

**Is the Thailand's urban labor market segmented?
Analysis using the switching model with unknown regime**

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Abstract. This paper seeks to show a particular aspect of the Thai labor market along the lines of the theory of labor market segmentation. Contrary to most studies on standard human capital theory in Thailand, the labor market is characterized by two distinct earnings functions. Technically, in order to escape from mythological limits concerning self-selection and truncation bias, this study is conducted under the switching model with unknown regime according to which individuals are sorted into segments without *a priori* demarcation of sectors. The results of the test of the labor market duality suggest that there are not only two different wage equations but also a bipolar form of workers' distribution across different sectors. In fact, there is a substantial number of workers in secondary whose wages are relatively low and returns to human capital variables are nearly nil. Recently implemented policies regarding to poverty and inequality reduction in Thailand should take into account this disparity between two segments in term of wages inequality and differential of return to human capital. Instead of considering the arbitrary sectors' separation such as formal and informal sector into policies implication, our study shows the alternative way to see this specific feature of urban labor market in Thailand.

Keywords: segmented labor market, earnings function, switching model, Thailand.

JEL classification : J31, J42

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1. Introduction

During the 1980's, Thailand's economic growth was considered as one of the most rapid in the world, remaining on average 10 per cent at the end of the 1980's. A number of poor people were considerably reduced by fifty percent between 1960 and 1996. However, such a capitalistic development model has led to increasing income inequality that could be harmful not only to long term economic growth but also to social stability. Several studies have addressed this crucial issue by searching for sources of persistence of inequality, one of the main factors attributed to the labor market outcome (Isra , 2001;Krongkeaw and Kakwani, 2003; NIDA, 2005). Moreover, during the economic crisis in 1997, urban labor market was strongly impacted through wage decompression and increasing unemployment across the whole country. Significant studies specifically focus on workers' skills, in other words the level of education and trainings. Consequently, political responses emphasized especially the promotion of human capital (World Bank, 2001). Accordingly, there has been a series of empirical studies that tend to estimate a standard earnings function using data from Thailand (Hawley, 2000; Blunch , 2004; Yamauchi, 2001). But the question concerns the validity of this single form of rates of return to human capital variables whereas workers become more and more heterogeneous. At the same time, there has been an increasing debate about the labor market segmentation such as formal and informal sectors. However, the use of formal and informal separation turns out to be arbitrary and its notion refers to institutional aspect. Then, according to recent researches (Manoley, 1999; Prapat and Quintin, 2003), individual's choices of the informal sector are in great part voluntary since employments cover partly good pay and better conditions in workplace. Empirical study applied to the Mexico's labor market by Maloney (1999) suggests that *both earnings differentials and patterns of mobility indicate that much of the informal sector is a desirable destination and that the distinct modalities of work are relatively well integrated. ...It is possible that the market is dualistic; however, the good job/bad job division cuts across lines of formality* (Maloney, 1999, p.296-297). To this effect, our analysis tends to verify the duality of the urban labor market in Thailand along the lines of *good* and *bad* job concepts. Empirical tests might give us a bimodal distribution of wages instead of the single earning function claimed by previous researches. In other words, we aim to show that even workers belonging to traditionally strong group- male head of household in the central age-group may be confined to secondary segment. This selection needs to be further discussed.

The theoretical controversy about poverty and persistent inequality is based on the trade-off between labor productivity and earnings. Human capital theory emphasizes that labor productivity resides in personal attributes such as education achievement, experience in the labor market and so on. Consequently, low-wage workers are always considered as those whose labor productivity remains relatively low. Thus, with respect to labor policies of reducing poverty, skill improvement must take place under all programs of education and training incentives. Contrary to this theory, advocates of labor market duality stipulate that labor productivity is based on the characteristics of jobs. In this

view, labor market is divided into two distinct segments, – primary and secondary. The primary sector contains all good jobs associated with high wages, high job security and good conditions in the workplace. The secondary sector covers low-wage jobs, low employment security and bad conditions at work. This distinction leads to the fact that individuals with identical endowment of human capital could gain differently, depending on which sector individuals are confined to. It can be restated that the discrepancy in terms of rates of returns to human capital between each sector is due to different mechanisms of earnings determination (Leontaridi, 1998, p.69). Thus, empirical tests for this hypothesis might show that the labor market is more characterized by two wage equations than a single one.

We adopted the switching model with unknown regime, developed by Dickens and Lang (1985a, 1985b, 1987, 1988, and 1992) for the test of labor market duality. We have several reasons for choosing this model. First, this econometric technique allows us to escape from selection and truncation bias issues because segments are not strictly defined. Then, the switching model only needs a small number of independent variables as compared with other methods such as cluster and factor analysis. The paper is organized as follows. Section 2 provides theoretical backgrounds with respect to the human capital and dual labor market models. Reviews of literature will also be integrated in this section. Section 3 consists of presenting the data used, namely the Labor Force Survey collected by The National Statistics Office in Thailand. Moreover, once the model specification is considered, the results of the test will clarify our hypothesis of the dual labor market. Section 4 describes the individuals' distribution by personal characteristics, industries and job categories.

