

Putting an Economic Framework into Thailand's Pension Reform

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I. Introduction

In many economic problems, market-oriented approaches often lead to more efficient outcomes. However, for the old-age income support, there is an economic rationale for government intervention. First, due to uncertainty regarding longevity, people may not save enough. The old-age income support can help insure against the longevity risk. Second, life-time earnings inequality is of serious concern; and without any intervention, those who barely made ends meet during their working lives would fail to have sufficient savings to live on later in life. Lastly, while most people have financial capacity to save, many of them may not have self-discipline to save at all. These justifications have led governments around the world to play a significant role in designing retirement income policies rather than letting people save voluntarily.

Therefore, the design of public old-age income support systems must take into consideration that the system will (i) insure against longevity risk; (ii) contain features permitting for life-time earnings redistribution; and (iii) mandate as well as incentivize savings. In this article, we analyze how well Thailand's old-age income support systems have performed along these dimensions, and subsequently propose some adjustments. We discuss the rules and regulations of the public old-age pension provided by Thailand's Social Security Office (SSO) and the National Savings Fund (NSF) - with the focus on the mandatory system for the formal workers (Article 33 of the Social Security system). We briefly summarize the issues and present additional empirical results from the administrative Article 33 contribution history in Sections II-VII. A more detailed proposal (in Thai) can be found in Wasi et al (2020).

II. Annuity Eligibility

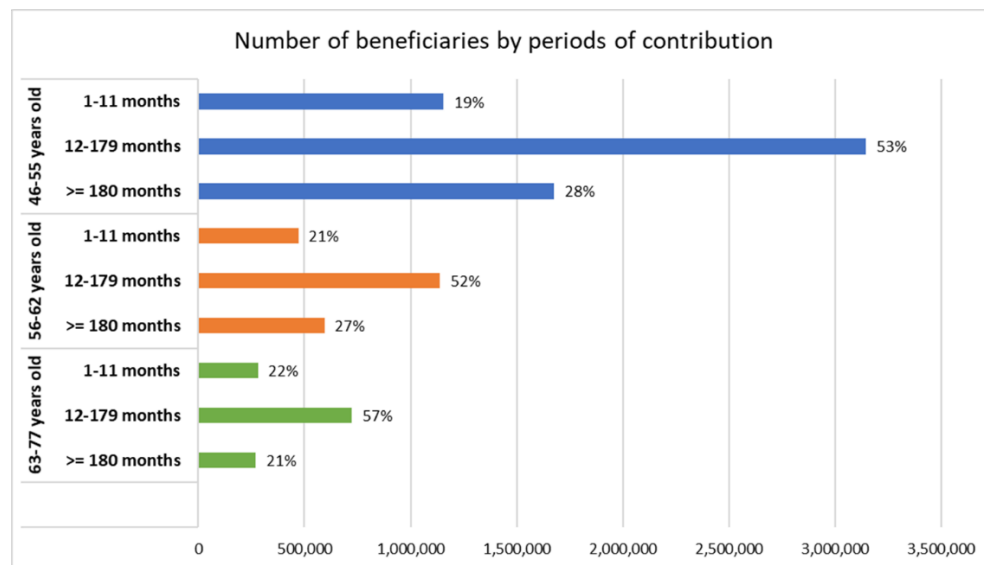
While members of some of Thailand's old-age income support schemes such as Social Security Article 33 and NSF could be eligible for annuity, empirical evidence based on recent data suggests it is not the case for the majority of workers.

Under the Social Security Article 33 (and Article 39) scheme, to qualify for annuity, the beneficiaries need to have paid contributions for at least 180 months (15 years). But for those having contributed between 12 and 179 months, they receive a lump sum benefit equal to the sum of their own and their employer's contributions. And those having contributed less than 12 months

receive a lump sum benefit equal to their own contribution only. Regarding NSF, the eligibility requires the beneficiaries' account balance to be more than 144,000 Baht. For the members with a lower balance, the NSF will pay allowance 600 Baht per month until the account runs out.

Figure 1 shows the number of beneficiaries of Article 33 by their ages in 2020 and contribution periods. These beneficiaries consist of whoever enrolled in Article 33 since December 1998, the date when the old-age pension fund started. For the two older cohorts, aged 63-77 years and aged 56-62 years in 2020, only 21% and 27% of beneficiaries have paid contributions more than 180 months, respectively.

Figure 1 Number of Article 33 Members by Cohort and Contribution Periods



Note that the short contribution years could be partly driven by the fact that the old-age pension fund started in 1998. During that year, the Social Security coverage only mandated firms with ten or more employees. The coverage extended to firms with at least one employee in 2002. Therefore, while some Article 33 members could contribute to the old-age pension fund since December 1998, many members just registered with the SSO in 2002.

