

Upalat Korwatanasakul; Pitchaya Sirivunnabood; Majoe, Adam

Working Paper

Demographic transition and its impacts on fiscal sustainability in East and Southeast Asia

ADB Working Paper Series, No. 1220

Provided in Cooperation with:

Asian Development Bank Institute (ADBI), Tokyo

Suggested Citation: Upalat Korwatanasakul; Pitchaya Sirivunnabood; Majoe, Adam (2021) : Demographic transition and its impacts on fiscal sustainability in East and Southeast Asia, ADB Working Paper Series, No. 1220, Asian Development Bank Institute (ADBI), Tokyo

This Version is available at:

<https://hdl.handle.net/10419/238577>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by-nc-nd/3.0/igo/>



ADB Working Paper Series

DEMOGRAPHIC TRANSITION AND ITS IMPACTS ON FISCAL SUSTAINABILITY IN EAST AND SOUTHEAST ASIA

Upalat Korwatanasakul,
Pitchaya Sirivunnabood,
and Adam Majoe

No. 1220
March 2021

Asian Development Bank Institute

Upalat Korwatanasakul is an Assistant Professor at the School of Social Sciences, Waseda University. Pitchaya Sirivunnabood is a Capacity Building and Training Economist at the Asian Development Bank Institute (ADBI). Adam Majoe is a Publishing and Brand Consultant at ADBI.

The views expressed in this paper are the views of the author and do not necessarily reflect the views or policies of ADBI, ADB, its Board of Directors, or the governments they represent. ADBI does not guarantee the accuracy of the data included in this paper and accepts no responsibility for any consequences of their use. Terminology used may not necessarily be consistent with ADB official terms.

Working papers are subject to formal revision and correction before they are finalized and considered published.

The Working Paper series is a continuation of the formerly named Discussion Paper series; the numbering of the papers continued without interruption or change. ADBI's working papers reflect initial ideas on a topic and are posted online for discussion. Some working papers may develop into other forms of publication.

Suggested citation:

Korwatanasakul, U., P. Sirivunnabood, and A. Majoe. 2021. Demographic Transition and its Impacts on Fiscal Sustainability in East and Southeast Asia. ADBI Working Paper 1220. Tokyo: Asian Development Bank Institute. Available: <https://www.adb.org/publications/demographic-transition-impacts-fiscal-sustainability-east-southeast-asia>

Please contact the authors for information about this paper.

Email: upalat@aoni.waseda.jp, psirivunnabood@adbi.org, amajoe@adbi.org

Asian Development Bank Institute
Kasumigaseki Building, 8th Floor
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

© 2021 Asian Development Bank Institute

Abstract

Many economies in East and Southeast Asia are progressing toward becoming aging or aged societies. The impacts of this demographic transition are multifaceted and far-reaching and include declining tax revenues, leading to fiscal imbalances, and possible increases in government expenditures for coping with care expenses and pension schemes. This study aims to provide insights into ways to balance fiscal revenue against costly pension and social security systems and increasing healthcare expenditures.

Using panel data for 178 countries across 18 years to capture the state of fiscal balance and data on demographic transition, we estimate three models to analyze the relationships between (i) demographic transition and government balance, (ii) demographic transition and government health expenditure, and (iii) demographic transition and government debt. The results first establish that health expenditure is negatively associated with the government balance. Then, for the relationship between demographic transition and health expenditure, old-age dependency and the share of the population aged over 64 shows a significant positive relationship with health expenditure. We find that demographic transition does not have a direct effect on the government balance, but instead has an indirect effect through higher government expenditure. This can be explained by the high costs of treating health conditions related to old age, including chronic illnesses.

Our findings provide important implications for fiscal sustainability and necessitate comprehensive reviews of public health spending; healthcare reforms that prioritize accessibility for all and efficiency in healthcare services; and cost-sharing measures to mitigate the age-related fiscal burden. These measures will be particularly important in dealing with the impacts of the coronavirus disease (COVID-19) pandemic, to which the elderly are particularly vulnerable.

Keywords: demographic transition, population aging, fiscal balance, fiscal sustainability

JEL Classification: J11, J14, J18, H30, H51, H55

Contents

1.	INTRODUCTION.....	1
2.	DEMOGRAPHIC OUTLOOK IN EAST AND SOUTHEAST ASIA	2
3.	FISCAL BALANCE IN EAST AND SOUTHEAST ASIA.....	6
4.	POPULATION AGING AND FISCAL BURDEN	10
4.1	Data and Methodology.....	10
4.2	Estimation Models.....	11
4.3	Limitations of the Study	12
4.4	Estimated Results	13
5.	POLICY IMPLICATIONS	15
5.1	Direct Policy Implications.....	15
5.2	Indirect Policy Implications	17
6.	CONCLUSION	19
	REFERENCES	21
	APPENDIX: AGE-RELATED POLICY MEASURES IN SELECTED EAST AND SOUTHEAST ASIAN COUNTRIES.....	23

1. INTRODUCTION

East and Southeast Asian economies are advancing toward, or have become, aging societies, although some countries are in the early stages while others are more advanced. This revolution in longevity is being demonstrated through longer life expectancies due to medical innovations, improvements in medical care, and people living healthier lifestyles. Meanwhile, a continuously decreasing trend in fertility rates due to changes in economic and social values is being witnessed across the two regions. These two factors combined create the demographic transition of population aging, and its multifaceted impacts have spread widely across East and Southeast Asia, although the degree of population aging varies by economy. This paper will examine the impacts of population aging on fiscal balance and assess how to achieve fiscal sustainability in economies at differing demographic stages.

Theoretically, the early phase of demographic transition has a larger proportion of workers, which increases aggregate consumption, cumulative investment, and total labor inputs—thus, output increases. This stage provides the first demographic dividend. Countries in this demographic phase include Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic (Lao PDR), Myanmar, and the Philippines. As the transition progresses, economies experience a significant drop in their labor supply due to lower total fertility rates and a decrease in the mortality rate, which reduces potential gross domestic product (GDP) as well as domestic savings. Although lower productivity is not necessarily implied from a rising aging population, changes in patterns of economic behavior are observed toward lower consumption and less investment, which in turn hamper overall economic growth. This stage requires supplements to technological advancement and investment in human capital to achieve the second demographic dividends. The transition phase can be referred to as economies with population aging, and these economies include the People's Republic of China (PRC), Malaysia, Singapore, Thailand, and Viet Nam. The last demographic group comprises economies with an aged population or a society with a high ratio of old-age dependency; these economies are Japan and the Republic of Korea (ROK).

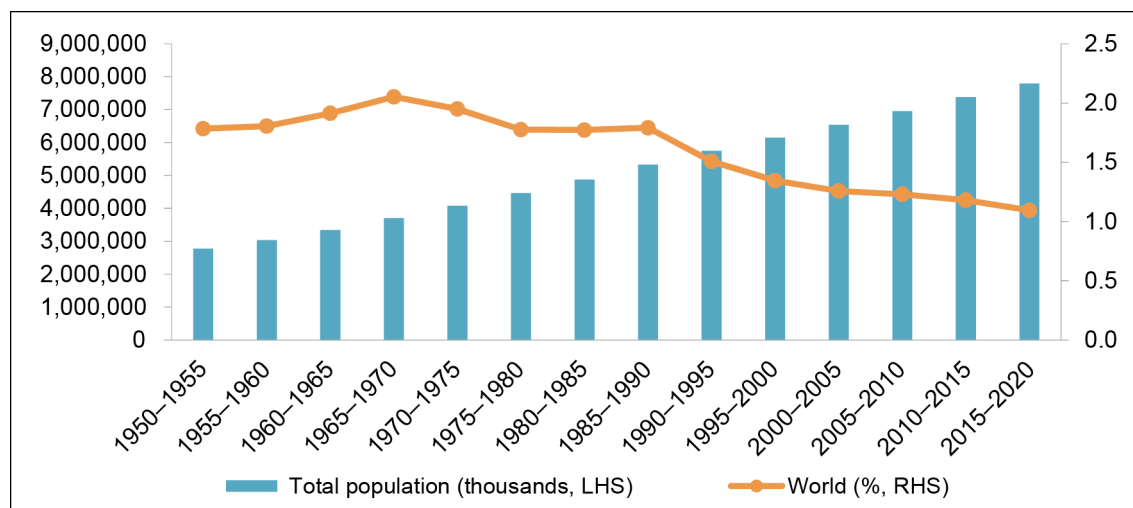
As an economy transits toward becoming an aged or aging society, the impacts can drive fiscal imbalance through declines in tax revenues and possible increases in government expenditures, especially those related to care expenses for the aged and pension schemes. A shrinking working population and lower productivity negatively affect government tax revenue, while a growing aging or aged population creates a fiscal burden through an increase in public health expenditure and probably protection and pension schemes. The challenge then emerges of how to balance fiscal revenue against the increasing burdens from social security and pension systems and rising healthcare expenditures.

