Labor Supply Intention of the Elderly in Thailand

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Abstract

Using data from the LFS conducted by the National Statistical Office (1998 - 2017), this paper studies personal and macroeconomic factors influencing the elderly's decisions to work after retirement. The findings show that working hours became the most significant factor affecting the elderly's work decisions at both the country and the regional levels. Personal factors also affected the elderly's work decisions at both levels. For macroeconomic factors, the growth rate of GPP significantly affected the elderly's work decisions only in the Northern Region. At the whole country level, the elderly who have the burden of raising children and providing care for senior family members were less likely to remain economically active. The study suggested that the government should issue a policy or measure that helps reduce the older persons' burdens to enable them to continue working.

Keywords: elderly labor, elderly worker, labor supply
JEL Classification Codes: J14, J21, J26

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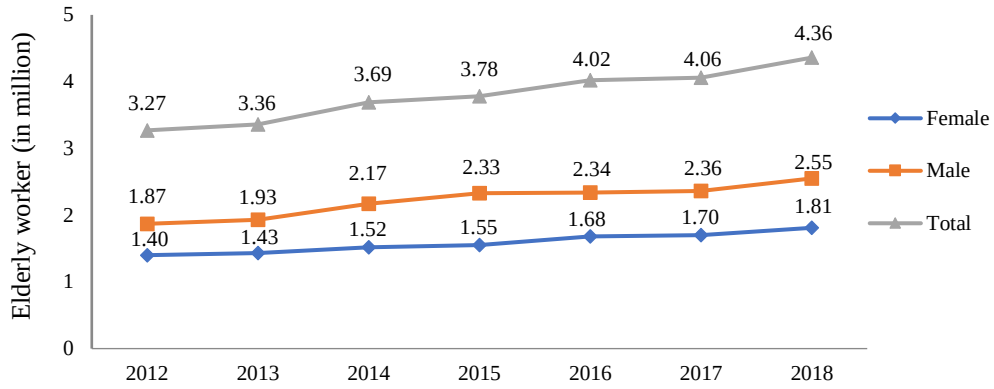
1. Introduction

Many countries are currently witnessing their transformation into an aging society while some have already become the completed demographic transition countries. Thailand is also experiencing this process (Institute for Population and Social Research, 2019). Its population structure change has been attributed by the decline of fertility and the increase in life expectancy (Chi, 2012; OECD, 2006). The Office of the National Economic and Social Development Council has predicted that Thailand will become a complete aged society in 2028 and a super-aged society in 2031 (Foundation of Thai Gerontology Research and Development Institute, 2016). This demographic transformation has affected the country's economy in several ways, for example, the decrease in the proportion of working age group which in turn leads to the decrease in the labor participation rate. It also affected the level of production rate and the country's economic growth (Bank of Thailand, 2018; Bloom et al., 2015; Cheng and Loichinger, 2017). Giles et al. (2015) found that becoming an aging society led to a decrease in GNI per capita and employment rate. Moreover, the government may be able to collect less annual tax, which affects the fiscal budget. Also, the government expenditure will increase with the aging society. A large amount of money will be spent on social welfare and medicare for the elderly (e.g. medical expenses, welfare allowance, pension, income tax deduction, transportation fare deduction, etc.). In addition, the working age group must bear the cost of caretaking for the elderly in the family who do not have income.

The Thai government had issued more national policies regarding the elderly. The existing legislations that contain the matters on elderly are the Constitution of the Kingdom of Thailand (B.E. 2560), the Act on the Elderly (B.E. 2546), the Eleventh National Economic and Social Development Plan (2012 - 2016), the Twelfth National Economic and Social Development Plan (2017 - 2021), Thai Elderly Declaration, the Second National Plan on the Elderly (2002-2021), and the 20-year National Strategy (2017 - 2036). There are also a couple of measures that assist in the transformation into the complete aged society, such as Employment Measures for the Elderly, and the measures on providing accommodation for the elderly, reverse mortgage, and allowance, etc. (Ministry of Social Development and Human Security, 2018). The Thai government has placed importance on the matter of elderly employment by stipulating elderly employment measure as a Royal Decree issued under the Revenue Code governing exemption on revenue taxes (No. 639) B.E. 2560. This code helps to promote and support the private sector to employ more elderly, which makes more space for the elderly in the labor market.

According to the data from the National Statistical Office (2019), the elderly tended to adapt their behaviors by extending their retirement periods. As shown in Figure 1, the elderly's intentions to work have been increasing in the past few years in both genders.