Nevertheless, even those aged 46-55 years old in 2020, who potentially have contributed for 18 years (if joining in 2002), the share of beneficiaries contributing more than 180 months

remains low at 28%. This number could provide a lower bound estimate as some members of this cohort likely continue to contribute for 5-10 years. The share of those contributed for less than 12 months is still quite large at 19%. The figure is consistent with our earlier work (Wasi et al., 2021) that analyzing employment patterns of Article 33 beneficiaries over time using k-means clustering technique. In that analysis, they found that approximately 30% of those aged 15-44 years old in 2002 and 2010 are semi-formal workers. Specifically, they either often entered and exited the formal sectors or left the formal sector long before their retirement age. If Article 33 members join the NSF after leaving the formal sector, their contribution years at the NSF could also be short.² This reduces their chance of meeting the annuity eligibility in neither scheme.

If one takes the current labor market pattern as given, it seems reasonable to reduce the required eligibility years (say, from 180 months to 120 months). However, a more crucial question for old-age income support and labor market policy design is why many workers switch between sectors or exit the formal sector early. This issue is beyond the scope of this article.

III. Unfairness of Pension Benefits

The current pension formula of Article 33 is based on the average salary from the last 60 working months (instead of lifetime earnings). This approach can lead to unfair pension benefits, and anomaly in some cases.³ Table 1 compares pension benefits calculation of three workers with different income patterns. The one who makes the highest lifetime contribution (Person 2) ends up receiving the smallest pension benefits based on the current formula.

Our proposal is to use career-average earnings as average salary base instead of the last 60 months. Table 2 presents counterfactual pension if the calculation were based on the average salary of maximum earnings over 180 months as the base earnings. In this case, each of the individual's pensions is in line with their pension contributions, which makes the benefit scheme fairer. Those who make larger contributions receive higher pension benefits. Note that the pension calculated in

² Because the NSF just started in 2015, we are not aware of any projection of the share of NSF members who will be eligible for annuity.

³ The last 60 working month rule likely mimics the formula of the pension benefit of civil servants. However, the nature of work pattern between the private sector and civil servants are different. For civil servants, their jobs are tenure and salary either stable or increase over time. In contrast, workers for the private sector could face lower salary in their unlucky years or reduce their hours toward their retirement.

this table only changes the base salary, but has not changed other features of the formula. Below we further suggest that the formula should be changed.

Table 1: Three patterns of annual contributions and pension benefits (the current scheme)

	Calendar Yr	Age	Annual contributions		
			Person 1	Person 2	Person 3
1	1998	35	15,000	15,000	5,000
2	1999	36	15,000	15,000	6,000
3	2000	37	15,000	15,000	7,000
4	2001	38	15,000	15,000	8,000
5	2002	39	15,000	15,000	9,000
6	2003	40	15,000	15,000	10,000
7	2004	41	15,000	15,000	11,000
8	2005	42	15,000	15,000	12,000
9	2006	43	15,000	15,000	13,000
10	2007	44	15,000	15,000	14,000
11	2008	45	15,000	15,000	0
12	2009	46	15,000	15,000	0
13	2010	47	15,000	15,000	0
14	2011	48	15,000	15,000	0
15	2012	49	15,000	15,000	0
16	2013	50	0	4,800	15,000
17	2014	51	0	4,800	15,000
18	2015	52	0	4,800	15,000
19	2016	53	0	4,800	15,000
20	2017	54	0	4,800	15,000
Contribution (3%)			81,000	89,640	61,200
Pension benefits			3,000	1,320	3,000

Table 2 Pension benefits, calculated based on the average salary of the maximum earnings over 180 months.

Base level of contributions	Person 1	Person 2	Person 3
Contribution (3%)	81,000	89,640	61,200
Avg. max earnings 180 months	15,000	15,000	11,333
Pension at age 55 years old	3,000	4,125	2,267

Source: Authors' own calculations.

One natural question is that are there many beneficiaries facing this particular unfair problem? Table 3 presents the share of pension-eligible beneficiaries by their working behaviors: (a) always Article 33 member; (b) started as Article 33 then joined Article 39 after having left Article 33; and (c) started as Article 33, then joined Article 39 but later returned to Article 33.

Table 3 : Number of Older Beneficiaries in Article 33 and 39 by their contribution pattern

Age in 2020	Types	No. of beneficiaries	Base salary (average 60 months)	Average benefits* (THB/month)
63-77 years old	Always in article 33	123,832	12,020	2,953
	Joined Article 39 after exiting Article 33	136,914	5,473	1,380
	Joined Article 39 for a certain period and returned to Article 33	9,300	10,687	2,628
56-62 years old	Always in article 33	389,693	12,270	3,219
	Joined Article 39 after exiting Article 33	153,073	6,000	1,484
	Joined Article 39 for a certain period and returned to Article 33	50,935	10,547	2,652

Source : Authors' calculation from contribution history in Article 33. The benefits are estimated from the contribution up to 2020. The figures would be underestimated for beneficiaries claiming after 2020.

