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Demographic Change and Fiscal Sustainability of Old Age Allowance Policy in Thailand

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ABSTRACT

Thailand must face the challenges of an ageing society. The government should manage their expenditure and revenue collection in accordance with an increase in the number of elders in the society on account of old age allowance expenditures. Old age allowance aims to cover all elders except those in the pension system. This paper examines the impact of demographic change on fiscal sustainability of old age allowance policy, particularly by setting model, where a computational overlapping generations model is employed under a general equilibrium context. The simulation is divided into 3 parts: the first part is the impact of demographic change on the economy, the second part is the introduction of old age allowance and its impact on fiscal burden, and the third part is the fiscal impact of an increase in government expenditure. The study found that government expenditure will increase as there will be an increasing proportion of aged individuals. The increase in government expenditure causes an increase in public debt, which eventually causes the delay of repayment of public debt and a shift to the next generation. The increase of value-added tax rate generates more revenue collection for the government when compared to increasing personal income tax rate. The value-added tax has more distortionary effect on the economy than an increased personal income tax.

Keyword: Aging society, Old age allowance policy, Fiscal sustainability, Demographic change, Fiscal policy

JEL Classification: E62, H30, H300

1. Introduction

The population structure of Thailand is changing. In the past, people used to have many children due to a lack of family planning. More children meant increased expenditure for the family. Recently however families have started to have fewer children, or no children at all, because of the increased cost of living and higher expenditure. Fewer children decreases Thailand's population growth. Thus, one of the causes of demographic change in Thailand is the decrease birth rate.

Table 1.The prospects of population growth in Thailand

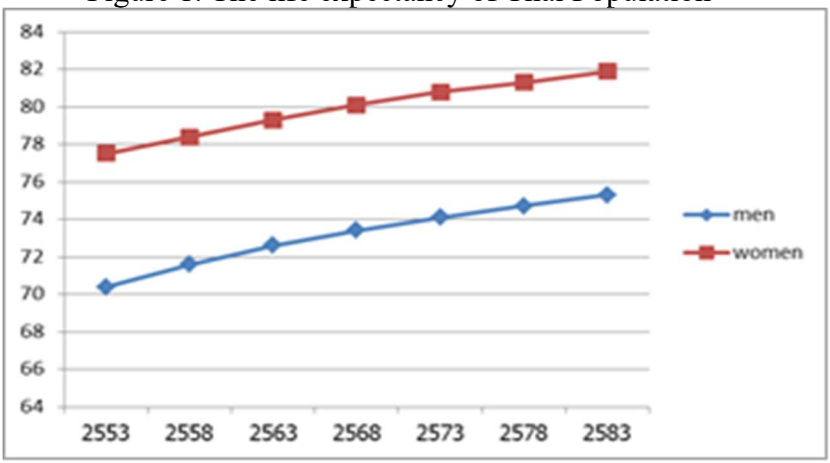
B.E.	Population Growth	Crude Birth rate (per 1,000 people)	Crude Death rate (per 1,000 people)
2558 - 2562	0.18	9.9	8.4
2562 - 2567	0.02	9	9.1
2567 - 2572	-0.11	8.6	10
2572 - 2577	-0.24	8.3	11
2577 - 2582	-0.38	8.1	12.1
2582 - 2587	-0.52	7.9	13.3
2587 - 2592	-0.65	7.7	14.5
2592 - 2597	-0.76	7.6	15.5
2597 - 2602	-0.83	7.6	16.1
2602 - 2607	-0.86	7.7	16.5
2607 - 2612	-0.86	7.8	16.7
2612 - 2617	-0.85	7.9	16.7
2617 - 2622	-0.84	8	16.6
2622 - 2627	-0.82	8	16.5
2627 - 2632	-0.8	8.1	16.4
2632 - 2637	-0.78	8.2	16.2
2637 - 2643	-0.74	8.3	15.9

Source: World Population Prospects, the 2015 Revision

The decreasing birth rate in Thailand shows that there will be less potential labor in the next generation. These workers are burdened with extra costs to look after the elderly because the government collects personal income tax to support the social benefit of the elderly. Table 1 shows that population growth in Thailand is on a negative trend, implying that total population will decrease.

When the government announced a social benefit policy for the elderly, life expectancy is a crucial factor. With an ageing population, the government will incur more expenditure.

Figure 1. The life expectancy of Thai Population



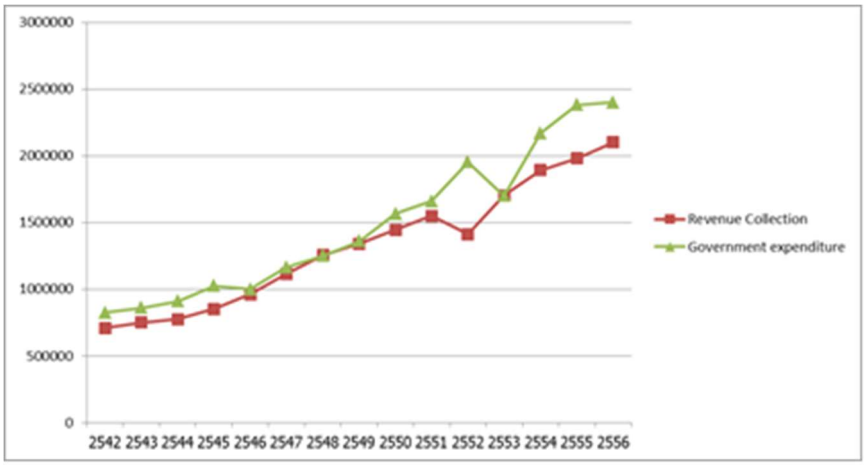
Source: Office of the National Economic and Social Development Board

Figure 1 shows that life expectancy of Thai people is increasing so there will be more old people in the future.

This demographic change affects the allocation of fiscal policy especially government expenditure. It is known that demographic change in Thailand is bound to happen. The government must invest in various areas to support this impact such as in education, public health, and social welfare. These

investments also have an important effect on Thai economy. The private sector must adapt to keep pace with change. When government expenditure increases, the government must collect more revenue to balance revenue collection and government expenditure. If government expenditure exceeds revenue collection over a long time, government will increase public debt.

Figure 2. Revenue collection and the expenditure of the Thai government



Source: Bureau of the Budget

Revenue collection and government expenditure have an important effect on fiscal sustainability. The increase in public debt incurs an interest expense. If public debt is high, then the interest expense will soar and revenue collection may not be sufficient to pay for government expenditure.