Source: The surveys of the working population 2012-2018. National Statistical Office (2019).
Figure 1. Number of elderly workers above 60 years old by gender 2012-2018

The intention to work of male elderlies is generally higher than females maybe due to the physical advantages and being head of household. Females' participation in the labor force seems to be impeded by children who need constant care and attention (Vicens et al., 2015). The elderly's income has increased from 28.9 percent in 2007 to 30.9 percent in 2017 (Foundation of Thai Gerontology Research and Development Institute, 2018). This is because elderlies are more skilled, experienced, and healthier than before. Moreover, elderly people want to improve their self-esteem and earn more money to help their children and government reducing expenses.

Elderly employment is an important issue that can help the country to retain a long-term production capacity. Elderly employment will help the elderly to develop their potential and self-pride. For other benefits, for example, it will help guarantee the elderly's income and decrease the long-term expenditure for elderly caretaking (Srisuchart et al., 2017). The results of the study can provide useful information indicating the elderly's characteristics that encourage them to work after retirement age. The results can help the government to set up the policies and measures regarding elderly employment promotion. As the elderly population increase every day, the knowledge on this topic becomes more and more significant. Those legislations will help support population structure change in the future.

Therefore, the objective of this paper is to analyze factors influencing the Thai elderly's work decisions. This study used secondary data from the survey on working conditions of the Thai population collected by the National Statistical Office of Thailand. According to Maestas (2010), the personal factors affecting the elderly to work after retirement usually are gender, age, marital status, education, work experience, residential location, and the size of the household.

However, considering only personal factors seems to be inadequate to predict whether the elderly will continue working after retirement due to the effects from the surrounding environment of each elderly. The other external factors, such as economic factors or financial status, may possibly affect the elderly's decisions either to work or not to work after retirement. In this study, the personal factors were considered together with the macroeconomic factors. Furthermore, the analysis was also split to look at the differences across regions in Thailand, namely Northern, Northeastern, Southern, and Bangkok. To

achieve our analysis, the probit model was then used to investigate these factors on Thai elderly's work decisions.

This paper was organized as follows: section 2 presents literature review, section 3 presents the data, section 4 present the study's results, and the final section is a conclusion.

2. Literature Review

In recent years, the transition to an aging society in many countries has occurred much earlier than in the past. Developed countries tend to become aging societies before the developing world. Recently, Thailand has experienced an increase in labor force participation (LFP) of the elderly in the same way as other developing countries. This transition negatively affected the country's economy due to the decrease in the number of working-age population. An empirical study shows that demographic structure change plays a crucial role in economic development in many countries around the globe (Székely, Behrman, & Duryea, 2011). The study stated that change in population structure can affect three groups of economic indicators: 1) macroeconomic aggregates (domestic savings as a share of GDP, GDP per capita, capita per worker, and tax revenue as a share of GDP); 2) government expenditures in education and health; and 3) social indicators (inequality, unemployment, homicide rates, and schooling progression rates). Therefore, the countries that are becoming aging societies must prepare themselves to be able to properly adapt to the situation. To reduce labor shortage in the future, many countries encourage the elderly to continue working in order to expand the labor force participation.

Many studies focused on the factors influencing older workers' decisions about retirement, and found that the three main factors are 1) physical limitations and health issues, 2) financial circumstances, and 3) employment opportunities and related policies (Patrickson & Hartmann, 1996; Hansson et al., 1997; Patrickson and Clarke, 2001). In addition, partner consideration is also included to be one of the influencing factors in some studies (Wolcott, 1998 and Gustman & Steinmeier, 1994).

For personal factors like gender, male elderlies seem to be more likely to be in the labor market longer than female elderlies due to some expectations and limitations. According to Economic Planning Agency (1990), 50 percent of the Japanese men, aged 60 to 69 years old want to work as long as physically possible. Seike and Yamada (2004) showed that the value of life is a primary reason that makes the Japanese elderly to continue working. However, some studies found that when age increases, the demand for work decreases due to the deterioration of their physical performance (McKee-Ryan et al., 2005; Kim, 2016). The elderly will decide to take more leisure than staying in the labor market. In terms of education level, Hotopp (2005) indicated that the higher the level of education of older workers, the higher the ratio of employee retention in the UK. Similarly, Copeland (2007) found that American elderlies with high level of education are significantly more likely to be in the labor force after retirement. This is because the one with higher education can get a better job. However, Kim (2016) argued that elderly workers with higher levels of education, at least a high school diploma, tend to walk out from the labor market than those with the lower ones. Moreover, Sakai et al. (2007) examined the factors affecting labor force participation in Japan and demonstrated that age, living in urban area, pension received, and health issues are the factors that affect the reduction of the probability of elderly's work retention.

