PalArch's Journal of Archaeology of Egypt / Egyptology

ANALYSIS OF THE POTENTIAL CONTRIBUTION OF THE SILVER ECONOMY IN THAILAND

Tanpat Kraiwanit[1], *Areeya Srijam*[2]

[1,2]Faculty of Economics, Rangsit University

E-mail: [1]tanpat.k@rsu.ac.th

Tanpat Kraiwanit, Areeya Srijam. Analysis Of The Potential Contribution Of The Silver Economyin Thailand-- Palarch's Journal Of Archaeology Of Egypt/Egyptology 18(4), 4948-4965. ISSN 1567-214x

Keywords: Silver Economy, Older Adults, Ageing Population, In-Kind Incomes, In-Cash Incomes, GDP, Thailand, Retirement, Early Retirement, Ageing Workers

ABSTRACT

There has been a dramatic increase in the older population size in Thailand and also other countries worldwide, leading to changes in population age structure; therefore, the structure of the working-age adult population has changed, and this might affect the national economy and GDP. This study aims to explore the factors affecting the contribution of the economic activity of the ageing population, the so-called silver economy, and to estimate the contribution of the ageing population to Thailand's total GDP. The findings show that gender, education level, career and income, along with frequency of internet use, device and internet access point, affect the contribution of the silver economy. Having taken both in-cash and in-kind incomes into account, the silver economy is calculated in this study as approximately 3,389 billion baht per year or 111.401 billion US dollars per year; in other words, Thai older adults are able to contribute one fifth of the country's GDP. The paper suggests that the retirement age could be extended in order to increase opportunities for quality ageing workers and benefits might be offered for companies that hire these skilled seniors. Moreover, new vocational skills or skills related to elderly's interests should be provided. Consequently, the ageing population can drive the nation's economy, leading to economic growth in Thailand.

INTRODUCTION

A country becomes an ageing society when more than 10% of citizens are 60 years old or older or over 7% of that country's citizens are 65 years old or older, while an aged society is defined as a country with a proportion of older adults aged 60 years and over accounting for more than 20% or the proportion of people aged 65 years and over amounting to more than 14% of the total population. A United Nations report shows that there are 900 million older

people, accounting for 12.3% of the global population. Japan holds first place in the ageing population ranking with 33.1% of its population aged 60 years and over, while Thailand is ranked 63 out of 201 nations, with 15.8% aged 60 years and above (Department of Economic and Social Affairs, Population Division, United Nations, 2015).

Since the proportion of the ageing population is increasing rapidly, the older population size has grown dramatically. Between 1980 and 2000, the total population of Thais grew from 46.7 million to just over 60 million, accounting for 31% growth. The share of Thai older adults grew from 8.7% in 2000 to 10.8% in 2010, and the Thai ageing population was expected to grow to 15.2% in 2020 and 29.6% in 2050. The 2015 United Nations report stated that the older Thai population growth rate is significantly high, above 3% annually. If the elderly population grows by around 3–3.6% annually, the number of Thai older adults will double in around twenty years; consequently, Thailand will become an ageing society within 10 years (Jittapunkul, Kespichayawattana, Wivatvanit, Panyacheewin & Kangkanpanich, 2003).

Demographic change such as becoming an ageing society leads to many impacts. Nawaporn Wiriyanupong, an economics specialist of the Fiscal Policy Office of Thailand, stated that the first problem to arise is "the burden on the federal budget", because tax revenues earned from workers need to be allocated to welfare for the aging population. As the older adult population is growing, the federal budget needs to be spent on aged care; therefore, it may affect the fiscal stability of the nation in the long-term. In other words, the proportion of working-age people who pay taxes has declined, while the government has a greater burden of caring for the elderly. For example, the allowance for the elderly has skyrocketed from 1,438 million baht in 2002 to 53,608 million baht in 2012; hence, the government needs to manage this consequence in order to prevent financial instability in the future. The next problem of becoming an ageing society is "low savings from unregistered labour". According to the National Statistical Office of Thailand, there are 38 million employees out of a working-age population of 49 million, and of these employees, only 14 million are formal employees, so the remaining employees, 24 million workers, are informal employees. There are specific welfare provisions for each group of formal employees such as the Government Pension Fund for civil servants and the Social Security Fund for private company employees, while informal employees can be protected under the Social Security Act, section 40; however, only 1.3 million informal workers, or 5%, are protected under this act. This means that 22.7 million unregistered employees or 95% need to be registered in the social security system and need to be supported to make regular savings.