The economic activities of the government sometimes show that there are some problems with expenditure which exceeds revenue collection, causing public debt. The

framework for fiscal sustainability suggests a ratio of public debt to GDP below 60 percent in the long run.

Old age allowance and the problem of fiscal policy in the long run

Old age allowance is a guarantee that the government gives to their people when individuals are old. Currently in Thailand, citizens who are 60-69 years old receive 600 Baht per month. For every 10-year increment in age, they receive an additional 100 Baht (up to 1000 Baht for those over 90 years).

Old age allowance is an expenditure of the government which is hard to cancel. In 2558 B.E., the Thai government incurred approximately 61,000 million Baht per year or 0.06 percent of GDP on old age allowance expense. If Thailand transitions into an old age society, there will be more expenditure on old age allowance. It is an important point, because the government must reconsider a budget allocation which supports the demographic change. Importantly increasing old age allowance expenditure needs to consider the dimension of public debt too. If the government cannot collect sufficient revenue, then public debt will increase in the long run and will happen time and again.

This paper aims to examine the impacts of adjusting for an increased old age allowance expenditure to alleviate fiscal burden and to study fiscal policy options of the government in responding to higher expenditure. This paper considers the case of a closed economy where there is no international trade, investment or immigration between countries. Life cycle for each person is assumed to last for two periods- workforce age and old age. After that they die and leave the economy.

The paper sets the initial value for simulation by determining the growth of GDP at period t (B.E. 2558). The

measures of fiscal sustainability of Thailand are as follows: (i) the ratio of public debt to GDP is not over 60 percent, (ii) the burden of the public debt to government expenditure is not over 15 percent, (iii) a balanced budget, and (iv) the proportion of investment budget per government expenditure is not below 25 percent.

2. Literature Review

Demographic change in Thailand

The transition to an ageing society is happening faster than expected. The data of the office of the National Economic and Social Development Board shows that the number of people aged over 60 years is on an increasing trend. Considering the ratio of elders per total population, in 2553 B.E. the ratio of elders per total population was 11.9 percent and it will be approximately 25.12 percent in 2573 B.E. (Suwanrada and Chandoevwit, 2010). This information is in line with the data from the United Nations Population Fund (UNFPA). The data of UNFPA says that population growth in Thailand is slowing down and the population is decreasing. The downward trend in birth rate also shows in hospitals decreased midwifes. The decrease of workforce is a pressing need for the country to enhance labor efficiency.

Suwankesorn (2013) shows that labor supply differs from other types of production factors because it serves the role of production factor and consumer at the same time. If the country can effectively manage the labor supply, it will build the growth of the economy. His result shows that the growth of population is an important factor in the growth of the economy in the ASEAN countries. (Suwankesorn, 2013)

Demographic change and the economy

Among all economic activities in each country, markets are the most important part of the economy: for example the labor market, capital market and goods market. The members in each market consist of households, private sector and government. These three parts are directly connected to the economy. When there are changes in some parts, other parts will be affected too. Demographic change affects all types of markets. It also has an effect on the labor supply of the economy. The decrease in workforce compels the private sector to increase more capital. Meanwhile households must adapt their consumption and leisure in response to the increase in the number of elderlies in each family. The government must adapt the management of expenditure to deal with an ageing society. All these changes show how demographic change impacts the economy.

Demographic change and consumption

Demographic change can affect economic growth because if there are a lot of people in the country, there will be a lot of economic activities. Demographic change impact the household sector. Manprasert (2010) studied the impact of demographic change on the patterns of consumption of Thai households. The results show that if the growth of the elderly's income in the first phase is high, there will be an increment on consumption of some goods such as furniture, vehicles, etc.

Demographic change and private sector

The downward trend in the fertility rate will lead to a decrease in the workforce in the future. Potipiti and Kulkolkarn (2010) studied the impact of demographic change

on production. The result shows that a decreasing workforce within an ageing society will lead to a decrease in the total production and production per capita within next 40 years. Therefore in order to solve this problem, the country should import workforce from other countries.

Demographic change and economic growth

Besides its impact on households, the private sector, and the government, demographic change also impacts economic growth because the three sectors are the main economic activities. Pitsayabut and Punpiamrat (2013) studied old age societies and the economic growth of Thailand. They showed that in the time of transition to an old age society, the aggregate labor supply and aggregate capital cause an increase in total output. The development of technological progress will affect the efficiency of labor supply which can compensate a lack of labor in the workforce age. If there are no developed technologies, the aggregate labor supply and total capital will decrease in the transition to an old age society. Furthermore, the development of technology can relieve the negative economic impact caused by the transition to an old age society.

Demographic change and Fiscal sustainability

One important point is the management of public debt. There should be a balance between revenue collection and government expenditure. Davis and Fabling (2002) studied the efficiency of public policy on demographic change in New Zealand. They found that smoothing taxes is more important to policy efficiency than balancing budget. Asset tax smoothing can yield the average return more than government borrowing.

When the demographic change occurs, the number of the elderly will increase which eventually causes a burden in terms of welfare. Ihori et al (2007) studied the impact of demographic change and public debt in Japan. They found that an old age society leads to an increase in expenditure in the form of public pension, including public health insurance.

The government budget, which is allocated for paying old age allowances, may increase the fiscal sustainability problem. The old age allowance expenditure is a long-term expenditure. To determine the old age allowance, the government must consider the cost of living and the fiscal burden in the long-term. Suwanrada (2014) studied the public reform pension. The paper points out that excessive allocation of old age allowance causes a fiscal problem in the long run. If Thailand's economic growth slows down, old age allowance expenditure will increase steadily and will be much higher than revenue collection of many ministries.

3. Model

This paper employs the Overlapping Generation model for the analysis. This model has the dimension of the difference in the behavior and productivity of the population in each age, which shows the transition from a young society to the old age society. This model is developed from the model in the research of Pisayabut and Punpiamrat (2013). It is assumed that agents live for a finite time and the length of time overlaps at least one period with other agents. This model consists of 3 sectors: household sector, private sector and government sector. These 3 sectors live together in a closed economy. Thus, there is no international trade, international investment, or international immigration.

3.1 Households

People start at 20 years old. They make decisions between consumption and leisure throughout their lifetime. It is assumed that each decision yields maximum utility subject to budget constraint. However, there is uncertainty of death along their lifetime. It is assumed that everyone retires at the age of 60 years old and die at the age of 80 years old. Therefore, people have the time for work between 20-60 years old.

