CHANGES IN THAI LABOR INCOME DISTRIBUTION FROM 1985 TO 2017: SOME EVIDENCE OF RISING DEMAND FOR HIGHER EDUCATION

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Abstract

This paper investigates changes in the distribution of the real hourly labor income in the Thai labor market from 1985 to 2017. The results show that overall labor income has increased over the past three decades. The gender earnings gap has substantially reduced; however, the disparity between regions still exists. The results also indicate an increase in labor income of workers with primary school and higher education during the past three decades. This study aims to evaluate the cause of the increase according to the changes in demand for labor. The results indicate that the increase in labor income of workers with higher education is due to the increase in their labor demand. In contrast, the increase in labor income of primary school workers is due to the increase in the minimum wage. The evidence on the industry-occupational distribution of workers supports the explanation of demand increase due to Skills-Biased Technological Change: SBTC.

Keywords: labor income, labor demand, higher education, Skill-Biased Technological Change

Introduction

Changes in the distribution of wages is an important research topic in labor economics since its impact directly affects workers' well-being and social justice. Recent literature has shown the dynamic changes in the trend of wages among different countries. For instance, the overall wage distribution in China has increased, as well as the rise in wages of college graduates compared to high-school graduates (Gustafsson & Wan, 2020). This trend is consistent with Thailand, where the wage and labor income of college graduates has significantly increased relative to workers with lower education levels (Lathapipat, 2011; Nada Wasi, Saiwimon

Warunsiri Paweenawat, Chinnawat Devahastin Na Ayudhya, Pucktada Treeratpituk, 2019).

Recent studies also emphasized the heterogeneity of labor compensation among gender. Literature found the convergence of wages or labor income among men and women in many countries during the recent decades, including United Kingdom, United States, France, Germany, Italy, Sweden, Poland, and Sri Lanka (Gallen, Lesner, & Vejlin, 2019; Gharehgozli & Atal, 2020; Hara, 2018; Majchrowska & Strawiński, 2018; Petrongolo & Ronchi, 2020; Seneviratne, 2020). The trend is consistent with findings in a local Thai labor market where the gender gap of wages and labor income decreased (Nakavachara, 2010; Pooittiwong, 2016; Srisomboon, 2016).

This paper contributes to the existing literature by updating the distribution trends with recently available data, i.e., the Thai Labor Force Survey from the year 1985 to 2017. This study also uses labor income instead of regular wages as it represents the more comprehensive labor compensation. This study serves as a robustness check as researcher can compare results in this study with other studies that use only regular wage. The various kinds of distribution are presented, including overall distribution, the distribution by gender, region, and education, respectively. This paper also tries to explain the cause behind some key findings, i.e., an increase in the labor income of workers with a college education. It provides some explanations associated with the change in labor demand and Skill-Biased Technological Change: SBTC.

This paper is organized as follows. The next section presents the literature review, section III describes the data set used in this paper, section IV presents the various dimensions of distributions from 1985 to 2017, section V presents the estimation of changes in labor demand from 1985 to 2017, section VI discusses some important results, section VII concludes, section VIII mention on limitations of this study and future research, and section IX discuss on managerial and public policy implication.

Literature review

Recent studies have investigated the labor income inequality in Thailand and relevant factors that contribute to the inequality. For instance, Wasi et al. (2019) studied the labor income inequality from 1988 to 2017 using Thai labor market data, i.e., the Thai Labor Force Survey (LFS) and the Social Security Office (SSO) employment data. The study found that the reduction in the inequality in the bottom part of the distribution could reduce overall inequality. However, the median wage gap between college and non-college has increased over time. Furthermore, the results found that employment history can describe wage inequality, e.g., workers who switch jobs or work in larger firm will receive a higher wage.

Suphanachart (2019) also documents the reduction in overall income inequality over the 1988 to 2017 period. The study uses the Total Factor Productivity (TFP) to proxy the technological progress and use the Gini coefficient to represent the income inequality. The results suggest that in the long run, income inequality

was reduced when TFP increased. The increase in human capital, income per capita, and the decline in agricultural GDP share contribute to reducing income inequality. However, the factors such as trade openness and FDI increase income inequality.

Some studies in the United States also investigate the role of technology in affecting wage inequality. For instance, Acemoglu (1998) suggests that the changes in labor supply of college graduates incorporate with technological advancement during that period can explain the college wage premium during the 1970s and 1980s. Acemoglu (2018) also investigate the role of technological progress toward wages and employment. The paper suggests that the new technology may replace human labor in the first place, but it could create a new task in which humans can work in complement with machines. Wage inequality will increase during the transition period but can stabilize in the long run.