For economic factors, Clark et al. (2004) indicated that the growth of the US economy led to an increase in labor demand, especially the demand for hiring elderlies. Thus, older workers tend to decide to continue working after retirement age. Arifin et al. (2009) stated that in the developing countries, economic factors are the main reason that makes elderlies remain in the labor market. This is because these countries do not have pension program or other benefits for elderlies or some might have but were judged inadequate. On the other

hand, previous studies have demonstrated that social security programs' enhanced generosity has been reducing elderly's labor supply, despite general improvement in their health condition (Shimizutani, Oshio, and Fujii, 2014; Wise, 2017; Oshio, Usui, and Shimizutani, 2018).

As for studies on the elderly in Thailand, Chansarn (2011) found that the transition into an aging society in Thailand has clearly affected the labor force structure of the country. Therefore, the government has been focusing on supporting and promoting the elderly to continue working after retirement (Soonthornchawakarn and Cintakulchai, 2009; Foundation of Thai Gerontology Research and Development Institute 2013; Amonvatana et al., 2008; Suksiriserakul, 2013). Some recent studies focused only on some specific areas or establishments. Raksasap and Intrawisaes (2008) found that the number of the elderly, aged from 50 to 60 years old, who want to continue working after retirement is larger than the group that does not want to work after retirement. The reason for conserving the elderly in the labor market is that they still want to work and get more income for their living expenses. Laowiwattana (2008) and Adhikari et al. (2011) examined the labor force participation among older people in Thailand and investigated the factors affecting their participation. The results indicated that those elderly living in the urban areas, having low levels of education, being the head of family, and being in debt are more likely to get involved in the labor market.

From the literature review, previous studies mostly focused on either personal or economic factors. However, none of the studies in Thailand so far have included both types of factors in the analysis. Hence, the current study will consider both personal and macroeconomic factors influencing the elders' work decisions after retirement age in Thailand. Moreover, due to the differences of population's characteristics, the study will focus at both the whole country and the regional levels.

3. Data

The data used in this study are mainly from The Labor Force Survey Whole Kingdom collected by the National Statistical Office. The results will be presented at both whole country level and regional level. By following the National Statistical Office, the regional level is split into five areas, namely Northern, Northeastern, Southern, Central, and Bangkok. Even though Bangkok is a province in the Central region, it will be solely considered because the elderly who live in the capital city usually have habit/behavior and surrounding contexts different from the elderly who live in other provinces.

The samples are both male and female Thai elderlies who are over 60 years old, surveyed from 1998 to 2017 (20 years). In this study, the 3rd quarter information was solely used to represent the whole year's information. Since the 3rd quarter period is the harvest season in the agricultural sector, it can perfectly clarify the ratio of labor in the agricultural sector. A data of our main variable was drawn from a question in the survey that asked "During the last 7 days before interviewing date did (name) have time for more/additional work and want to work more?" for using as the dependent variable in this study. To clarify, the elderlies in Thailand mostly are currently employed. Thus, for those who are employed the term 'intention to work' means 'intention to work more'.

For other information used in this paper, we collected the aggregated data from the National Statistical Office, the Office of the National Economic and Social Development Board, and Bank of Thailand (as shown in Table 1). The factors focused in this study are Labor Force Survey Whole Kingdom, average allowance per elderly (allowance), growth rate of gross domestic product (ggdp), growth rate of gross provincial product (ggpp), growth rate of core consumer price index (inflation), unemployment rate by regions (unem_rate) – calculated from the ratio of the number of unemployed*100 and total labor force, child dependency ratio (propor_under19) – calculated from the ratio of the number of people aged

under 19 years and the total population number of the province, and old-age dependency ratio (propor_60) – calculated from the ratio of the number of people aged over 60 years and the total population number of the province.

Table 1. Data sources used to construct each variable.