The survival equation is

$$Q_{i,s} = \prod_{j=0}^{s} q_{i,j+1,j} \quad \ldots\ldots\ldots (1)$$

$Q_{i,s}$ = the amount of people that survive since age i to s
j = age of people start at 0 years
s = the last of age of people
q = the amount of people in each age

Each person is assumed to maximize his expected lifetime utility with respect to his own consumption. The household's expected lifetime utility of generation i is given by

$$u_i = \sum_{s=0}^{s-20} \prod_{j=0}^{s} q_{i,j+1,j} \frac{\{u[c_{it}, 1-l_{it}]\}^{(1-1/\gamma)}}{(1-1/\gamma)(1+\rho)^{t-i}} \quad \ldots\ldots\ldots\ldots (2)$$

u_i = the utility throughout a person's life
u [c_{it} , l-l_{it}] = the utility obtained from consumption and relaxation
c_{it} = consumption
l_{it} = the proportion of working
1-l_{it} = the proportion of relaxation
γ = the elasticity of substitution during the periods
ρ= the discount rate of complacency

Determining the utility equation at time t has constant elasticity of substitution (consumption and leisure) that

$$U[c_{it}, 1 - l_{it}] = [c_{it}^{\frac{\varepsilon-1}{\varepsilon}} + \delta(1 - l_{it})^{\frac{\varepsilon-1}{\varepsilon}}]^{\frac{\varepsilon}{\varepsilon-1}} \ldots\ldots\ldots\ldots (3)$$

ε is the elasticity of substitution between consumption and leisure, and δ is parameter that reflects the intensity of satisfaction with the rest compared with consumption.

People in each generation make decisions by maximizing utility subject to the budget constraint. The budget constraint of generation i at time t is

$$A_{it} = \left(1 + \left(\frac{r}{p}\right)_t\right) A_{it-1} + y_{it} - c_{it}(1 - T_c) + \overline{P}_{it} \ldots.(4)$$

A_{it} = the wealth of generation I at time t
y_{it} = the real income after tax
c_{it} = consumption
T_c= value-added tax
$\overline{P}_{it}$= the allowance paid for the elderly at age 60

The condition of paying old age allowance is

$$\overline{P}_{it} \begin{cases} = 0 \,, t = i, i+1, \ldots, i+40 \\ > 0 \,, t = i+41, \ldots \,, i+60 \end{cases}$$

The equation of real income after tax of generation i at time t can be written as

$$y_{it} = \left(\frac{w}{p}\right)_t l_{it} h_{it}(1 - T_w) \ldots\ldots\ldots (5)$$

$(w/p)_t$ = the real wage per effective unit of labor
tax_t = the income tax collected from people aged 20-60
h_{it} = the effective units of labor of generation i

The effective units of labor of generation i is

$$h_{it} = f(age) \times tech_t \text{ …….. (6)}$$

f(age) = age-specific productivity
$tech_t$ = the technology impacts the effective unit of labor

The first order necessary condition yields the Euler Equation

$$C_{it} = q_{i,s+1,s}\{\frac{\left(\frac{r}{p}\right)}{\left(1+\frac{r}{p}\right)(1-T_c)}\left(A_{it-1} + \left(\frac{w}{p}\right)_t l_{it}h_{it}(1-T_w)\right) + \frac{\bar{P}_{it}}{(1-T_c)} - \delta[1-l_{it}]\} \text{ …… (7)}$$

3.2 Private Sector

The firm is assumed to maximize its profit, taking the wage rate and the interest rate as given. The aggregate private production function is assumed to be Cobb-Douglas such that

$$Y_t = aK_t^{\propto}L_t^{1-\propto} \text{ ……. (8)}$$

Y_t = the aggregate output
K_t = the aggregate capital
L_t = the aggregate labor
a = is technology of production of firm

Assuming that in the competitive market the real return of capital and labor is equal to the marginal output of each production factors.
The real return of capital is

$$(r/p)_t = \propto a(\frac{L_t}{K_t})^{1-\propto} \text{ …… (9)}$$

The real return of labor is

$$(\frac{w}{p})_t = (1-\propto)a(\frac{K_t}{L_t})^{\propto} \quad \ldots\ldots\ldots (10)$$

At the equilibrium, the total capital of the economy is equal to total wealth of the economy minus the total public debt in the economy. That is equal to the total wealth of the household plus old age allowance at period t minus the amount of public debt at period t. The relationship of the equation is

$$K_t = A_t - B_t = \sum_{i=t-6}^{t} pop_{it}A_{it} - B_t \ldots\ldots\ldots\ldots (11)$$

$\sum_{i=t-80}^{t} pop_{it}A_{it}$= the total wealth of generation i at period t
A_{it} = the wealth of generation i at period t
Pop_{it} = the ratio of generation i per total population at period t
B_t = the total public debt at period t

At the equilibrium, the total supply labor at period t is

$$L_t = \sum_{i=t-6}^{t} pop_{it}l_{it}h_{it} \ldots\ldots\ldots\ldots (12)$$

$\sum_{i=t-60}^{t} pop_{it}l_{it}h_{it}$= the total supply labor of generation i at period t
Pop_{it} = the ratio of generation i per total population at period t

3.3 Government sector

The government sector is assumed to collect personal income tax and value-added tax from the households in order to pay old age allowance to the elderly. If the revenue is not sufficient for old age allowance, the government will issue bonds and pay interest rate.

The revenue, which is the summation of personal income tax, value-added tax and government bonds, is equal to the government expenditure focused on old age allowance at period t, along with the repayment including interest rate expense. The equation is

$$G_t = \sum_i \overline{P}_{it} + (1 + (r/p)_t)B_{t-1} \quad \ldots\ldots\ldots (13)$$

$$T_t = B_t + \sum_i (^{w}/_{p})_t \, l_{it} h_{it} T_w + \sum_i C_t(T_c) \quad \ldots\ldots\ldots (14)$$

$$G_t = T_t \quad \ldots\ldots\ldots\ldots (15)$$

$\sum_i \overline{P}_{it}$ = old age allowance expenditure of the government

$(r/p)_t$ = interest rate on public debt at constant price at period t

B_t = public debt at period t

T_t = government revenue at period t

With restrictions, government bonds will not generate crowding-out effects.

