《Chapter 2》 Convergence and Experiences

Lewis Turning Point and Agricultural Development in the Mekong: A Case of Thailand

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Abstract Agriculture sector was one of the major growth engines of emerging countries like Mekong economy. The surplus labor in the agriculture sector had been absorbed by industrialization in Thailand during the last decades. The agriculture output has been sources of foreign currencies earning from export-led growth policy in Thailand. The rural-urban migration in Thailand has resulted in a labor shortage in agriculture with successful industrialization process. This paper tests the Lewis turning point hypothesis applying the Minami's criterions (1968). We have tested the criterions especially the equality between the marginal productivity and real wages with data 1990-2015 and found that the turning point may occur around early of 2000's. Although, it is still a 'local' rather than 'global turning point' as has been hypothesized by Minami. The Mekong economy, the CLMV currently has surplus labor in their agriculture sector. The surplus labor may be dried up should they would reach their turning point in the distant future. The Mekong economy has to plan for their turning periods if the industrialization in Mekong economy would repeat Thailand's experiences.

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1 Introduction

In the mid-50s, W. Arthur Lewis[2] (1954) has proposed a well-known contribution to development economics the theory of "turning point". The theory has hypothesized an existing of the *'labor-surplus'* in the subsistence sector. In economics, this means labor has his or her labor's *'marginal productivity'* approached to zero value in terms of output. If surplus labor is transferred to participate in the labor-intensive manufacturing development would not incur any loss in marginal output in the rural sector. Lewis has postulated that the outflow of labor doing agriculture activities to an urban area is hypothesized to reach the *'Turning point'* in the long-run. It is a situation when the marginal labor is working with his full potential. Thus, labor's marginal productivity in the rural area doing agriculture activities is equivalent to its real wage. Lewis's theory is relevant to many developing countries. Minami (1968) has tried to prove the Lewisian *'turning point'* hypothesis to several countries. However, the hypothesis with Minami's criterion has remained to be proved for the Mekong[3] economies. Thailand as the economic forerunner of the Mekong Sub-region has its share of agricultural value added in GDP surpassed *by* that of the industries. This lead to the question about whether Thailand has passed the turning point and what will be implications for Mekong economies.

This paper empirically proves whether Thailand had passed 'the turning point' as postulated by Lewis (1954). The study applied the Minami's criterions. The empirical result will be the basis for the policies debates of the Mekong economy.

2 Agricultural Developments in Mekong Economies

The agriculture development of the selected Mekong economies as compared with some East Asian countries like Japan, Korea, and China is shown in Table 1 and Figure 1 respectively. The Mekong economies have followed the footsteps of the transition path of those forerunners like Japan and Korea respectively. In terms of value-added share of the agriculture sector, Myanmar and Cambodia have still relied on the sector with their share of 25.7 and 24.5 percent respectively. Laos PDR and Vietnam seem to have a lower share of 17.2 and 16.3 percent reactively. Thailand and China have their agriculture value added of 8.5 and 8.6 percent as compared with the forerunners like Korea and Japan of 1.9 and 1.2 percent respectively. The employment in the agriculture sector of Mekong has adjusted with a time lag after

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2 Nobel Prize in Economic Sciences in 1979 in the field of economic development

3 The Greater Mekong Sub-region (GMS), comprises Cambodia, Laos, Myanmar, Vietnam (CLMV), Thailand and Yunnan Province and special an autonomous region of China PRC respectively established in 1992, The economy covers 2.6 million square kilometers and a combined population of around 326 million and is an important agriculture products exporter.

the production share. Mekong economies including Thailand still have a dominant share of employment in agriculture. Laos PDR, Myanmar and Vietnam have their employment shares of 62.0, 51.3 and 41.9 percent respectively. Cambodia and Thailand have their employment share of 33.3 and 27.4 percent respectively. The value added and employment shares indicate the likelihood of an existing of the turning points.

Clearly, both shares for Japan and Korea have been much lower than those of the Mekong economies. China has much less employment share (18.4%) than half of Thailand (33.3%) where their value-added share is roughly at 8.5 and 8.6 percent. It is interesting to observe from the scattered plot of GDP per capita and employment share in Fig. 1 that Mekong economies behave along the same transitional path of their East Asian forerunners like Japan, Korea, China, and Thailand. It may be also hypothesized from the rising trend of the agriculture value added per head of employers in Mekong economies that the agriculture sector is normal and following the path of transition following Thailand as well. It might be postulated to test whether Thailand has reached the 'Turning Point'.

Fig.1 Comparison of the Employment in Agriculture, GDP per capita and value added per head 1990-2015
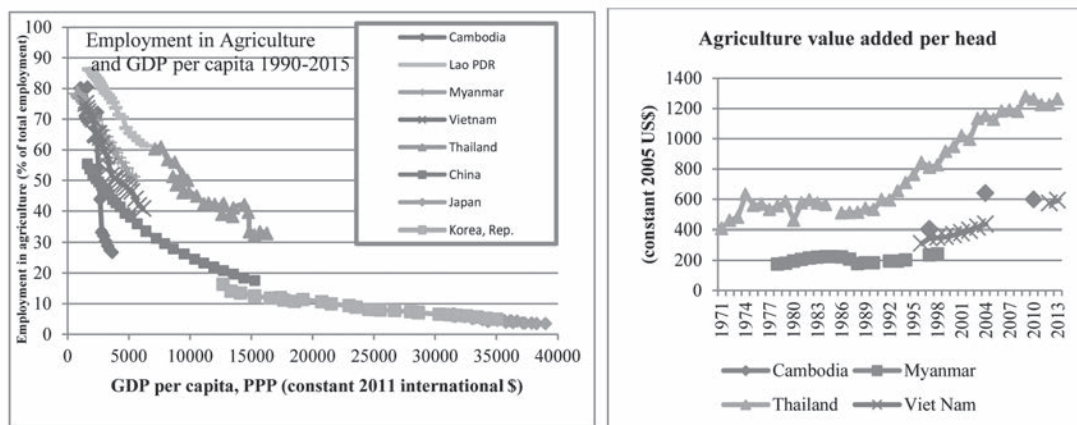