2. Human capital and dual labor market theories

2.1. Theoretical background

During the 1960's and 1970's, the human capital approaches was pioneered by Schultz (1961) and Becker (1964). According to this model, all human activities are likely to have a more or less positive impact on further returns. For instance, investment in schooling is a result of individual decisions so as to perceive more expected labor income in the future. The relationship between related costs of the investment in human capital (schooling, experience, migration etc.) and returns on those investments was mathematically resumed by the earnings function, developed by Mincer (1974). In fact, in a competitive labor market, highly educated workers earn relatively more money than those with poor education due to the differential in human capital investment. Although individuals with the same human capital endowment earn different level wages at the beginning of their career, differences tend to decrease with time because of the automatic mechanism of the clear labor market. Conversely, according to the institutional theory, there are two types of labor market, namely *competing group* and *non-competing group market*. The first one is similar to the type of labor market described by the

neoclassical theory and the second one refers to groups of individuals who stay less competitive with regard to wage and employment. Beyond this concept, Doeringer and Piore (1971) define the internal and external based industrial relations as follows....*an administrative unit, ..., within which the pricing and allocation of labor is governed by a set of administrative rules and procedures. The internal labor market governed by administrative rules, is to be distinguished from the external labor market of conventional economic theory where pricing, allocating and training decisions are controlled directly by economic variables. These two markets are interconnected however and movement between them occurs at certain job classifications which constitute ports of entry and exit to and from the internal market.* (Doeringer and Piore, 1971, p.2).

Following this description, one can divide the labor market into *good* and *bad* jobs. The primary sector contains a set of *good* jobs whereas the secondary sector includes all *bad* jobs. Regarding the internal sector, since institutional law and customs substitute all mechanisms of the labor market, the employment reallocation and the wage are determined by collective bargaining. Thus, the average wage level remains relatively high. Contrary to the internal market, the secondary segment consists of *bad* jobs and low wages because of the intensive wage competition across the sector. As a result, not only secondary jobs are badly paid but also the return on human capital remains relatively low as labor competition is rough. Such a situation is especially due to the existence of barriers to entry to the primary segment that prevents the labor market from equalizing wages. Consequently, it's likely that poverty and inequality in the labor market is related to the fact that poorly workers face difficult access to the primary segment. The consideration of policies should allow them to easily reach the primary sector (Piore, 1970, p.55)². All in all, in order to cope with the validity of the duality of the labor market, one should show whether there are, on the one hand, two mechanisms of wage determination rather than one, and on the other hand, the existence of barriers to entry to the primary sector. Such an approach requires methodological techniques so as to achieve a decisive conclusion.

2.2. Methodological approaches of dual labor market

During the past three decades, there have been a number of empirical literatures on tests for the labor market segmented using *a priori* definitions of segments. We include in *a priori* definitions of labor segments the techniques of classification by *industrial* and *jobs* categories. Moreover, both techniques of cluster and factor analysis will be considered as non presupposed methods. We will make brief descriptions of those two approaches and their corresponding methodological criticisms.

We qualify *a priori* definition techniques when the demarcation becomes arbitrary either by self-definition of low and high wages or using industrial/occupational classification. In general, the

² For instance, to gain information on employment as well as social network enables workers to escape the situation of confinement in secondary sector (Wial, 1991, p.41).

first step of the process consists of dividing the labor market into two or more distinct segments by wage threshold or job criteria³. Then, one estimates earnings functions for each segment so as to verify whether rates of return on human capital variables show the same story as claimed by the duality model. Most of tests for the validity of the dual labor market (Boston, 1990; Leontarifi, 1998; Theodossiou, 1995) confirm the bimodal wage distribution. In other words, it means that the duality hypothesis is accepted. Although several empirical studies have given almost similar conclusions, such methods suffered from technical problems related to *truncation* and *selection* bias. In fact, using *a priori* definition of segments exposes to truncation bias, noted by Cain (1976), and to selection bias, commented by Heckman (1979). With respect to the truncation issue, the econometric regression on data truncated on the values of dependent variables gives biased coefficients of independent variables. This is due to the fact that some groups of the population being at the top or at the bottom of wage distribution were excluded from the estimation processes (Cain, 1976, p.1246). As a result, the validity of the labor market duality was simply indicated by the high degree of dependence between wage and human capital variables. Besides allowing for this mythological limit, the coefficients from estimated wage equations could also be caused by the selection bias. According to Heckman (1979), such a problem occurs through the fact that a given sample is arbitrarily selected in order to establish economic comprehension with regard to human behavior. There are two sources of selectivity. First, it concerns a process of collecting cross-sectional samples. For instance, there could be an overrepresentation of women and poorly educated workers in a specific survey such as informal sector studies. Second, the selection bias could be related to auto-selection mechanisms of researchers or pollster's decisions with respect to *a priori* demarcation. For example, the self-selection of some low-wage job categories generates an overrepresentation of young workers with low education attainment. Thus, low returns on human capital variables directly derive from this self-selection.

Concerning the cluster and factor analysis, the technical advantage is to avoid the above problems. However, the conclusions of studies using cluster analysis seem to be divergent with respect to theoretical predictions of dual labor markets (Anderson *et al.*, 1986; Sloane *et al.*,1993). For instance, Anderson *et al.* (1986) found that their second cluster, considered as a primary segment, contained not only a great proportion of workers, but also a substantial number of casual workers that were not indicated by the duality model. Moreover, *although cluster analysis solves the problem of a priori segment determination, the results are highly dependent upon the number or type of variables used to determine the cluster and the kind of algorithms used* (Leontaridi, 1998, p.61). With regard to the factor analysis technique, most empirical researches⁴ failed to reject the duality of the labor market. *It was found however, that such analysis only served to reinforce the perceived homogeneity*

³ For instance, studies of Psacharopoulos(1978), McNabb and Psacharopoulos(1981) were based on *occupational rating scale*, developed by Goldthorpe and Hope (1974).