3.4 Market Equilibrium

The equilibrium condition in the capital market at period t requires total wealth of the household to be equal to total capital plus public debt

$$A_t = K_t + B_t \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (16)$$

The equilibrium condition in the goods market at period t is the aggregate output, which is equal to the sum of household's consumption, private investment and the government expenditure.

$$Y_t = C_t + K_t + G_t \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (17)$$

3.5 Parameter specifications

1. Elasticity of substitution during the periods = 0.75
2. Discount rate of complacency = 0.015
3. Elasticity of substitution between consumption and leisure = 0.8
4. Intensity of satisfaction with the rest compared with consumption = 0.33
5. Ratio of the return of capital per income of the country = 0.5

4. Results and Simulation Analysis

We estimate the effects of transitioning to an old age society on the economy by simulating the Overlapping Generations model from section 3. For the old age allowance, the payment of old age allowance follows the actual policy in Thailand. The average used in the model is calculated by multiplying the amount with the population. Regarding the length of the simulation, the model is simulated for 87 years because population growth data from World Population Prospects (2015 Revision) shows only 87 years of information.

From the simulation, the results are divided into 3 parts. The first part shows the economic impact from demographic change. The second part shows the relationship between

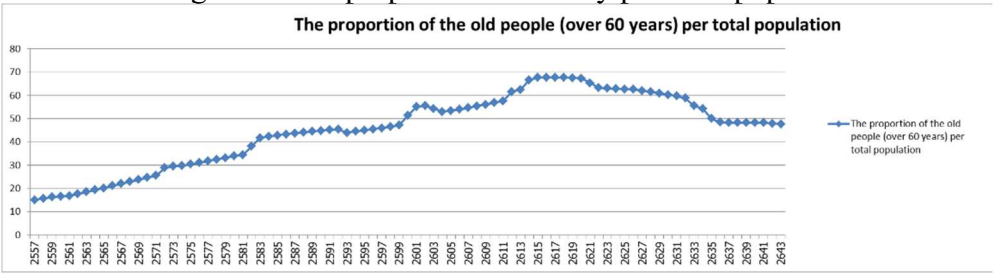
increased old age allowance policy and its fiscal burden. The third part shows the financing options to respond to the increase in government expenditure.

4.1 Economic impact from demographic change

Demographic change affects all economic factors: consumption, GDP, government expenditure, fiscal burden, etc.

In simulating the model, it is assumed that the government collects revenue from personal income tax and valued-added tax. The average of personal income tax rate of Thailand in 2556 B.E. is 9.74 percent, thus the model sets average personal income tax at 10 percent. The value-added tax rate is set at 7 percent for the simulation which corresponds to the actual rate. The government has expenses for the elderly and the repayment of bonds. The old age allowance expenditure is designed to increase step by step: people who are 60-69 years old will receive 600 baht per month, individuals 70-79 years old will receive 700 baht per month, and individuals 80-89 years old will receive 800 baht per month. Individuals over 90 years old will receive 1000 baht per month. In the present, Thailand is an ageing society and will change to an aged society at 2567 B.E., and super-aged society at 2576 B.E.

Figure 3. The proportion of elderly per total population



Source: World Population Prospects, 2015 Revision

Transitioning to an old age society affects factors such as labor supply, consumption, social benefit, fiscal burden, etc. The main reason for this is the increase in the proportion of elderly per total population. In the future, the proportion of the elderly per total population will increase to 67 percent which is termed as a super-aged society.

Table 2. the impact of demographic change on the economy

B.E.	Average proportion of elderly (over 60 years) of total population*	Labor supply	Total consumption	GDP	Government Revenue	Government expenditure	Bond from old age allowance	Fiscal burden	The proportion of bond per person
2558 - 2567	18.365	-1.186	-0.1607	2.539	-0.130	3.887	3.899	1.326	5.146
2568 - 2577	27.801	-1.725	-0.6279	1.586	-0.628	2.533	2.539	0.938	4.339
2578 - 2587	38.574	-1.983	-1.1162	1.005	-1.116	1.777	1.781	0.768	3.840
2588 - 2597	44.839	-2.035	-1.5033	0.634	-1.503	1.287	1.290	0.651	3.394
2598 - 2607	52.472	-1.552	-2.2653	0.416	-2.265	0.903	0.905	0.487	2.496
2608 - 2617	61.955	-1.066	-2.4232	0.301	-2.423	0.621	0.623	0.321	1.706
2618 - 2627	64.389	-0.559	-1.9513	0.244	-1.951	0.456	0.457	0.212	1.021
2628 - 2637	55.744	-0.228	-1.4317	0.221	-1.432	0.359	0.360	0.139	0.589
2638 - 2643	48.083	-0.037	-0.7062	0.197	-0.706	0.293	0.294	0.097	0.330

* average value
Factors not marked by * indicates average percent growth (% growth) that is computed by CAGR.
Source: Author's calculation.

From table 2, the average proportion of elderly of total population is increasing. There will be a lot of elderly in society. On the other hand, labor supply is decreasing, which shows that the transition to an old age society reduces labor supply. The total population is an important factor on consumption. If there are a lot of people in society, there will

be a lot of consumption. Table 2 shows the negative growth trend of consumption, showing a decrease in total consumption.

Decreasing consumption will influence GDP growth, slowing down growth. Table 2 shows the trend of average GDP growth diminishing. This shows the economy in an old age society will slow down. The decrease in economic growth will also affect government revenue collection. Conversely, when the economy grows, the government will collect a lot of revenue in the form of personal income taxes and value added taxes.

Table 2 shows government revenue collection decreasing. Transitioning to an old age society decreases revenue but increases government expenditure, especially old age allowance expenditure. It can also be seen that the increase of old age allowance expenditure is diminishing as it follows the trend of the elderly in the society.

Both the increase in government expenditure and the diminishing GDP growth have an effect on public debt. If the government cannot collect enough revenue, it will issue bonds, affecting public debt through the fiscal burden and the capability of repayment.

Table 2 shows that the growth of the fiscal burden is a diminishing positive trend, following the growth of bonds. Although the fiscal burden of the old age allowance policy is not over 60 percent of GDP, the repayment of public debt must be considered. If the government builds more and more public debt until it cannot repay the public debt, it will shift this duty to the next generation creating inequality between generations. Table 2 shows that the proportion of bond per person is a diminishing growth trend. If the bond per person increases continuously, the next generation will repay more debt.

Simulating longer life expectancy

In the transition to an old age society, the age of the population is an important consideration. The longer the life expectancy of a population, the more government expenditure increases, especially old age allowance expenditure, which is designed to pay continuously until individuals die.