This paper is developed equivalently to a policy paper. Thus, the focus is on the empirical trends of the demographic change in various economies and their relationship with fiscal balance. Section 2 presents the demographic outlook in East and Southeast Asia, while Section 3 shows the status of fiscal balance in the two subregions. Section 4 assesses the relationship between population aging and fiscal balance through economic and demographic models. Section 5 derives the policy implications from the statistical findings from Section IV. Finally, Section 6 concludes the paper.

2. DEMOGRAPHIC OUTLOOK IN EAST AND SOUTHEAST ASIA

The world population has been growing constantly but at a decreasing rate (Figure 1). In 2019, the total world population reached 7.7 billion; however, projections by the United Nations (UN) predict slowing growth, with estimates of 8.5 billion in 2030, 9.7 billion in 2050, and 10.9 billion in 2100 (UN DESA 2019). During the 1970s and 1980s, Asia and Latin America and the Caribbean were the two regions that contributed most to the global population. After 1990, the trend shifted to Africa, while the population growth in Asia shrank significantly after 2000 (Figure 2).

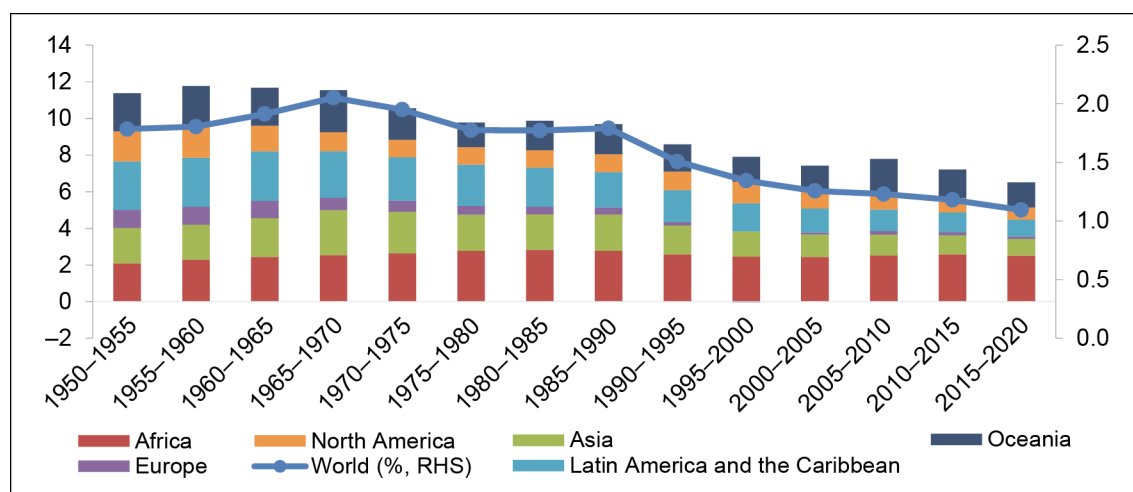
Figure 1: World Population



LHS = left-hand scale, RHS = right-hand scale.

Source: World Population Prospects (2019), UN DESA (2020).

Figure 2: World Population Growth by Region (%)

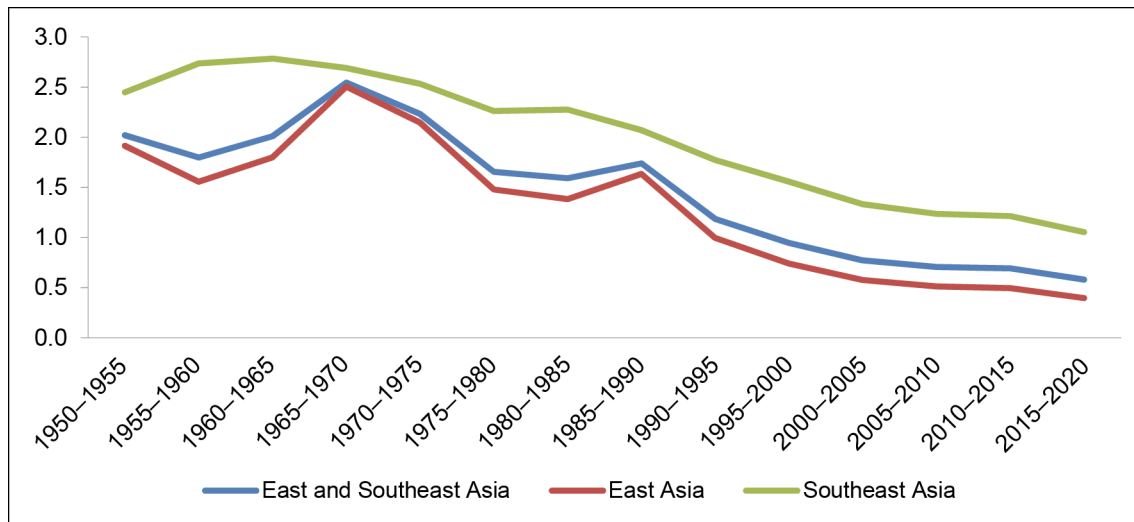


RHS = right-hand scale.

Source: World Population Prospects (2019), UN DESA (2020).

The East and Southeast Asia regions combine three groups of populations based on their demographic stage. Overall, population growth in East and Southeast Asia has continued to decrease since 1970, particularly as East Asian economies have experienced stronger impacts of population aging (Figure 3). More than half of the countries in these two regions had less than a 1% population growth between 2015 and 2020. These circumstances signal that the regions are entering the phase of becoming aging or aged societies.

Figure 3: Population Growth in East and Southeast Asia (%)



Source: World Population Prospects (2019), UN DESA (2020).

As referred to by the World Health Organization (WHO) and the United Nations (UN), an “aging society” is one in which more than 7% of the population is aged 65 or older, an “aged society” is a society in which more than 14% of the population is aged 65 or older, and a “super-aged society” is a society in which more than 21% is aged 65 or older. These criteria are also used for the purposes of the analysis throughout this study. Table 1 shows the demographic status of countries in East and Southeast Asia in comparison to the global population in 2020 according to the criteria. Six countries are still classified as young societies, and five countries are considered aging societies. The ROK has entered the aged society category, while Japan has progressed to becoming a super-aged society.

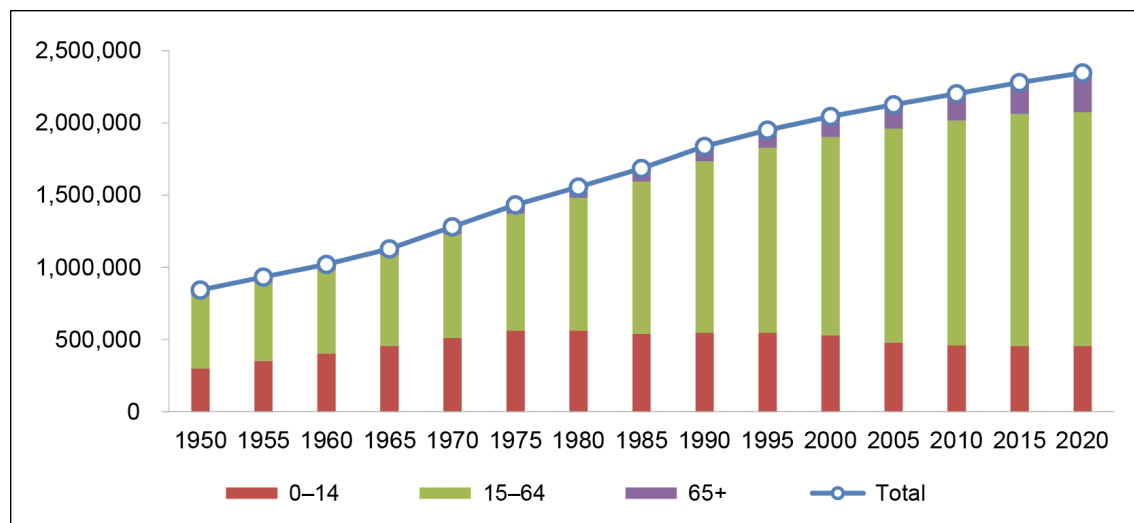
Table 1: Demographic Status in East and Southeast Asia, 2020 (estimated)

	Total Population	Population Aged 0–14	Population Aged 15–64	Population Aged 65+	Share of Population Aged 65+	Status
World	7,794,799	1,983,649	5,083,544	727,606	9.3%	Aging society
People's Republic of China	1,439,324	254,930	1,012,131	172,262	12.0%	Aging society
Japan	126,476	15,744	74,816	35,916	28.4%	Super-aged society
Republic of Korea	51,269	6,431	36,743	8,096	15.8%	Aged society
Brunei Darussalam	437	98	315	24	5.6%	Young society
Cambodia	16,719	5,170	10,737	811	4.9%	Young society
Indonesia	273,524	70,941	185,453	17,129	6.3%	Young society
Lao PDR	7,276	2,324	4,641	310	4.3%	Young society
Malaysia	32,366	7,589	22,452	2,325	7.2%	Aging society
Myanmar	54,410	13,867	37,150	3,393	6.2%	Young society
Philippines	109,581	32,921	70,620	6,040	5.5%	Young society
Singapore	5,850	720	4,350	781	13.4%	Aging society
Thailand	69,800	11,554	49,202	9,044	13.0%	Aging society
Viet Nam	97,339	22,577	67,105	7,657	7.9%	Aging society

Lao PDR = Lao People's Democratic Republic.