Source: World Bank (reproduced from Klyuev, 2015) and FAO stat

Table 1 Key Economic Indicators of the Mekong Economies in 2015

	Cambodia	Lao PDR	Myanmar	Vietnam	**Thailand**	China	Korea, Rep.	Japan
Agriculture, forestry, and fishing, value added (% of GDP)	24.7	17.2	25.5	16.3	**8.5**	8.6	1.9	1.2
Employment in agriculture (% of total employment)	27.4	62.0	51.3	41.9	**33.3**	18.4	4.9	3.5
Employment in industry (% of total employment)	27.1	9.5	16.3	24.8	**22.8**	26.8	24.9	25.6

Employment in services (% of total employment)	45.5	28.5	32.4	33.4	**44.0**	54.9	70.2	70.9
GDP per capita (constant 2010 US$)	1,079.1	1,642.7	1,408.1	1,735.3	**5,910.5**	6,894.5	25,484.0	47,660.9
Agriculture, forestry, and fishing, value added per worker (constant 2010 US$)	1,696.5	873.3	1,584.5	1,080.3	**2,797.8**	5,325.8	18,795.7	22,653.4
Services, value added per worker (constant 2010 US$)	1,593.2	NA	NA	3,405.5	**13,031.3**	10,509.5	37,151.3	91,829.5
Agriculture/Service ratio of value added per worker	1.06	NA	NA	0.32	**0.21**	0.51	0.51	0.25

Source: World Bank

Fig. 2 Agriculture, forestry, and fishing, value added and gross production value share of Mekong Economies
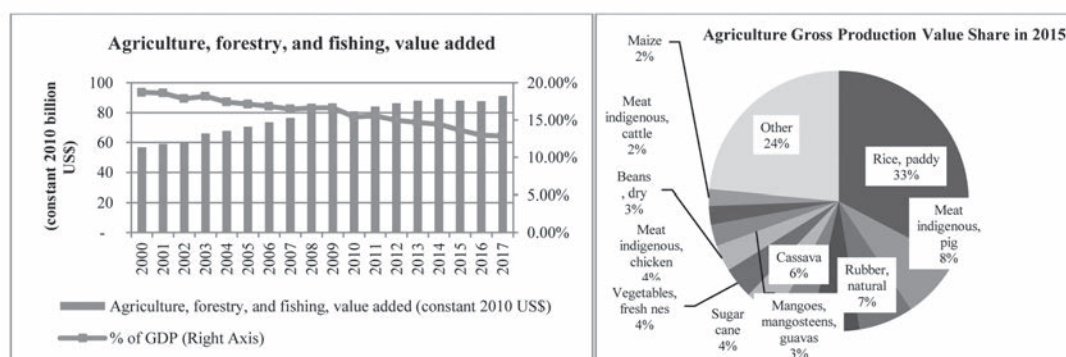
Source: World Bank and FAOstat

Table 2 Agriculture Gross Production Value in 2015 of GMS countries and share. (Constant 2004-2006 1000 International $)

	1	2	3	4	5
Cambodia	Rice, paddy	Cassava	Meat indigenous, cattle	Meat indigenous, pig	Vegetables, fresh nes.
	2,601,291 (57.04)	983,069 (21.55)	171,808 (3.77)	132,329 (2.90)	101,615 (2.23)
Laos	Rice, paddy	Vegetables, fresh nes	Cassava	Bananas	Maize
	1,143,063 (38.70)	317,223 (10.74)	248,881 (8.43)	221,644 (7.50)	214,800 (7.27)
Myanmar	Rice, paddy	Beans, dry	Meat indigenous, chicken	Meat indigenous, pig	Groundnuts, with shell
	7,303,767 (34.63)	2,959,563 (14.03)	1,541,065 (7.31)	953,758 (4.52)	684,790 (3.25)
Thailand	Rice, paddy	Rubber, natural	Cassava	Sugarcane	Mangoes, mangosteens, guavas
	7,719,493 (23.05)	5,108,439 (15.26)	3,380,187 (10.10)	3,091,225 (9.23)	1,995,893 (5.96)
Viet Nam	Rice, paddy	Meat indigenous, pig	Vegetables, fresh nes	Coffee, green	Cashew nuts, with shell
	12,568,965 (37.14)	4,946,516 (14.62)	2,436,894 (7.20)	1,561,044 (4.61)	1,232,542 (3.64)

Note: the numbers in parenthesis are the share of total agriculture production
Source: FAOstat

The agriculture sector is an important sector in GMS countries as the sources of employment and production. According to the statistics, agriculture value-added share of GDP in GMS was declining from around 20 percent in 2000 to around 13 percent in 2015. The main agriculture products in GMS were rice (33 percent), meat (8 percent), rubber (7 percent) and cassava (6 percent). The share of rice and paddy production in total agriculture products was 57.04, 38.70, 37.14, 34.63 and 23.05 percent in Cambodia, Laos, Vietnam, Myanmar, and Thailand, respectively.

In order to test the hypothesis of a turning point in Thailand, we describe selected issue of the agricultural development in Thailand. The agricultural sector has played an important role in the Thai economy during 1960-2000. It was a major source of production and employment in the country. Thailand has gradually shifted to light manufacturing industrial development as a result of an export led-growth policy in 1987 -1990's. Before 1997, Thai economic growth has been contributed by the manufacturing and service growth as a result of foreign direct investment and trade. In a long-term development process, it should be noted that the agriculture share in the GDP has reduced from 37.5 percent in 1965 to 9.46 percent in 2015. Growth potential was explained by the increase of the industry share from 14.24 to 37.48 percent in 1965 and 2015 respectively. Thailand had her employment in the agricultural sector reduced from 76.72 in 1971 to 32.28 percent in 2015. The industry and service sector's employment increased from 16.38 and 6.85 in 1971 to 43.87 and 23.68 percent respectively.