Edwards and Lucke (2019) observed the UK's wage inequality changes from 1979 to 2000. The study points out the plausible cause of changes in wage inequality, including (i) trade, (ii) Skill-biased technical progress (SBTP), (iii) capital cheapening combined with capital-skill complementarity, (iv) taste parameters, (v) changes in intermediate input parameters, (vi) labor supply changes. The study used the computable general equilibrium (CGE) technique to decompose the inequality changes into each factor mentioned above. The results found that the rising supply of skilled labor negatively affects skills premium, but the effect is offset by Skill-biased

technical progress, which favors skilled labor.

The distribution of wages among gender is also widely studied by the economist. For instance, Paweenawat and Liao (2019) investigate the inequality in wage among gender in the Thai labor market and factors contributing to the inequality. The results found that using the Thai Labor Force Survey (LFS) data from 1985 to 2017, the gender wage gap appears to converge. This convergence is related to many factors such as education, occupation, and industry. However, the study found an increase in inequality of wages between a woman who has and does not has children. Furthermore, the study also employs the panel data from Socio-Economic Survey (SES). The results indicate that male and female with children (i.e., has father or mother status) have lower wages than their counterparts, the phenomenon called a parenthood wage penalty.

Literature also reports the growth of wages and wage inequality in some emerging economy. Gustafsson and Wan (2020) observed the changes in wages and wage inequality in urban China by using the China Household Income Project Data from 1988, 1995, 2002, 2007, and 2013. The results show that the wage distribution substantially improves during the entire period. However, the results show an increase in the gender wage gap and the college-high school wage disparities. The data also document various changes in the labor market compared to the planned economy era, such as the middle-aged worker has higher wages than an old-age worker and wages being more correlated with education level. Wage premium also has

been found for a worker working in a foreign company or state own enterprise.

Data

This study uses the Thai Labor Force Surveys (LFS) data from 1985 to 2017. The National Statistical Office (NSO) has surveyed the LFS since 1963. The initial survey took place in the first quarter of the year, i.e., from January to March and the third quarter of the year, i.e., from July to September. Then from 1984 to 1997, the NSO extended the survey to include the second quarter, from April to June. Finally, from 1998 onward, the survey extended to include the fourth quarter, from October to December. This study uses data from the third quarter of each year since it took place during the agricultural season, where the labor force is fully employed. The LFS provides information on weekly working hours, wages, and other types of compensation, such as overtime, bonuses, and other money[1] . This study uses the above information to compute hourly labor income. The study also converts the nominal term of hourly labor income into real value by using the consumer price index with 2011 as a base year.

This paper restricts the sample set to wage earners, aged between 16 and 60, who worked at least 35 hours in the past seven days. This group of workers represents a potential workforce of the labor market. The Labor Force Survey data also provides a sample weight as a probability weight. This paper used this weight in all estimations.

The distribution of real hourly labor income from 1985 to 2017

This section provides empirical evidence of changes in the distribution of real hourly labor income from 1985 to 2017. The results include the various dimensions of distributions, i.e., the overall distribution, the distribution by gender, region, and education, respectively.

Overall distribution

This subsection presents the kernel density estimation of the real hourly labor income for
four representative years, including 1985, 1995, 2005, and 2017. The graph in Figure 4 shows that labor income distributions increased over the past three decades. The distributions in the years 1995, 2005, and 2017 shifted to the right. These changes suggest an increase in overall labor income. The most significant change occurred between 2005 and 2017, where there was a dramatic increase in labor income for the entire distribution. Surprisingly, the proportion of workers who earn at the high wage position, i.e., higher than 50 baht per hour in real value, had dramatically increased during this period. This increase is in contrast with

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1 The LFS also provides information on other types of in-kind compensations such as food, clothing, housing, and other money. However, the formats of these variables are not uniform across the period of study. From 1985 to 2000, these variables are dummy variable. The variable had the value of one when the worker received income and value of zero otherwise. Then from 2001, the variable indicates the monetary value of the in-kind income, which the respondent self-estimates. So, this study omits the information on in-kind compensation for the sake of consistency.

the prior period, where we observe that the shift only occurred at the lower part of wages distribution. The kernel density plot, therefore, reveals the increase of labor income in the upper part of the distribution in recent years.

Distribution by gender

The next trend of interest is the distribution of real hourly labor income by gender. Figure 5 presents the trend from 1985 to 2017 of men and women. The graph shows that there exists a gap between men and women at the beginning of 1985, where the real hourly