Another problem of the ageing society is "inadequate retirement income". Civil servants are the only retired workers who have earned sufficient retirement incomes, accounting for 50 to 70% of their last month's salary, while formal workers registered in the social security system earned 38 to 40% of their last month's salary, and informal employees registered in the social security system will obtain a lump sum payment. Therefore, the last group of

employees have the highest risk of experiencing low quality of life in retirement (National Health Commission Office, 2013).
Because there are different needs and productive capacities among different age groups, a nation's economic characteristics tend to change depending on the population age structure. According to Bloom, Canning and Fink (2011), the impacts of demographic changes can be assessed in relation to age-related behaviours such as employment, consumption and savings, and then evaluating these consequences affecting national income. Even though this strategy is uncomplicated, it is probably misleading, because changes in norms and expectations tend to change one's behaviour, which could impact the economic impacts due to ageing population, particularly life expectancy.

When people desire a long life, it might motivate them to stay in the labour market for longer and to start to save money at an older age. Due to an increase in longevity and older populations, there are changes to retirement policies, pensions and healthcare costs, labour market efficiency, capital market efficiency, and the structure of domestic and global economic systems. Moreover, in an ageing society, the share of labour will fall (Chen, Murayama & Kamibeppu, 2010: 61-71) presenting a challenge for human resource management in both the public and private sectors. Every sector has to prepare for this trend and provide strategies for human resource management which are appropriate for labour management, especially ageing workforce management, in order to maintain the stability of organisations and the national economy (Ciutiene & Railaite, 2014: 69-73). Public and private sectors should allow older adults to participate in driving the economy, for example, creating policies covering the economic and social dimensions of managing an ageing society such as labour, education and public health policies which could lead to unlimited learning in the elderly. Therefore, these older adults can obtain professional skills leading to retirement age extension and independent living. This idea can raise the roles of the elderly in economic growth through investing in human capital because recruitment of older adults can increase individual incomes leading to the improvement of quality of life.

Moreover, organisations can benefit from quality ageing employees in order to maintain their competitive advantage, since these proficient senior workers are able to transfer knowledge to the young generation effectively. Therefore, the federal budget for age care will reduce and the government can allocate more of the national budget to other sectors (Sadangharn, 2015: 94-104). The demographic changes in Thailand from a younger to an older society can be compared with the patterns in many Western countries. Thai nations will face problems related to costs of healthcare, social security and intergenerational equity within a shorter period than that in Western countries; hence, appropriate policies are required to deal with these issues (World Health Organization, 2019).

There are many studies related to the impacts of an ageing population on the economy. For example, the study of Huang, Lin and Lee (2019: 1-13) revealed the consequences of ageing population and workforce affecting economic growth in Taiwan, and their findings show that old-age citizens and workforce

affect Taiwanese productivity through total factor productivity (TFP). Nagarajan, Teixeira and Silva (2016: 4-35) investigated the mechanisms by which economic growth is affected by ageing population. Marešová, Mohelská and Kuča (2015: 534-538) explored the increase in European healthcare expenditure spent on seniors and the potential of investing in medical innovation in an ageing society. However, there are only a few studies that investigate the contribution of older adults to national GDP, particularly in Thailand. It is therefore interesting to study the factors affecting the contribution of the economic activity of the population aged 55 to 70 years and the contribution of the ageing population to Thailand's total GDP. The findings in this research are expected to indicate the importance of the ageing population, who are still able to drive the Thai economy; therefore, the government might relax the retirement laws and other regulations regarding older adult employees. For example, there should be an extension of the retirement age, because some elderly still have the potential to work and they may still offer excellent vocational skills due to having experience in a specific field. As a result, these ageing people can gain pride and can live independently. Since this is a digital era, the government might support the public and private sectors to create new careers for ageing people that can be linked to mobile applications. Drivers and guides are examples of this kind of occupation. The government might cooperate with existing taxi applications such as Uber and Grab to accept ageing employees, or the public sector may collaborate with the private sector to create mobile local guide applications which offer employment opportunities to ageing people.

LITERATURE REVIEW

Definition of the silver economy

The silver economy is defined as the economic activity of older people, whereby the elderly participate in the system of production, distribution and services consumption in order to use the purchasing potential among the older population and satisfy their consumption, living and health needs (Klimczuk, 2012: 52-56). In this study, the silver economy is the contribution from the economic activity of the population aged 55 to 70 years, divided into two types: in-cash income (money), such as salaries, pensions, savings, interest and provident funds; and in-kind income (non-money), such as health, happiness and participation in society.