⁴ Buchele (1983) and McNabb (1986) used the factor analysis as so to separate labor segments and then the authors preceded the estimation of wage functions. Those studies confirmed the existence of dual labor market.

of the labor market... This technique has been used most widely to test a 'strict' industrial dualism model (Thomson, 2002, p.19). As a result, all above methods have been strongly criticized with regard to technical limits and economic interpretations⁵. However, the contribution of Dickens and Lang (1985a, 1985b, 1987, 1988, and 1992) to the switching model with unknown regime manages to get through all above criticisms. However, one should pay attention to its dual forms of labor and hence Dickens and Lang argue that *we do not propose that the labor market consists of exactly two distinct segments. Only that dualism is a useful simplification* (Dickens and Lang, 1988, p.131). Moreover, we are not indifferent to the specificity of labor markets in developing countries according to which there are likely be more than two segments. This depends on objectives of studies⁶.

3. Model specification and sample selection

This section consists of specifying econometric models and labor data used. As mentioned above, the test for segmentation will be conducted under the switching model with unknown regime using the Labor force survey from 2002 and 2003.

3.1. General setting

The switching model derives from the endogenous econometric approach⁷ because individuals were classified into segments by observed variables. To begin, consider a worker who maximizes the lifetime utility functions over wage and non-pecuniary characteristics of the job. The standard form of switching model with one sorting equation and two regimes equations could be described as follows:

$$\ln W_{ip} = X_i \lambda_p + v_{pi} \quad (1-1)$$

$$\ln W_{is} = X_i \lambda_s + v_{si} \quad (1-2)$$

$$Z^*_i = D_i \Pi + v_{wi} \quad (1-3)$$

Sorting equation (1-3) reflects the probability of an individual's attachment to the primary sector. In other words, it serves as a selection criterion that sorts workers into primary or secondary segments according to their observed characteristics. $\ln W_{ip}$ and $\ln W_{is}$ are both logs of wage associated to upper and lower tier respectively. X_i and D_i are independent variables. Then, λ_p , λ_s and Π represent the coefficients related to two regimes equations and sorting equation. Finally, v_{pi} , v_{si} and v_{wi} are considered as error terms of the three equations. In fact, as Z^* is a latent variable and non-observable, it may be defined through W_i :

⁵ See also the technical method proposed by Lachaud (1994) based on jobs and workers characteristics, namely protection, regularity and autonomy, suggest that most of urban labor markets in Africa are segmented, caused particularly by discriminations in workplace.

⁶ See recent research on this field in developing countries for instance, Bowles and Dong (2002) and ADB (2005).

⁷ See Maddala (1983) for the original version of all endogenous switching methods.

$$W_i = \ln W_{ip} \quad \text{if } Z^* > 0 \quad (1-4)$$

$$W_i = \ln W_{is} \quad \text{if } Z^* \leq 0 \quad (1-5)$$

With respect to this specification, Z^* simply derives from utilities differences between primary and secondary segments (idem page précédente). Indeed, the probability attached to the primary sector reflects those differences. To establish the log likelihood function, some assumptions might be introduced. The strong hypothesis of this standard model, that would be worth being further discussed, concerns the actual form of error terms distribution. In fact, in this paper, errors terms follow the normal distribution. Then, the log-likelihood function for this model is given by:

$$\sum_{i=1}^N \ln \left\{ 1 - \theta \left[\frac{-D_i \Pi - \frac{\sigma_{pw}}{\sigma_{pp}} v_{pi}}{\left(1 - \frac{\sigma_{pw}^2}{\sigma_{pp}^2}\right)^{1/2}} \right] \cdot \phi \left(\frac{v_{pi}}{\sigma_{pp}^{1/2}} \right) \cdot \sigma_{pp}^{-1/2} + \theta \left[\frac{-D_i \Pi - \frac{\sigma_{sw}}{\sigma_{ss}} v_{si}}{\left(1 - \frac{\sigma_{sw}^2}{\sigma_{ss}^2}\right)^{1/2}} \right] \cdot \phi \left(\frac{v_{si}}{\sigma_{ss}^{1/2}} \right) \cdot \sigma_{ss}^{-1/2} \right\} \quad (1-7)$$

It is technically shown that the variance of error terms in a switching equation has to be normalized to one since variance-covariance matrix requires an identification⁸. Regarding to the function (1-7), σ_{pw} and σ_{sw} are covariances between v_{pi} and v_{wi} and between v_{si} and v_{wi} , respectively; σ_{pp} and σ_{ss} are variances of error terms for primary and secondary wage equation. $\theta(\cdot)$ and $\phi(\cdot)$ are the normal density and accumulative distribution. Furthermore, the results given by the switching model with unknown regime will be compared with those stimulated by the Ordinary Least Square method (OLS) in order to show which of them better represents the sample. To this end, the OLS has to be replaced by the log-likelihood method so as to make it comparable with the switching model. Thus, the alternative hypothesis is the existence of only one wage equation. The log-likelihood (1-7) with these restrictions⁹ collapses to:

$$LFR = \prod_{i=1}^N \left[\sigma^{-1/2} \phi \left(\frac{Y_i - \tilde{X}_i \tilde{\beta}}{\sigma^{1/2}} \right) \right] \quad (1-8)$$

Maximization of log-likelihood functions must be made with sample selection as so to maintain the credibility of the test.