Variable Name	Variable Code	Sources
Household members	hhmember	The Labor Force Survey Whole Kingdom by National Statistical Office
Head of household	headofhh	
Gender (Male=1)	male	
Age	age	
Marital Status	maritalstatus	
Education level	edu	
Working hours	workinghours	
Wage	wage	
Allowance	allowance	Department of Older Persons, Ministry of Social Development and Human Security
The growth rate of gross domestic product	ggdp	Bank of Thailand
The growth rate of gross provincial product	ggpp	Office of the National Economic and Social Development Board
Inflation	inflation	Bank of Thailand
Unemployment rate by region	unem_rate	Unemployment Rate by the Whole Kingdom, Region by Office of the National Economic and Social Development Board
Child dependency ratio	propor_under19	Components of Census Population by Sex and Age by Department of Provincial Administration
Old-age dependency ratio	propor_over60	

Table 2 presents the descriptive statistics of variables used in this paper. We restrict our samples to the population aged 60 and older, with the average age of around 66 years old and most of them are married males. The average family size is 3.428 persons. For academic background, Thai elderlies are literate. Most of them had attended only some formal education, with an average of 2.613 years or below fundamental education (Compulsory Education Act B.E. 2002). At the regional level, the educational level of the elderly in each region is not different. Central, Northern, Northeastern and Southern Regions have the average level of education at 2.459, 2.321, 2.821, and 2.513 years, respectively. Only Bangkok has a high level of education with an average of 4.977 years. For work status, the study found that 98.8 percent (22,069 persons) of the elderly are still working. For the elderly's intention to work in the future, the study found that only 3.3 percent (728 persons) intended to continue working in the future. For work duration, the average work duration per week of the elderlies was 43.046 hours. The elderlies in Bangkok had the longest work duration, a maximum of 46.575 hours per week, while the elderlies in the Southern Region worked the shortest duration, a minimum of 38.101 hours per week. For the elderly' income, the study found that the average income that the Thai elderlies could earn per month was 8,846 baht, which is quite comparable to the elderly in the Central Region with the average of 9,246 baht. The elderly in the Northern Region got the lowest income at averagely 5,912 baht per month. The elderly in Bangkok earned the highest amount of income which was 26,907 baht per month.

Table 2. Descriptive statistics of samples by geographic classification

Variable	Obs.	Mean	Std. Dev.	Min	Max
Whole country					
Current work	22,069	0.988	0.109	0	1
Intention future work	22,069	0.033	0.179	0	1
Number of household members	22,069	3.428	1.933	1	26
Gender (Male = 1)	22,069	0.594	0.491	0	1
Age	22,069	65.885	4.936	61	98*
Marital status (Married = 1)	22,069	0.673	0.469	0	1
Years of education	22,069	2.613	2.282	1	17
Working hours	22,069	43.046	15.239	0	98*
Wage	22,069	8,846	52,508.05	10	999,998**
Central Region					
Current Work	8,580	0.988	0.108	0	1
Intention Future Work	8,580	0.029	0.167	0	1
Number of household members	8,580	3.565	2.064	1	26
Gender (Male = 1)	8,580	0.579	0.494	0	1
Age	8,580	65.973	4.994	61	98*
Marital Status (Married = 1)	8,580	0.654	0.476	0	1
Years of Education	8,580	2.459	1.944	0	17
Working Hours	8,580	44.270	14.756	0	98*
Wage	8,580	9,246	58,252.87	15	999,998**
Northern Region					
Current Work	5,969	0.990	0.099	0	1
Intention Future Work	5,969	0.047	0.213	0	1
Number of household members	5,969	3.022	1.633	1	14
Gender (Male = 1)	5,969	0.547	0.498	0	1
Age	5,969	66.067	4.907	61	98*
Marital Status (Married = 1)	5,969	0.644	0.479	0	1
Years of Education	5,969	2.321	1.866	1	17
Working Hours	5,969	43.082	14.917	0	98*
Wage	5,969	5,912	41,267.5	10	999,998**
Northeastern Region					
Current Work	3,091	0.995	0.072	0	1
Intention Future Work	3,091	0.034	0.180	0	1
Number of household members	3,091	3.502	1.863	1	12
Gender (Male = 1)	3,091	0.635	0.481	0	1
Age	3,091	65.23	4.892	61	98*
Marital Status (Married = 1)	3,091	0.709	0.454	0	1
Years of Education	3,091	2.821	2.386	1	15
Working Hours	3,091	43.601	14.435	0	98*
Southern Region					
Current Work	3,290	0.974	0.159	0	1
Intention Future Work	3,290	0.030	0.171	0	1
Number of household members	3,290	3.648	2.026	1	16
Gender (Male = 1)	3,290	0.671	0.470	0	1
Age	3,290	65.800	4.785	61	98*
Married	3,290	0.749	0.434	0	1
Years of Education	3,290	2.513	2.234	1	17
Working Hours	3,290	38.101	17.468	0	98*
Wage	3,290	8,356	49,622.99	25	999,998**

Table 2. Descriptive statistics of samples by geographic classification (Continued)