The age dependency ratio of Thailand has reached the bottom in 2010 reflecting that Thailand had entered the aging society including the agricultural laborers. Meanwhile, the new generation of farmers has reduced as a result of schooling for social mobility and the rising the wage gap between rural-urban during last decades. The new generations have chosen to work in the non-agricultural sector like manufacture and services sector instead. Thailand is observed to have a rising of value added per head of the employed person in Thai agriculture production after1990. It can be postulated the rising *average wages* in the rural labor market which should induce the substitution between labor-land and farm machinery-land ratio. However, this has not happened until 2005. This can be explained as the data on the land area for agriculture has been decreased from the past trend at a rate of 0.16 percent per year after 2003[4]. The rapid substitution trend of the tractor to labor-land use was gradually increased after 1990 but had sudden rapid surged after 2005. This implied that the agriculture sector in Thailand had her structural change earlier than the other Mekong economies. More importantly, it is whether Thailand has already passed the turning point according to the theory proposed by Lewis.

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4 https://www.thairath.co.th/content/953812 retrieved on 14 May 2018 (Thai language)

Fig.3 Thailand's Agriculture Value added per worker and Newly Registered Tractor Record
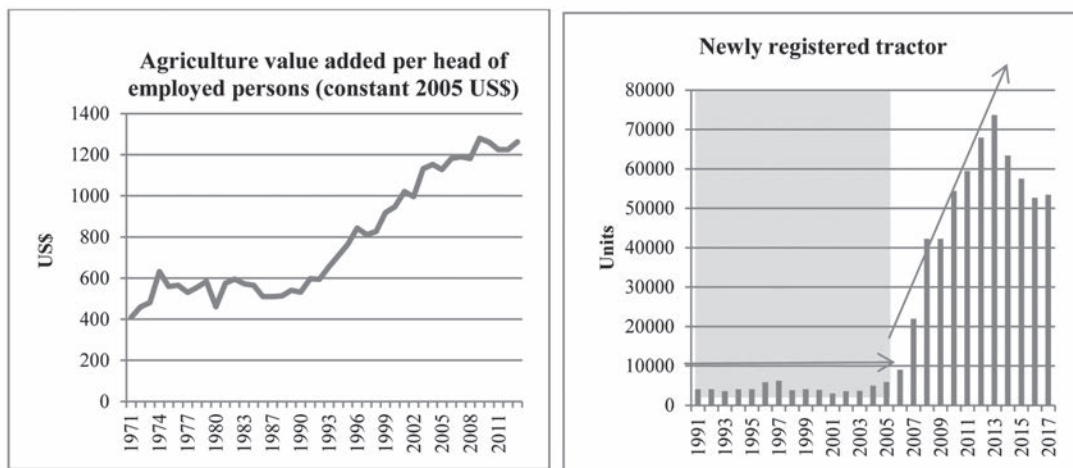
Source: FAO statistics and Department of Transport, Thai government.

Despite the average value added per head has increased significantly since 1990, the substitution of capital for labor was delayed after the Asian Financial Crisis in 1997 (See Fig. 3, and 4). The new register of farm machinery was delayed until 2007. The capital investment demand has been pushed upwards perhaps by the 'Rice Pledge Policy during 2011-2014'. It has declined thereafter when the policy was disrupted by the new government's policy. Labor in the agriculture sector has decided to move to the non-agriculture sector after 2014. The growth of capital-labor ratio also slows down compared with before 1998 crisis (Figure 4).

Fig. 4 Thailand's agriculture labor (Million persons) and growth of capital-labor ratio (Percent)
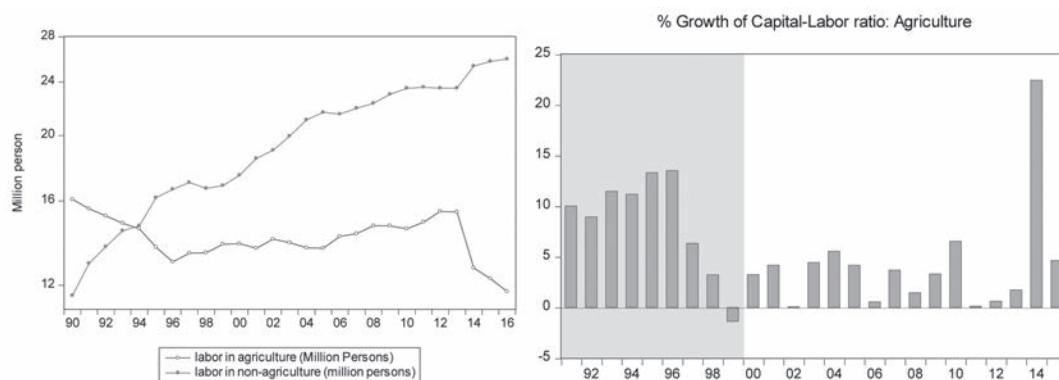
Source: World Bank and Bank of Thailand

Another evidence that may support the structural change in Thailand is an influx of foreign migrant workers to the labor market in both the agriculture and manufacturing and services sector in

recently. According to the Ministry of Labor migrant workers from Myanmar, Laos PDR, and Cambodia are registered to work in manufacturing, construction and service sectors and in the agricultural and fishery sectors. In January 2018, there 2.14 million migrants are from CLM countries, of which 17.33 percent (372,477 persons) works in agriculture sectors. Clearly, their demand for migrant's labor is in the construction and manufacturing sector as well as private and household services respectively. This indicates the tight labor market in agriculture as well as a labor-intensive sector in the urban area in Thailand.