⁸ The variance-covariance matrix described as follows :

$$Cov(v_p, v_s, v_w) = \begin{bmatrix} \sigma_p^2 & \sigma_{ps}^2 & \sigma_{pw}^2 \\ \sigma_{sp}^2 & \sigma_s^2 & \sigma_{sw}^2 \\ \sigma_{wp}^2 & \sigma_{ws}^2 & \sigma_w^2 \end{bmatrix}$$

⁹ It means that there is one set of parameters: $\tilde{\beta}_s = \tilde{\beta}_p = \tilde{\beta}$; $v_s = v_p = v$; $\sigma_{ss} = \sigma_{pp} = \sigma$.

3.2. Data selections

Data from Labor Force Survey (LFS) for the years 2002 and 2003 are used. The LFS is a nationwide and representative survey annually collected by The National Statistics Office. The first LFS was conducted in 1963. Beginning in 1971, two rounds of the survey have been conducted each year: the first round enumeration was held during January-March corresponding to the non-agricultural season and the second round during July-September coinciding with the agricultural season. From 1998 to 2000, the LFS had been undertaken 4 rounds a year; the first round in February, the second in May, the third and the fourth round in August and November respectively. Since 2001, the LFS has been conducted monthly. The data have been collected by using a series of questionnaires intended for more than 60 thousand households a year. The LFS allows for the main variables in relation to work conditions such as employment, unemployment, the number of work hours, the wage, the industrial and professional types, and the educational achievement and so on. Although this data is based on international standards in terms of concept, definition and classification, there are a large number of technical limits. At one point, it is possible that an account of employed persons is overestimated with regard to numbers of work hours. This is due to the large definition of employed that refers to all persons who work for at least one hour paid or unpaid during a week (Anon Juntavich, 2000, p.7). Then, since 2001, the classification in terms of industrial and professional types has been modified so as to update the survey regarding international classification changes. It is thus difficult to compare the data between 1961-2000 and 2001-2004, particularly with respect to the industrial and occupational classification. Finally, countability of unemployed suffers from a seasonally adjusted bias. According to all those issues, our study is based on data from LFS for the year 2002 and 2003 since those two years are considered as the most relevant survey in terms of international standard.

One of the specificities of the switching model concerns a crucial assumption relative to the non-pecuniary characteristics of a job. In fact, the non-pecuniary components are important for people's well being. However, the model supposes that these elements do not explain workers' choices because their contribution to utility does not change with the observable characteristics of the individual (Cipollone, 2001, p.10). This assumption says that two different individuals will make the same evaluation of jobs' non-pecuniary characteristics. The credibility of the test is destroyed if workers are heterogeneous. The way to reduce this effect is making the population more homogeneous. In other words, a homogeneous group of people should have the same preferences of jobs' non-pecuniary aspects. The selection will include workers in private companies, non agricultural, in urban areas, aged between 15 and 64 years old. For males, the sample contains only heads of household in order to respect the homogeneity of workers' evaluation of jobs. One should expect it to be harder to find evidence for the dual labor market among heads of household than mixed population. For females, representative individuals could be either head of household or spouse. With respect to

work hours and the wage, individuals considered might have at least 20 hours a week. The wage is the hourly wage¹⁰ including all benefits related to both primary and secondary jobs.

The selection of relevant independent variables could be pointed out as follows. Educational achievement is one of the survey's categorical variables. A number of years of schooling are computed according to Thailand's educational classification. Experience is then constructed as potential experience and experience squared is simply the product vector of the latter¹¹. We also introduce the variable potential experience multiplied by educational attainment as a complementary effect between experience and education¹². Besides years of schooling, we introduce three dummy variables into the switching equation such as *highly skilled worker*, *size of firm* and *residence in Bangkok*. In fact, the International Standard Classification of occupation (ISCO-88) classifies all occupations according to skill levels (ILO, 1990). In this analysis, *highly skilled worker* could be defined as persons whose jobs meet the third and fifth skill level, namely (1) *legislators, senior*, (2) *officials and managers*, (3) *Professionals*, (4) *Technicians and associate professionals*. Thus, if the worker has a mentioned job, *highly skilled job* = 1 and 0 otherwise. Regarding *size of firm* variable, we follow the evidence from Suehiro and Wailersak (2004)¹³ that shows high probabilities of large firms to promote internal labor market, especially among managers. If an individual works in a firm whose size is more than 50 persons, *size of firm*=1 and 0 otherwise. The last dummy variable concerns residence in Bangkok, the capital of Thailand, where there is a great concentration of economic activities. If the worker reside in Bangkok, *Bangkok*=1 and 0 otherwise.

4. Results

Two steps of test for the existence of a dual labor market were required. First, the labor market must consist of two distinct wage equations rather than one single function. To do so, results of estimates should confirm that two wage equations given by switching model with unknown regime are more acute than one standard equation set by the OLS. Then, relevant coefficients must allow us to check if returns on human capital in the primary segment are largely more than those in the secondary segment. Moreover, this last segment should show that returns on human capital are nearly nil.

¹⁰ To compute hourly wage, monthly wage registered in LFS is divided by 4 as so to get a weekly wage and then numbers of works hours by week is used for dividing weekly wage.