It is surprising that a large number of workers have moved from Article 33 to Article 39 before they reached pensionable age. Although the shares of those always staying in Article 33 is higher for the younger cohort, the absolute number of those ending up at Article 39 and likely facing this unfairness is still non-trivial. The last column of Table 3 shows the estimated benefits based on earnings history. Consistent with our explanation above, the beneficiaries who switched from Article 33 to Article 39 would receive lower benefits than other groups.⁴

Moreover, once using career-average as a base salary, salaries needed to be indexed for wage growth because each worker's best 180 months would be from different years. For example,

⁴ Another counter-argument is that there could be a selection bias. Those moving to Article 39 tend to have lower earnings even when they were in Article 33.

the nominal average of those with their best 180 months are between 2015 and 2030 are likely to be higher than those having their top 180 months between 2005 and 2020 due to wage growth over time. Before computing the average earnings, we propose adjusting nominal wages to the equivalent Baht value at the year the beneficiaries turn 55 years old. Possible indices are (a) the median wage from Article 33 data; (b) the median wage calculated from the formal workers in the Labour Force Survey; and (c) the monthly CPI. Appendix A provides more details.

IV. Redistribution and Adequacy of Pension Benefits

For current and future pensioners (those who receive annuity), their monthly pension benefits are unlikely adequate for living because (i) the scheme is not income-progressive; (ii) the cap on maximum earnings contribution has never been adjusted; and (iii) pension benefits are calculated at the time of retirement but cost-of-living increased over time.

Under the current formula, the SSO Article 33 benefits are calculated as 20% of the average salary of the last 60 working months, with an increment of 1.5% for every additional year over 15 years. Specifically, the benefit is calculated by

$$pension = (0.2 + 0.015 \times \text{Max}[\text{years contributed} - 15; 0]) \times \text{average salary} \quad (1)$$

where average salary is the average of the last 60 month that the beneficiaries worked, and the maximum Thai Social Security taxable earnings remains at 15,000 THB since the fund started.

The formula above has no mechanism to redistribute lifetime earnings across people because the replacement rate is constant for all income given the same number of contribution years to Article 33. This implies that there is no guarantee that low-income earners would have sufficient pension benefits. The differences between twenty percent of average earnings at the bottom 10 earners and that of the top 10 earners could be large.⁵ In addition, with no cap adjustment for three decades, the fraction of Article 33 insured with earnings more than 15,000 THB rose from 10% to 33% in 2019. This means that if the cap were increased according to the average wage growth, the top income group, they could have been forced to save more for their retirement;

⁵ The current difference might not be that large because the base earnings for the top 10 group has been capped at 15,000 THB. The gap would be larger if there is an increase in the cap, but no change in the benefit formula.

and together with a redistributive formula, the scheme could have generated more revenue to redistribute to the low-income group.

The top panel of Table 4 presents the average benefits calculated from earnings history of the SSO beneficiaries (cohort aged 63-77 years in 2020 who contributed for 180 months or longer). The bottom panel presents the replacement rates. The quartiles are calculated based on the average indexed wages over their best 180 months.⁶ The first column shows the benefits calculated from the current Article 33 formula. The average benefit for beneficiaries is around 1,308 THB for the bottom 25th, and 3,143 THB for the top 25th. The average replacement rates are 24-25%. These figures confirm the two shortfalls (i) the replacement rates from the Thai Social Security system are quite low, compared to other countries (OECD average replacement rate is around 50%); (ii) there is no redistribution.

Table 4 Pension benefits calculated under different formula

Quartile of average salary	Current	Career average, wages are indexed to real value at age 55				
		No redistribution	.8*Bottom + .2*Middle + .1*Top	.8*Bottom + .5*Middle + .1*TopInc	.8*Bottom + .2*Middle + .1*Top	.8*Bottom + .5*Middle + .1*TopInc
		Base salary capped at 15,000			Increased cap	
	[1]	[2]	[3]	[4]	[5]	[6]
Benefits (THB/month)						
Q1	1,308	1,061	3,159	3,322	3,161	3,324
Q2	1,755	1,702	4,046	4,564	4,065	4,588
Q3	2,371	2,741	4,344	4,989	4,465	5,117
Q4	3,143	4,317	5,340	6,087	5,620	6,358
Replacement rate (benefit / avg. income)*						
Q1	0.24	0.24	0.73	0.76	0.73	0.76
Q2	0.25	0.25	0.59	0.67	0.59	0.67
Q3	0.25	0.25	0.41	0.47	0.39	0.45
Q4	0.25	0.25	0.31	0.36	0.28	0.32

In other countries, for example, the US, the replacement rate is inversely related to the average income. The replacement rates for bottom, middle, top earners are approximately 90%,

⁶ The quartiles in columns 1-4 are the same and based on the wage capped at 15,000 THB per month. The quartiles in columns 5-6 are recomputed based on imputed wages to be explained below.