Table 3 Registered Foreign Migrant Workers in Thailand as of January 2018

	Persons	**percent**
Total	2149328	100.00%
from CLM	1913533	89.03%
working in		
-Agriculture	372477	17.33%
-Fishery	111599	5.19%
-Construction	304818	14.18%
Manufacturing	394284	18.34%
-Mining	1895	0.09%
-Private and Household services	465535	21.66%

Source: Ministry of Labor, Thailand

3 Evidence of the 'Lewisian' Turning Point in Asia

Minami (1968) has studied the turning point in the Japanese economy around 1960's by pointing out five criterions. Moo-ki (1985) has applied the criterions and proved that the Korean economy has agricultural labor had the marginal productivity approach real wage in the 1970's. In addition, Kim (2014) has also traced the South Korean economy and found consistently that the Korean's turning point was around 1973. Minami and Ma (2014) point of that Chinese economy has not yet passed its turning point. Watanabe (1994) had tried to test the hypothesis that Japanese emigrants to rest of the world cause a Reduction of a surplus labor and thereby quickening an economy's arrival at its turning point. The study has concluded that the Japanese economy had reached its turning point around 1960. But the 'emigration factor' had played little role in this process Kyoji and Yuan (2012) had constructed a three-sector open economy model to further explain the Chinese economy. The study had concluded that China has still not yet passed its turning point. This might be owing to the characteristics of Chinese economic development. That is to say, China has growth of export or the low absolute price, retard the economy from reaching its turning point. Mitali and N'Diaye (2013) have further constructed the simultaneous equation model determining the mechanism of the labor market in China. They have applied the model to predict a Turning point in China. The result showed that China is likely to reach its turning point around 2020-2025.

In ASEAN countries, Nguyen (2014) has applied the descriptive statistics to track the structural

change and the turning point in Vietnam. He concluded that the Vietnamese economy follows the Lewis-Fei and Ranis' growth model and exhibit a significant transition of labor from the agriculture to the manufacturing sector. This study did not predict the turning point of the Vietnamese economy. Yamada (2016) however has applied the Minami's criterions to estimate the turning point of Vietnam and concluded that the economy has not reached its turning point. Hondai and Nakamura (2014) have tried to explore the Indonesian turning point. They have estimated agriculture production function in line with the Minami's attempt. They finally have pointed out that the surplus labor in the agricultural sector has still existed in Indonesia. Cheng et al. (2015) have applied a panel model to predict the return on education investment in Cambodia. They have applied a *Mincerian* wage equation which categorized into areas-occupations. They had found that Cambodia has not passed its turning point yet. They had found a labor shortage in certain specific rural areas in 2011.

In Thailand, there was no explicit conclusion of the 'turning point'. Most of the studies were centered on labor shortages in Thailand, especially in the Agriculture sector. Charoenwongsak (2000) pointed out that labor in agriculture has declined over time. Tansri (2014) has pointed out the labor shortage in agriculture due to the lack of new entrant of a farmer, the rise in production cost and price instability. The rising of a migrant worker from neighbor countries, substitution of agricultural machinery like tractors etc. are a current phenomenon of labor shortages and structural change in Thai agriculture sector. In sum, there were few studies on the labor surplus and turning point in Thailand that followed the Minami hypothesis. And it is the objective of our paper to apply the criterions to test with Thai data. We will describe the criterion as following.

4   The Lewisian Turning Point Hypothesis and the Lewis-Fei-Ranis' Phases of Industrialization

Lewis (1954) has hypothesized that during the early period of economic development, the subsistence sector e.g., the agriculture sector has a marginal productivity of labor equal to zero[5]. In another word, agriculture had a phenomenon of 'surplus labor'. Thus, if a marginal unit of labor is transferred to work in non-agriculture there will incur no marginal output loss in the agriculture but a positive marginal output in the non-agriculture sector. Hence, society will gain from transferring labor resources from rural to urban for industrial development. The process of labor transfer is induced by the wage differential between the agriculture-industrial sectors until it reaches the turning point.

Figure 4 depicts phases of economic development where the left-hand and right-hand axis shows the level of wage in the industrial sector (left) and subsistence or agriculture sector (right). The total amount of labor 'L' is allocated between the two sectors during the process of development according to

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5 This implies that employment of a marginal unit of labor produced no additional output.

their marginal productivity and wage. The marginal productivity of labor $\overline{A1B1}$ is downward sloping from left to right intersecting with the wage W_i, a level where employment is determined. Lewis (1954) has hypothesized that the subsistence or agriculture sector has the marginal productivity of labor equals to zero (represented by the horizontal line W_s – $\overline{CD_1}$). Labor in agriculture sector obtains the wage rate W_s. The maximized profit level of output in the industrial sector is therefore optimized by employing an OuL_1 amount of labor. This is to leave the remaining labor amount OrL_1 as a slack labor value in the subsistence or agriculture sector.

Ranis and Fei (1961) have formalized the Lewis theory. They have partitioned development phases into three stages. The first stage, $\overline{wB_1}$, is the early stage of development with *surplus labor*. In this stage, the marginal product of rural labor (equivalent to the agriculture in most developing countries in the Mekong), rMPL, is close to zero, shown as the horizontal line on the right of B_1. The average productivity of labor (APL) is equivalent to the imputed average wage rate or income sharing in the rural sector. Thus, in this economy the rMPL= 0 and rAPL = imputed average wage or income sharing Wr respectively.

The industrial development in the non-agriculture sector owing to FDI and export-led growth policy has led to the rising demand for labor in the modern sector. The two-sector wage differential has induced and internal migration from agriculture to modern industry in the urban area. The continuation of emigration toned down the excess supply or the surplus labor in the Agricultural sector. The process continues until the economy reached B2. In this phase, the shortage of rural labor may occur. Here, the condition is explained as the marginal productivity of the rural labor is positive but still less than its average productivity, 0<rMPL<rAPL= imputed average. The capital accumulation process continues until the economy reached the third point at B_3 where the economy will face with a labor shortage situation. From this point B_3 onward, the rural wage increases, too. This is known as the 'Lewis Turning Point'where the marginal productivity of labor in the agriculture sector equals the *market wage*, rMPL= Wr.