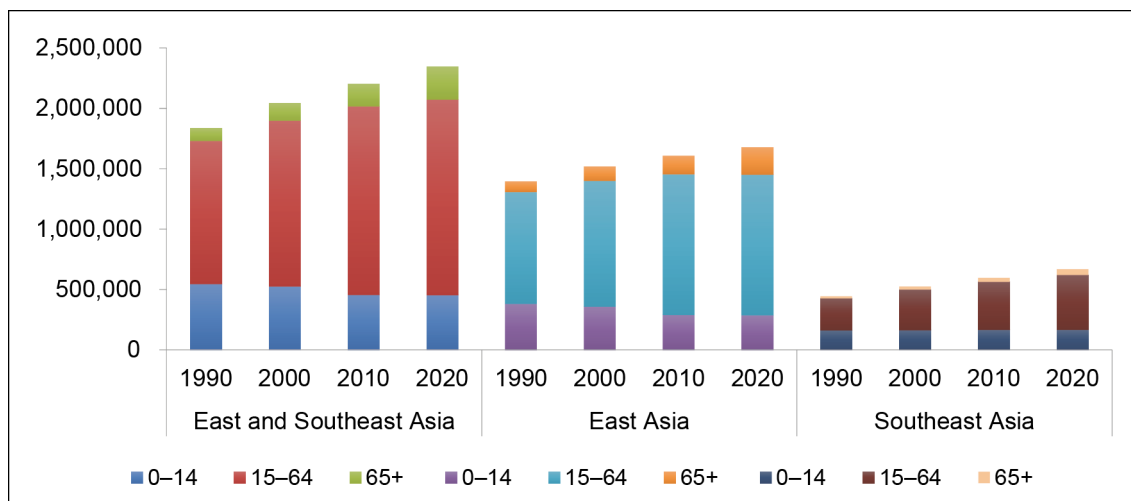
Source: World Population Prospects (2019), UN DESA (2020), and authors' calculations.

Although the working population has gradually increased over several decades in East and Southeast Asia, the proportion of the aged population (those aged 65+) has also grown progressively during this time (Figure 4). If we consider the population size by age group, the ratio of the working population to the total population in Southeast Asia is relatively larger than the ratio for East Asia. However, the increase in the population aged more than 65 years from 1990 to 2020 in both regions was almost the same, showing an increase of approximately 160% (Figure 5).

Figure 4: Total Population in East and Southeast Asia
(thousands)

Source: World Population Prospects (2019), UN DESA (2020).

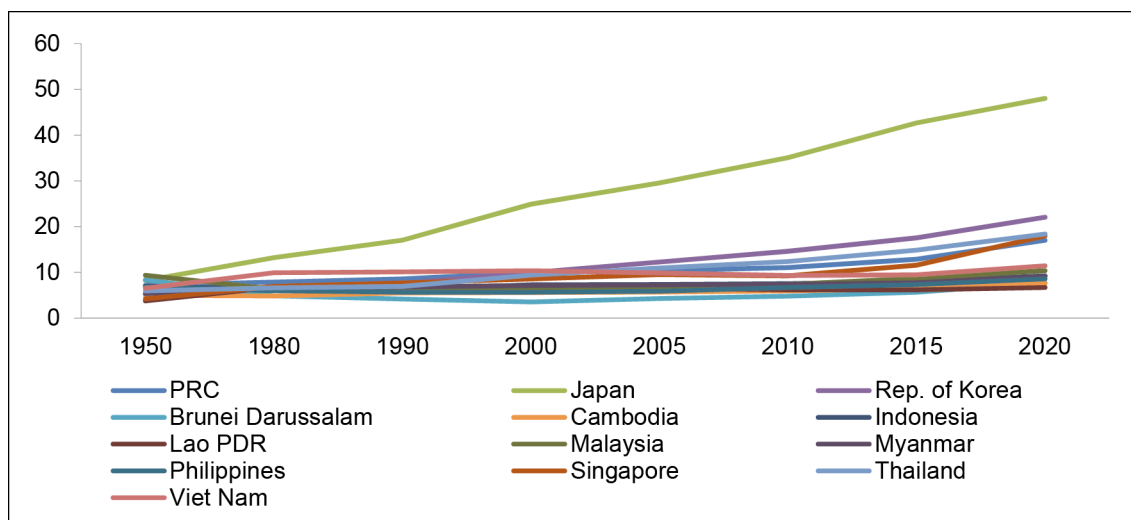
Figure 5: Total Population by Age Group
(thousands)



Source: World Population Prospects (2019), UN DESA (2020).

The continuous increase in the population aged more than 65 has led to a rising old-age dependency ratio in East and Southeast Asia overall. The ratio, however, varies across the different countries in the region. Two out of three East Asian countries have higher rates than countries in Southeast Asia, and this can be seen particularly over the past 10 years. Thailand's old-age dependency ratio is the highest among ASEAN member states and even higher than that of the PRC.

Figure 6: Old-Age Dependency Ratio
(%)



Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

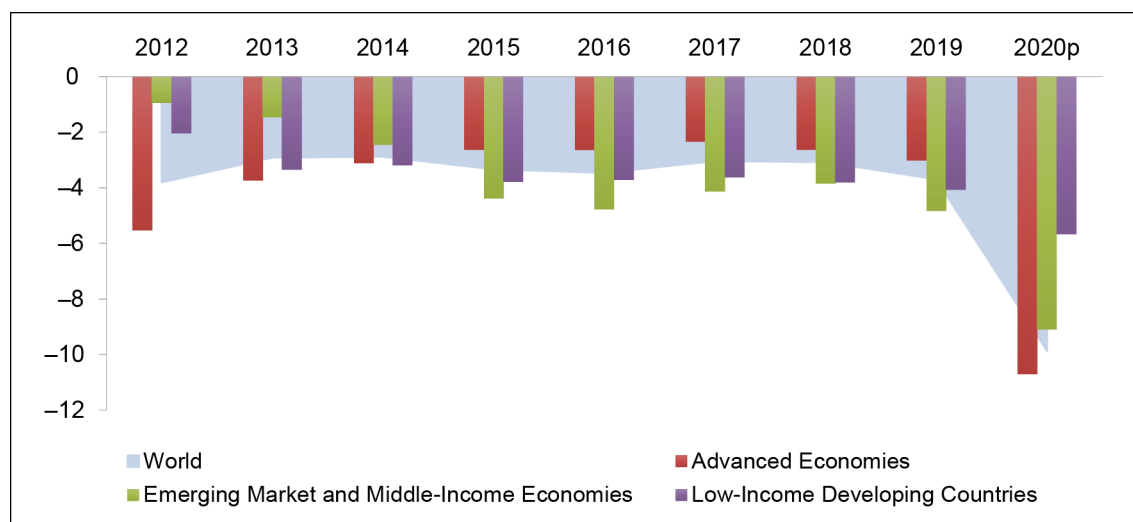
Source: World Population Prospects (2019), UN DESA (2020).

Consequently, these population trends summarize one important fact about the economies of East and Southeast Asia, which is that there are a continuously increasing number of aged populations with potential shrinking working populations.

3. FISCAL BALANCE IN EAST AND SOUTHEAST ASIA

The global outlook for the general government fiscal balance has always demonstrated a fiscal deficit (Figure 7). The deficit of emerging and middle-income economies has been bigger than that of other economies since 2015 and remained higher than the global average since then. For 2020, taking into account the impacts of the coronavirus disease (COVID-19)¹ on health and economic sectors, the International Monetary Fund (IMF) projects overshooting of the fiscal deficit in all three country groups due to increased spending on health and additional support for people, firms, and sectors. The overall deficit is expected to increase more in advanced economies due to the tremendous amount of fiscal stimulus and a more pronounced projected economic contraction (IMF 2020).