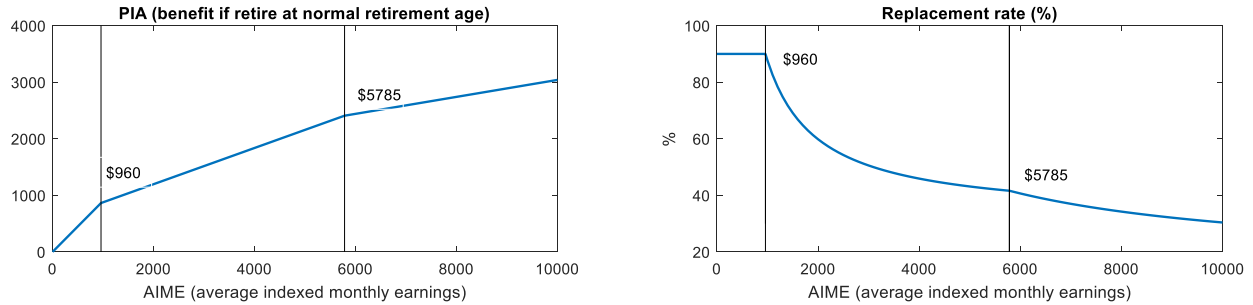
50% and 30%, respectively (see more details in Wasi et al., 2020). The second column shows that using the indexed career average earnings alone increase the benefit of the top earners, but this does not change the redistribution.

To make the pension benefit more adequate, we proposed three further changes.

IV.A Change the pension benefit formula

We propose the three-interval formula to allow the scheme to redistribute lifetime earnings. The basic idea is similar to the formula of the US Social Security illustrated in Figure 2 below. The left figure depicts that the benefit (called Primary Insurance Amount: PIA) does not increase with the average indexed monthly earnings in a linear fashion. There are two bend points to change the slope. The right figure shows that while the high-income still receive higher benefit, their replacement rates are lower.

Figure 2: Bend points and replacement rate of the US Social Security



Source: US Social Security formula in 2020

We propose the following formula in equation (2) for the initial pension benefit :

Pension benefit

$$= \begin{cases} R1 * \text{avg. income} & \text{if } \text{avg. income} \leq BP1 \\ R1 * BP1 + R2 * (\text{avg. income} - BP1) & \text{if } BP1 < \text{avg. income} \leq BP2 \\ R1 * BP1 + R2 * (BP2 - BP1) + R3 * (\text{avg. income} - BP2) & \text{if } \text{avg. income} > BP2 \end{cases}$$

(2)

The parameters R1, R2 and R3 determine the replacement rates for beneficiaries with different levels of income. BP1 and BP2 are the first and second bend points that help “bend” the benefit from increasing linearly with average income as seen in Figure 2. BP1 is the cutoff wage for bottom earners to receive the replacement rate R1. Typically, BP1 can be specified to be the 10th or 15th percentile of earnings distribution while R1 should be 80% or 90%. Note that if the country were to implement a basic pension guarantee, $R1 \cdot BP1$ can be replaced with the guarantee amount. BP2 is the wage cutoff between the middle and high wage earners. For the portion of the average income that is greater than BP1, its return rate is R2. It seems natural to define BP2 at the mean or median of the earnings distribution.

The average income (avg. income) in equation (2) refers to the average salary of maximum earnings over the best 180 months as the base earnings that is adjusted to real value.⁷ BP1 and BP2 should also adjust over time to reflect the real value. We propose adjust the average income, BP1 and BP2 to the year the beneficiaries turn 55. Possible values of the bend points (BP1 and BP2) are discussed in Appendix B.

Note that equation (2) also removes the 1.5% incremental rule for an additional year of contribution that is over 15 years. While the 1.5% incremental rule can create incentive to stay in the system for those who are likely to contribute for less than 15 years, this rule could be income regressive if the service years and earnings are positively correlated.

IV.B Increase the maximum Social Security taxable earnings so that the cap is approximately at the 90th percentile of earnings distribution while we do not have the actual (non-cap) wages for SSO beneficiaries, the Thai Labour Force Survey (LFS) suggests that for formal sector workers, the 90th percentile in 2019 is approximately 30,000 THB. Practically, to catch up with the three past decades of wage growth, the cap might need to rapidly increase in the initial five years. Once catching up, the cap should gradually adjust based on actual wage growth.

