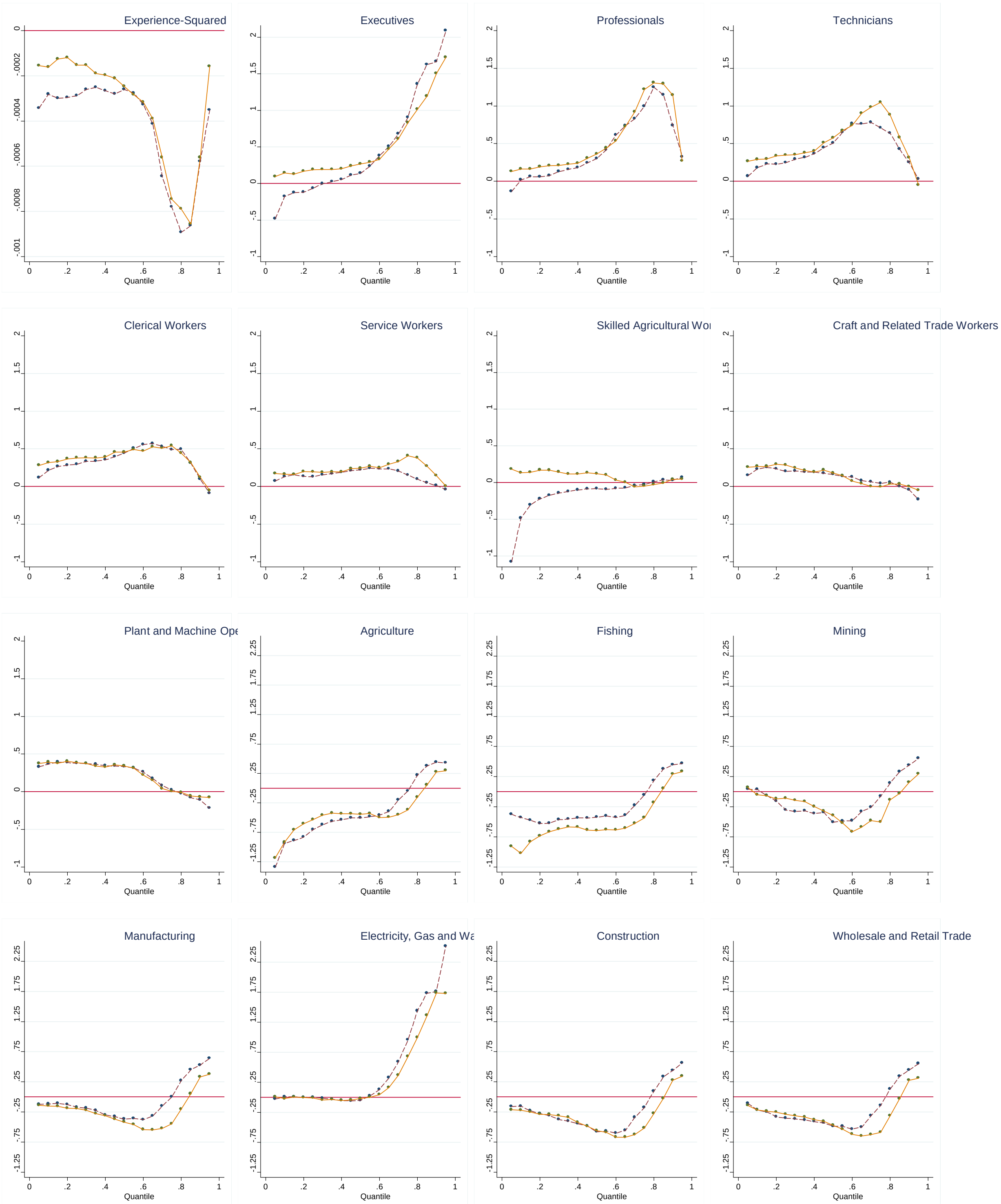