The economic impacts of population ageing

There are many models and different viewpoints regarding the factors influencing economic growth. Some studies focus on the significance of all sectors' productivity improvement and worker demands for sectorial shifts; for example, there have been relocations of workers from low productivity industries to higher productivity industries, for example from the agricultural sector to the manufacturing and service sectors. However, some studies emphasise contributions to the development of technological progress, human

capital, macroeconomic and trade policies, national governance and institutions, and random shocks (Bloom, Canning, & Fink, 2011).

An analysis by Bloom and Williamson (1998: 419-455) of the demographic changes in emerging Asia in the second half of the twentieth century shows the impact of the age shift in society. In the 1940s, infant and child mortality dropped, leading to a decrease in fertility rates, the crude birth rate falling from over 40 childbirths per 1,000 population in 1950 to just over 20 by 1980; there was a large cohort born in the interim, called the 'baby boom' generation, due to the lag between the drop in mortality and the drop in fertility. When this generation entered the labour market, they contributed to savings rates, as well as to the size of the workforce. Between 1965 and 1990, the numbers of workers increased annually by 2.4%, while dependent citizens grew by just 0.8%. It was concluded that this demographic change could explain around 30% of the economic phenomena across East Asia from 1965 to 1990. Taking the behaviour of age-specific populations regarding labour supply and savings into account, the growth of an ageing population might cause a drop in labour supply and savings per capita. Considering all other factors—for example, if there were equality of productivity and migration—income per capita would rise slowly (World Health Organization, 2019). Peter Peterson's argument (Stevens, 2002) supports this analysis, as he stated that the global ageing issue could influence any problem related to the world economy and might threaten democracy itself.

The theories of human capital for economic growth

There are many theories about human capital associated with economic growth, for example, the Lucas Growth Model. Lucas (1988: 3-42) defined human capital as the knowledge and expertise of labour; hence, human capital is a factor of production which is used to produce goods and services. Workers can choose whether they will do further study to improve knowledge and skills or use existing skills to work now. If they choose to study now, they will lose current consumption in return for a higher return in the future because of the knowledge and skills gained. Lucas divided the technology of each country into two types: pure technology and human capital. Pure technology includes all technologies invented or applied by an individual country, while human capital is the source of technology improvement. Hence, the difference in the economic growth rates of each country can be explained, even though the technologies of those countries may be at the same level, by the Human Capital Index (HCI) of a country.

Another interesting theory of human capital related to the development of the economy is the Mankiw-Romer-Weil model (MRW) explaining the relationship between investment and saving. The findings of this study show that the national incomes obtained from the accumulation of physical capital differ from that contributed by human capital. The countries with high labour productivity are countries that spend money on technology, physical capital and human capital at a high level with a low population growth rate (Mankiw, Romer & Weil, 1992: 407-437). The MRW model can be adopted in Thailand

because Thailand has both capital accumulations. The Thai government has enhanced the accumulation of human capital by supporting unlimited learning among the labour force leading to skilled ageing workers. Furthermore, there are many policies which support the lives of the elderly such as the extension of the retirement age leading to independent seniors, health promotion for good health for the elderly, and enhancing the social participation of older adults. If these policies are administered effectively, they could lead to a decrease in the fiscal burden of the Thai government (Sukpaiboonwat, 2017: 182).

MATERIALS AND METHODS

Population and samples

The population in this study is people aged between 55 and 70 years who still work, who retired early, and who retired at the retirement age. The sample group is 854 ageing people selected by random selection. This research aims to study the factors affecting yearly in-kind and in-cash incomes of an individual older adult and to estimate the contribution to Thailand's GDP gained from older adults' incomes, called the economy of the ageing population.

The independent variables can be divided into two groups: demographic factors (gender, education level, career and income) and factors relating to internet use (device, internet access point and frequency of internet use). The dependent variables are the square roots of yearly in-cash and in-kind incomes of an older adult before tax deduction (SQRTCASH and SQRTKIND). The values of in-cash and in-kind incomes were adjusted to square roots for normality.

Study tools

The study tools in this research are a survey based on the literature review and an in-depth interview addressing the independent variables. The survey was validated by checking its content validity; it was developed for use in this study, covering all the objectives of the study and context. The reliability of the survey was tested by the index of item-objective congruence (IOC). Subsequently, the survey was uploaded via Google Forms.