To assess the effects of proposed changes, Columns 3-6 present the counterfactual pension benefits for this older cohort when using the redistributive formula in equation (2). Future work

⁷ The number of months used to average the lifetime earnings could increase further. We use 180 months now to accounting for the fact that the scheme had expanded only recently in 2002, some workers have been registered for only 18 years. The US Social Security use average earnings of the best 35 years.

will try to project the effect on beneficiaries who will retire in the next decade.⁸ Columns 3 and 4 are cases without raising the cap. Columns 5 and 6 are cases where cap was raised to the 90th percentile of the wage distribution every year.

The difference between Columns 3 and 4 is the value of R2 (.2 vs. .5). If the SSO were to implement this formula, the benefits of all beneficiaries (of this cohort) would have gone up to 3,000-6,000 THB. The replacement rates would be 74-77% for the bottom quartile and 32-36% for the top quartile.

Columns 5 and 6 show the case where the cap was consistently raised to the 90th percentile. In this experiment, we rely on imputed wage value whenever observed wages are 15,000 THB. Appendix C explains the details on the imputing procedure. As expected, the results remain similar to those in Columns 3 and 4, except for the top two quartiles. Note that lower replacement rates in Columns 5-6 are driven by their higher denominators (raising cap on wages).

IV.C Adjust benefits to align with costs of living in post-retirement years

The proposed formula in equation (2) is the benefits for initial retirement year. Given that the post-retirement years of some beneficiaries could be in 20 or 30 years, it is necessarily to adjust the benefit so that its equivalent Baht value is constant over time.

V. Aging population and Fiscal Sustainability

Like many other countries, Thailand is an aging society with a significant increase in life expectancy and decline in the fertility rate. According to ILO actuarial valuation (ILO 2016), without any adjustment, the Thai Social Security old-age pension fund would deplete in 2054. Although there are several potential approaches to reduce the fiscal burden of the system such as raising contribution rates or reducing benefits, creating incentives for beneficiaries to work longer and retire later has been a common approach.

In this section, we only discuss a strategy to increase retirement age. While other countries have successfully increased their retirement age with a plan to increase further, the pensionable age for the Thai Social Security has remained at 55 years old since 1998. Although there was a

⁸ Projecting benefits for those who have not retired require assumptions on their contribution years (in Article 33 and 39) and wage growth before claiming benefits.

discussion of increasing retirement age from 55 to 60, it was objected by beneficiaries who could be impacted by such abrupt change.⁹ Here we consider a strategy to create incentives to delay benefit claiming while posing minimal adverse impacts on the insured population who are currently close to the retirement age. These beneficiaries should not be directly affected by the rule change since they have limited time and options to make any adjustment.

Our proposal consists of the following logics:

(i) Those aged close to the current eligible age should not be impacted by the change because there is no time for them to adjust. For instance, if the regulation would go into effect in 2021, those who were born in 1971 or earlier should not be affected.

(ii) Eligible age remains at 55 years. Set up “full pensionable age” or FPA which gradually increases for each cohort. Claiming before or after the FPA would result in a benefit decrease or increase, respectively, in an actuarially fair rate. For those who still wish to claim the benefits when turning 55 due to health or other reasons, they could still do so. Note that if the proposal in this section implemented together with the proposal in Section III, these beneficiaries are still likely to receive higher benefits. It is just that other beneficiaries who claim at the FPA or later would receive much higher benefits. Adjusting for “actuarially fair rate” means that the benefits are adjusted according to the number of years the beneficiaries will receive the annuity compared to the average survival probability of for his/her birth cohort. Claiming early implies longer years of receiving benefits whereas delayed claiming implies the shorter pension years.

Table 5 : Example of Full Pensionable Age adjustment

Birth year	Full Pensionable Age
before 1971	55 years
1971	55 years 6 months
1972	56 years
1973	56 years 6 months
1974	57 years
...	...
1980	60 years
...	...

⁹ https://www.matichon.co.th/columnists/news_787073

(iii) The FPA should gradually increase by birth cohort. Note that there is a trade-off between the rapid increase and the gradual increase. While the gradual increase minimizes the impact on beneficiaries, it would take longer to affect the status of the fund. In other words, if we wait until the fund is depleted, the more drastic change is needed (e.g., increase contribution rates or benefit cut). Table 5 gives one possible rule if the change were to be in effect this year. Appendix D shows the example of how the US adjusted their full pensionable age.

(iv) As most private companies set the mandatory retirement age at 60, increasing FPA from 55 to 60 should not be difficult. Whether the FPA can be increased further than 60 years old, however, depends on the business practice.