Table 3. Average old age allowance expenditure per year (million Baht)

B.E.	The average of old age allowance expenditure per year (million Baht)						
	Age 80 years (Base case)	Age 81 years	% change	Age 82 years	% change	Age 83 years	% change
	(A)	(B)	((B-A)/A)*100	(C)	((C-B)/B)*100	(D)	((D-C)/C)*100
2558 - 2567	68.585	72.238	5.327	75.839	4.984	79.353	4.635
2568 - 2577	96.293	101.966	5.892	107.668	5.592	113.337	5.266
2578 - 2587	121.509	129.092	6.242	136.820	5.986	144.608	5.692
2588 - 2597	143.533	152.844	6.487	162.406	6.256	172.116	5.979
2598 - 2607	161.786	172.612	6.691	183.812	6.489	195.260	6.229
2608 - 2617	175.802	187.871	6.865	200.431	6.685	213.335	6.438
2618 - 2627	186,450,548.35	199,465,856.40	6.981	213,077,124.50	6.824	227,124,421.43	6.593
2628 - 2637	194,977,706.83	208,733,952.93	7.055	223,161,196.33	6.912	238,089,217.37	6.689
2638 - 2643	200,899,681.95	215,155,430.14	7.096	230,131,420.05	6.961	245,649,999.66	6.743

Source: Author's calculation.

As per table 3, longer life expectancy of a population makes old age allowance expenditure increase at a diminishing

rate. In 2638 – 2643 B.E., if the population lives for 1 year longer, (80-81) , the old age allowance expenditure will increase 7.096 percent. If the population has an increasing longer life expectancy by 1 year; from 81 to 82, then the old age allowance expenditure will increase 6.961 percent. This change shows the old age allowance expenditure increase at a diminishing rate.

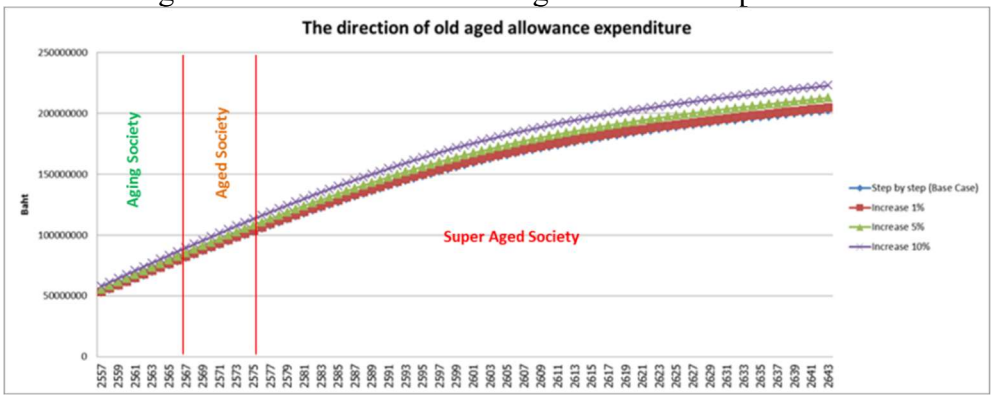
From part 1 we can conclude two points: first is that demographic change in Thailand comes faster than expected. In the simulation, Thailand will change to an aged society at 2567 B.E. There will be some effects on the economy. Economic welfare will be worse. At the level of a super-aged society, GDP will decrease. There will be higher old age allowance expenditures. This will make public debt increase and lead to a fiscal burden. Therefore, it leads to higher avoidance of repayment and shifting burdens to next generations. The second point is that longer life expectancy leads to an increase in government expenditure. Higher government expenditure increases the fiscal burden and more avoidance of repayment and burden shifting to next generations.

4.2 Simulation of increasing old age allowance policy and the impact on fiscal burden

In order to change old age allowance policy, not only must the cost of living of the population be considered, but also the fiscal burden must be considered too. If the government increases old age allowance payments, it may not collect enough revenue which leads to an increase in public debt. The increase in public debt impacts fiscal sustainability. In this situation, it was determined that an increased payment of old age allowance by 1 %, 5% and 10% respectively with the previous assumption. The main expenditure of the government

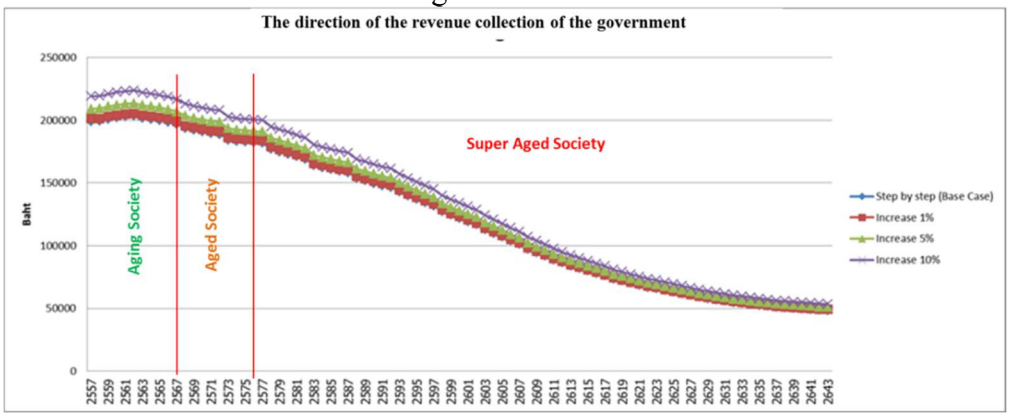
is old age allowance expenditures. The other is the repayment of the debt.

Figure 4. The direction of old age allowance expenditure



Source: Author's calculation

Figure 5. The direction of the revenue collection of the government

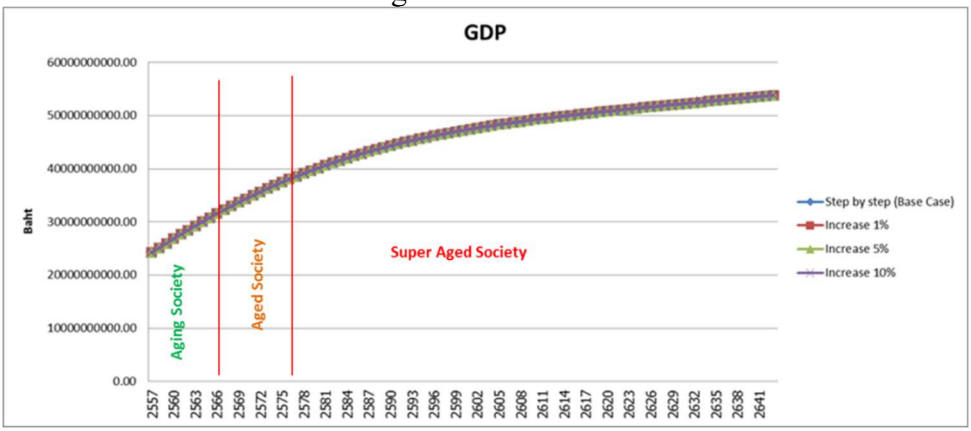


Source: The calculation of researcher

Changing old age allowance costs leads to more government expenditure. Figure 4 shows the increase of old age allowance expenditure, as well as percent change.