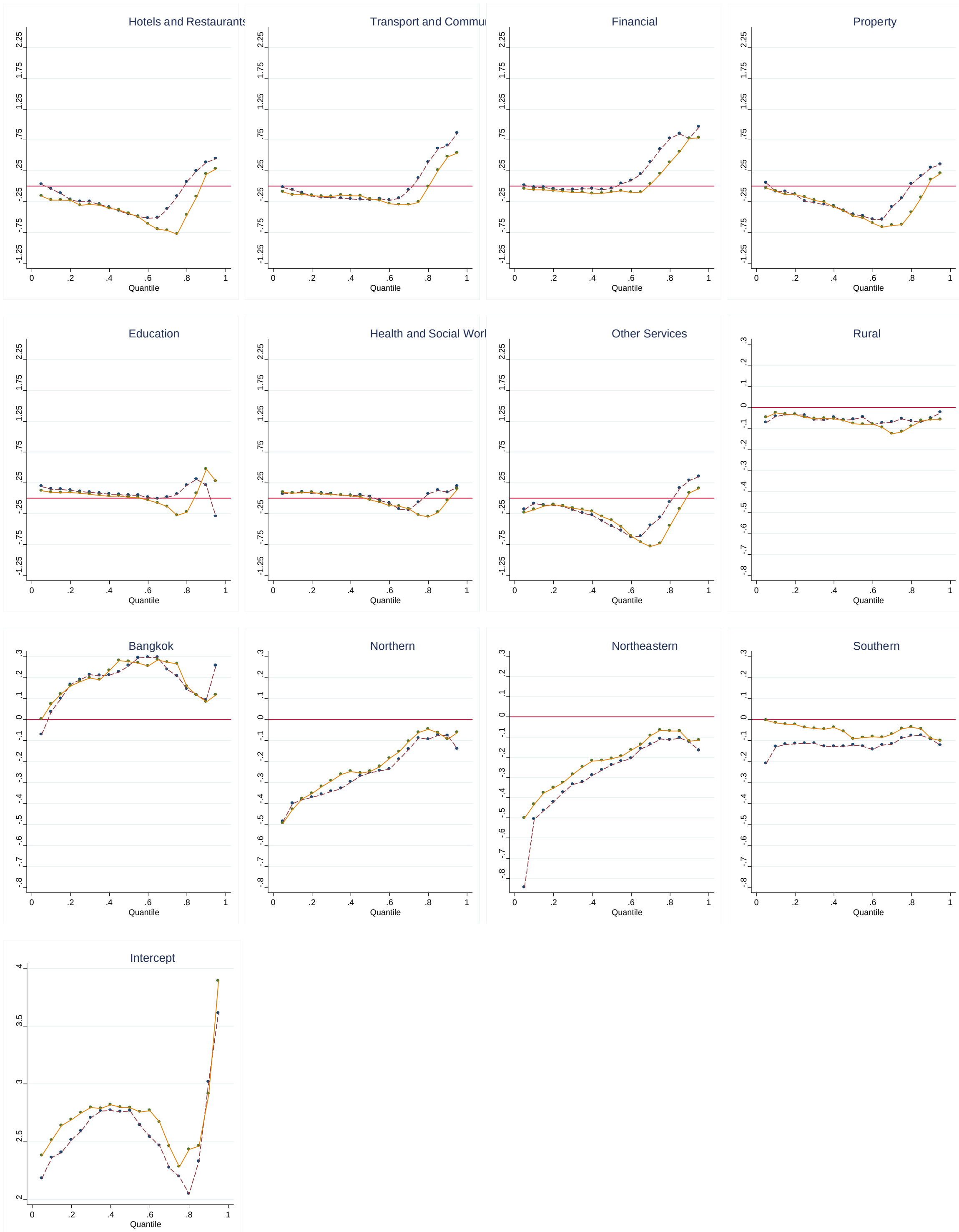