Fig.5 Lewis-Ranis-Fei Phases of Economic Development
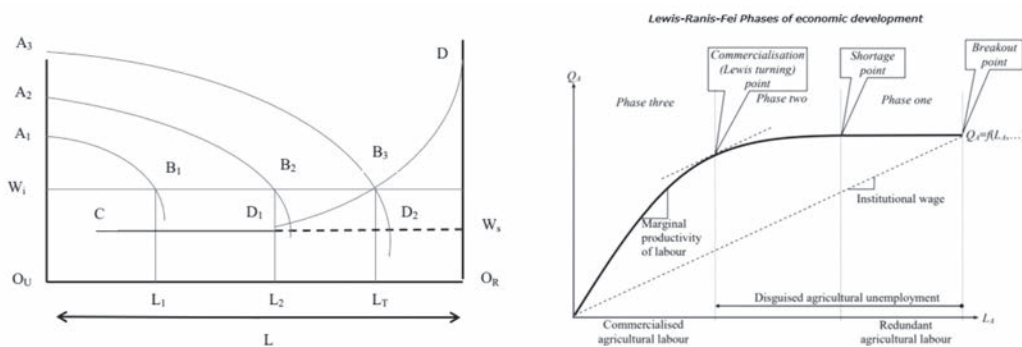
Source: Basu (1997), M. G. Egcolani and Wei (2010)

According to Egcolani and Wei, (2010), the Lewis-Ranis-Fei has three phases of economic development as shown in the right-hand graph of figure 5. The economic development now is separated into three phases which are leftward depicted as the 'breakout', 'shortage', and 'turning points respectively. It is defined as follows: **The breakout** is the phase where there is a redundancy of the agricultural labor. **The shortage phase** is the development with the disguised agricultural unemployment. **The commercialization phase** is the self-sustaining economic growth t with the commercialization in the agricultural sector. It is nominated as the **'Lewis Turning Point'**.

In short, the economy reaches the turning point where wage rate in the agricultural sector theoretically is equalized with its marginal productivity. The redundant agricultural labor or surplus labor is completely disappeared. As a result, the wage differential of unskilled workers in rural-urban will disappear.

4.1 The Minami's Criterions in Identifying the Turning Point

Minami (1968) proposed the Minami's criterions to identify turning point as follows:

<u>*Criterion 1*</u>: *Comparison between Real Wages and Marginal Productivity of Labor in the Subsistence Sector*

The pre-turning point phenomenon can be observed where the marginal productivity of labor (MPL) in the agricultural sector is *lower* than its real wages (W). After the turning point has passed, W equals to the MPL. The wages gap function is defined as *GAPt = Wr/P -MPLr. Before the turning point: GAPt>0 → Wr/P> MPLr* At the turning point: GAPt=0 → Wr/P= MPLr Where Wr = wage rate in agriculture, P = price level; the MPLr = marginal productivity of labor in agriculture respectively.

<u>*Criterion 2*</u>: *Correlation between the Real Wages and the Marginal Productivity of Labor in the Agriculture Sector*

Define the correlation between marginal productivity and real wage as follows:

$$\text{Corr}(MPL_{A,t}, W_A) = \frac{\Sigma(MPL_{A,t}-\overline{MPL_A})(W_{A,t}-\overline{W_A})}{\sqrt{\Sigma(MPL_{A,t}-\overline{MPL_A})^2 \, \Sigma(W_{A,t}-\overline{W_A})^2}}$$

The non-existence of the correlation suggests that the wage rate is determined by the *agriculture sector 's* level of income or 'income sharing hypothesis'.

<u>*Criterion 3*</u>: *Movements of Real Wages in the agriculture sector*

The time series data of the real wages in the *agriculture sector* may show a shift from constant (or slowly increasing trend) to a rapidly increasing trend. This could verify the relationship between the subsistent incomes sharing return to labor towards the marginal productivity is equalized with market wage finally in the long-run.

<u>*Criterion 4*</u>: *Change in Wage Differentials*

The wage differentials between unskilled and skilled workers will tend to rise over a period of time if skilled workers are limited during the initial stage of development. After the turning point, the wage differentials will gradually disappear.

<u>*Criterion 5*</u>: *Elasticity of Labor Supply to the non-agriculture sector*

Before the turning point, since there are unlimited labor supplies, the elasticity of labor supply is infinite. Then, after the turning point, the elasticity of labor supply will have a positive value. The point when the slope shows a kink from the sharp to slow increase can be specified as the turning point.   Elasticity can be computed by

$$\varepsilon = \frac{dL'_m / L'_m}{dW_s / W_s}$$

where L'_m is the labor supply in non-agriculture originally supplied from the agriculture and W_s is the real supply price.

5 The Empirical Results

We have followed Minami (1968)'s criterions mentioned earlier to prove the 'Turning point' hypothesis of the Thai agriculture sector. These are criterion_1, 'comparing real wage and productivity, criterion_2 'correlation between productivity and real wage', criterion_3 'change in real wage overtime' criterion_4 'tendency of wage differential' and criterion_5 'elasticity of labor supply' respectively. We have chosen 1990 as the benchmark year depicting the starting year of the labor shortage phenomenon. This is corresponding to the changing of the agriculture sector mention in the above section.

Criterion 1: Comparison between Real Wages and Marginal Productivity of Labor in the Subsistence Sector[6]

We have estimated the marginal productivity of labor in agriculture and compared them with the existing wage rate. We have assumed the Cobb-Douglas production function,

$$Y = AK^{\beta_1}\ L^{\beta_2}N^{\beta_3},$$

With a constant return to scale, $\beta_3 = 1 - \beta_1 - \beta_2$, then, it can be easily transformed into

$$Y/N = A(K/N)^{\beta_1}(L/N)^{\beta_2},$$

Taking the double logarithmic,

$$\ln(Y/N)\ = \ln A + \beta_1 \ln(K/N) + \beta_2 \ln(L/N)$$

where Y is value-added, K, L, and N are capital, laborer and land respectively. The data used in the estimation are time series data from the National Income account statistics, the Capital Stock of Thailand published by the NESDB, and the Labor Force Survey of Thailand[7] by the NSO and Office of Agricultural Economics. The value-added and capital are in local Thai baht at constant 2015's prices while labor and land are an *effective unit of working hour*[8] per land area or *Rai*[9] respectively. The marginal productivity of the laborer is computed as $\partial Y/\partial L = \beta_2 A \left(\frac{K}{N}\right)^{\beta_1} \left(\frac{L}{N}\right)^{\beta_2-1} = \beta_2 APL$ and the average product per worker, APL=Y/L. (See Table 4). Here is the estimation result.

The production function is significant with correct signs. The share of labor capital, labor, and land are 0.33, 0.577 and 0.09 respectively. We use real wage in *monthly* term deflated by the consumer price index (CPI)[10] to compare with marginal productivity shown in Table 4.