¹¹ We note that those independent variables are defined following the standard earnings function, see Mincer (1964). The potential experience is computed by age-6-years of schooling. The experience² is introduced for capturing the depreciation of human capital.

¹² Futoshi (2004) shows that schooling and destination experience are complementary in migrants' wage adjustment in Thai urban labor market. Following this study, we will closely look at the complementary effect by introducing this variable.

¹³ Suehiro and Wailersak (2004) claims that there are internal labor market within the great enterprise in Thailand, such as public company "*Siam Cement Public Company Limited*". This firm, one of the most modern companies, promotes manager carriers development and internal mobility that generate internal labor market.

4.1. Estimates results

The optimization process of the log-likelihood function is obtained with difficulties. This is mainly due to the fact that optimizations depend largely on types of algorithms used. Some basic algorithms failed to reach the maximum of log-likelihood. Among basic optimization algorithms under the program Limdep version 7¹⁴, we used two algorithms, namely BFGS for the first run and Newton's for reaching the maximum. Several starting values were tested in order to avoid unbounded areas or inexistent maxima. Tables 1 and 2 show results of estimates for men and women, respectively. We note that the first column derives from the OLS estimation, replaced by the maximum likelihood. The next three columns report two wage equations for primary and secondary sectors and one sorting equation, respectively. We include in our tables all variances of wages equations, except for covariances of error terms. As mentioned above, our variances of switching equation were normalized to one in order to respect the identification of variance-covariances matrix. Those tables also show the values of log-likelihood and log-likelihood ratios that we need to compute our statistical test.

According to our regression, attention should be drawn to relevant coefficients of switching equation. At first glance, most coefficients seem to be statistically significant at convention level for both males and females, except for the coefficients of education variable for 2002 that are significantly nil for all sexes. In other words, it means that our selected variables are merely relevant. It can be noticed that having a highly skilled job increases substantially the probability of being in the primary sector. The positive coefficients of *size of firm* and *residence in Bangkok* variables reflect the positive impact of being in a great firm and in Bangkok on the probability of having a job in the upper tier of the labor market. However the coefficients of education variables in sorting equation are rather low as compared to others. This result suggests that being more educated has only a slight impact on the probability of obtaining a primary job. For 2003, they turn out to be positively significant for both males and females. Therefore, taking into account these differences, we can say that entry to the primary segment depends not only on the human capital, but also closely on other factors such as occupational and firm types and geographical area. Moreover, the complementary hypothesis with regard to trade-off between education and experience is surprisingly contrary to what we expected. The coefficient of variable *experience*education* drawn from OLS method appears to be positively significant at convention level while in switching model, it differs from one sector to another. For instance, the impact of this complementarily on wage seems to be negative for male head-of-household in 2003 while it is significantly positive for females in 2002 and 2003.

¹⁴ The basic algorithms in LIMDEP v.7 (Green, 1995) are Broyden-Fletcher-Goldfarb-Shanno(BFGS); Dadidon-Fletcher-Powell (DEP); Steepest ascent; Newton's and Berndt-Hall-Hall-Hausman (BHHH).

Table 1: Switching regression model: males (2002-2003).

	Males							
	2002				2003			
	OLS	Primary	Secondary	Switching	OLS	Primary	Secondary	Switching
Constant	0.7561	0.1028	1.1860	-1.1608	0.6579	-0.0900	1.1172	-1.3836
	9.222***	0.737	13.797***	-8.782***	8.023***	-0.562	11.701***	-9.806***
Education (years)	0.0556	0.1080	0.0166	0.0180	0.0657	0.1285	0.0193	0.0447
	9.347***	11.372***	2.387**	1.304	11.277***	11.224***	2.432**	2.823***
Experience (years)	0.0191	0.0735	0.0057		0.0171	0.0696	0.0095	
	3.746***	8.895***	1.109		3.444***	7.581***	1.777	
Experience ²	-0.0004	-0.0009	-0.0002		-0.0003	-0.0007	-0.0002	
	-5.562***	-7.460***	-2.513**		-4.520***	-5.528***	-3.033***	
Experience*Education	0.0015	-0.0008	0.0006		0.0014	-0.0013	0.0005	
	5.683***		2.135*		5.325***	-3.032***	1.656	
Highly skilled worker				1.0805				0.7632
				10.268***				8.735***
Size of firm (>50)				0.3417				0.3253
				5.400***				5.493***
Residence in Bangkok				0.3475				0.3492
				5.616***				6.020***
Standard error	0.1131	0.0670	0.0543	one	0.1162	0.0855	0.0558	one
	28.636***	11.654***	14.229***		30.619***	9.610***	12.086***	
Log-likelihood	-539.7693		-186.4610		-642.4238		-281.1392	
Log-likelihood ratio			706.6166				722.5692	
N			1640				1875	

Notes: *significant at 10%; ** significant at 5%; *** significant at 1% and t-student is indicated under coefficients.

Table 2: Switching regression model: females (2002-2003).