Variable	Obs.	Mean	Std. Dev.	Min	Max
Bangkok					
Current Work	1,223	0.996	0.064	0	1
Intention Future Work	1,223	0.004	0.064	0	1
Number of household members	1,223	3.712	1.971	1	15
Gender (Male = 1)	1,223	0.616	0.487	0	1
Age	1,223	65.468	5.073	61	97
Marital Status (Married = 1)	1,223	0.645	0.479	0	1
Years of Education	1,223	4.977	4.203	1	17
Working Hours	1,223	46.575	12.545	0	98*
Wage	1,223	26,907	80,512.27	75	999,998**

Note: * defined as ≥ 98 years old or 98 hours per week in LFS, ** defined as ≥ 999,998 baht
Source: Calculation.

Methodology

This study used selected personal and economic variables to analyze factors affecting the working intention of elderly people at the national level and the regional levels (Central, North, Northeast, South, and Bangkok). The geographic classification was already pre-determined by the National Statistical Office in its LFS reports. The Probit model was employed for the present analysis. Therefore, the dependent variable is a dummy variable with the values of 0 and 1 – $Y_i = 0$ (No intention to work) and $Y_i = 1$ (Has an intention to work). According to Liao, T.F. (1994), the result obtained from the Probit model is the probability of choosing one choice relative to another choice.

In addition, we need to control for regional fixed effects and year fixed effects. Thus, we can write our empirical model as follows:

$$\begin{aligned}\text{Intention}_{ipt} &= \beta_0 + \beta_1 \text{hhmember}_{ipt} + \beta_2 \text{headofhh}_{ipt} + \beta_3 \text{male}_{ipt} + \beta_4 \text{age}_{ipt} \\ &+ \beta_5 \text{maritalstatus}_{ipt} + \beta_6 \text{edu}_{ipt} + \beta_7 \text{workinghours}_{ipt} + \beta_8 \text{wage}_{ipt} \\ &+ \beta_9 \text{allowance}_t + \beta_{10} \text{ggdp}_t + \beta_{11} \text{ggpp}_{pt} + \beta_{12} \text{inflation}_t + \beta_{13} \text{unem\_rate}_t \\ &+ \beta_{14} \text{propor\_under19}_{pt} + \beta_{15} \text{propor\_over60}_{pt} + \varepsilon_{ipt} \quad \ldots\ldots\ldots (1)\end{aligned}$$

where Intention_{ipt} is the intention to work more where
$\text{Intention}_{ipt} = 1$ if the interviewee wants to work more
$\text{Intention}_{ipt} = 0$, otherwise

hhmember_{ipt} is number of household members (person)

headofhh_{ipt} is a dummy variable where$\text{headofhh}_{ipt} = 1$ if the respondent is the head of household
$\text{headofhh}_{ipt} = 0$, otherwise

male_{ipt} is a dummy variable where
$\text{male}_{ipt} = 1$ if the respondent is mal
$\text{male}_{ipt} = 0$, otherwise

age_{ipt} is age (years)

$\text{maritalstatus}_{ipt}$ is a dummy variable where$\text{maritalstatus}_{ipt} = 1$ if the respondent is married $\text{maritalstatus}_{ipt} = 0$, otherwise

edu_{ipt} is education duration (years)

$\text{workinghours}_{ipt}$ is total number of work hours in the past seven days before the interview (hours)

$wage_{ipt}$	is	monthly wage rate (baht)
$allowance_t$	is	average allowance per elderly (baht)
$ggdp_t$	is	growth rate of gross domestic product (percentage)
$ggpp_{pt}$	is	growth rate of gross provincial product (percentage)
$inflation_t$	is	growth rate of core consumer price index (percentage)
$unem\_rate_t$	is	regional unemployment rate (percentage)
$propor\_under19_{pt}$	is	proportion between the number of people aged under 19 and the total population number of the province (proxy for child dependency ratio)
$propor\_over60_{pt}$	is	proportion between the number of people aged over 60 and the total population number of the province (proxy for old-age dependency ratio)
i	is	individual i
p	is	province p
t	is	time t
ε_{ipt}	is	error term