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6 The 'subsistence will be interchangeable with the agriculture sector'. In fact, Thailand's agriculture sector is much different from the image of 'subsistence' in the sense of Lewis, even in the 1960s. However, this is just to keep the original word of the literature.

7 Since this is a quarterly data, we choose the third quarter as a full employment period in Thailand.

8 Total hour work of worker in Agriculture computed by the number of labor x average working hour per year

9 Rai = 1600 m^2

10 We convert all type of wage earner to monthly by 1) For hourly wage earner, we use number of hours work per week 2) For daily wage earner, we use number of day per week, 3) We typically assume that 1 month contains, 4 weeks. All elements are available in Labor Force Survey by NSO.

Table 4 Comparison between labor productivity and real wages and estimation of surplus labor in agriculture 1990-2015

(1) Comparison between labor productivity and real wages

Years	Output elasticity of labor	APL	MPL	Real Wage	Relative income share W/APL
		Baht/Month			(%)
1990		3,471.58	2,003.10	3,054.4	88
1995		5,024.05	2,898.87	4,202.3	84
2000		5,863.42	3,383.19	4,091.9	70
2002		5,959.75	3,438.78	3,517.5	59
2004	0.577	6,795.51	3,921.01	3,691.4	54
2006		6,790.62	3,918.19	4,072.7	60
2008		6,866.94	3,962.23	4,819.7	70
2010		6,890.19	3,975.64	4,685.4	68
2012		7,090.13	4,091.00	5,024.3	71
2014		8,629.57	4,979.26	5,682.6	66
2016		8,551.90	4,934.45	5,597.1	65

(2) Estimation of surplus labor

| Years	Employment	Equilibrium Employment	Surplus employment	Rate of Surplus Labor
	Thousands of persons	(%)		
	(1)	(2)	(3) =(2) - (1)	(4) = (3)/(1)
1990	1,608.51	1,054.89	553.62	34.4
1995	1,366.58	942.70	423.87	31.0
2000	1,383.04	1,143.51	239.53	17.3
2002	1,404.18	1,372.76	31.41	**2.2**
2004	1,363.39	1,448.18	-84.80	**-6.2**
2006	1,417.05	1,363.29	53.75	**3.8**
2008	1,469.91	1,208.40	261.51	17.8
2010	1,454.69	1,234.336	220.35	15.1
2012	1,543.36	1,256.676	286.68	18.6
2014	1,273.27	1,115.671	157.60	12.4
2016	1,174.66	1,035.594	139.07	11.8

Source: Author's calculation

The estimated surplus labor is obtained from the difference between actual employment (1), and equilibrium employment (2) in agriculture[11]. The surplus labor in the agriculture sector had declined from 1990 until 2002. The 2008-09 there was a Global Financial Crisis impact on the Thai economy. In 2011, there was 'flood' in Thailand which had further accentuated the impact on manufacturing in the urban area. The then government had introduced the 'Rice Pledge Policy' to buy in paddy at a subsidized price. Thus, it was likely that labors in the non-agriculture sector have perhaps sought their sanctuary back home in rural to do agriculture. This is proved that the neoclassical conjecture of the 'Turning point' was not a 'once and for all' in a developing country like Thailand and perhaps applied to the Mekong region as well. The government policy was, in fact, has a significant impact on the ups-and-downs of the labor demand in

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[11] Assume that the economy is at a turning point, therefore, W is determined by MPL thus, equilibrium employment can be computed from $L = \beta_2 Y/W$. See Minami (2014, p.28) for more detail.

agriculture vis-à-vis the non-agriculture sector. It can be postulated that the Minami (2014) hypothesis is a 'local equilibrium' in the case of Thailand whereas it might be a 'global equilibrium' the case of Japan and some other forerunners.

Fig. 6 Marginal productivity of labor, real wage of agriculture in Thailand, an estimated surplus labor 1990-2015 (at a constant price of 2015)
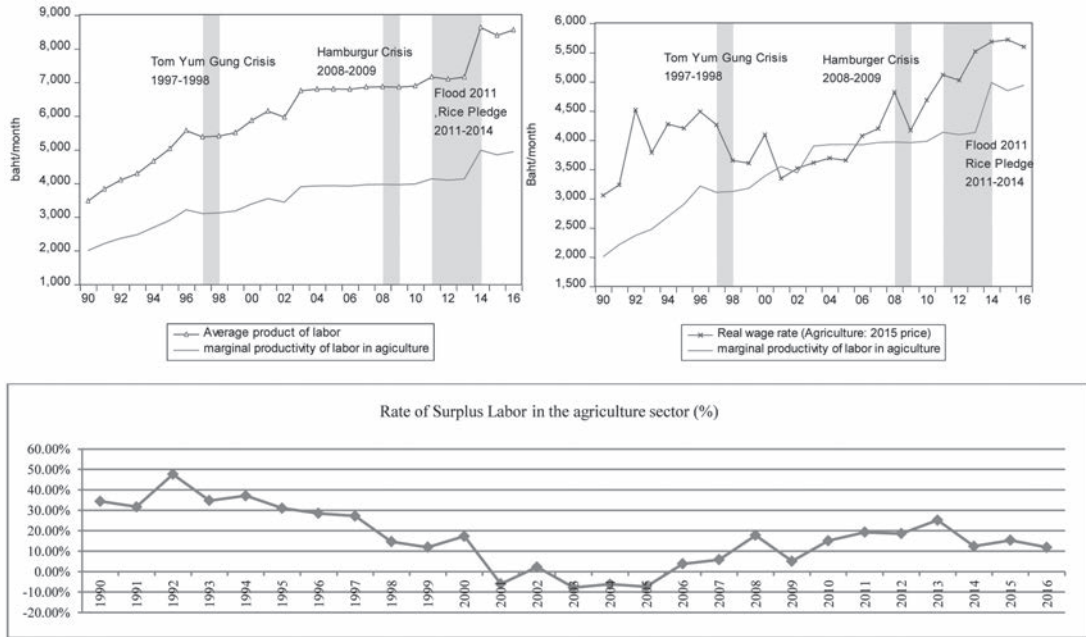

Source: Author's calculation

This surplus labor fluctuation around the 'local equilibrium' has *however confirmed the Minami's criterion 1 that she has passed* its turning point around 2001-2002 (See fig. 6). Left-hand graph shows the average product as compared with the marginal product of labor in the agriculture sector. The right-hand graph depicts the marginal productivity of labor and its real wage. The equality of real wage with marginal product of labor has occurred around 2001 and surpassed real wage until 2007. The effective real wage in agriculture, weighted by effective hourly used has later surpassed marginal product of labor after 2007. It is interesting that the marginal productivity of labor was stagnant from 2007 until 2013 as a result of delayed capital investment and labor-capital substitution as mentioned above. The marginal productivity has again risen sharply in 2012 and 2014 as a result of government policy.