IOC is a statistical tool used to measure the reliability and evaluate the items of a survey. Content experts weigh the items (R) between -1 and +1; the items can be weighed as congruent (+1), questionable (0) or incongruent (-1). The item was kept if the IOC value was equal to 0.5 or above; it was revised if the IOC value was lower than 0.5.

In this study, three experts scored the items used to measure the in-kind and in-cash incomes.

Multivariate analysis of variance (MANOVA)

MANOVA is used for multivariate sample means comparison. In other words, it is used when two or more dependent variables need to be tested and sometimes significance tests for each dependent variable are required (Stevens, 2002; Warne, 2014: 1-10). Moreover, the power of the MANOVA test depends on the correlations between the dependent variables, as well as the effect sizes related to the dependent variables (Frane, 2015: 233-247).

RESULTS

Test of appropriation to use MANOVA

Table 1 Test of normal distribution

Descriptions	**Yearcash**		**Yearkind**	
	Statistic	**Std. Error**	**Statistic**	**Std. Error**
Mean	288,044.731	8,167.992	19,243.560	596.872
Variance	56,975,540,646.293		304,242,414 .512	
Std. deviation	238,695.498		17,442.546	
Skewness	0.717	0.084	1.337	0.084
Kurtosis	-0.279	0.167	1.935	0.167

* Yearcash is yearly in-cash incomes of an older adult before tax deduction.

**Yearkind is yearly in-kind incomes of an older adult before tax deduction.

Table 2: Data distribution after adjustment by square root

Descriptive	**SQRTCASH**		**SQRTKIND**	
	Statistic	**Std. Error**	**Statistic**	**Std. Error**
Mean	478.225	8.341	120.759	2.338
Variance	59,415.360		4,666.260	
Std. deviation	243.753		68.3100	
Skewness	-0.030	0.084	-0.020	0.084
Kurtosis	-1.024	0.167	-0.378	0.167

* SQRTCASH is adjusted values of yearly in-cash incomes of an older adult before tax deduction.

**SQRTKIND is adjusted values of yearly in-kind incomes of an older adult before tax deduction.

The ratio of skewness to its standard error can be used as a test of normality (that is, there is not normal distribution if the ratio is less than -1.96 or greater than +1.96). As the results of in-kind income (Yearkind) and in-cash income (Yearcash) shown in Table 1 are outside this range, they do not show normal

distribution. Due to their positively skewed distributions (Manikandan, 2010: 126-127), the values of the data were adjusted by using the square root formula, the results of skewness shown in Table 2 are between or close to the range of +/-1.96; therefore data distribution is normal.

Table 3 Test of correlations of dependent variables

		SQRTCASH	**SQRTKIND**
SQRTCASH	Pearson correlation	1	0.231(a)
	Sig. (2-tailed)		0.000
	N	854	854
SQRTKIND	Pearson correlation	0.231(a)	1
	Sig. (2-tailed)	0.000	
	N	854	854

* a is $p = 0.01$

To use MANOVA, the dependent variables must be interrelated. They are not separately analysed and proofed by testing the correlations of dependent variables. The findings in Table 3 indicates that the dependent variables, the square roots of in-cash and in-kind incomes, are correlated at a significance level of 0.01; hence multivariate analysis was used for data analysis, because this method is suitable for an analysis that contains independent variables in a group or on a nominal scale and there is correlation between two dependent variables.

Table 4: Box's test for equivalence of covariance matrices (a)

Box' s M	576.477
F	13.177
df1	42.000
df2	50,505.879
Sig.	0.000

* a Design: Intercept + Gender + Education + Career + Income + Gender * Education * Career * Income * Government

In Table 4, the equality of covariance is not equal across groups of demographic factors including gender, education level, career and income with Box's M value of 576.477 and F value of 13.177; as a result, there is a violation of assumption. A larger sample size will decrease the significance level of residual error—hence the sample of 854 in this study rather than the minimum sample size of 400 (D'Alonzo, 2004: 804-812). Therefore, the test is

robust, or the power of the test decreases. As a result, Wilks' lambda, a commonly used test in MANOVA, must be amended to Pillai's trace, which is more robust when assumptions are violated. However, test statistic values are usually similar.