labor income of men was higher than women. This unequal trend continued for two decades before converging in 2009. This phenomenon is consistent with existing literature in Thailand (Pooittiwong, 2016; Srisomboon, 2016) and in many other countries, e.g., Australia, China, Korea, Sri Lanka (Kennedy, Rae, Sheridan, & Valadkhani, 2017; Seneviratne, 2020; Tromp, 2019; Zhao, Zhao, Chou, & Leivang, 2019). The causes of convergence are mostly explained by the higher education of woman (Nakavachara, 2010), and the role of the minimum wage (Majchrowska & Strawiński, 2018).
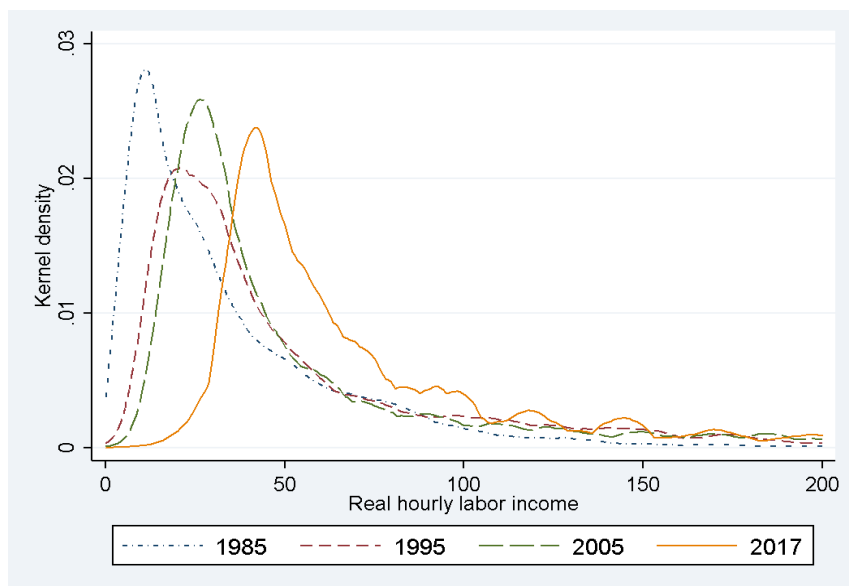

Figure *4* Kernel density estimation of real hourly labor income
in 1985, 1995, 2005, and 2017
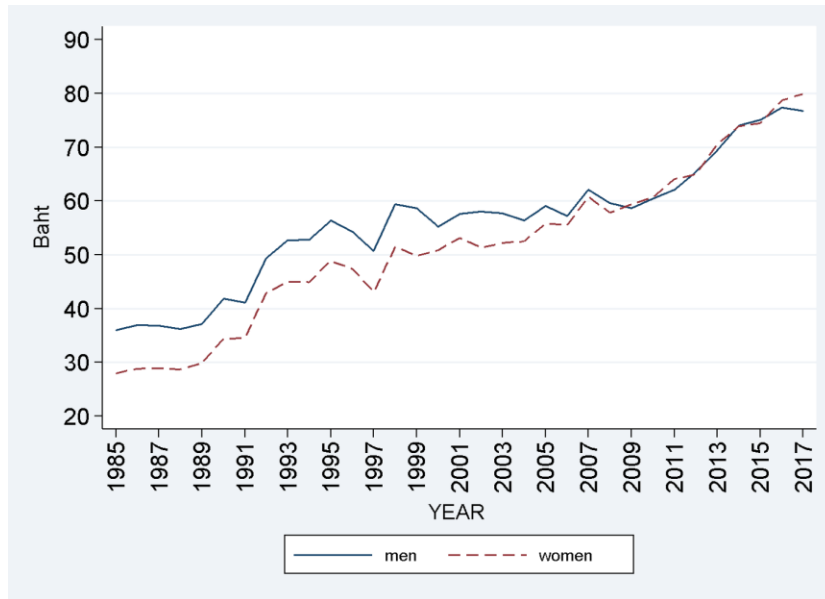
Source: Thailand Labor Force Survey (LFS), quarter 3

Figure *5* Real hourly labor income by gender, 1985 to 2017

Source: Thailand Labor Force Survey (LFS) data, quarter 3

Distribution by regions

Figure 6 presents the distribution from 1985 to 2017, separated by regions, including Bangkok Metropolitan, Central, North, North Eastern, and South, respectively. The graph also categorizes the distribution in each region by education level. This methodology aims to avoid bias if workers with a specific education tend to work in a specific region. The results show that Bangkok Metropolitan has the highest hourly labor income, followed by Central, South, North, and North Eastern, respectively.

The graph shows that there exists the heterogeneity of real hourly labor income between the regions; however, the gaps between regions had been relatively constant over the past three decades. Note that the gap between Bangkok Metropolitan and other regions seems to increase during the early 1990s. This result is consistent with the literature in another country where the metropolitan area has higher wages than other regions, see, e.g., South Korea (Kim, Min, & Choi, 2015).

Another interesting fact from the figure is that the average real hourly labor income of workers with zero to six years of schooling and workers with more than twelve years of schooling tends to increase. These two categories represent the educational level of primary school and higher education, respectively. The next subsection further investigates this issue by illustrating the trend of real hourly labor income by education level.