Criterion 2: Correlation between real wages and marginal productivity of labor in the in agriculture

We estimate the correlation between the real wage rate and marginal productivity. If it is positively correlated, it would depict the situation of a turning point. It is clearly shown that before 2001, there is no

correlation between the two variables. However, thereafter,   we have found a strong positive relationship between real wage and agriculture marginal productivity of labor. This reconfirms that Thailand has passed the turning point around 2001.

Fig.7 Correlation between real wages and marginal productivity in the agriculture before 1990-2001 and 2001-2015
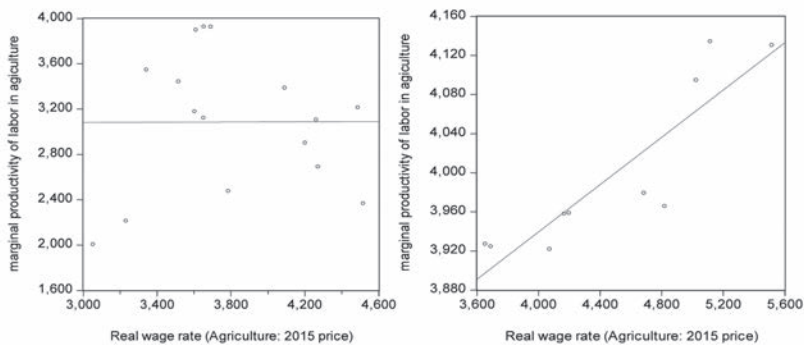
Criterion 3: The Movements in Real Wages in the Subsistence Sector and Criterion 4: Change in Wage Differentials

In criterion 3 it is verified that wage in the agriculture sector has risen in a nominal and real term. Especially, the real wage has increased sharply after 2011. The Thai economy has started new episode of economic development after the GFC 2008-09.

In criterion 4, although the average wage differential between the agriculture and non-agriculture sectors still exists, the wage-ratio has declined smoothly during 2001-2008. After the GFC in 2008-2009, there was a differential shock temporary. Thereafter during 2010-2016, the wage differential between sectors has smoothly kept at the level of 2.0 throughout rather than tending to 1.00 to show equality of wages. (See Fig. 8, second graph). Thus, it is conjecture that the wage ratios have moved consistently together. This seems to contradict with the Minami's conjecture in criterion 4 which stated that wage gap should disappear at a certain point in time of 'Turning Point'. In our analysis, the ratio (Fig. 8) was constructed from a ratio of the composite wage of skilled and unskilled labor (non-agriculture) divided by the unskilled labor (agriculture). The skilled-to-unskilled wage ratio of the manufacturing sector was recorded as follows: The daily minimum wage in non-agriculture was 6,000 baht per month (equivalent t0 300 baht per day) while the wage for a new entrance to the company was 12,000- 15,000 baht per month. In other words, the skill wage is 2.0- 2.5 times of the unskilled wage. This exactly explained the ratio of 2.0 in our graph. The wage in agriculture sector is also 300 baht per working day with less effective hours of a day. They work from very early morning (3 hours before noon) afternoon but take a long break during hot sunlight (12.00-14.00 hrs) and resume effectively working from 14.00-17.00 hrs. Thus, the Minami

criterion 4 is verified.

Criterion 5: Elasticity of Labor Supply to the non-agriculture sector

Lewis' Theory indicates that the elasticity of labor supply is *infinite* and decreased after passing the turning point. In our paper, the wage rate in the agriculture sector is a proxy of the *minimum supply price* of labor supply (Minami, 1968)[12]. We also use the labor in non-agriculture as the proxy of labor supply *outflow* from the agriculture sector. In Fig. 9 we have shown the scattered plot of the employment in the non-agriculture against the wage in agriculture on a logarithmic scale. The slope of this graph can be interpreted as the elasticity of supply and it shows a clear kink at 2005. We have estimated the elasticity of labor supply. They are 1.10 for 1990-2001, 0.54 for 2001-2005 and 0.24 for 2005-2015 respectively. Clearly, the labor supply in the agriculture sector has a transition from elastic to inelastic with respect to a change in the wage rate. Thus, this can verify the Minami's criterion 5 that the unlimited labor supply from agriculture has reached its end after 2001-2005.

Fig.8 Real wages in Agriculture and the comparison with a real wage in manufacturing[13].
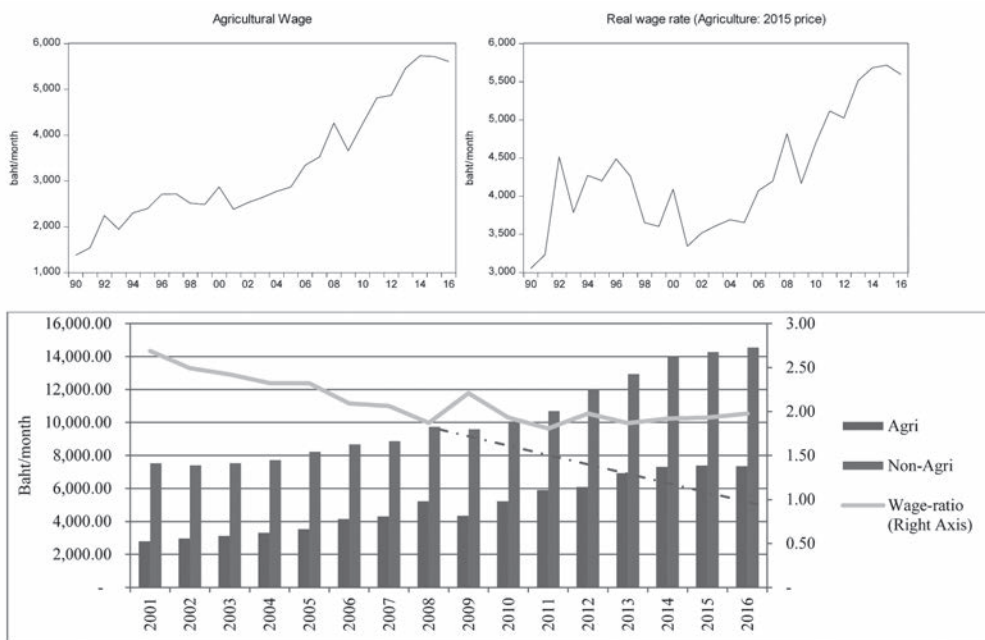