Tests of demographic factors

Table 5: Interaction effect by multivariate test method

Effect		**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**
Intercept	Pillai's trace	0.671	838.881[a]	2.000	822.000	0.000
	Wilks' lambda	0.329	838.881[a]	2.000	822.000	0.000
	Hotelling's trace	2.041	838.881[a]	2.000	822.000	0.000
	Roy's largest root	2.041	838.881[a]	2.000	822.000	0.000
GENDER	Pillai's trace	0.014	5.740[a]	2.000	822.000	0.003
	Wilks' lambda	0.986	5.740[a]	2.000	822.000	0.003
	Hotelling's trace	0.014	5.740[a]	2.000	822.000	0.003
	Roy's largest root	0.014	5.740[a]	2.000	822.000	0.003
EDUCATION	Pillai's trace	0.075	16.010	4.000	1646.000	0.000
	Wilks' lambda	0.926	16.044[a]	4.000	1644.000	0.000
	Hotelling's trace	0.078	16.077	4.000	1642.000	0.000
	Roy's largest root	0.056	22.859[b]	2.000	823.000	0.000
CAREER	Pillai's trace	0.101	8.737	10.000	1646.000	0.000
	Wilks' lambd	0.901	8.817[a]	10.000	1644.000	0.000
	Hotelling's trace	0.108	8.898	10.000	1642.000	0.000
	Roy's largest root	0.088	14.550[b]	5.000	823.000	0.000

INCOME	Pillai's trace	0.346	34.452	10.000	1646.000	0.000
	Wilks' lambda	0.658	38.319[a]	10.000	1644.000	0.000
	Hotelling's trace	0.515	42.252	10.000	1642.000	0.000
	Roy's largest root	0.503	82.797[b]	5.000	823.000	0.000
GENDER * EDUCATION * CAREER * INCOME	Pillai's trace	0.250	7.358	32.000	1646.000	0.000
	Wilks' lambda	0.765	7.354[a]	32.000	1644.000	0.000
	Hotelling's trace	0.286	7.349	32.000	1642.000	0.000
	Roy's largest root	0.158	8.124[b]	16.000	823.000	0.000

* [a] Exact statistic. [b] The statistic is an upper bound on F that yields a lower bound on the significance level. Design: Intercept + GENDER + EDUCATE + CAREER + INCOME + GENDER * EDUCATION * CAREER * INCOME.

Table 5 shows all the independent variables, including gender, education level, career and income, which affect the dependent variables or square root of in-kind and in-cash income, at a significance level of 0.050.

Table 6: Tests of between-subjects effects

Source	**Dependent Variable**	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	SQRTCASH	36,053,019.238[a]	30	1,201,767.308	67.612	0.000
	SQRTKIND	808,695.182[b]	30	26,956.506	6.995	0.000
Intercept	SQRTCASH	24,019,812.018	1	2,401,9812.018	1,351.376	0.000
	SQRTKIND	2,390,061.089	1	2,390,061.089	620.193	0.000
GENDER	SQRTCASH	109,301.711	1	109,301.711	6.149	0.013
	SQRTKIND	12,314.371	1	12,314.371	3.195	0.074
EDUCATION	SQRTCASH	649,567.458	2	324,783.729	18.273	0.000
	SQRTKIND	90,122.892	2	45,061.446	11.693	0.000
CAREER	SQRTCASH	1,163,358.057	5	232,671.611	13.090	0.000

	SQRTKIND	69,814.651	5	13,962.930	3.623	0.003
INCOME	SQRTCASH	7,328,262.427	5	1,465,652.485	82.459	0.000
	SQRTKIND	139,685.933	5	27,937.187	7.249	0.000
GENDER * EDUCATION * CAREER * INCOME	SQRTCASH	2,117,470.656	16	132,341.916	7.446	0.000
	SQRTKIND	467,448.853	16	29,215.553	7.581	0.000
Error	SQRTCASH	14,628,282.548	823	17,774.341		
	SQRTKIND	3,171,624.497	823	3,853.736		
Total	SQRTCASH	245,990,200.000	854			
	SQRTKIND	16,434,000.000	854			
Corrected Total	SQRTCASH	50,681,301.785	853			
	SQRTKIND	3,980,319.679	853			

* [a] R squared = 0.711 (Adjusted R squared = 0.701). [b] R squared = 0.203 (Adjusted R squared = 0.174).

The findings from Table 6 show that gender, education level, career and income affect the silver economy. These independent variables can explain the dependent variables, square roots of in-cash and in-kind income, with an R squared of 0.711, or 71.1%, for the square root of in-cash income, and 0.203, or 20.3%, for the square root in-kind income.