Figure 7: General Government Fiscal Balance by Country Group, 2012–2020
(% of GDP)



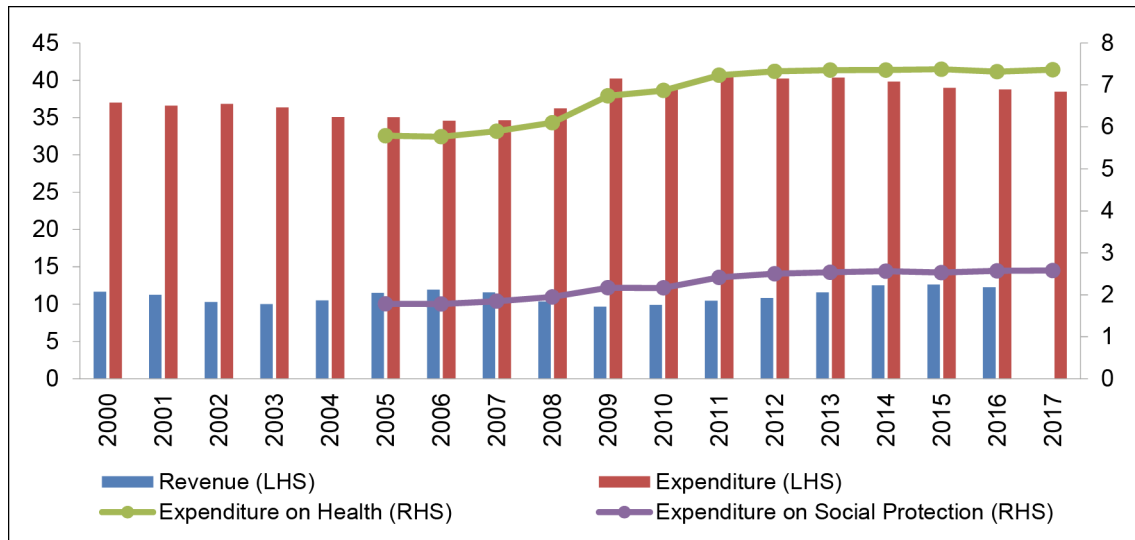
GDP = gross domestic product.

Source: Fiscal Monitoring, IMF (2020).

The fiscal balance varies among the economies of East and Southeast Asia. Three economies are selected in this section to present the difference in the fiscal balance for each group of economies subject to its demographic stage—aged, aging, and young societies. First, Japan represents an aged society. Japan's fiscal position (Figure 8) has shown a continuous fiscal deficit since 2000. The government deficit has usually been financed by the issuance of government bonds and external debt. The Japanese government's expenditure in terms of the percentage of GDP has exceeded government revenue. A big proportion of government spending is allocated to both health and social security expenditures. This reflects the government's effort to keep its promises to provide health and long-term care and pension benefits to the country's rapidly aging population. The data show that government health expenditure is relatively high and gradually rising.

¹ For fiscal policies to protect the elderly from the COVID-19 pandemic, see Box 1.

Figure 8: Japan's Fiscal Position
(% of GDP)



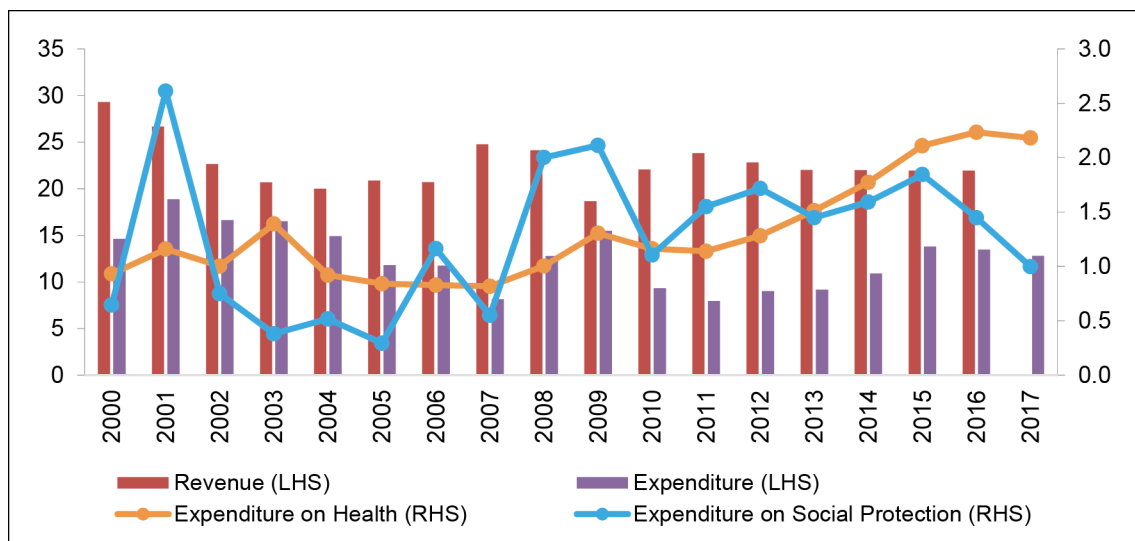
LHS = left-hand scale, RHS = right-hand scale.

Note: No data available for revenue for 2017.

Source: ADB (2020).

Representing an aging society, Singapore's revenue as a percentage of GDP has exceeded its expenditure as a percentage of GDP. Government health expenditure has constantly increased since 2011, while expenditure on social protection has fluctuated in the past decade (Figure 9).

Figure 9: Singapore's Fiscal Position
(% of GDP)



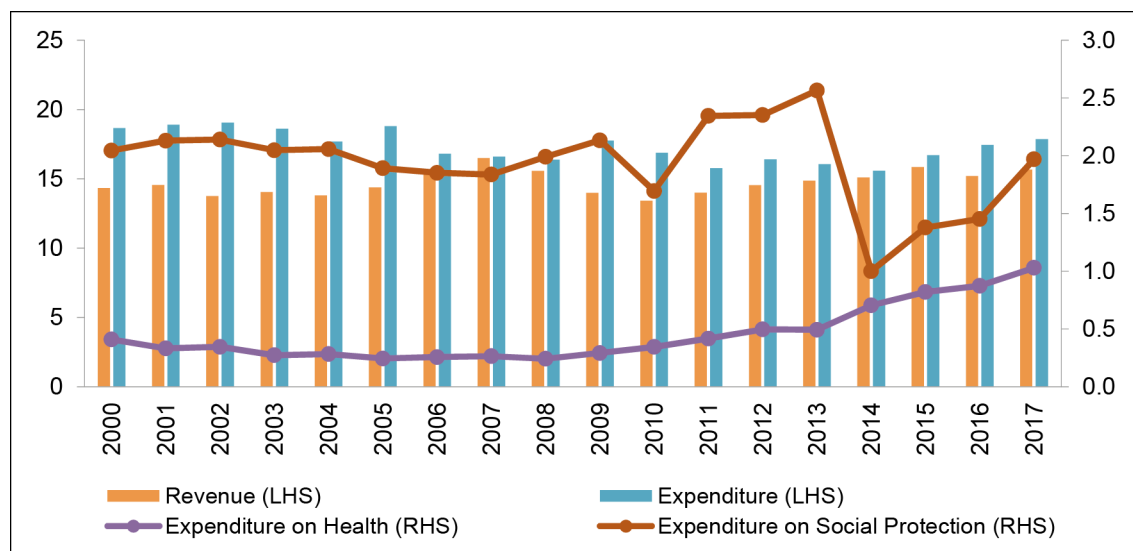
LHS = left-hand scale, RHS = right-hand scale.

Note: No data available for revenue for 2017.

Source: ADB (2020).

The Philippines represents a young society. The levels of government revenue and government expenditure are almost comparable. Although government health expenditure is relatively low, an increasing trend has been evident since 2008. Expenditure on social protection, however, was comparatively high during the 2000–2013 period. Although expenditure on social protection dropped drastically in 2014, it bounced back and has continued to increase (Figure 10).

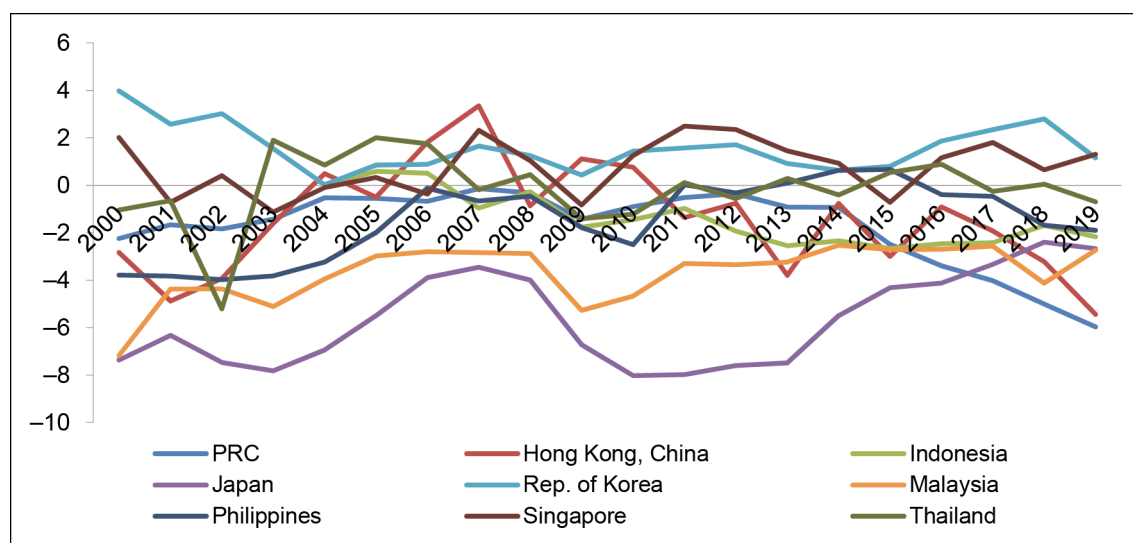
Figure 10: Philippines' Fiscal Position
(% of GDP)



LHS = left-hand scale, RHS = right-hand scale.