Source: Bank of Thailand

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12 In the sense that laborers don't want to work if their wages are less than this level. See Minami (1968) page 3 for more detail

13 By comparing with manufacturing wage, we use hourly works per week as a weight variable to adjust the equivalent of hour worked. The manufacturing wage is a composite wage of skilled and unskilled labor.

Fig.9 Elasticity of Labor supply to the non-agriculture sector
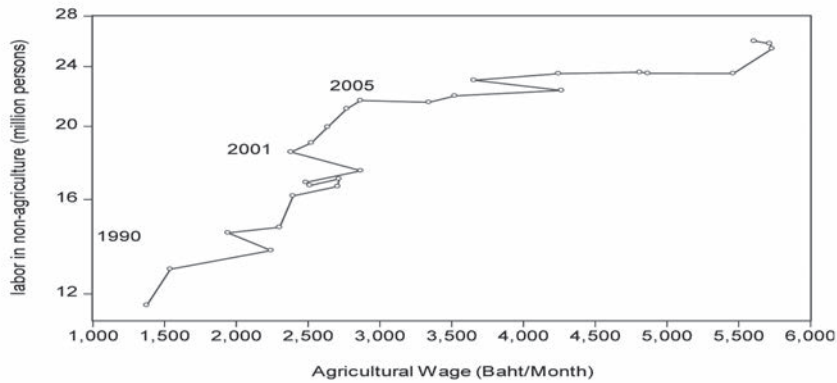
Post Effect of the turning point on income distribution

If the Lewis (1954) hypothesis has been proved to pass the turning point, it would be generally postulated that income distribution would be more equalized. As the wage increased hence the income inequality would decrease in the agriculture or rural sector. This follows the Kuznets inverse-U shaped hypothesis (Kuznets, 1955) where inequalities would decline according to Minami (1998). The Gini's coefficients in Thailand have decreased since the 1990's as showed by Gini's Coefficients in Fig. 10. The pace of declining was rapid in a rural area after 2006. However, unlike the conclusion of Minami for Japan's experiences, the declining of the coefficients in Thailand may be attributed by many government policies. Thus, this is not conclusive and would be postponed to further studies

Fig.10 Thailand Gini's coefficients
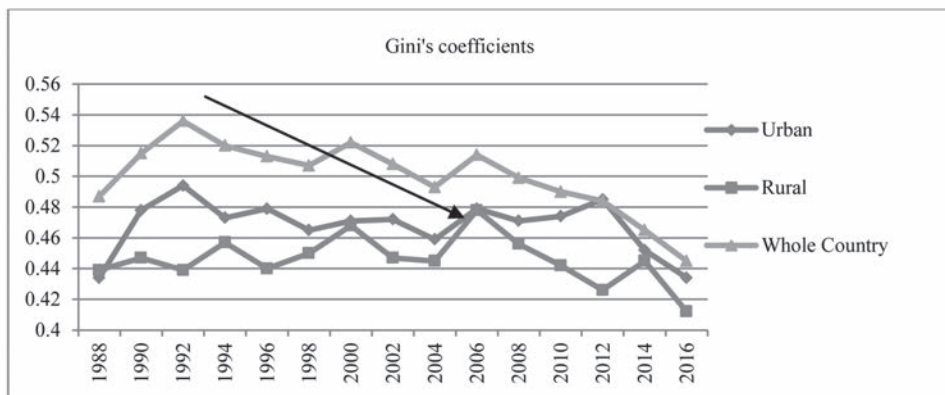
Source: NESDB

6 Policy Discussions for Mekong Development

The agricultural sector is a major driver of economic development in Thailand and other Mekong economies. The change in the labor market structure especially the decrease in labor supply due to the low birth rate and the outflow of migration to the non-agricultural sector could lead to a change in agriculture wage and marginal productivity. The empirical result shows that Thailand has shown labor shortage since the early of the 1990s and has passed the turning point around early of 2000s respectively. Although, we still suspect that the turning point is a 'local equilibrium of turning point in rural labor market' rather than a permanent 'global turning point' like what has occurred in Japan and developed economies.

Implications for the Mekong are as follows: 1) The Mekong economies of CLM would still have a surplus labor situation. Vietnam may follow Thailand in near future as far as the value added and employment ration of the agriculture are concerned. 2) The CLM can still enjoy the transition of surplus labor in agriculture and may learn how to move this abundant resource to the non-agriculture sector without loss of marginal output of the agriculture. 3) The CLMV may have to balance the growth of agriculture-industrial development. The rapid declining in labor resource in the rural sector may mean rising food prices produced by the agriculture sector as well. This will harm the process of economic development towards the industrialization as the price of the wage goods will destabilize the employment in the industrialization process. 4) The economic development path of Thailand may be a good example of policy deficiency concerning the delay in capital investment in industries after the financial crisis. Thailand was too dependent on foreign migrants from neighboring Mekong economies. In the distant future when Mekong countries would reach their turning point, the need for foreign migrants may be overly difficult to manage than the current situation in Thailand. This should be learned from Thailand's difficulties at present too.

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