Tests of factors related to internet use

Table 7: Box's test of equality of covariance matrices (a)

Box's M	258.288
F	9.352
df1	27
df2	85,722.217
Sig.	0.000

* a: Design: Intercept + Internet + Device + Place + Government + Internet * Device * Place * Government

The equality of covariance is not equal across groups of internet use factors including internet use, device and internet access with Box's M value of 258.288 and F value of 9.352; as a result, there is a violation of assumption. Therefore, the test is robust, or the power of the test decreases. As a result, Wilks' lambda, a commonly used test in MANOVA, must be amended to Pillai's trace, which is more robust when assumptions are violated. However, test statistic values are usually similar.

Table 8: Interaction effect by multivariate test technique

Effect		**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**
Intercept	Pillai's trace	0.436	319.845[a]	2.000	829.000	0.000
	Wilks' lambda	0.564	319.845[a]	2.000	829.000	0.000
	Hotelling's trace	0.772	319.845[a]	2.000	829.000	0.000
	Roy's largest root	0.772	319.845[a]	2.000	829.000	0.000
INTERNET	Pillai's trace	0.113	16.518	6.000	1,660.000	0.000
	Wilks' lambda	0.888	16.967[a]	6.000	1,658.000	0.000
	Hotelling's trace	0.126	17.415	6.000	1,656.000	0.000
	Roy's largest root	0.123	34.080[b]	3.000	830.000	0.000
DEVICE	Pillai's trace	0.035	7.454	4.000	1,660.000	0.000
	Wilks' lambda	0.965	7.508[a]	4.000	1,658.000	0.000
	Hotelling's trace	0.037	7.561	4.000	1,656.000	0.000
	Roy's largest root	0.036	14.840[b]	2.000	830.000	0.000
PLACE	Pillai's trace	0.215	50.049	4.000	1,660.000	0.000
	Wilks' lambda	0.785	53.390[a]	4.000	1,658.000	0.000
	Hotelling's trace	0.274	56.748	4.000	1,656.000	0.000
	Roy's largest root	0.274	113.680[b]	2.000	830.000	0.000

INTERNET * DEVICE * PLACE	Pillai's trace	0.472	16.017	32.000	1,660.000	0.000
	Wilks' lambda	0.564	17.186[a]	32.000	1,658.000	0.000
	Hotelling's trace	0.710	18.373	32.000	1,656.000	0.000
	Roy's largest root	0.605	31.406[b]	16.000	830.000	0.000

* [a] Exact statistic. [b] The statistic is an upper bound on F that yields a lower bound on the significance level. Design: Intercept + INTERNET + DEVICE + PLACE + INTERNET * DEVICE * PLACE.

Table 8 shows that all independent variables, including internet use, device and internet access point affect the dependent variables, square root of in-kind and in-cash income, at a significance level of 0.05

Table 9: Tests of between-subjects effects

Source	**Dependent Variable**	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	SQRTCASH	24,967,875.114[a]	23	1,085,559.788	35.041	0.000
	SQRTKIND	729,027.799[b]	23	31,696.861	8.092	0.000
Intercept	SQRTCASH	15,887,875.146	1	15,887,875.146	512.842	0.000
	SQRTKIND	1,081,528.056	1	1,081,528.056	276.096	0.000
INTERNET	SQRTCASH	2,333,966.786	3	777,988.929	25.113	0.000
	SQRTKIND	42,302.198	3	14,100.733	3.600	0.013
DEVICE	SQRTCASH	896,408.033	2	448,204.016	14.468	0.000
	SQRTKIND	20,937.997	2	10,468.999	2.673	0.070
PLACE	SQRTCASH	6,995,565.016	2	3,497,782.508	112.904	0.000

	SQRT KIND	97,604.894	2	48,802.447	12.458	0.000
INTERNET * DEVICE * PLACE	SQRT CASH	15,277,815.248	16	954,863.453	30.822	0.000
	SQRT KIND	357,485.216	16	22,342.826	5.704	0.000
Error	SQRT CASH	25,713,426.671	830	30,980.032		
	SQRT KIND	3,251,291.880	830	3,917.219		
Total	SQRT CASH	245,990,200.000	854			
	SQRT KIND	16,434,000.000	854			
Corrected Total	SQRT CASH	50,681,301.785	853			
	SQRT KIND	3,980,319.679	853			

* [a] R squared = 0.493 (Adjusted R squared = 0.479). [b] R squared = 0.183 (Adjusted R squared = 0.161).