4. Results and Discussion

This section presents an analysis of factors affecting the elderly's work intentions in Thailand. As shown in Table 3, men are more likely to want to continue working after retirement age than women. This result supports what Cheng and Loichinger (2017) found. This might be because men are considered the head of the family who has to earn money to take care of the whole family. Men are also stronger than women in their physical characteristics which encourage elderly men to stay in the labor market longer than women. Apart from the physical limitation, the value of life is one of the main reasons that keeps elderlies in the labor market (Seike and Yamada, 2004). Moreover, elderlies who have high education level are less likely to want to continue working than those with lower education level. The elderly with high education level are more likely to hold high positions, which require high level of education, abilities, and skills, leading them to receive high salary. As a consequence, the elderly with a high education level could retain more savings for their living expenses after retirement. The result affirmed a previous study which stated that a higher level of education tends to improve job opportunities through higher wages (Duggan, 1984). Also, the better-educated people enjoy better health and live longer than their counterparts (Elo and Preston 1996; Cutler and Lleras-Muney 2008). It implies that they are physically ready to work longer years. However, those with high position may choose to retire early due to high pressure, less flexibility and stressful environment in their career (Filer & Petri, 1988; Hurd & McGarry, 1993). In addition, Table 3 shows that the elderly who worked for longer hours tended to want to stop working in the future. Other factors such as the number of household members, being head of household, marital status, and income per month did not affect the elderly's decision to continue working.

For the economic indicators that may affect the intention for the elderly to continue working, the results showed that macroeconomic variables including GDP growth rate, GPP growth rate, inflation, unemployment rate, and average allowance per elderly do not have any impact at the aggregate level. However, the elderly that have a burden to support their children aged under nineteen years old or their seniors were not likely to continue working. This result is consistent with Bank of Thailand (2018) which indicated that the main reason that makes elderlies leave labor market in Thailand was that they have to take care of the family's members who are not able to rely on their own, such as children, seniors, and sick relatives.

Table 3. Determinants of elderly labor force participation at the whole country level using the Probit regression model.

VARIABLE	Whole country	
	Coefficient	**Marginal Effects**
hhmember	-0.014	-4.211-04
	(0.011)	(3.4e-04)
headofhh	-0.021	-6.364e-04
	(0.014)	(4.2e-04)
male	0.077*	2.3e-03*
	(0.044)	(0.001)
age	-0.017***	-5.2e-04***
	(0.004)	(1.3e-04)
maritalstatus	-0.018	-5.548e-04
	(0.046)	(0.001)
edu	-0.078***	-0.002***
	(0.014)	(4.3e-04)
workinghours	-0.039***	-0.001***
	(0.001)	6e-05
wage	-9.86e-08	-3.01e-09
	(3.81e-07)	(0.000)
allowance	-98.33	-3.000
	(232.7)	(7.106)
ggdp	0.017	5.169e-04
	(0.360)	(0.011)
ggpp	2.82e-04	8.61e-06
	(0.00317)	(1.0e-04)
inflation	0.144	0.004
	(0.617)	(0.019)
unem_rate	-0.121	-0.004
	(0.0758)	0.002
propor_under19	-2.284**	-0.070**
	(0.954)	(0.029)
propor_over 60	-2.924**	-0.089**
	(1.249)	(0.038)
Observations	22,069	
Pseudo R2	0.2343	

Note: Standard errors are reported in parentheses. ***, **, * Denote significant level at 1%, 5%, and 10%, respectively.The constant term is not included in the model.

Factors affecting the elderly's intention to work at the regional level.

There exist cultural and religious belief differences across regions in Thailand which are often overlooked in the aggregate analysis. Therefore, this section presents the results of the same analytical procedures at the regional level. Table 4 shows that the results at the regional level are similar to those at the whole country level with some variations. The number of work hours is negatively correlated with the elderly's work intentions at both the national and the regional levels, with Bangkok having the smallest impact. Moreover, it is the only significant factor in Bangkok area but with the smallest impact compared to other regions. From the summary statistics in Table 2, most of the elderly in Bangkok have higher level of education than their counterparts in other regions. They might hold high career positions with larger salary and, hence, savings implying the lower need for them to continue working after retirement. This tendency also allows them to have fewer work hours. This result confirms the theory of individual labor supply by Becker (1965). Elderlies in Bangkok, a hub of most

advancement and modernity, always have background and settings different from those living elsewhere in Thailand. Therefore, when private and public organizations contemplate a policy related to elderly labor participation, it is necessary to consider the differences in this aspect.

Wage is only negatively significant in the Northern and Northeastern Regions[4]. The result was in accordance with the backward bending supply curve. Considering the wage rate as an opportunity cost of leisure when wage rate increases, the overall income increases leading the elderly to reduce their work hours through the income effect. Since the population in the North and Northeastern Regions are mainly employed in the agricultural sector that requires heavy labor, the elderly will choose to work less once they are able to afford it. In addition, it was found that the intention to continue to work for the elderly in the Northeastern Region depends on the number of household members and gender. Due to the characteristics of agricultural careers that require a lot of workforces and physical effort, the number of household members is important to maintain their income level. If the number of household members is more likely to decrease, the elderly will decide to continue working to maintain their income level. Moreover, working after retirement age also helps to maintain their well-being and support themselves in the future (Srisuchat et.al, 2019).