Hotels and Restaurants
Transport and Commu
Financial
Property
Education
Health and Social Worl
Other Services
Rural
Bangkok
Northern
Northeastern
Southern
Intercept
Quantile

FIGURE B3: Recentred Influence Function Regression Coefficients 2001/2006




Experience-Squared
Executives
Professionals
Technicians
Clerical Workers
Service Workers
Skilled Agricultural Wo
Craft and Related Trade Workers
Plant and Machine Ope
Agriculture
Fishing
Mining
Manufacturing
Electricity, Gas and Wa
Construction
Wholesale and Retail Trade
Quantile


Hotels and Restaurants
Transport and Commu
Financial
Property
Education
Health and Social Worl
Other Services
Rural
Bangkok
Northern
Northeastern
Southern
Intercept
Quantile

9 Data Appendix

Variables	LFS codes
Before 2001	
Education Levels	
No Schooling	1 10
Some Lower-Primary	11/13
Lower Primary	14
Some Upper-Primary	15/16 41/42
Upper-Primary	17 43
Some Lower-Secondary	20/22 51/52
Lower Secondary	23 53
Some Upper-Secondary	24/25 26
Upper Secondary	54 55
Upper Vocational	56
Post-Secondary Academic	31/35 73/77 39
Post-Secondary Vocational	61/62
Bachelor Academic	36 78
Bachelor Vocational	63
Post-Graduate	37/38
Occupations	
Executives, Legislators and Senior Officials	0680/0683 1010/1199 3010/3090 4010/4019
Professionals	0937 0010/0039 0110/0199 0210/0520 0610/0633 0684/0935 0Y10/OY99
Technicians and Associated Professionals	0936 0939 2010 2014 9020 9090 0530/0599 3110/3119 9610/9719 0X10/0X99
Clerical Workers	2011/2013 2019/2999
Service and Market Sales Workers	9010 9019 9194 9198 3210/3320 3390/3399 4417/4418 9091/9129 9210/9219 9410/9419 9810/9919
Skilled Agricultural and Fishery Workers	4113/4115 4210/4212 4310/4313 4410/4415
Craft and Related Trades Workers	5010 5013 5994 7510 7519 8199 7020/7299 7320/7329 7359/7416 7419/7502 7530/7659 7692/7729 7790/7992 7994/8129 8140/8149 8220/8270 8272/8273 8290/8299 8410/8412 8533/8599 8730/8739 8760/8769
Plant and Machine Operators	4111 5014 7418 7509 7690 8271 8279 9514 5011/5012 5110/5219 5990/5993 6010/6115 6120/6319 6410/6419 6610/6724 6920/7019 7310/7319 7330/7353 7511/7513 7520/7529 7730/7739 8130/8139 8190/8193 8210/8219 8310/8399 8522/8532 8610/8729 8740/8759 9511/9512
Elementary Occupations	4110 4112 4119 4219 4314 4319 4416 4419 5019 5999 6119 7993 9199 9510 9513 3321/3329 6420/6519 6810/6913 8810/8991 9190/9193 9195/9197 9310/9329 9515/9519
Industries	
Agriculture, Forestry and Hunting	0111/0309
Fishing	0411/0489
Mining and Quarrying	1101/1999

Variables	LFS codes
Before 2001 (continued)	
Manufacturing	2011/3999
Electricity, Gas and Water Supply	5111/5211
Construction	4001/4009
Wholesale and Retail Trade	6111/6129
Hotels and Restaurants	8521/8539
Transport, Storage and Communication	7111/7309
Financial Intermediation	6201/6309
Property and Business Activities	6401/6409 8231/8239
Education	8211/8219
Health and Social Work	8221/8229
Other Services	5221 8241/8399 8411/8431 8541/8599 8511
Public Administration and Defense	8101/8105

Before 2001

Years of Schooling	LFS Codes
0	1 10
1	11
2	12
3	13
4	41 14
5	42 15 16
6	43 17
7	51 20
8	52 21 22
9	53 23
10	54 24
11	55 25
12	56 26
13	31 75 73 61
14	39 32 76 74 62
15	35 34 33 77
16	36 78 63
18	37
21	38