VI. Effectiveness of Voluntary Savings Programs

VI.A Savings Incentive

Normally, the matched contribution by the government is incorporated into a voluntary scheme in order to induce incentives for workers to participate in the scheme or to encourage more savings. The matched contribution by government deems not necessarily for compulsory schemes. Moreover, in the existing benefit formula, individual's benefit has no link to the government contribution.

Table 6 Workers and Government Matched Contributions by Schemes

	Article 33	Article 39	Article 40 (option 2)	Article 40 (option 3)	NSF
Worker contribution	5% of wage ~3% for pension	432 THB/m	100 THB/m	300 THB/m	Not specified
Gov. matched contribution	2.75% of wage capped at 412 THB/m (+tax deduction) ~1% for pension capped at 150 THB/m	120 THB/m	50 THB/m	150 THB/m	50%, 80%, 100% of savings (varying by age) capped at 50,80,100 THB/m

The Thai government co-contribution rates for the compulsory and voluntary systems are presented in Table 6. The picture is contrast to the economic logic above. The Thai government has co-contributed proportionally to salary for the compulsory scheme (Article 33). However, this is simply a public transfer to the SSO fund since the transfer has zero effect on individuals' benefits. Moreover, the government uses a fixed rate contribution into the voluntary schemes (Article 39/40). Thus, both mentioned contributions do not create an incentive for workers to join A33 or A39. Although the matched rate for NSF appears to be high, the capped contribution is limited to 50-100 THB per month. As a consequence, the design of the voluntary programs do not provide strong incentives to induce either participate (extensive margin) or higher saving (intensive margin).

We propose that the government's contribution for compulsory scheme should be reduced (and eventually removed).¹⁰ To increase the overall savings rates, the government is better off to allocate budget to the matched contribution of the voluntary scheme as a much higher matched rate can create incentives for participation and for higher contributions. In addition, the application of an 'opt-out' technique (starting the default saving rate at a high level but participants can opt for a lower rate), similar to the Save More Tomorrow program (Thaler and Benartzi, 2004), can be integrated to help guarantee high contribution of the schemes.

VI.B Conflicting incentives

Here we consider why an informal worker would choose to join either Article 39, Article 40 (options 2 and 3) or NSF; or none. One common explanation for a low participation rate is that informal workers have low and irregular income and cannot contribute. That is likely true but to fix the low-income problem is beyond the scope of this paper. In this subsection we discuss the features of existing public voluntary savings programs which maybe unattractive.

First, the fact that Article 39 and 40 bundle the short-term benefits (e.g., illness, child-allowance) with the long-term benefit (retirement benefit) could be unattractive to some workers. For example, a healthy and single worker may not have a strong incentive to join the program

¹⁰ In theory, the government's contribution is not needed unless there is some other political reason. For example, the enforcement is not fully effective and by having government help contribute to the scheme helps employers to comply.

given that the health benefit is not much better than the free Universal Healthcare Coverage Scheme (UCS); and the lump sum benefit is not insured against longevity risk. In addition, those who were in Article 33 and already qualified for pension may not want to join Article 39 due to the reduced pension benefit discussed in Section II.

Second, the voluntary savings programs face a time-inconsistent problem. The workers may expect that it is impossible that the government would let its citizens suffer from hunger or extreme poverty. At the end, the government would always step in (e.g., increasing the elderly allowance or other income assistance).

We propose that the public old-age income support programs should be separated from other short-term benefits. This means that the workers do not have to choose between joining Article 40 (receive health insurance and lump sum retirement income) vs. joining NSF (receive annuity without health insurance). There should just be one retirement income scheme and another top-up health insurance scheme or disability insurance.

VII. Challenges of implementation

Another challenge for implementing pension reform in Thailand is that while the country has established many schemes, there is no single responsible institution with the authority to comprehensively investigate, research and reform the old-age income policies. Currently, each scheme (SSO, NSF, elderly allowance, providence fund) is managed by different, loosely connected agencies. The lack of a unifying authority has resulted in each agency conducting own reform, and even more schemes getting separately proposed.

Since the elderly's old-age income comes from multiple schemes, it is of the highest important to consider the big picture of the overall old-age income support systems. For example, if the SSO scheme can insure against longevity risk and make benefits adequate, other schemes may not need to adjust on this dimension. On the other hand, if a proposed new mandate scheme would also collect contributions from employers and employees, the SSO would be unlikely to be able to raise the cap as the employers and employees would dislike and object the uncoordinated, double increase.

Note that all public old-age income support programs receive some subsidy from the government. Some schemes are directly tax-financed, while other receive indirect subsidies in a form of tax exemption or deduction for the contribution to the schemes. The marginal value of each public subsidy is not the same across the funds. By integrating into One National Public Pension System, we can equalize the marginal value of public money across all existing funds.