Increasing the rate of old age allowance policy makes people have more money to consume, which means the government can collect more value added tax. Figure 5 shows the government's direction of the revenue collection. The more government increases the old age allowance paying rate, the more the revenue increases.

Figure 6. The direction of GDP in the case of changing old age allowance rate

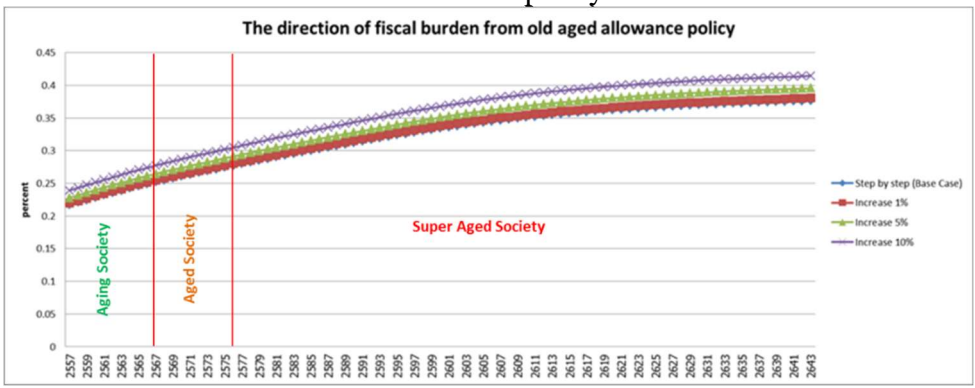


Source: Author's calculation

The changing old age allowance rate also affects the growth of the economy. Figure 6 shows the direction of GDP in the case of increasing old age allowance rate. The increase of old age allowance rate makes people have more money. The more people use money to consume, the more GDP increases.

Increasing the rate of old age allowance increases government expenditure. The transition to an old age society leads to less revenue collection. The increased expenditure and the decreased revenue leads to the government increasing public debt. The increase of public debt brings an increasing fiscal burden.

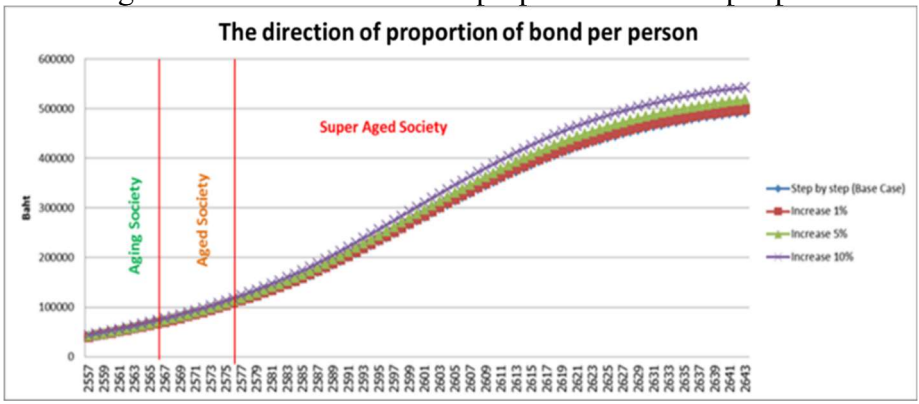
Figure 7. The direction of fiscal burden from old age allowance policy



Source: Author's calculation

Figure 7 shows the direction of fiscal burden from old age allowance policy. The direction increases following the increase of old age allowance expenditure. The higher the percentage, the more fiscal burden increases. Increased fiscal burden brings avoidance of repayment. If the government cannot repay its public debts, it will shift its duty to the next generation.

Figure 8. The direction of the proportion of bond per person



Source: Author's calculation

Figure 8 shows the direction of the proportion of bond per person. The higher the percentage old age allowance policy increases by, the more the proportion of bond per person increases. In 2581 – 2611 B.E., the high positive slope of the bond per person is caused by the high negative slope of revenue collection. In 2613-2643 B.E., the flat positive slope of the bond per person is caused by the flat negative slope of the revenue collection. If the bond per person increases continuously, the next generation will repay more debt. From figure 8, the more the government increases the rate of old age allowance policy, the greater the amount of bonds per person.

Part 2 can be concluded in 3 main points. The first point is that increasing the old age allowance rate leads to higher government expenditure. The second point is that increasing old age allowance rate increases government revenue collection and economic growth. The third point is that lower government revenue and their higher expenditure lead to higher fiscal burden. Fiscal burden which increases will cause the avoidance of repayment and shifting to future generations.

4.3 Government financing in response to increasing expenditure

Government financing is important for fiscal stability, the economic system, the disparity of generations, etc. If the government collects too much tax, social benefit will decrease. If revenue collected from tax is too little, government will build more public debt. The fiscal burden will increase and cause a fiscal problem. People of the next generation must repay more public debt.

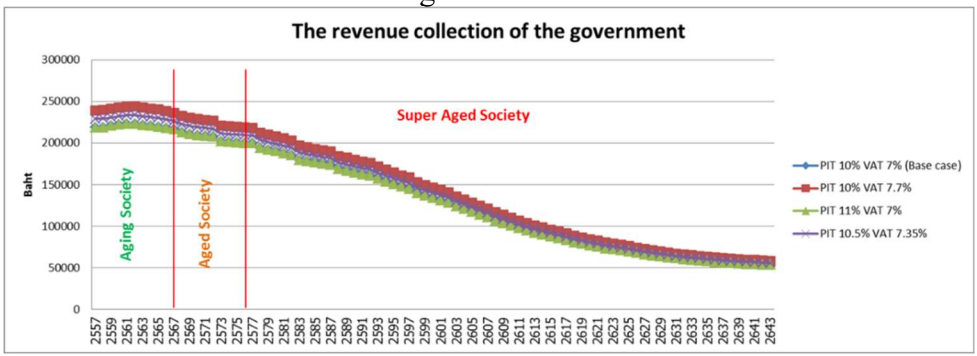
The situation, which is simulated in this part, is an increased old age allowance policy of 10 percent. The change in government expenditure (ΔG) will be constant. The patterns for financing are:

1. Personal income tax rate increases, and value-added tax rate is constant.
2. Personal income tax rate is constant, and value-added tax rate increases.
3. Personal income tax rate increases, and value-added tax rate increases.