The findings from Table 9 show that internet use, device and internet access point affect the square roots of in-kind and in-cash income. These independent variables explain the dependent variables, square roots of in-cash and in-kind income, with an R squared of 0.493, or 49.3%, for the square root of in-cash income, and 0.183, or 18.3%, for the square root of in-kind income.

Estimation of the silver economy

Table 10: Means of yearly in-cash and in-kind incomes of an older adult before tax deduction

Year cash	**Year kind**	**Year cash + Year kind**
288,044.731	19,243.560	307288.291

According to the Department of Older Persons of Thailand (2019), the number of Thai older adults equalled 11,030,287 people in 2019, while a report of The World Bank Group (2020) shows that the GDP of Thailand in 2019 accounted for 543.65 billion US dollars or around 16,521,523,500,000 Thai baht (1 US dollar = 30.64 baht, exchange rate on 9 November 2020). An estimation of the silver economy can be calculated by multiplying the mean of annual in-cash income by the number of the aging population; the calculation is shown in Equation 1.

Silver economy = Mean (in-cash) × n (Thai ageing population) (1)
= 288,044.731 baht per year × 11,030,287 people
= 3,177,216,100,000 baht per year
or = 104.527 billion US dollars per year

In general, the GDP of any country is calculated from the national in-cash income without taking the in-kind income into account; however, in-kind incomes can contribute to GDP as indirect incomes. For example, if older adults enjoy well-being such as being healthy and happy, as well as having adequate incomes, the government can decrease the federal budget for seniors and spend this budget on other goals. Therefore, if in-kind income is used for the calculation of the silver economy, the result is shown in Equation 2.

Silver economy = Mean (in-cash + in-kind) × n(Thai ageing population) (2)
= 307,288.291baht per year ×11,030,287 people
= 3,389,478,000,000 baht per year
or = 111.401 billion US dollars per year

Therefore, if Equation 2 is considered as the calculation for the silver economy of this study, this means the Thai ageing population are able to contribute 20.51% or one fifth of Thailand's total GDP.

DISCUSSION

Income is one factor affecting the contribution of the silver economy of the ageing population, since it is understandable that when people earn high incomes, they are likely to purchase good quality goods and services to fulfil their needs. However, people who have inadequate incomes cannot afford these things, so they do not enjoy the same good quality life; as a result, they might contribute less to the economy. The study by Soonthornchawakarn (2016: 62-78) states that nearly half of Thai elderlies (43.9%) had annual incomes lower than 10,000 baht in 1994, the median income being between 10,000 and 19,999 baht, while 11.5% of Thai seniors earned more than 50,000 baht annually. The report also emphasises that the income of the Thai older population living in urban areas is dramatically higher than the income of those living in rural areas; furthermore, male seniors seem to have more independent lives than female seniors. In addition, 65.2% of employed older persons earned a monthly income of less than 2,000 baht and 20.8% earned a monthly income between 2,001 and 4,000 baht (World Health Organization, 2019).

Internet use factors are significant to the contribution of the silver economy, because technology is a considerable factor allowing older citizens to remain active in the community. The application of technology increases the opportunities for employment and independent living in the senior population and improves the equality of older people; it can also reduce social isolation.

CONCLUSION AND RECOMMENDATIONS

Regarding demographic factors, gender, education level, career and income all affect the silver economy, while internet use factors including frequency of internet use, device and internet access point, also influence the silver economy. The age group between 55 and 70 years contributes one fifth of the nation's total GDP. In addition, there were actually 915 respondents in this study, then this group was randomly adjusted to 854 respondents in order to weight the sample, which is in accordance with the population pyramid of Thailand in 2019 (PopulationPyramid.net, 2019); therefore, the sample is expected to be representative of the population.

According to the findings of this study, having a high income, good career and high education level will increase opportunities in many ways among older citizens; hence, it is recommended that the public sector create policies based on these three factors to support the current and future older population. For the retired older population, the government can bring them back into the labour market by supporting the recruitment of ageing people. Benefits such as tax reductions might be offered for companies that hire these skilled older people. For education projection, the ageing population should have the opportunity to learn new vocational skills or skills related to their interests, so free or low cost courses should be provided for this group of the population. Hence, they will have more opportunity for employment and living independently.