Source: ADB (2020).

Figure 11: Fiscal Balance
(% of potential GDP)



GDP = gross domestic product, PRC = People's Republic of China.

Source: Fiscal Monitoring, IMF (2020).

It is generally common that the fiscal balance is negative for most nations. Figure 11 shows the fiscal balance as a percentage of GDP for selected economies in East and Southeast Asia. As expected, Japan shows the largest fiscal deficit. The PRC and Malaysia have also observed a fiscal deficit since 2000. In general, for the economies, the trends in the fiscal balance have fluctuated over time.

Box 1: Fiscal Policies to Protect the Elderly from the COVID-19 Pandemic

Amid the COVID-19 pandemic, older people tend to be left out from policy responses or financial safety nets imposed to cope with the effects of COVID-19. In developing countries, the impacts seem to be greater due to them having more immature healthcare systems, resulting in the overburdening of health and medical institutions. Due to this burden, two possible outcomes are expected. The first is inadequate healthcare services and discrimination against aged and aging populations in receiving healthcare. Second, inefficiencies in the healthcare system caused by this overburdening can threaten the fiscal balance as governments are likely to spend more than necessary on expenditures on public health and support for medical institutions. Moreover, risks associated with older people who require aged care and caretakers have risen in all environments, i.e., nursing homes, among family members, and refugee camps. These outcomes imply a burden on the fiscal balance, particularly on health expenditure. It seems that the greater the aged or aging population in a society, the higher are the costs of the pandemic that need to be absorbed by the government.

Consequently, it is inevitable that efforts should be made to protect older populations while maintaining fiscal sustainability in the face of the pandemic. First, it is crucial to integrate a focus on older people into policy responses or policy design, both in socioeconomic and humanitarian contexts. The coverage of social protection systems should include older people while ensuring income security for them. Along with continuing investment in universal healthcare coverage, a universal healthcare scheme should provide adequate benefits and equal access for older people. When a health crisis hits a society, a government should endorse the immediate provision of relief measures and social safety nets to guarantee basic needs: for example, food, clean water, and basic healthcare for all groups of people. Together, governments should make efforts to strengthen the legal frameworks that ensure the protection of human rights, including those of the elderly. Second, during social distancing and travel restrictions, disruption to essential care and medical support for the elderly tends to occur. Although access to healthcare can be facilitated through technological advances, the digital divide can hinder such access for the elderly. Governments should implement measures or action plans to help boost social cohesion and solidarity by facilitating access to healthcare for the elderly as well as enhancing knowledge of digital technology. Third, in designing response measures or a policy framework, socioeconomic factors should be included for social inclusiveness. The policy-corresponding model, data analysis, and the database for policymaking decisions should include these factors, e.g., various age groups, gender, income level, etc. In addition, transparent and comprehensive standards should be adopted for a COVID-19 surveillance and monitoring system. This system will improve reporting on the COVID-19 situation by capturing the risks among older people categorized by their gender, age, and underlining health conditions. In sum, to ensure safety nets in an aging society, protection, prevention, and inclusive measures must be put in place. It is also essential to disseminate knowledge about health services, sanitation, and humanitarian support to the elderly, their families, and caretakers. Furthermore, promoting care and support across the life cycle is critical through investment in universal healthcare and social protection schemes, particularly for the aged group.

The biggest lesson learned from the COVID-19 pandemic is that it is necessary and mandatory to prepare enough fiscal space for these kinds of unprecedented events in order to guarantee social and economic stability. The pandemic causes challenges in forecasting tax revenue, with the possibility of underestimating a decline in revenue due to asymmetric impacts and various elasticities of shocks across different business sectors and business sizes (IMF 2020). On the other hand, the inclusive framework for health expenditure to protect and prevent the elderly from the negative effects of the pandemic requires an adequate amount of public health funding.

4. POPULATION AGING AND FISCAL BURDEN

In order to better comprehend the association between population aging and fiscal burden in East and Southeast Asia, we next conduct a panel data analysis to empirically investigate the relationship and allow us to derive potential policy measures and insights.

4.1 Data and Methodology

The country-level panel data set used in this study combines data related to demographic transition, fiscal balance, and other macroeconomic indicators from two sources, namely the World Development Indicators of the World Bank and the Fiscal Monitor of the International Monetary Fund (IMF). Data from 178 countries² (including 43 Asian countries) around the globe from 1991 to 2019 (29 years) are used in the analysis. Non-Asian economies are also included in the regression analysis since analysis with more observations provides a better estimation. Table 2 provides the summary statistics for each variable.

Table 2: Summary Statistics

Variable	Description	Observations	Mean	Standard Deviation	Minimum Value	Maximum Value
<i>Fiscal balance variables</i>						
Government balance	Net lending (+)/net borrowing (–) (% of GDP)	2,915	–1.38	10.26	–203.72	236.56
Government balance	Cyclically adjusted balance (% of GDP)	1,535	–2.35	3.92	–57.21	46.22
Government revenue	Revenue (% of GDP)	3,349	29.06	13.38	0.64	163.94
Government debt	Gross debt (% of GDP)	3,043	53.82	37.30	0	495.20
<i>Demographic transition variables</i>						
Government health expenditure	Current health expenditure (% of GDP)	3,350	6.30	2.79	1.03	25.48
Old-age dependency	Age dependency ratio, (population aged 65+ as % of working-age population)	5,809	11.47	7.35	0.80	47.12
Population aged over 64	Population aged 65+ (% of total population)	5,812	7.33	5.11	0.69	28.00
<i>Control variables</i>						
GDP growth	GDP growth (annual %)	5,808	3.51	6.20	–64.05	149.97
Inflation rate	Inflation, GDP deflator (annual %)	5,803	33.97	461.67	–31.57	26,765.86
Population growth	Population growth (annual %)	6,427	1.46	1.53	–9.08	17.51
Trade	Trade (% of GDP)	5,288	87.54	55.91	0.02	860.80
Unemployment rate	Unemployment, total (% of total labor force) (modeled ILO estimate)	5,394	8.08	6.21	0.09	37.98

GDP = gross domestic product, ILO = International Labour Organization.

Source: Authors.

The analysis uses four variables related to fiscal balance. These are: (i) government balance, calculated as the net government lending or borrowing as a share of GDP; (ii) government balance, cyclically adjusted as a share of GDP; (iii) government revenue as a share of GDP; and (iv) government debt, calculated as gross debt as a share of GDP.

² The number of estimated countries depends on the estimation model. Refer to Table 3 for more details.

For demographic transition, the analysis uses three main variables: (i) government health expenditure, calculated as the current expenditure on health as a share of GDP including healthcare goods and services consumed, but excluding capital health expenditures; (ii) old-age dependency, defined as the share of older dependents (older than 64) in the working-age population (those aged between 15 and 64), and (iii) the share of the population aged over 64 in the total population (all residents).

As control variables, the estimation includes variables for: (i) the annual GDP percentage growth; (ii) the annual percentage rate of inflation—the annual population percentage growth rate (for all residents); (iii) trade, calculated as the sum of exports and imports as a share of GDP; and (iv) the unemployment rate, defined as the percentage of the workforce that is unemployed but seeking employment.

4.2 Estimation Models

Demographic Transition and Government Balance

In order to investigate the relationship between demographic transition and government balance, we employ an adjusted form of the model used by Tujula and Wolswijk (2004) as follows:

$$\text{Government balance}_{it} = \beta_0 + \beta_1 \text{Demographic transition}_{it} + \beta_2 X_{it} + \epsilon_{it}$$

Here, *government balance* is proxied by the net lending or borrowing of country i in year t as a share of GDP. To represent *demographic transition* toward becoming an aging/aged society, we use two explicit proxy variables: the ratio of older dependents, people older than 64, to the working-age population (hereafter, “old-age dependency”); and the share of the population aged 65 and in the total population (hereafter, “population aged over 64”). As an implicit proxy, we use government health expenditure as a share of GDP. This indicator is used as older people have a greater tendency to suffer from chronic conditions that are costly to treat. Medical technology related to aging has also been shown to be an important contributor to health expenditure growth (De Meijer et al. 2013), and thus a large share of health expenditure is likely to result from the effects of having an aging or aged population. X_{it} represents a set of control variables: GDP growth, government revenue, the unemployment rate, and trade. ϵ_{it} is the disturbance term. The unemployment rate captures the changes in fiscal expenditure that are made to stabilize macroeconomic conditions. These changes are mostly automatic and come from unemployment-related expenditures to act as stabilizers. Fiscal expenditures are also used to dampen the effects of cyclical unemployment, and this leads to downward pressure on the government balance, particularly in times of recession.