	Females							
	2002				2003			
	OLS	Primary	Secondary	Switching	OLS	Primary	Secondary	Switching
Constant	0.8030	0.5305	1.0592	-1.2322	0.8054	0.5924	1.3158	-2.1813
	11.802***	2.900***	13.043***	-7.409***	10.450***	3.482***	17.595***	-12.285***
Education (years)	0.0547	0.0879	0.0266	0.0070	0.0558	0.0779	-0.0019	0.1250
	11.239***	7.716***	4.222***	0.3880	10.421***	7.042***	-0.293	8.238***
Experience (years)	0.0131	0.0321	0.0052		0.0065	0.0263	0.0008	
	2.844***	2.396**	0.9590		1.268***	2.365**	0.179	
Experience ²	-0.0004	-0.0004	-0.0003		-0.0003	-0.0003	-0.0002	
	-5.784***	-1.851	-3.850***		-3.585***	-1.479	-2.836***	
Experience*Education	0.0013	0.0005	0.0010		0.0018	0.0006	0.0009	
	5.451***	0.723	3.0190***		7.005***	1.141	3.257***	
Highly skilled worker				0.6917				0.5536
				6.893***				4.554***
Size of firm (>50)				0.4509				0.5994
				6.850***				7.583***
Residence in Bangkok				0.2826				0.3891
				4.400***				5.189***
Standard error	0.0876	0.0769	0.0555	one	0.1022	0.1344	0.0341	one
	29.1380***	9.474***	15.856***		28.644***	14.806***	13.152***	
Log-likelihood	-341.9806		-52.0109		-457.1117		-90.0015	
Log-likelihood ratio			579.9395				734.2205	
N			1698				1641	

Notes: *significant at 10%; ** significant at 5%; *** significant at 1% and t-student is indicated under coefficients.

Now, we turn attention to constant values that are different from one sector to another. One can see that the coefficients of constants are all lower in the primary sector than those of secondary sector. This is due partly to the fact that the shorter term relationship between workers and firms in secondary sector provokes a substantial wage premium while the employment relationship in primary sector is likely to be long term. Then, as workers in secondary start working younger than primary workers, the high level of the constant may be explained by experience accumulated between the actual age and entry age for secondary workers.

4.2. Test results

As noted above, to test the dual labor market hypothesis according to which there are two distinct segments, we need to show that the primary wage equation is different from that of the secondary sector. The standard approach calls for the likelihood ratio test¹⁵ used by Dickens and Lang. Such a method requires an alternative hypothesis that is the single wage equation. To do so, some coefficients in switching regression have to be restricted. The problem arises from the fixation of a degree of liberty since two covariances of error terms remain non-identified¹⁶. Dickens and Lang (1985a) suggest that Monte Carlo results consisting in using a chi-squared distribution with degrees of freedom equal to the difference between the number of parameters in the unconstrained and constrained equations (Goldfeld and Quint, 1975). In the case of this study, the degrees of liberty are equal to 13: 6 parameters constraints to equality for two wag equations; 5 parameters constraints to zero in sorting equation and 2 non-identified covariances. The log-likelihood ratio indicated in tables 1 and 2 reveal that the two-equation model clearly fits the data better than the single-equation model. In fact, as observed in those tables, log-likelihood ratios are largely far away from 34.53, the critical value at one percent of error risk: 579.939 for males and 734.220 for females. Thus, it can be argued that the two-equation model fix the data better than the single equation. However, it would be better to note that the assumption of normal distribution of error terms was strongly criticized by Heckman and Hotz (1986). In fact, according to authors, the error terms of the switching equation may follow other forms. The validity of this test would derive from the distributional assumption. Dickens and Lang (1992) apply a goodness of fit test in order to reply to this criticism. They fail to reject the distributional assumption at the 0.05 level. The recent study by Baffoe-Bonnie (2003) allows for Weibull distribution of error terms that avoids the normality assumption. The results of the estimation are similar to those obtained by the normal distribution model.

The next step of the test consists in verifying whether these equations resemble the prediction of the dual labor market. In other words, we show that the primary segment gives more returns on human capital than those in the secondary segment on the one hand, and the impact of human capital variables on the wage is not significant in the secondary sector, on the other hand. To this end, we need to compute the rates of return on each variable of human capital.

Considers our standard earning function as follows:

$$E(\log W_i | W_i = W_p) = \beta_{p0} + \beta_{p1}s_i + \beta_{p2}e_i + \beta_{p3}e_i^2 + \beta_{p4}e_i s_i \quad (1-9)$$

The implied rate of return to schooling is

¹⁵ The log-likelihood ratio test (LRT) could be mentioned as follow:

$$LRT = -2 \log \frac{\prod_{i=1}^N LFR_i}{\prod_{i=1}^N LFUN_i} = -2 \log \frac{Max_{\beta} LFR}{Max_{\beta} LFUN}$$

¹⁶ It concerns the covariances of error terms between the sorting equation and the primary wage equation on the one hand, sorting equation and secondary wage equation on the other hand.

$$\partial E(\log W | W = W_p) / \partial s = \beta_{p1} s_i + \beta_{p4} \bar{e} \quad (1-10)$$

And the rate of return to experience is

$$\partial E(\log W | W = W_p) / \partial e = \beta_{p2} + 2\beta_{p3} \bar{e} + \beta_{p4} \bar{s} \quad (1-11)$$

The rates of return on human capital for the secondary sector are analogically expressed. The rates of returns on human capital variables and the predicted wages (in log) for the primary and secondary sectors are reported in table 4.

Table 4: Returns (%) to human capital variables in the primary and secondary sectors and predicted wages.