REFERENCES

Department of Economic and Social Affairs, Population Division, United Nations (2015) World Population Ageing 2015 Retrieved from http://www.un.org/en/development/desa/population/.../pdf/ageing/WPA2015_Report.pdf

Jittapunkul, S., Kespichayawattana, J., Wivatvanit, S., Panyacheewin. J. & Kangkanpanich, P. (2003). WHO/HQ Programme on Ageing and Life Course – Developing Integrated Response of Health Care Systems to Rapid Population Ageing (INTRA). Retrieved from https://www.who.int/ageing/projects/intra/phase_one/alc_intra1_finalreport_thailand.pdf?ua=1

National Health Commission Office (2013) National Agenda in Handling Ageing Society, Encourage Personal Savings and Increase Labor Productivity. Retrieved from http://suchons.wordpress.com/?p=8988

Chen, J., Murayama, S. & Kamibeppu, K. (2010) Factors related to wellbeingamong the elderly in urban China focusing onmultipleroles.BioScience Trends, 4(2), 61-71.

Ciutiene, R. & Railaite, R. (2014). Challenges of managinganageingworkforce. Procedia-Social and Behavioral Sciences, 156, 69-73.

Sadangharn, P. (2015). Elderly employment in Thailand.Institute for Continuing Education and Human Resources, (10)2, 94-104.

World Health Organization. (2019). Older Population and Health System: A profile of Thailand. Retrieved from https://www.who.int/ageing/projects/intra/phase_one/alc_intra1_cp_thailand.pdf.

Bloom, D. E., Canning, D. & Fink, G. (2011). NBER Working Papers No. 16705 – Implications of Population Aging for Economic Growth. Cambridge, MA: National Bureau of Economic Research.

Klimczuk, A. (2012). Supporting the development of gerontechnology as part of silver economy building. Ad Alta: Journal of Interdisciplinary Research, 52-56.

Bloom, D. E. & Williamson, J. G. (1998). Demographic transitions and economic miracles in emerging Asia. World Bank Economic Review, 12(3), 419-455.

Stevens, J. P. (2002). Applied multivariate statistics for the social sciences. Mahwah, NJ: Lawrence Erblaum.

Lucas, R. E. (1988). On the mechanics of economy development. Journal of Monetary Economics, North-Holland, 22, 3-42.

Mankiw, N. G., Romer, D. & Weil, D. N. (1992). A contribution to the empirics of economic growth. The Quarterly Journal of Economics, 7(2), 407-437.

Sukpaiboonwat, S. (2017). The role of population aging on economic growth in Thailand. Srinakharinwirot Research and Development (Journal of Humanities and Social Sciences). 9(17), 182.

Warne, R. T. (2014). A primer on multivariate analysis of variance (MANOVA) for behavioral scientists. Practical Assessment, Research & Evaluation. 19(17), 1-10.

Frane, A. (2015). Power and type I error control for univariate comparisons in multivariate two-group designs. Multivariate Behavioral Research, 50(2), 233-247. doi:10.1080/00273171.2014.968836.

Manikandan S. (2010). Data transformation. Journal of Pharmacology & Pharmacotherapeutics. 1(2), 126-127, doi:10.4103/0976-500X.72373.

D'Alonzo, K. T. (2004). The Johnson-Neyman procedure as an alternative to ANCOVA. West Journal of Nursing Research. 26(7), 804-812.

Department of Older Person of Thailand. (2019). Older Statistics. Retrieved from http://www.dop.go.th/th/know/side/1/1/238.

The World Bank Group. (2020). GDP (current US$) – Thailand. Retrieved from https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=TH&name_desc=true

Soonthornchawakarn, N. (2016). The workings of the Thaielderlyandtheirearnings. Executive Journal.3(1), pp. 62-78.

PopulationPyramid.net. (2019).Population Pyramids of the World from 1950 to 2100 Retrieved from https://www.populationpyramid.net/thailand/2019/ Last access: 17-4-2020

Huang, W. Lin, Y. and Lee, H. (2019). Impact of population and workforce aging on economic growth: Case study of Taiwan. Sustainability, 11(6301), 1-13. doi:10.3390/su11226301

Nagarajan, N., Teixeira, A., & Silva, S. (2016). The impact of an ageing population on economic growth: An exploratory review of the main mechanisms. Análise Social, 51(218), 4-35.

Marešová, P., Mohelská H., & Kuča, K. (2015). Economics aspects of ageing population. Procedia Economics and Finance, 23, 534-538. doi: https://doi.org/10.1016/S2212-5671(15)00492-X.