Demographic Transition and Government Health Expenditure

Next, we examine the relationship between demographic transition and government health expenditure using a model adapted from that used by Xu, Saksena, and Holly (2011):

$$\text{Government health expenditure}_{it} = \beta_0 + \beta_1 \text{Demographic transition}_{it} + \beta_2 X_{it} + \epsilon_{it}$$

where *government health expenditure* is again the current health expenditure as a percentage of GDP for country i in year t . For *demographic transition*, we use the old-age dependency ratio and the population aged over 64. We expect the population structure to have an impact on government health expenditure. The previous literature

often uses the share of the population aged over 60 or the share aged under 5 or 15 years old. However, we use the population aged over 64 in this study since we aim to focus specifically on the impacts of population aging, and the shares of the population aged under 5 and over 60 (or 64) can often be highly correlated.

It is clear that aged and aging populations need more health services, leading to higher government health expenditure. Therefore, in our estimations, we expect to see a positive correlation between having an aged or aging population and government expenditure on healthcare. We would expect to observe this particularly for the upper-middle-income and high-income economies that are experiencing rapid aging populations and facing strains on their healthcare systems due to the elderly's healthcare-related needs. Countries with lower income levels generally do not face the issue of population aging and, as such, are unlikely to have a strong association between population aging and health expenditure. As previously mentioned, X_{it} is the set of control variables of GDP growth, the inflation rate, and population growth. ϵ_{it} is the disturbance term. The estimations were carried out using a random-effects model based on Hausman test results.

Demographic Transition and Government Debt

Lastly, we examine the association between demographic transition and government debt by using a model adapted from Bittencourt (2015). The empirical model is specified as follows:

$$\text{Government debt}_{it} = \beta_0 + \beta_1 \text{Demographic transition}_{it} + \beta_2 X_{it} + \epsilon_{it}$$

where *government debt* is the gross debt of country i in year t as a percentage of GDP. The indicators for *demographic transition* to becoming an aging/aged society are old-age dependency and the population aged over 64. X_{it} is the set of control variables—GDP growth, inflation rate, government revenue, and unemployment rate—and ϵ_{it} is the disturbance term. Economic growth is likely to have a strong association with government and external debt as higher growth can help to suppress rising debt and even reduce it. Conversely, a higher rate of inflation can lead to increased government debt through higher nominal interest rates. Similarly, unemployment can increase the debt through greater unemployment-related expenditure and fiscal stimulus packages.

All necessary tests, including the Granger causality test, Hausman specification test, panel-data unit-root test, and time-fixed effect test, were carried out for all estimation models. No major problems were found, and the model specifications followed the results of the tests. Robust standard errors were used, and all regressions include country- and time-fixed effects, except when indicated.

4.3 Limitations of the Study

Good data availability across an 18-year time series for a large sample of 178 countries allowed us the opportunity to conduct robust analysis on fiscal budget, government debt, and health expenditure. However, some limitations of the study do exist. While 18 years of data are likely to be sufficient for drawing implications from this analysis, a longer time series would allow us to observe even longer-term impacts. The data quality is also likely to have affected the estimation results to some degree due to variance in the reporting methods used by countries. Meanwhile, due to a lack of panel data, this study does not include some important variables such as the share of private services, private health expenditure, old-age pension costs, and provider payment

mechanisms. The private healthcare sector has been growing and plays a significant role in some developing countries due to their underdeveloped or overcrowded public healthcare sectors. This is particularly obvious in the Asian developing countries that are still in the early stages of economic development and demographic transition. Moreover, the old-age pension costs are left out from the analysis despite their importance in the social security systems in East Asia. The lack of these variables to some extent may affect the estimated results. Finally, issues with the model specifications could mean that endogeneity could be problematic in the analysis, but where possible we hope that these issues were kept minimal. In this study, we utilized both a standard fixed-effects model and different proxies for variables of interest in order to test the sensitivity of the results. The limitations of the study warrant future research to improve upon data and methodology.

4.4 Estimated Results

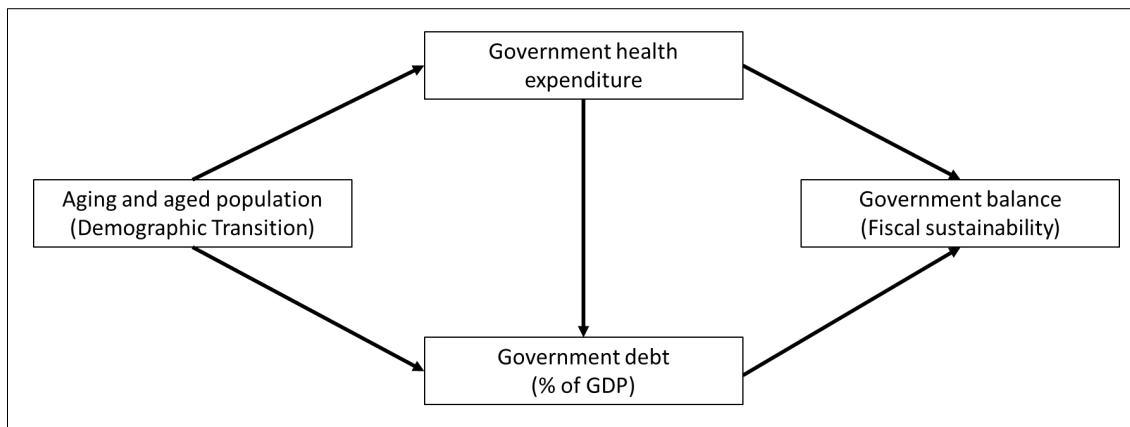
The estimation results in Table 3 point to the mechanisms of demographic transition and the impacts on fiscal sustainability. Estimation Model 1 (Columns 1–3) shows the effects of demographic transition proxied by different variables, including old-age dependency (Column 1), population aged over 64 (Column 2), and government health expenditure (Column 3). The coefficient for health expenditure is statistically significant and shows a negative sign. A 1% increase in health expenditure is associated with a 1% decrease in the government balance. In contrast, the estimated coefficients of the other two proxies are not statistically significant. The results are quantitatively and qualitatively robust when using the cyclically adjusted balance (% of GDP) as a dependent variable. However, the sample size decreases by half and therefore we opt to report only the results with the net lending or borrowing (% of GDP) as the dependent variable.

The impacts of old-age dependency and the population aged over 64 on the fiscal balance cannot be observed from the estimation in Model 1. Yet, when considering the estimated effects of demographic transition (explicit proxies) on health expenditure (Model 2), old-age dependency and the population aged over 64 show a statistically significant positive impact on health expenditure. In other words, economies with a higher proportion of an aging or aged population tend to experience higher health spending (as a share of GDP). The estimated results show that a 1% increase in the aging and aged population share is associated with a 0.1%–0.2% increase in health expenditure. The results from estimation Models 1 and 2 imply that the explicit proxies of demographic transition, i.e., old-age dependency and the population aged over 64, do not have a *direct* effect on the government balance. However, they *indirectly* and negatively affect the fiscal balance through the effect of a higher share of government expenditure. Aging in the population indicates a higher incidence of chronic illnesses, which are inherently more costly to treat, requiring higher expenditure. Moreover, there is evidence that medical technology related to population aging is the most important driver of health expenditure growth (De Meijer et al. 2013). Therefore, it is likely that a large share of health expenditure comes from the costs associated with the aging and aged populations.

The estimated results for Model 3 (Columns 6–8) reaffirm the mechanisms of the demographic transition variables. The dependent variable in this model is gross government debt as a percentage of GDP, which is related to the government balance variable in Model 1. All the demographic transition variables are statistically significant and positively associated with gross debt. A 1% rise in the aging and aged population share corresponds to a 5%–9% increase in gross debt, whereas a 1% increase in

health expenditure raises the debt by 2.5%. Both the explicit and implicit proxies of demographic transition *directly* affect gross debt, where the effects in turn reflect on the fiscal balance. Even though the actual relationship between demographic transition and government budget may be more complex and involve more factors, Figure 12 illustrates the mechanisms and the directions of the impacts of demographic transition on the fiscal balance, derived from the estimation models. In short, an aging or aged population *indirectly* affects the government balance through two channels, namely health expenditure and government debt. In order to achieve fiscal sustainability, government balance needs to be managed.

Figure 12: Mechanisms and Directions of Demographic Transition Impacts on Fiscal Balance



Source: Authors.

The control variables in all estimation models are statistically significant. Their coefficients express the expected signs, which are consistent with previous studies (e.g., Bittencourt 2015; Tujula and Wolswijk 2004; Xu, Saksena, and Holly 2011). In Model 1, GDP growth, government revenue, and trade openness contribute positively to the fiscal balance, while unemployment shows a negative effect. In Model 2, all of the control variables, i.e., GDP growth, inflation rate, and population growth, are negatively associated with health expenditure. The countries with high GDP and population growth rates are developing countries, which place relatively less emphasis on domestic healthcare and social services and, therefore, have lower health spending as a share of GDP. Lastly, in Model 3, the coefficients of unemployment and inflation rates show positive signs for gross debt, whereas the coefficient for GDP growth is negative. Unfavorable macroeconomic conditions, particularly the unemployment rate, adversely affect the overall economy. This in turn leads to higher government debt as the debt is used to finance and boost the economy when necessary.