Even with the integrated system, the challenges remain. Consider the case of elderly allowance which is now universally available to all Thai citizens aged 60 years or over except for the retired civil servants. Currently, the only single source of income for millions of elderly is the elderly allowance, leading to a proposal of increasing the levels of elderly allowance to the country's poverty line (from 600-1000 THB per month to 3000 THB per month). However, such triple increase will lead to substantial fiscal burden for the government.

On the other hand, if SSO pension is adequate, it seems unnecessarily to transfer this amount of money to SSO beneficiaries. Using means-tested SSO pension for elderly allowance could be another option. Specifically, if elderly allowance is increased to the poverty line, the SSO beneficiaries receiving pension benefits greater than that amount is not eligible for elderly allowance. Doing so could save the government some budget and avoid raising taxes in the future. However, means-testing program could induce people who expect their benefits to be lower than the poverty line, not to participate in the SSO at all because they could receive the same amount of pension without paying any contributions.

VIII. Conclusion

We analyze to what extent Thailand's key public old-age income support systems insure against longevity risk, contain features permitting life-time earnings to be redistributed, and incentivize savings. We conclude that the current system needs some adjustments in order to effectively meet these three criteria.

Our three key proposals are (i) a new pension benefit formula for the mandatory Social Security system to make the system fairer and the benefits more adequate; (ii) a strategy to increase retirement age while minimizing the impact to beneficiaries; and (iii) a stronger incentive for voluntary savings program. A new pension benefit formula includes a redistributive feature, a

career-average salary base, an adjustment to equivalent THB value at eligible age, and flexible cap that reflects the changing economy.

We should emphasize two important points. First, the suggested adjustments should not be a one-time change but should be continuous flexible adjustments to reflect the changes in the economy or population structure. Second, any adjustment should be gradual, not an abrupt change to minimize the impacts to beneficiaries who have no time to adjust and avoid the jump in benefits between two consecutive cohorts.

This study is a part of work-in-progress on our evaluation project. Future work will evaluate how the proposed adjustments affect the young cohorts and the old-age pension fund status. While increasing the maximum Social Security taxable income and delaying claiming age (if successful) can raise the revenue, the new benefit formula also leads to higher expenses.

In a big picture, several challenges remain. Without a single unified responsible authority, the attempt to untangle the old-age income support problem is unlikely successful. On the labor market side, the early exit from the formal sector and the low and irregular income of the informal sector are still pertinent issues.

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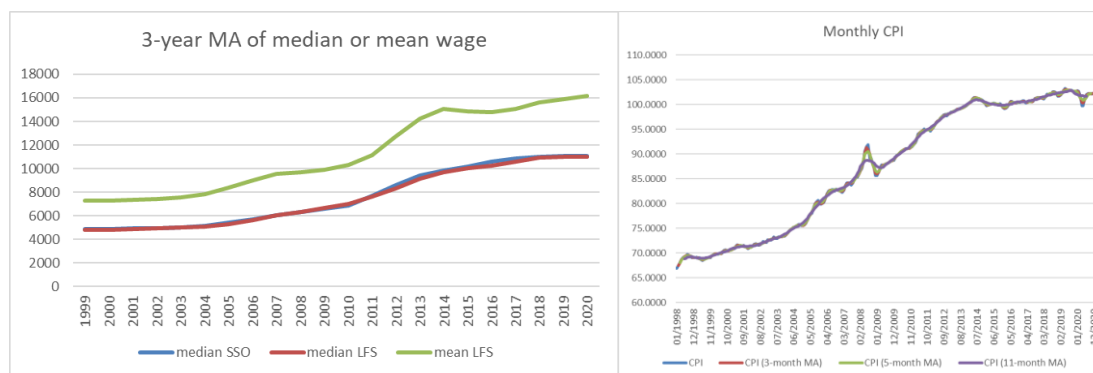
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Appendix A : Wage Growth Indexation

Our proposal includes using career-average wages and adjusting wages to real value of the calendar year when the beneficiaries turn 55. We consider four possible indices: (i) median nominal wages from Article 33 (3-year moving average); (ii) average nominal wage from the Labour Force Survey (3-year moving average); (iii) median nominal wage from the Labour Force Survey (3-year moving average); and (iv) monthly consumer price index (CPI). Note that we propose the median wage from Article 33, not the average, because the wage is capped at 15,000 making the average biased downward.