		Schooling		Experience		Log wage	
		Primary	Secondary	Primary	Secondary	Primary	Secondary
Males	2002	8.8	2.9	2.2	0.3	2.4	1.4
	2003	10.0	3.0	2.5	0.4	2.4	1.4
Females	2002	9.6	4.5	2.2	0.2	2.3	1.4
	2003	8.7	1.6	2.6	0.0	2.2	1.3

The results show that returns on human capital variables are different across sectors. For both men and women, rates of return on schooling and experience are higher for the upper tier than the lower tier. Returns to schooling and experience are relatively low in secondary sector, as predicted by the traditional literature on segmentation. Surprisingly, return to experience for females in secondary segment is nil whereas it is positively significant for females in the primary segment. Regarding wage prediction, it can be noted that predicted wages obtained by workers in primary sector are on average higher in the primary sector than in the secondary sector. One should claim the endogeneity of human capital variables, especially education attainment and experience¹⁷. Cipollone(2001) takes into account into the regression. The author found that the effect of endogeneity on human capital is quite strong but it does not have a significant impact on human capital variables in the switching model. Thus, the endogeneity does not alter the overall qualitative picture by comparison with the standard model. All in all, we conclude that the urban labor market in Thailand is clearly segmented. Furthermore, the form of distribution of workers for each segment should give more information about wage disparities.

5. Distribution of workers in the primary and secondary segments.

The model does not say which sector workers belong to. We need to compute the probability of being in the primary sector using the conditional probability¹⁸.

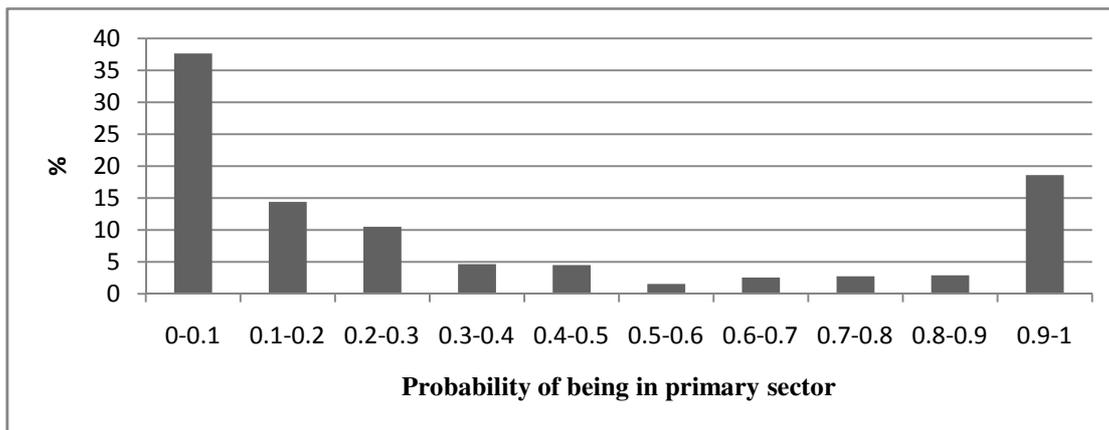
¹⁷ This leads to the fact that labor market experience and educational attainment may be correlated with unobservable individual ability component. In this case, the coefficients from OLS will be biased.

¹⁸ This expression is simply a mathematical formula by Bayes' Theorem.

$$\frac{\Pr \{v_{wi} > -D_i \Pi | D_i, X_i, v_{pi} \} \cdot f(v_{pi})}{\Pr \{v_{wi} > -D_i \Pi | D_i, X_i, v_{pi} \} \cdot f(v_{pi}) + \Pr \{v_{wi} \leq -D_i \Pi | D_i, X_i, v_{si} \} \cdot f(v_{si})} \quad (1-12)$$

Figure 1 reports the distribution of workers in percentages according to their probability of belonging to the primary sector for males in 2002. Figure 1 shows that the distribution of workers is bimodal. In other words, there is a bipolar concentration of individuals. One fraction of the population is less attached to the primary sector while the other seems to be more covered by this segment. However it is impossible to determine a worker's segment if the predicted probabilities are around 50 per cent. Consequently, we classify all workers into segment by using the following threshold. The secondary sector contains workers whose probabilities are in the ranges 0-0.3 percent. The primary sector includes workers whose probabilities are in the ranges 0.70-1.0 percent. If the probabilities remain between 0.3 and 0.7 percent, workers will be considered as not classified. Contrary to studies from developed countries¹⁹, most Thai workers are classified into the secondary sector. Only one-third of individuals are in the primary sector. According to table 5, some important points should be noted.

Figure 1: Distribution of workers according to the predicted probability of being in the primary sector.



On the first point, the probability of having a job in the primary sector rises with the education level. Almost all individuals with no education work in the secondary. The greater the number of schooling year is, the more workers have the probability of being in the primary segment. Thus individuals with a university education have relatively more chance of working in the primary sector. Moreover, as expected, residing in Bangkok and the vicinity and having at least an elementary schooling reduces a risk of being in the secondary tier. Regarding the remaining areas, there is a relatively high share of individuals with a residence in the central and southern regions as compared to those being in the northern and northeastern areas. This is due to the fact that not only those regions

¹⁹ Dickens and Lang (1985a) and Cipollone (2002) found that a substantial number of workers were classified in primary sector.

are less economically developed but also there are a substantial number of poor people in those regions. Finally, the probability of belonging to the primary sector rise with potential experience. Otherwise, workers with high experience in the labor market have relatively more probability of being in the primary tier. Table 5 reports the distribution of workers by individuals' characteristics, industry and occupational category for males.

Table 5: composition of the sample by workers' characteristics, by Industry and occupation category, males and head of household for 2002 (%).