Table 3: Demographic Transition and its Impacts on Fiscal Sustainability

	Dependent variable							
	Model 1			Model 2		Model 3		
	Government Balance	Government Balance	Government Balance	Government Health Expenditure ^a	Government Health Expenditure ^a	Government Debt	Government Debt	Government Debt
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Demographic transition variables								
Old-age dependency	0.193 -0.127			0.128*** -0.0138		5.057*** (0.284)		
Population aged over 64		0.312 -0.241			0.226*** -0.0259		8.964*** (0.552)	
Government health expenditure			-1.050*** -0.164					2.479*** (0.874)
Control variables								
Government revenue	0.452*** -0.0802	0.497*** -0.104	0.551*** -0.0637					
Trade	0.0183** -0.00862	0.0180** -0.00859	0.0235*** -0.00796					
Unemployment rate	-0.249*** -0.073	-0.253*** -0.0719	-0.131*** -0.0494			2.306*** (0.199)	2.341*** (0.201)	2.700*** (0.228)
GDP growth	0.218*** -0.0474	0.158** -0.0615	0.252*** -0.0381	-0.0207*** -0.00688	-0.0206*** -0.00688	-0.741*** (0.149)	-0.640*** (0.160)	-0.709*** (0.128)
Inflation rate				-0.000918*** -0.000158	-0.000947*** -0.00016	0.0372** (0.0188)	0.0367** (0.0187)	0.0290*** (0.0107)
Population growth				-0.0497*** -0.0156	-0.0486*** -0.0156			
Constant	-20.42*** -3.41	-21.88*** -3.958	-14.02*** -2.278	4.957*** -0.204	4.715*** -0.241	-36.27*** (5.312)	-48.80*** (6.430)	25.50*** (6.005)
Observations	1,853	1,855	1,396	3,136	3,136	2,740	2,742	1,973
Number of countries	97	97	96	178	178	113	113	112
Number of years	28	28	18	18	18	29	29	18
R-squared	0.304	0.3	0.674	0.884	0.884	0.691	0.688	0.725

GDP = gross domestic product.

^a In accordance with the Hausman test, regressions were carried out with random-effects estimators.

Notes: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Robust standard errors are reported in parentheses. All regressions include country- and time-fixed effects, except when indicated.

Source: Authors.

5. POLICY IMPLICATIONS

The policy implications in this paper are categorized by the results from Section IV. First, the direct policy implications are derived from the results of the three main models, showing the relationships between the demographic variables and the government fiscal balance. Another subsection provides indirect policy implications derived from the relationships between the control variables and the government fiscal balance.

5.1 Direct Policy Implications

The results from Section IV imply an indirect effect of demographic transition on government fiscal balance through an increase in public health expenditure and government debt. Additionally, a positive relationship between public health expenditure and government debt is evident, which indirectly implies an increase in fiscal imbalance.

Based on the above-mentioned results, the following recommendations are proposed. First, **a comprehensive review** of public health expenditure will help improve the government fiscal balance and achieve fiscal sustainability. To diagnose their fiscal status, governments need accurate information on healthcare spending and funding sources. Generally, reviews of public health expenditure will help governments address issues related to the distribution of health spending and services across the population. Moreover, the reviews will also improve the efficiency of healthcare provision and evaluate the macroeconomic impacts of revenues and expenditures on societies. Certain analysis is required for the comprehensive reviews, such as on public resource mobilization, health risks, benefit incidence, health-sector outputs, and health policy. Medium-term assessments and long-term forecasts on spending will shed light on better scenarios for decision-making processes. According to Schick (2005), the budget review offers fiscal tools for assessing governments' fiscal position. Although a medium-term expenditure review framework applies too short a time horizon for sustainability, the framework with fiscal rules introduced techniques that can facilitate the analysis of a country's future fiscal position. For fiscal sustainability in the long run, the assessment and forecast frameworks should include information on estimated trends in healthcare spending, spending requirements in different periods, possible funding and revenue sources, funding availability, actual spending in relation to budget targets, and detailed spending in subcategories. Together, social and economic factors, e.g., demographic factors, inflation, etc., should be taken into account in the assessment and analysis. Many OECD countries (OECD 2015) conduct periodic and systemic spending reviews, particularly of subcategory spending, to ensure savings in health expenditure. Cutting or removing unnecessary health expenditures and subsidies that do not translate to improvement in healthcare services, healthcare technology, inclusive social protection, and economic development must be prioritized. The review will in turn help to control (unnecessary) government spending and stabilize public or government debt, resulting in fiscal efficiency and sustainability. The benefits of comprehensive reviews are highlighted particularly for developing Asia to follow and implement. However, several limitations are identified in developing economies, such as data and resource limitations. The costs of data assessment and analysis can be very expensive and unaffordable to some developing member countries. It is also worth noting that the review of government spending usually takes time—some countries conduct it annually while others may take two or three years or more.

Second, **a healthcare reform** is needed to not only strengthen social and economic inclusiveness but also to maintain a buoyant fiscal balance. It will also promote the development of an effective healthcare system for an aging society. Given the characteristics of healthcare services, policymakers might find it difficult to strike a balance between promoting equitable and affordable access to a set of basic health and social services and modernizing the health and social services sector with recent technologies. The reform should be conducted based on three principles: accessibility for all (universal healthcare), efficiency in healthcare services, and cost control/monitoring. Accessibility and efficiency in healthcare services can be improved by competitiveness and technological advances. Promoting competition in the industry such as through trade liberalization of health-related and social services will bring market efficiency, possibly with lower costs and improved quality. It can also provide more healthcare and insurance options to consumers. In addition, trade liberalization and regional cooperation in healthcare services play a crucial role in addressing many of the national and regional technical, financing, and knowledge-capacity constraints while providing sustained quality of such services in the region (Korwatanasakul et al. 2020). Together, the new healthcare technologies extend the scope, range, and quality of medical services (OECD 2015). Although some healthcare innovation can be

expensive, it can help reduce other healthcare costs through shortened morbidities or by allowing for less costly treatment inputs, which will help relieve some of the health-related fiscal burden. Additionally, countries can set cost ceilings/budget caps on their public health expenditures to limit overshooting expenses. Cost controls should be set where a reasonable level of spending is determined at the equilibrium of demand for and supply of health services. In order to impose spending controls on health expenditure, the central government should conduct consultations with both local government and healthcare stakeholders, e.g., hospital, pharmaceutical, and insurance sectors. The consultations will help the central governments to prioritize health expenditures as well as promoting the effectiveness of the healthcare system. In relation to aging and aged populations, countries have implemented various approaches to seek a suitable balance between government health spending and requirements/demands for different healthcare services for the elderly. Some elderly people need intensive care, while some only need basic age-related care and have no health complications. The latter group can stay at home while receiving basic care, but the former group may have to stay in hospitals or nursing communities for more intensive care or treatment. To support aging and aged populations, social and economic evaluations are required to strengthen healthcare performance as well as for the policymaking processes that will ensure fiscal sustainability as an economy faces population aging.

In addition, **cost-sharing measures** should be considered to reduce the age-related fiscal burden. Health financing can generally help lower the government fiscal burden in the short run; however, this may cause an adverse impact on access to care and patients' health outcomes, particularly for vulnerable groups. The cost-sharing approach usually involves insurance and pension schemes through individual contributions. Private health insurance can be encouraged; however, there is no concrete evidence to suggest this will lead to a significant reduction in public health spending (OECD 2015). The out-of-pocket approach requires individuals and healthcare consumers to pay a certain proportion of their healthcare expenses in addition to the financial support from the government. This approach can potentially reduce the fiscal burden, particularly on public health expenditure, as some of the responsibility is pushed to the healthcare consumers. Some arguments, however, suggest that increased cost-sharing in public schemes may lower the volume of healthcare services; thus, the total health spending may not necessarily fall (OECD 1995). It is also necessary for governments to take into account social protection for vulnerable groups, such as the poor and elderly, when implementing such cost-sharing measures. The pension scheme, on the other hand, helps prepare younger populations for life after retirement and possibly diminishes fiscal burden or fiscal imbalance in the future. In many developing countries, pension schemes are still immature and need to be further developed. An upgrade of social security systems, together with public and private pension schemes, will improve social security contributions and savings after retirement. Thus, fiscal sustainability is possible when the fiscal burden is lessened. A comprehensive assessment of such upgraded social security systems should include socioeconomic factors, i.e., human capital, financial education, labor movement, informality, and equality.