Most of the macroeconomic factors do not affect the elderly's work intention at the regional level just as at the country level. Only the growth rate of gross provincial product was found to increase the elderly's work intention in the Northern Region. For child dependency ratio, the study found that this factor had a negative relationship with the elderly's intention to continue working only in the Southern Region[5]. Contreras et al. (2011) noted that the number of young children in the household is a deterrent to female labor force participation. In addition, the elderly dependency ratio is an important determinant for the elderly's intention to work only in the Northern Region. The results reveal that in the Northern Region the elderly who had to look after his/her seniors in the family were not likely to continue working. This might due to its outstanding "Lanna" culture and traditions that always teach people to be kind and generous, especially for the young to look after the elderly in the family (Ministry of Culture, 2016). In essence, the factors affecting the elderly's intention to work are similar to those at the country level with few exceptions.

[4] However, this factor has lower level of impact compared with the others.

[5] According to Sukontamarn and Herberholz (2018), the elderly in the Southern Region tended to work part-time more than full-time compared with those in other regions.

Table 4. Analysis of factors affecting the elderly's labor supply in each region using the Probit Model

VARIABLE	(1) Bangkok	(2) Central	(3) Northern	(4) Northeastern	(5) Southern
hhmember	-0.050	0.005	-0.009	-0.057*	-0.011
	(0.152)	(0.017)	(0.022)	(0.032)	(0.027)
headofhh	0.085	-0.005	-0.032	-0.051	-0.035
	(0.113)	(0.021)	(0.024)	(0.060)	(0.045)
male	0.748	0.058	0.122*	0.260**	0.038
	(0.606)	(0.073)	(0.074)	(0.130)	(0.126)
age	0.005	-0.021***	-0.015**	-0.042***	-0.004
	(0.049)	(0.007)	(0.007)	(0.015)	(0.011)
maritalstatus	-0.209	0.046	-0.114	-0.004	0.043
	(0.566)	(0.078)	(0.077)	(0.134)	(0.138)
edu	0.057	-0.090***	-0.063**	-0.098**	-0.072*
	(0.057)	(0.029)	(0.027)	(0.048)	(0.040)
workinghours	-0.034*	-0.037***	-0.040***	-0.046***	-0.038***
	(0.019)	(0.002)	(0.002)	(0.004)	(0.004)
wage	-3.04e-05	1.99e-07	-1.54e-05**	-5.73e-05***	4.28e-07
	(2.41e-05)	(4.91e-07)	(7.51e-06)	(2.16e-05)	(7.44e-07)
allowance	944.200	-497.4	-3,574	-215.900	-514.200
	(623.300)	(1,824)	(3,513)	(880.200)	(516.700)
ggdp	0.471	0.765	-0.561	0.100	0.513
	(0.344)	(0.563)	(0.699)	(0.429)	(0.435)
ggpp	0.042	-0.002	0.012*	-0.006	0.001
	(0.229)	(0.005)	(0.007)	(0.014)	(0.006)
inflation	0.662	1.679	-2.595	0.095	0.710
	(1.003)	(1.092)	(2.718)	(1.196)	(1.061)
unem_rate	-	-2.026	-3.469	-0.006	-0.535
	-	(5.309)	(3.904)	(0.799)	(0.419)
propor_under19	166.500	-2.070	-0.254	-2.370	-4.924***
	(111.500)	(2.230)	(1.563)	(3.514)	(1.695)
propor_over60	-55.920	-2.328	-4.789**	-3.962	2.132
	(65.580)	(1.999)	(2.385)	(5.699)	(3.143)
Observations	1,223	8,580	5,969	3,091	3,290
Pseudo R2	0.410	0.234	0.244	0.264	0.241

Note: Standard errors are reported in parentheses. ***, **, * denote significant level at 1%, 5%, and 10%, respectively. The constant term is not included in the model.

Table 5. Estimated marginal effects of the elderly's labor supply at the regional level.