	<i>Primary</i>	<i>Not classified</i>	<i>Secondary</i>	<i>Total</i>
Education				
No education	0.0	20.7	79.3	100
Primary	10.1	13.7	76.2	100
Lower secondary	15.8	15.4	68.9	100
Upper secondary (general)	20.8	14.9	64.3	100
Upper secondary (vocation)	39.5	8.4	52.1	100
Diploma level	34.3	13.9	51.8	100
University	70.8	9.1	20.1	100
total	24.2	13.2	62.6	100
Region				
Bangkok and vicinity	27.9	16.0	56.2	100
Centre	23.7	12.6	63.8	100
North	12.2	6.3	81.5	100
Northeast	14.3	3.9	81.8	100
South	24.2	13.2	62.6	100
total	24.2	13.2	62.6	100
Experience				
0-10	16.9	16.0	67.2	100
11-20	22.2	16.9	60.8	100
21-30	27.5	10.1	62.4	100
31-40	34.2	7.1	58.7	100
>41	17.0	10.5	72.5	100
Occupational Category⁽²⁾				
Senior officials and managers	83.9	4.8	11.3	100
Professionals	77.7	14.9	7.3	100
Associate professionals	61.5	17.0	21.4	100
Clerks	37.4	13.0	49.6	100
Service and sales workers	8.4	7.9	83.7	100
Craft and related trades workers	8.3	10.7	81.1	100
Machine operators	16.2	18.3	65.5	100
Elementary occupations	3.8	13.2	83.0	100
Industry Category⁽¹⁾				
Industry	23.5	16.9	59.7	100
Construction	11.5	5.7	82.8	100
Electricity, gas and water supply	79.5	12.1	8.4	100
Wholesale trade	17.0	14.2	68.8	100
Transportation and communication	30.7	13.9	55.4	100
Business services	20.4	12.6	67.0	100
Banking and financial services	47.5	5.6	46.9	100
total	24.2	13.2	62.6	100

Notes: (1) Industry category follows the International Standard Classification of Industry (ISCI-88); (2) Occupational category follows the International Standard Classification of Occupation (ISCO-88).

We turn our attention to the distribution of workers by industry and occupational category. Table 5 indicates that some industries and occupations maintain the large share of primary jobs to the detriment of their counterparts. With regard to occupational distribution, the majority of primary jobs belongs to the first three occupational categories such as senior officials and managers, professionals and associate professionals. It is not surprising since those jobs are considered as highly skilled jobs that in turn generate a better pay. At the same time, most individuals with low skilled jobs such as sales and trade workers and elementary occupations have more risk of being in the secondary segment. These findings confirm the prediction of the theory of segmentation which suggests the distinction between good and bad jobs in the labor market. In fact, the good jobs are mostly found in highly

skilled professions, especially in the primary sector while the bad jobs correspond to low skilled professions. Such an idea reaches an important point of our studies since it refutes most previous studies' conclusion with regard to resources of increasing earning inequality²⁰. With respect to workers' distribution by industry type, workers seem to be equally distributed by each sector of production, except for certain sectors. In fact, having a job in the electricity, gas and water supply or banking and financial services' sector generates substantially the probability of being classified in the primary sector while working in the construction sector entail the increasing probability of being in secondary sector.

6. Conclusion

The objective of this study consists in clarifying the sources of persistent earning inequality along the lines of the theory of the labor market segmentation. The analysis tends to establish the existence of bimodal structure of the wages distribution, contrary to previous research in the human capital field. Using the Switching method with unknown regime, our test results show a particular side of the labor market structure in Thailand. First, we explain the persistent wage inequality by the existence of a labor market duality. In fact, using the switching model with unknown regime, the empirical test of the duality of the labor market leads us to reject the assumption of the human capital model according to which there is only one earnings function for the all heterogeneous population. In other words, the wage dispersion is partially explained by this duality in terms of income distribution. The returns to human capital differ from one sector to another, consequence of a dynamic process of wage determination in each segment. Second, the probabilities attached to the primary segment enable us to carry out an analysis of the workers' distribution which shows the different structures across segments. Indeed, the primary sector is overrepresented by people having reached a higher education level and having highly skilled work whereas the secondary sector is characterized by a substantial number of employees who obtain a primary education level and having low skilled employment. Consequently, we adopt an idea according to which the access to the primary sector depends not only on the level of education, but also on the geographical area and size of firm and other factors need to be explored. In other words, the wage distribution is caused not only by the difference in term of the human capital, but also by the employment distribution and other factors previously quoted. Accordingly this study leads to accept an assumption of Sobel (1982), concerning the complementarities of the human capital theory and the labor market segmentation theory. Finally, policies of poverty reduction should take into account the effective targeting with regards to vulnerable groups. Better targeting of public expenditure and a more efficient and forward-looking

²⁰ The neoclassical view with respect to earning disparities claims that the increasing earnings inequality is mainly related to the differences in workers' qualification. In Thailand, there are a number of economic literatures in line with this idea. See for instance Medhi and *al.* (2006).

budgeting system will be the main tools. Particular attention should be paid to increased use of participatory approaches, and to transparent financing and delivery. The poor are not only poor because they lack money. But they are poor because they lack access to and bargaining power in attaining resources (Shao Zhiqin, 2001, p.10). The pauperization and the persistence of wage inequalities are closely associated with individuals' incapacity to reach the primary sector through access to social or informational resources.

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