Distribution by education level

This section further investigates the distribution of real hourly labor income by workers' education. The results in Figure 7 show that the hourly labor income of workers with primary education and higher education increased. Note that the trends of wages for workers with seven to nine and ten to twelve years of schooling were relatively stable across the past three decades. These two education levels represent lower-secondary and upper-secondary, respectively.

Figure 8 confirms the facts in Figure 7 by presenting the percentage change of real hourly labor income in each education level. The results show that the changes for workers with zero to six years of schooling and more than twelve years of schooling are substantial, compared to other education groups. The increase in real value is ninety-five percent and seventy-six percent for those two education levels, respectively. This phenomenon has also been recognized in the United States labor market, where wage increases were polarized into high and low skills workers (Autor, Katz, & Kearney, 2006). The question that arises here is, what would be the cause of these increases?

Existing literature in Thailand points out that an increase in demand for highly educated workers plays a role in an increase in wages at the top-end of distribution from 1987 to 2006 (Lathapipat, 2011), while the minimum wage helps compress the wages in the lower part of the distribution from 1985 to 2010 (Leckcivilize, 2015). In this paper, the author proceeds to investigate this issue with real hourly labor income and more recent data. The next section provides the empirical estimation to see how much the results of changes in labor demand can explain the changes in labor prices from 1985 to 2017.

Change in labor demand from 1985 to 2017

This section provides the empirical test for the demand changes from 1985 to 2017 of workers at each education level. The changes in demand were measured in the form of demand shift index (Katz & Murphy, 1992), shown in equation (3) as follows,

$$\Delta X_k^d = \frac{\sum_j \alpha_{jk} \Delta E_j}{E_k}, \tag{3}$$

where ΔX_k^d denotes the demand shift index for workers in education level k, α_{jk} denotes the average share of total employment in sector j and education level k over the 1985 to 2017 period,

ΔE_j denotes the change of employment share in sector j, and E_k denotes the employment share of group k between 1985 to 2017, respectively. The author computed the overall-industry demand

shift indexes by using equation (3) and categorizing sector *j* based on the industry-occupation group and computed the between-industry demand shift indexes by categorizing sector *j* based on the industry group. Then the author computed the within-industry demand shift indexes by subtracting the between-industry demand shift indexes from the overall-industry demand shift indexes. The overall demand shift indexes reflect the change in employment among the various groups of industries and occupations. In contrast, the between-industry demand shift indexes reflect the changes in employment among the various industries. Also, the within-industries demand shift indexes reflect the changes in employment among occupations within industries (Katz & Murphy, 1992).

Table 10 presents the demand shift indexes during the full period from 1985 to 2017 as well as the sub-periods from 1985 to 1995, 1995 to 2005, and 2005 to 2017, respectively. The author also summarizes the overall demand shift index in the graphs, where Figure 9 and Figure 10 present the overall demand shift indexes for men and women, respectively. The results of the overall-period from 1985 to 2017 clearly show that the demand shifts for overall industries are in favor of workers with thirteen or more years of schooling—workers with higher education. The demand shift indexes for workers in this group are positive and substantial. The demand shift of this group is in contrast with the other lower education groups, where the shifts are mostly negative, suggesting the reduction in demand. Note that the negative changes are most considerable for the workers with primary and secondary school education,

respectively. These trends are similar for both men and women.

The results on the sub-period reveal the increase of labor demand for workers with lower and upper-secondary education in recent decades. The results in panel C show that the labor demand for these two groups increased from 1985 to 2017, while the results in panel B also suggest a small increase for the upper secondary education. Note that the demand for workers with higher education increased in all periods.

Table 10 also shows that the trends of within-industry are consistent with the overall industry. The within-industry demand shifts for workers with primary and secondary education are negative, while the shifts for workers with higher education are positive and substantial. This within-group demand shift indicates that the employment trend within the industry was moving toward higher education workers – workers who received college or university education. These full-period trends are consistent for both men and women.

The final part of the results presents the between-industry demand shift. The results show that the higher the workers' education level is, the higher the demand for workers. Workers with college or university education have maximum demand growth while workers with primary education have the least. Note that the demand shift for women with lower-secondary education is higher than the upper-secondary level in some sub-periods. The women's trend of demand shift is different from men, which exhibit the monotonically increasing among education levels.