	(1)	(2)	(3)	(4)	(5)
VARIABLE	**Bangkok**	**Central**	**Northern**	**Northeastern**	**Southern**
hhmember	-5.60e-13	1.45e-04	-3.996e-04	-9.72e-04*	-2.406e-04
	(0.000)	(4.7e-04)	(0.001)	(0.001)	(0.001)
headofhh	9.51e-13	-1.421e-04	-0.001	-8.67e-04	-7.518e-04
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
male	1.16e-11	0.002	0.005*	0.004**	8.12e-04
	(0.000)	(0.002)	(0.003)	(0.002)	(0.002)
age	5.07e-14	-0.001***	-6.581e-04**	-7.046e-04**	-9.15e-05
	(0.000)	(2.1e-04)	(3.1e-04)	(2.8-04)	(2.4e-04)
maritalstatus	-3.14e-12	0.001	-0.005	-6.22e-05	9.14e-04
	(0.000)	(0.002)	(0.004)	(0.002)	(0.003)
edu	6.35e-13	-0.003***	-0.003**	-0.002*	-0.002*
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
workinghours	-3.75e-13*	-0.001***	-0.002***	-0.001***	-0.001***
	(0.000)	(9e-05)	(1.5e-04)	(0.000)	(1.4e-04)
wage	-3.41e-16	5.56e-09	-6.59e-07**	-9.74e-07***	9.28e-09
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
allowance	1.06e-08	-13.896	-152.579	-3.670	-11.155
	(0.000)	(50.931)	(149.8)	(15.003)	(11.282)
ggdp	5.27e-12	0.021	-0.024	0.002	0.011
	(0.000)	(0.016)	(0.030)	(0.007)	(0.009)
ggpp	4.71e-13	-4.45e-05	0.001*	-9.59-05	1.19e-05
	(0.000)	(1.4e-04)	(0.000)	(2.4e-04)	(1.3e-04)
inflation	7.41e-12	0.047	-0.111	-0.002	0.015
	(0.000)	(0.031)	(0.116)	(0.020)	(0.023)
unem_rate	-	-0.057	-0.148	-9.93e-05	-0.012
	-	(0.148)	(0.167)	(0.014)	(0.009)
propor_under19	1.86e-09	-0.058	-0.011	-0.040	-0.107***
	(0.000)	(0.062)	(0.067)	(0.060)	(0.040)
propor_over 60	-6.26e-10	-0.065	-0.204**	-0.067	0.046
	(0.000)	(0.056)	(0.103)	(0.096)	(0.068)
Observations	1,223	8,580	5,969	3,091	3,290
Pseudo R2	0.4103	0.2344	0.2444	0.2644	0.2410

Note: Standard errors are reported in parentheses. ***, **, * denote significant level at 1%, 5%, and 10%, respectively. The constant term is not included in the model.

5. Conclusions and Implications

Since Thailand has become a complete aged society like other developed countries, its number of working-age population decreases. At the same time, the number of elderly labor force has continuously increased. This change led to the behavioral adjustments of the Thai elderly. Currently, there are only a few studies that analyze the factors affecting the elderly's labor supply in Thailand. None of them considered individual characteristics along with macroeconomic factors, and most of the previous pieces of research focused only on some specific areas or industries. To fill the gap in the literature, this study focused on the analysis at both the whole country and the regional levels of the elderly's decisions to continue working using "the Labor Force Survey Whole Kingdom from 1998 to 2017 (20 years)" data collected by the National Statistical Office.

The factor of being male was found positively significant at the whole country level, and in the Northern and Northeastern Regions, meaning that men want to continue working after retirement more than women. However, age, education level, working hours, number of household members, and wage were found negatively significant relating to elderly's work

intention. Only working hours was found to affect the elderly's work intention both at the national level and in all regions, and only the number of household members had effect only in the Northern Region. For economic factors, only the growth rate of GPP was found positively significant only in the Northern Region, while child dependency ratio and old-age dependency ratio were found negatively significant at the country level and in some regions. To promote the elderly to work longer, the government should remove some difficulties that may restrain them from working further. For example, the government should set up more healthcare centers for bedridden elderly in order to reduce the burden of the potential older workers in taking care of their infirm seniors, or encourage hiring elderly people as a children nanny.In addition, we observe that the elderly in different region have different opinion. The government should devise region-specific policies in response to their differences. The efficacy and practicality of the elderly-related policies and measures will be beyond reach if the policymakers fail to get those policies and measures designed after a thorough review of contextual differences across regions and comprehensive understanding of the changing demographic needs

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Appendix

Table 1. Analysis of factors affecting the elders' labor supply in each region by using the Probit Model

VARIABLES	(1) Bangkok	(2) Central	(3) Northern	(4) Northeastern	(5) Southern
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