Dividing the proportion of revenue collection of the government following the model, the proportion of revenue collection from the value-added tax per total revenue is over 90 percent. Value-added tax is not collected locally but it is collected by the central government.

There are different distortionary effects from both taxes. The increase of personal income tax decreases personal incentive of working because people get less in return. The increase of value-added tax doesn't affect consumption patterns but it affects the value of money for consumption. The result is that the value of total consumption goes down. Therefore, the impact of changing value-added tax rate on the economy is more than the changing personal income tax rate.

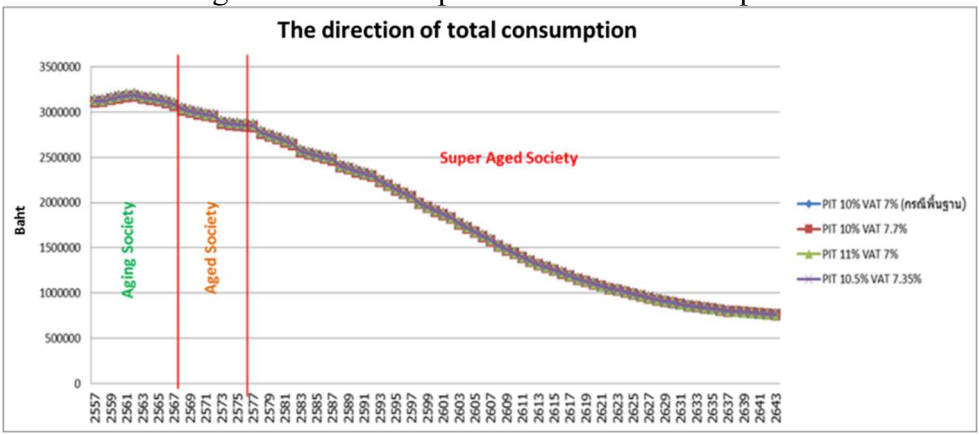
Figure 9. The comparison of revenue collection by the government



Source: Author's calculation.

The financing of government is important. The revenue that is collected is used to pay for social benefits of the elderly. If the government cannot collect enough revenue, it will build public debt. From the simulation, increasing the value added tax rate increases revenue collection more than increasing the personal income tax rate. Increasing personal income tax rate also leads to less income, decreasing consumption and causing revenue collection to decrease. Figure 9 shows the revenue collection of the government. In the case of increasing the value added tax rate by 10 percent, it will increase revenue collection the most.

Figure 10. The comparison of total consumption

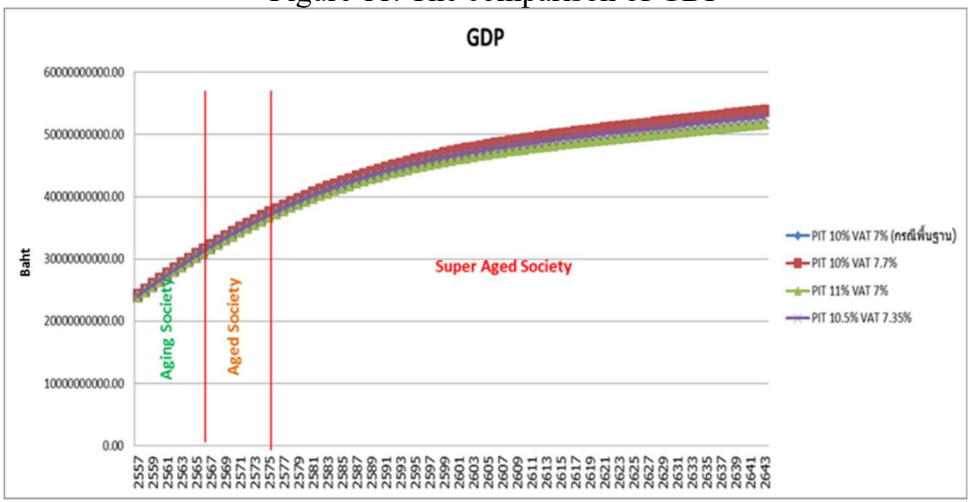


Economic welfare is one of the most significant variables, and it is shown by total consumption. Increasing the value-added tax rate decreases economic welfare. The increase of value added tax rate increases the price of goods. This leads to a fall in total consumption because goods are more expensive. In contrast, increasing personal income taxes affects economic welfare less than value-added tax. Therefore, government financing by increasing value-added tax rate will affect economic welfare more than increasing the personal

income tax rate. Figure 10 shows the comparison of total consumption in the case of changing tax rate.

When the government manages the policy, it must consider the economic growth which affects GDP.

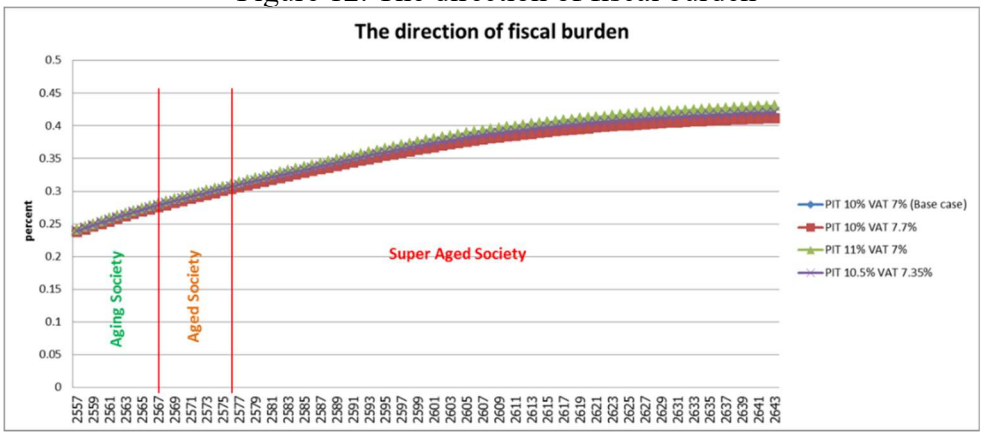
Figure 11. The comparison of GDP



Transitioning to an ageing society affects economic growth. Labor force is important for the economy. Figure 11 shows the direction of GDP. GDP is affected by demographic change. In the case of increasing value-added tax rate by 10 percent, the government will collect more revenue compared to other measures causing higher GDP value.