At this point, it is reasonable to conclude that the increase in real hourly labor income of higher education workers is due mainly to the increase in labor demand. However, the demand for primary education workers did not increase as expected. The demand shifts for this group of workers show negative signs, which suggest a reduction in demand. In the next section, the author further discusses the cause of the increasing labor income of the primary-educated workers from non-market factors, i.e., the minimum wage. The author also further discusses the possible cause of an increase in demand for higher education workers based on Skill Biased Technology Change (SBTC).
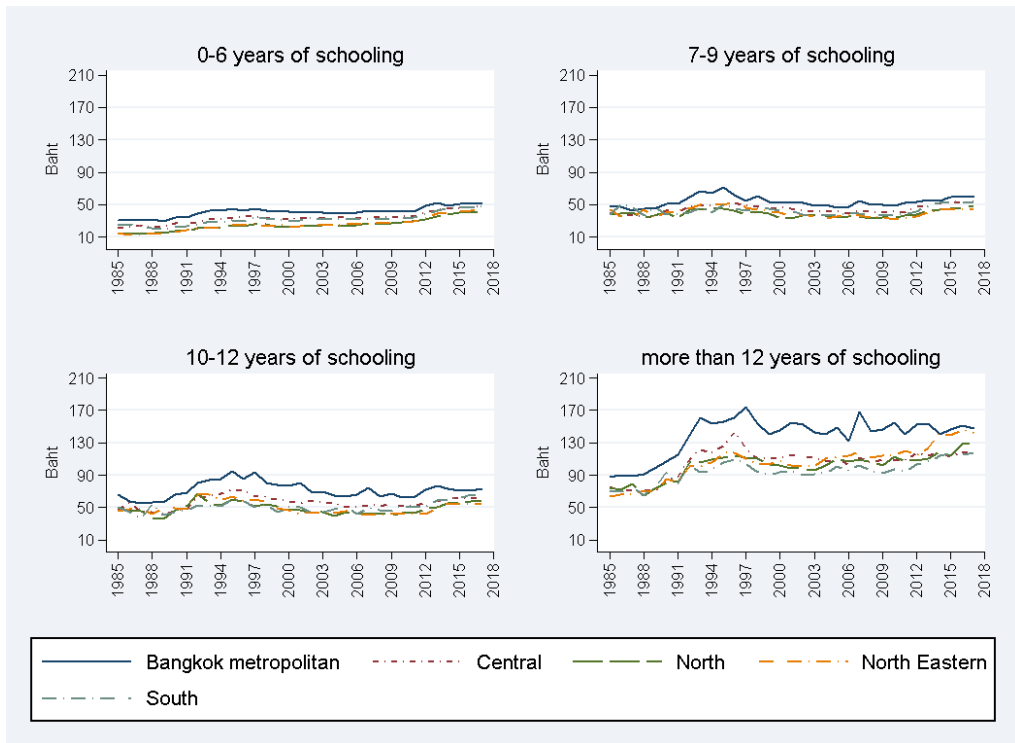

Figure *6* Real hourly labor income by region 1985 to 2017

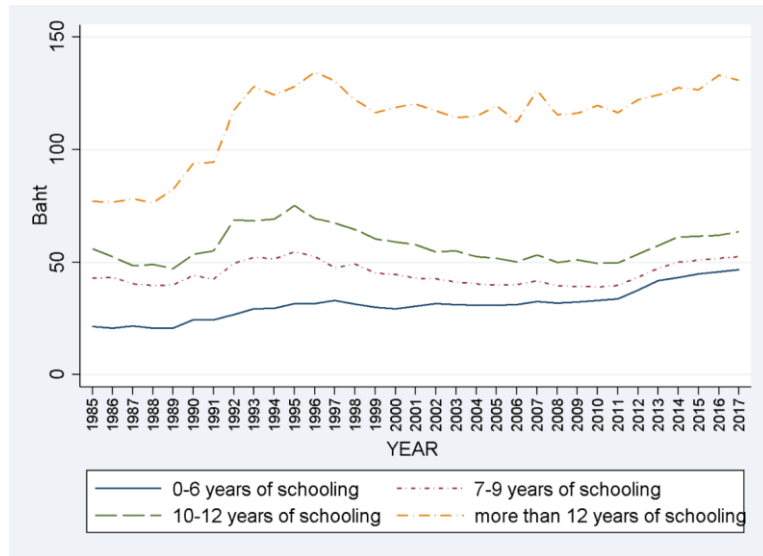*Source: Thailand Labor Force Survey (LFS) data, third quarter*

Figure *7* Real hourly labor income by education level from 1985 to 2017

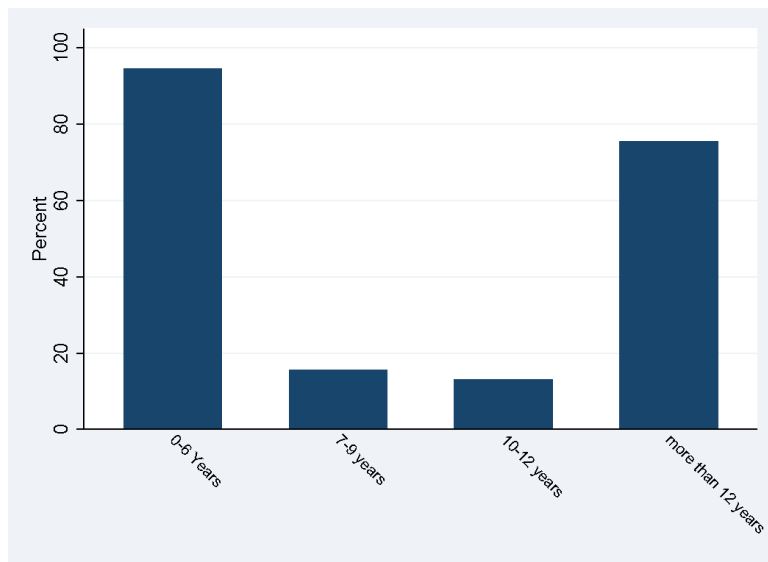*Source: Thailand Labor Force Survey (LFS) data, quarter 3*