Figure A1 presents these four indices, which show similar trends. The average is higher than the median as expected. The median wages from SSO and LFS are fairly close. The SSO data is based on data in July. For LFS, the monthly earnings are taken from Quarter 3. Total earnings are calculated from salary and compensation for overtime hours and bonus. The sample include only those who are under the 'employee' status (state and private employees) excluding small number observations with zero value. The statistics used individual survey weight provided by NSO. In the calculation in Table 4, we use median SSO wages.

Figure A1 : Wage data to use for wage indexation



Appendix B Bend points in the proposed pension formula

We propose the following formula in equation (2) for the initial pension benefit :

Pension benefit

$$= \begin{cases} R1 * \text{avg. income} & \text{if } \text{avg. income} \leq BP1 \\ R1 * BP1 + R2 * (\text{avg. income} - BP1) & \text{if } BP1 < \text{avg. income} \leq BP2 \\ R1 * BP1 + R2 * (BP2 - BP1) + R3 * (\text{avg. income} - BP2) & \text{if } \text{avg. income} > BP2 \end{cases}$$

BP1 is the cutoff for the bottom earner group. It can be 10th, 15th, 20th or 25th of wage distribution from LFS or SSO. BP2 is the cutoff for the average earners and the high-income group. It can be defined as median wage from the SSO, median or average wage from LFS. In the current version, we define BP1 at the 15th percentile and BP2 at the 50th percentile of SSO wage distribution. Note that the average income is adjusted to the real value at the year the beneficiaries turn 55. Therefore, the bend points (BP1 and BP2) have to be adjusted in the same way over time.

Appendix C : Wage Imputation

To simulate the case where we raise the maximum Social Security taxable earnings to be over 15,000 THB, we need information on actual earnings. Unfortunately, the current SSO earnings history data we have accessed do not contain such information. In this appendix, we describe the steps we use to impute wages for censored cases. The basic ideas are as follow.

First, we want to incorporate auxiliary information from empirical wage distribution in LFS conditional on being in the same year and age groups. Second, wages for the same individual tend to be correlated over time. Earnings grow as people age (at least for the high skilled) and increase over time. Lastly, SSO has the information of transition probabilities of whether next period wage continues to be lower than 15,000 or move over this threshold.

We start by dividing the wage distribution into 5 bins where the first bin is for wage lower than 15,000 THB per month. The size of the first bin is smaller over time. Bin2-Bin 5 are assumed to be equal in size. When the observed wage is 15,000, we draw wages from Bin 2-Bin 5 relying on two identification assumptions : (1) consecutive bin mobility; and (2) symmetric transition probability.

Figure C1 : Assumed transition probabilities for censored wages

				t+1		
		bin 1 ≤15000	bin 2	bin 3	bin 4	bin 5
	bin 1 ≤15000	P1_1	P1_2	-	-	-
	bin 2	P2_1	P2_2	P2_3	-	-
t	bin 3	-	P3_2	P3_3	P3_4	-
	bin 4	-	-	P4_3	P4_4	P4_5
	bin 5	-	-	-	P5_4	P5_5

where P_{i_j} refers to the probability of transition from bin i in month t to bin j in month $t+1$.

From SSO data, we observe (i) size of bin 1 over time; (ii) the probabilities of moving from bin 1 to a higher bin and moving down to bin 1. Assuming that bin 2 – bin 5 are equal sizes and symmetric probabilities ($P_{i_j} = P_{j_i}$), together with the fact that the sum of probabilities in each row must be one allow us to estimate the parameters in the transition matrix above. We calculate the above transition matrix for each age group (5-year-interval) and each month.

For each observation with observed wage equals to 15,000, if this is the first observation (or the first after wages drop below 15,000 or missing), we assign bin equals to bin 2. For the next observation of the same individual, we then draw the new bin based on the transition matrix above. Conditional on the assigned bin, we then draw wage from empirical frequencies from the Labour Force Survey. The empirical frequencies are also computed by age group for each calendar year.

In terms of how often to draw, we consider three following approaches. First, draw the bin and wage value every time the observed wage is 15,000. Second, draw the bin every time the observed wage is 15,000 but assign the same wage as the previous one if the newly draw bin remains the same as the bin in the previous period. Lastly, draw the bin and wage value every six month and convert the transition matrix to be six-month transition probabilities. The result reported in Table 4 uses the first approach.

Appendix D The US Social Security Full Pensionable Age

The US full pensionable age is called the normal retirement age (NRA). The NRA has increased gradually by the beneficiaries' years of birth as shown in the table below.

Year of birth	Age
1937 and prior	65
1938	65 and 2 months
1939	65 and 4 months
1940	65 and 6 months
1941	65 and 8 months
1942	65 and 10 months
1943-54	66
1955	66 and 2 months
1956	66 and 4 months
1957	66 and 6 months
1958	66 and 8 months
1959	66 and 10 months
1960 and later	67