Variables	LFS codes
After 2001	
Education Levels	
No Schooling	0/3
Some Lower-Primary	4/6
Lower Primary	7
Some Upper-Primary	8/9
Upper-Primary	10 35
Some Lower-Secondary	12/14 37/38
Lower Secondary	15 36 39
Some Upper-Secondary	17 18 40 41
Upper Secondary	19 58
Upper Vocational	42 44
Post-Secondary Academic	21/27 59/67 77 82 29
Post-Secondary Vocational	11 16 20 43 55 56 45/53
Bachelor Academic	30 68
Bachelor Vocational	54 57
Post-Graduate	31/33 69/70
Occupations	As in LFS Data Dictionary
Industries	As in LFS Data Dictionary for all other industries except "Other community and social work", " Extra-territorial organizations and bodies" and " Private households with employed persons", which are included under "Other Services"

After 2001

Years of Schooling	LFS Codes
0	0/3
1	4
2	5
3	6
4	7
5	8/9
6	10 35
7	12 37
8	13 14 38
9	15 36 39
10	17 40
11	18 41
12	19 42 44 58
13	11 21 23 29 43 51 60 62 63 45/49
14	16 22 24 50 52 59 61 64 66
15	20 25 26 27 53 55 56 65 67 77 82
16	30 54 57 68
18	31 32 69
21	33 70

References

BLINDER, A. S. (1973): "Wage Discrimination: Reduced Form and Structural Estimates," *The Journal of Human Resources*, 8(4), 436–455.

CHALAMWONG, Y., AND S. AMORNTHUM (2001): "Rate of Return to Education," *Human Resources and the Labour Market of Thailand, by Thailand Development Research Institute.*

COWELL, F. A. (2000): *Measuring Inequality*, LSE Economic Series. Oxford University Press, third edn.

DINARDO, J., N. M. FORTIN, AND T. LEMIEUX (1996): "Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach," *Econometrica*, 64(5), 1001–1044.

FIRPO, S., N. M. FORTIN, AND T. LEMIEUX (2006): "Unconditional Quantile Regression," .

——— (2007): "Decomposing Wage Distributions using Recentered Influence Function Regressions," .

FOFACK, H., AND A. ZEUFACK (1999): "Dynamics of Income Inequality in Thailand: Evidence from Household Pseudo-Panel Data," .

HAMPEL, F. R. (1974): "The Influence Curve and Its Role in Robust Estimation," *Journal of the American Statistical Association*, 69(346), 383–393.

HAWLEY, J. D. (2004): "Changing returns to education in times of prosperity and crisis, Thailand 1985-1998," *Economics of Education Review*, 23(3), 273–286.

ISRANGKURA, A. (2003): "Income inequality and university financing in Thailand," Discussion paper, National Institute of Development Administration (NIDA).

JOSÉ, M., AND A. F. M. JOSÉ (2005): "Counterfactual decomposition of changes in wage distributions using quantile regression," *Journal of Applied Econometrics*, 20(4), 445–465.

KOENKER, R., AND J. BASSETT, GILBERT (1978): "Regression Quantiles," *Econometrica*, 46(1), 33–50.

MELLY, B. (2005): "Decomposition of differences in distribution using quantile regression," *Labour Economics*, 12(4), 577–590.

——— (2006): "Estimation of counterfactual distributions using quantile regression," .

MINCER, J. (1974): *Schooling, Experience, and Earnings*, National Bureau of Economic Research. Columbia University Press.

MISES, R. V. (1947): "On the Asymptotic Distribution of Differentiable Statistical Functions," *The Annals of Mathematical Statistics*, 18(3), 309–348.

Motonishi, T. (2006): "Why has income inequality in Thailand increased?: An analysis using surveys from 1975 to 1998," *Japan and the World Economy*, 18(4), 464–487.

Oaxaca, R. (1973): "Male-Female Wage Differentials in Urban Labor Markets," *International Economic Review*, 14(3), 693–709.