Figure *8* Percentage changes in real hourly labor income
from 1985 to 2017, by education level

Source: Thailand Labor Force Survey (LFS) data, quarter 3

Table *10* Industry and Occupation Based Demand Shift Measure, 1985 to 2017

	Change in log relative demand (multiplied by 100)											
	Between Industry				Within industry				Overall (industry and occupation)			
Group	85-95	95-05	05-17	85-17	85-95	95-05	05-17	85-17	85-95	95-05	05-17	85-17
Men												
Primary school (0-6 years)	-0.91	0.38	0.39	-0.15	-3.00	-0.96	-2.61	-5.76	-3.91	-0.58	-2.22	-5.91
Lower secondary (7-9 years)	-0.14	1.00	0.85	2.24	-1.12	-5.59	1.53	-4.90	-1.26	-4.59	2.38	-2.66
Upper secondary (10-12 years)	1.00	2.83	0.87	3.58	-2.46	-1.20	1.88	-4.82	-1.46	1.64	2.75	-1.24
Higher education (13+ years)	1.20	2.09	0.00	4.12	2.01	5.19	4.53	2.53	3.21	7.28	4.53	6.65
Women												
Primary school (0-6 years)	-0.12	-1.36	1.37	0.10	-1.54	0.10	-2.83	-5.72	-1.66	-1.26	-1.46	-5.62
Lower secondary (7-9 years)	1.03	0.32	2.69	4.38	-1.84	-0.35	-0.75	-7.17	-0.81	-0.03	1.93	-2.78
Upper secondary (10-12 years)	0.37	0.49	2.32	3.76	-2.71	2.99	6.53	-5.82	-2.35	3.49	8.85	-2.06
Higher education (13+ years)	1.70	2.09	0.60	4.40	-4.42	5.64	3.74	0.73	-2.71	7.73	4.34	5.13

Discussion

In the last section, the results on the demand shift index indicate that the increase in primary school workers' labor income does not come from the increase in labor demand. However, there exists another explanation, i.e., the increase in the minimum wage. Literature suggest the role of the minimum wage in raising the wages of workers, especially for a worker earning at the bottom of the wage distribution (Adams, Schweitzer, & Wascher, 2000; Wascher, 2015). This explanation seems consistent with the empirical data of the Thai labor market. Figure 11 presents the trends of real hourly labor income and the real hourly minimum wage from 1985 to 2017, showing that the real hourly labor income and real hourly minimum wage tend to move in the same direction. This result is consistent with the existing study, which found that minimum wage helps compress wages at the bottom of the wage distribution (Leckcivilize, 2015).

This evidence suggests that the minimum wage contributes to an increase in the labor price of primary school-educated workers.

In the preceding section, the results of the demand shift indexes support the explanation that an increase in demand for workers with higher education leads to an increase in their labor price. An immediate question arises here is what would be the cause of this demand increase? One possible explanation is the Skill-Biased Technological Change (SBTC) hypothesis. The hypothesis states that technological advancement replaced the physical labor who did a routine-task with a machine. It also creates a new task that requires workers to work in tandem with machines. (Acemoglu, 1998; Acemoglu & Restrepo, 2018; Katz & Murphy, 1992).

This argument is supported by empirical evidence, where

Table **11** shows an increase in employment for workers who cannot be

replaced by a machine such as skilled workers, professional workers, service workers, and plant and machine operators. The employment in industries with complex and non-routine tasks such as commercial, manufacturing, and construction also increased. These occupations and industries are likely to require workers and modern technology or machines to work together.

Higher education may support workers to work with modern technology and machines by providing them with *general skills*. General skills allow workers to work in various types of firms and do various types of tasks (Becker, 1967). These general skills may include critical thinking, essential knowledge such as mathematics and English language, and other skills such as communication and team organization. This set of skills allows workers to perform a complex, non-routine, and problem-solving task, the task which the modern computer and machine cannot accomplish yet. Therefore, the demand for workers with higher education

increased from 1985 to 2017. This finding is consistent with the prior study, which suggests the role of SBTC in the Thai labor market (Lathapipat, 2011).