To reduce the fiscal burden, the government must collect more revenue. Figure 12 shows the direction of fiscal burden. Increasing the value added tax rate can reduce the fiscal burden more than increasing personal income tax rate because of more revenue collection. More revenue collection makes the government build less public debt.

Figure 12. The direction of fiscal burden



Source: Author's calculation

Figure 13. The comparison of the proportion of bond per person

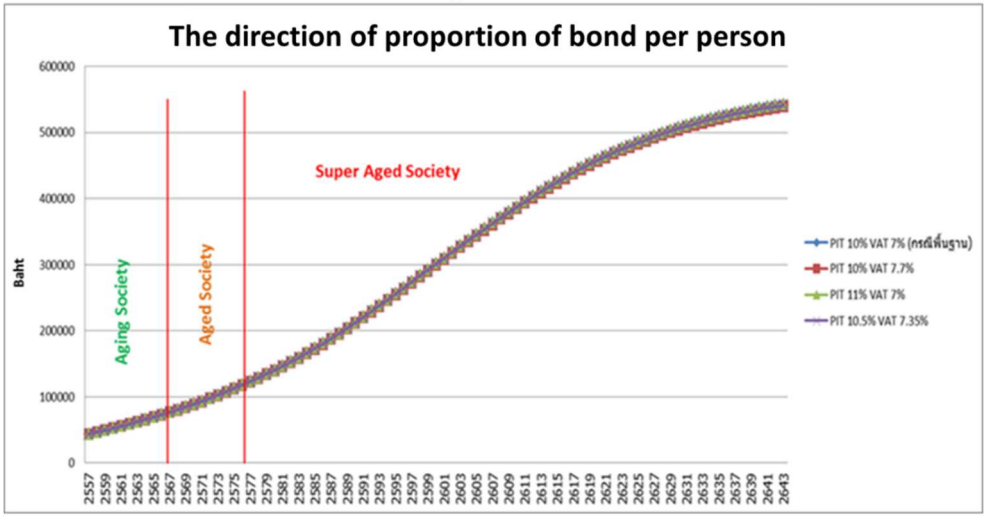


Figure 13 compares the proportion of bonds per person. Whether using any tax patterns to reduce the proportion of bond per person, they cannot reduce and avoid repayment of

public debt and also shift it to next generations. The government should not increase public debt and should reduce the proportion of bond per person.

Part 3 can concluded in 5 main points. The first point is that increasing value-added tax rate increases government revenue collection more than increasing personal income tax. It means that a value-added tax rate increase is more efficient than increasing personal income tax rate because value-added tax is collected from the entire population. Therefore, money value of value-added tax collection is higher than personal income tax collection. The second point is that increasing value-added tax has an effect on population consumption more than increasing personal income tax rates. Increasing value-added taxes increase the price of goods, and leads to a decrease in consumption. The third point is that increasing value-added taxes leads to higher GDP than increasing personal income taxes. The fourth point is that an increased value-added tax decreases the fiscal burden but increasing personal income tax rates cannot reduce the fiscal burden. The fifth point is that if the government still increases public debt every year, financing patterns for decreasing fiscal burden cannot solve the fiscal problem. The avoidance of repayment and a shift to future generations will continue. Not increasing public debt is the best for reducing fiscal burden.

5. Conclusion

The transition of Thailand to an ageing society comes faster than expected. The government should manage expenditure and revenue collection in accordance with the increase of the elderly in society, especially old age allowance expenditure. Old age allowance is paid to all elderly except the people in pension system. The old age allowance expense is

determined according to age. It is paid step by step as per the present policy in Thailand.

This paper examined the impact of demographic change on fiscal sustainability of old age allowance policy by computing an overlapping generations model under a general equilibrium context. This model can show the dimension of transition from the current situation to an old age society. The simulation was divided into 3 parts.

The *first part* is the impact of demographic change on the economy. The study found 2 points. The first point is that demographic change in Thailand comes faster than expected. In the simulation, Thailand will change to an aged society at 2567 B.E. There will be some effects on the economy. Economic welfare will be worse. At the super-aged society stage, GDP will slow down. There will be higher old age allowance expenditures. They make public debt increase and lead to fiscal burden. Therefore, it leads to higher avoidance of repayment and shift to next generations. The second point is that longer life of the population leads to government expenditure increase. Higher government expenditure makes fiscal burden increase and more avoidance of repayment and burden shifting to next generations.

The *second part* is the impact of an increased old age allowance on the fiscal burden. This part presents increasing an old age allowance rate and analyzes impacts on fiscal burden. The study can conclude 3 points. The first point is that increasing the old age allowance rate leads to higher government expenditure. The second point is increasing the old age allowance rate increases government revenue collection and economic growth. The third point is that lower government revenue and higher expenditure leads to a higher fiscal burden. Fiscal burden which increases will cause the avoidance of repayment and shift to next generations.

The *third part* is how to finance the increase of government expenditures. This part presents government financing in response to an increase in old age allowance expenditure, especially to reduce fiscal burden. The study can conclude to 5 points. The first point is that increasing value-added tax rate increases government revenue collection more than increasing personal income taxes. It means a value-added tax rate increase is more efficient than increasing personal income tax rate because value-added tax is collected from the entire population. Therefore, money value of value-added tax collection is higher than personal income tax collection. The second point is that increasing value-added tax rate has an effect on population consumption more than increasing personal income taxes. Increasing value-added tax rate affects the goods price, and leads to a decrease in consumption. The third point is that increasing value-added taxes leads to higher GDP than increasing personal income taxes. The fourth point is that increasing value-added taxes makes fiscal burden decrease but increasing personal income taxes cannot reduce the fiscal burden. The fifth point is that if the government increases public debt every year, changing financing patterns for decreasing fiscal burden cannot solve the fiscal problem. The avoidance of repayment and a shift to next generations will continue. Avoiding increasing public debt is the best for reducing fiscal burden.

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