The other results in this paper can compare to recent literature as follow. For the study in Thailand, Wasi et al. (2019) found that the wage gap between college and high school has widened over time. This result is in line with this paper, which uses labor income instead of a regular wage. This paper shows that the labor income of workers with a college education has substantially increased compared to the lower education worker.

This result is also consistent with a study in China. Gustafsson and Wan (2020) found the increasing disparity of wages between college and high school. However, the gender wage gap in China has also increased. This result contrasts with this study which found that the gender wage gap has substantially decreased in Thailand. This result is consistent with Paweenawat and Liao (2019) which found that the gender wage gap appears to converge.
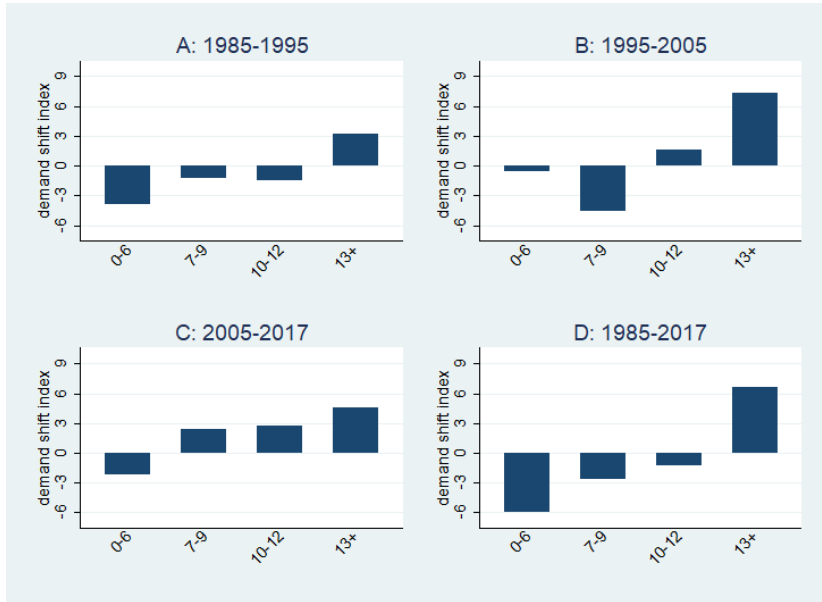
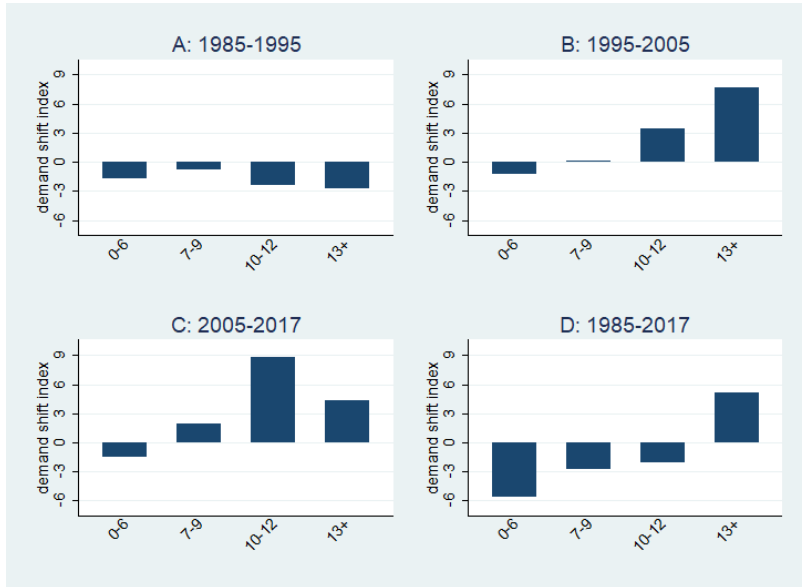**Figure** *9* The overall industries demand shift index for men

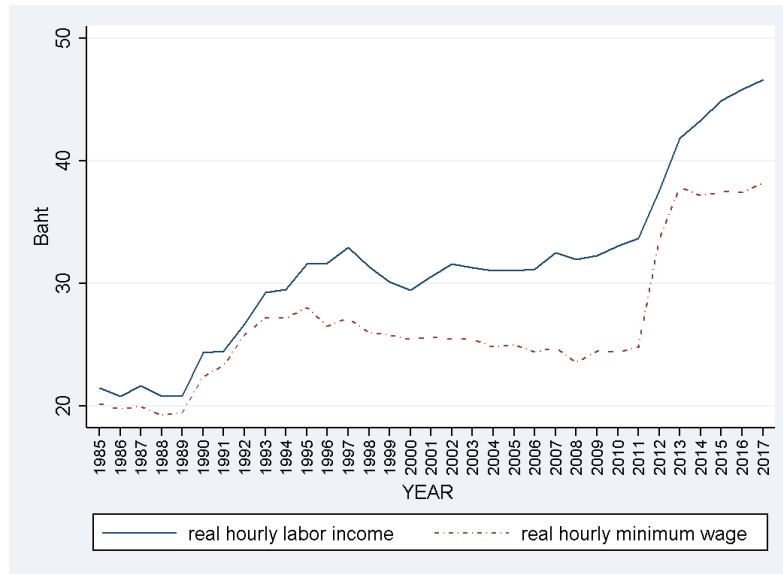**Figure** *10* The overall industry demand shift index for women

Figure *11* Real hourly labor income of workers with zero to six-year
of schooling and real hourly minimum wage, 1985 to 2017

Table 11 Overall industries and occupation employment distribution, 1985-2017

	Percentage of employment shares				
	85-95	95-05	05-17	85-17	Full Period Change
Industry					
Agriculture, hunting, fishing	14.11	8.83	6.59	7.74	-6.38
Commercial	0.16	0.26	18.14	24.92	24.75
Construction	1.58	1.54	10.08	14.26	12.68
Manufacturing	19.85	21.21	26.09	35.89	16.04
Mining and quarrying	0.56	0.41	0.29	0.59	0.03
Others	0.06	0.02	4.47	1.70	1.64
Services	49.90	49.99	32.82	9.70	-40.21
Transport and communication	5.11	3.81	0.63	3.60	-1.51
Utilities	8.67	13.93	0.90	1.61	-7.06
Occupation					
Agricultural and fishery workers	14.11	9.30	3.28	2.05	-12.07
Clerks	11.90	11.16	9.42	8.00	-3.90
Managers and legislators	3.86	3.66	3.13	4.80	0.95
Plant and machine operators	7.37	6.59	15.45	15.40	8.04
Professionals	0.22	15.55	12.17	11.98	11.76
Service workers	6.36	6.03	12.66	16.19	9.83
Skilled workers	2.13	1.71	15.78	15.14	13.01
Technicians	26.03	20.75	10.12	7.97	-18.06
Unskilled workers	28.01	25.25	18.00	18.46	-9.55

Conclusion

This study investigates the changes in the distribution of the real hourly labor income in the Thai labor market from 1985 to 2017. The study found that the overall labor income distribution improved over the past three decades, suggesting that workers had received higher labor income. The results also suggest a reduction in the earnings gap between men and women.

Women's labor income has risen and converged with men since 2009. It also revealed the disparity of labor income among the regions, where the Bangkok Metropolitan ranks at the top and the North and Northeast at the bottom. The distributions by education levels reveal that the real hourly labor income of workers with primary school and higher education increased.

This study evaluated the cause of this increase according to changes in labor demand. The results indicated that demand for workers with primary school education had reduced; hence

the increase in their labor price is due to the increase of minimum wage. However, the demand shift index indicates a substantial increase in labor demand for workers with higher education. The evidence of the industry-occupational distribution of workers supports the explanation of demand increase due to Skills-Biased Technological Change: SBTC.

Limitations and future research

It is worth noting some limitations in this paper and the direction for study in the future. First, this paper shows the stylized facts about the change in labor income distribution in some key dimensions, such as overall distribution, distribution by gender, and region respectively. However, this paper did not investigate the factor associated with the change in these distributions. The study in the future can examine these factors. For instance, see Suphanachart (2019) for investigating factors affecting overall income inequality in the Thai labor market and Edo & Toubal (2017) for examine the effect of immigration on the gender wage gap in France. Having more detail on factors affecting labor income inequality in the Thai labor market will provide a more in-depth understanding of the labor market and support policy implications more effectively.

Second, the Thai government has implemented the policy to adjust the base salary of bachelor's degree graduates to reach 15,000 baht starting from January 2012. The policy has been implemented for government employees, but we can expect the spill-over effect to other sectors or the entire labor market as well. The analysis in this paper did not account for this policy yet. The study in the future can evaluate the role of this policy toward the changes in labor income of college graduates and the overall distribution.

Managerial, business, and public policy implication

The results in this paper show that workers' labor income has been increasing over the past three decades.

The increase occurs dramatically for the bottom and top of the distribution. The industries-occupations employment distribution also changes in favor of high-skills workers. These changes imply that Thailand is no longer an economy that relies on cheap physical labor. The recommendation of this paper is that for business to survive the competition, in the long run, firms and companies should adapt their production process to utilize more capital, such as modern technology and machines, and rely less on physical labor. Using high-skill workers to complement modern production technology will reduce the cost and improve firms' productivity and competitiveness in the long run.

In addition, the increase in labor demand and labor income for higher education may induce more students who finish high school to continue to study in higher education. For some students with financial obstacles, the government should support students by providing financial tools such as scholarships or student loan funds that provide loans base on student needs and market labor demand.

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