5.2 Indirect Policy Implications

Turning attention to the results of the control variables, indirect policy implications are derived for government revenue and GDP growth in relation to the government balance. The positive relation between government revenue and government balance implies an upgrading of the fiscal balance with an increase in government revenue. An

aging population causes potential shrinking working populations, who pay tax. A tax reform can help maintain the taxpayer base as well as compensating for such a potential decline in government revenue. In developed economies, a **shift in the tax mix** is proposed toward other types of taxes beyond individual income tax. For example, some countries have turned their focus to environmental taxes, including carbon and emission taxes, to raise substantial government revenue without compromising efficiency. Other economies impose a “sin tax,” e.g., on excise duties on alcohol and tobacco, to finance public contributions to healthcare, even though the impact is limited (OECD 2015). Japan, to compensate for a potential shortfall in individual income tax, increased its consumption tax from 8% to 10% from September 2019 (Sirivunnabood 2020). Developing countries, on the other hand, rely heavily on income taxes for their government revenue. A timely recommendation is for **strengthening tax administration** to improve the taxation process and thus enhance governments’ revenue-generating capacity. In addition, improving transparency through a thorough review procedure and application of digital technology in the tax collection process can also improve government revenue. In sum, the tax system should be designed, upgraded, and customized subject to each economy’s characteristics and demographic stage. Some changes in fiscal design may have more impact and be more politically feasible if done earlier than later (OECD 2019).

Another indirect way to increase government revenue is to **improve GDP growth through upgrading productivity**. Lower productivity can negatively affect government revenue. Sheiner (2017) explored the implications of productivity growth for a long-term outlook for government budgets in both the state and local sectors. He suggested that lower productivity growth would have real effects on taxpayers, i.e., a slowdown in labor productivity growth would increase primary deficits relative to GDP due to its tie with revenue. Technological advances and skills development can help offset the impacts of a growing aging or aged population on productivity in an economy. The application of technological innovation and automation will boost overall productivity in all sectors, which in turn will increase GDP growth. In light of the digital economy and the fast-changing world, new skill sets and knowledge are required to overcome the barriers to productivity caused by innovation and rapid technological advances. In relation to demographic transition, lifelong education and training programs offered to the working and aging populations would enhance human capital and provide such skills to workers in different age groups. In parallel, in preparation, countries with younger populations should invest more in education and skills development to prepare their labor markets and thus ensure long-term productivity. A quality labor force will bring in higher productivity, resulting in economic growth and an increase in government revenue. Another idea that has always been discussed for enhancing productivity is to promote labor participation through labor-market reforms, which include an increase in female participation, extension of the retirement age, and accommodative migration policies for shortages of in-demand skills. The greater the labor participation, the bigger the base of taxpayers, which leads to higher government revenue.

Consequently, various recommendations are made to achieve fiscal sustainability, both in terms of boosting government revenue and reducing government expenditure. The most important point to recognize is that there is no silver bullet for all. The fiscal strategy must be designed and/or customized based on specific characteristics and the demographic status of each economy.

6. CONCLUSION

In this study, we have analyzed the global trends in demographic change and highlighted the progression of East and Southeast Asian countries toward becoming aging and aged societies. The impacts of these are both multifaceted and far-reaching, and include declining tax revenues leading to fiscal imbalances and possible increases in government expenditures for coping with care expenses and pension schemes. This study hopes to provide insight into ways to balance fiscal revenue against costly pension and social security systems and increasing healthcare expenditures.

Using panel data for 178 countries across 18 years to capture the state of fiscal balance (namely variables representing the government balance, government revenue, and government debt) and data on demographic transition (namely variables for government health expenditure, old-age dependency, and the population aged over 64), we conducted estimations of three models to analyze the relationships between (i) demographic transition and government balance; (ii) demographic transition and government health expenditure; and (iii) demographic transition and government debt.

The results first established that health expenditure is negatively associated with the government balance. Then, for the relationship between demographic transition and health expenditure, old-age dependency and the share of the population over 64 years of age showed a significant positive relationship with health expenditure. We found that demographic transition did not have a direct effect on the government balance, but rather an indirect effect through higher government expenditure. This can be explained by the high costs of treating health conditions related to old age, including chronic illnesses. Our findings provide important implications for fiscal sustainability and necessitate comprehensive reviews of public health spending combined with the appropriate assessments and forecasts to optimize spending on healthcare and allow for effective planning and decision-making. Through these measures, governments can reduce unnecessary expenses and stabilize their debt to achieve fiscal efficiency and sustainability. A healthcare reform that prioritizes accessibility for all, efficiency in healthcare services, and cost control and monitoring will also be beneficial for the purposes of maintaining fiscal balance, strengthening social and economic inclusiveness, and building an effective healthcare system for aging and aged societies. Finally, cost-sharing measures, such as through insurance and pension schemes through individual contributions, should be encouraged to mitigate the age-related fiscal burden. In doing so, governments should ensure that vulnerable groups, such as the poor and elderly, are appropriately protected and that the relevant schemes are efficiently and carefully designed, especially for developing countries where the schemes may still be relatively immature. In addition to these, as indirect policy implications, the findings suggest that it would be prudent for governments to consider a shift in the tax mix, strengthening of the tax administration, and measures to upgrade productivity to improve GDP growth.

All these proposed measures should be tailored and combined in a way that meets the specific needs and characteristics of each economy in order to implement a strategy for fiscal sustainability by boosting government revenue and reducing government expenditure. Working toward fiscal sustainability will be particularly important amid the COVID-19 pandemic as the elderly are especially vulnerable to the virus. Governments of aging and aged societies will have to manage spending to cope with the increased strain placed on their healthcare systems and ensure the elderly receive adequate social protection. This can be achieved by incorporating support for the elderly in policy design, facilitating access to healthcare, and taking socioeconomic factors into consideration for social inclusiveness.

This study has highlighted the rising challenges that economies in East and Southeast Asia are facing from the current trends in demographic transition. Ensuring fiscal sustainability while protecting and addressing the needs of aging and aged populations will be a key priority for governments and will require careful policy planning and implementation, and we expect the findings of this study and its implications to be valuable in achieving these objectives. Although there are some limitations in the analysis, this study serves as an initial steppingstone for contributing to future findings on the relationships between (i) demographic transition and government balance, (ii) demographic transition and government health expenditure, and (iii) demographic transition and government debt. Future research may improve upon the data and methodology to handle the endogeneity issue.

REFERENCES

- Asian Development Bank (ADB). 2020. Asian Development Outlook 2020. <https://www.adb.org/publications/asian-development-outlook-2020-innovation-asia>.
- . 2020. Key Indicators for Asia and the Pacific 2020. <https://www.adb.org/publications/key-indicators-asia-and-pacific-2020>.
- Bittencourt, M. 2015. Determinants of Government and External Debt: Evidence from the Young Democracies of South America. *Emerging Markets Finance and Trade*, 51(3): 463–472. <https://www.tandfonline.com/doi/abs/10.1080/1540496X.2015.1025667?journalCode=mree20>.
- De Meijer, C., B. Wouterse, J. Polder, and M. Koopmanschap. 2013. The Effect of Population Aging on Health Expenditure Growth: A Critical Review. *European Journal of Ageing*, 10(4): 353–361.
- International Monetary Fund (IMF). 2020. Fiscal Monitoring Report April – 2020. <https://www.imf.org/en/Publications/FM/Issues/2020/04/06/fiscal-monitor-april-2020>.
- . 2020. Challenges in Forecasting Tax Revenue – Special Series on Fiscal Policies to Respond to COVID-19. IMF Fiscal Affairs. <https://www.imf.org/en/Publications/SPROLLS/covid19-special-notes#fiscal>.
- Korwatanasakul, U., Kalirajan, K., Ishodo, H., and Primanthi, M. (2020). *Trade in Services: Health Related and Social Services* (Promoting Services Trade in ASEAN: Second Phase (Social Services Paper 1). Tokyo: ASEAN-Japan Centre. Accessed on 14 September 2020, <https://www.asean.or.jp/ja/wp-content/uploads/sites/2/Trade-in-Health-and-Social-Services-Paper-1-full-web.pdf>.
- Ministry of Health, Labour and Welfare of Japan. 2016. Long Term Care Insurance System of Japan. Accessed on 14 September 2020, https://www.mhlw.go.jp/english/policy/care-welfare/care-welfare-elderly/dl/ltcisj_e.pdf.
- Organisation for Economic Co-operation and Development (OECD). 1995. Healthcare Reform: Controlling Spending and Increasing Efficiency. Accessed on 1 September 2020, <https://www.oecd-ilibrary.org/docserver/338757855057.pdf?expires=1600075232&id=id&accname=guest&checksum=BBCA76CAD222DEE70B51CC5BC94E1FF9>.
- . 2015. Fiscal Sustainability of Health Systems: Bridging Health and Finance Perspectives. Accessed on 1 September 2020, <https://www.oecd.org/publications/fiscal-sustainability-of-health-systems-9789264233386-en.htm>
- . 2019. Fiscal Challenges and Inclusive Growth in Ageing Societies. Paris: OECD.
- Schick, A. 2005. Sustainable Budget Policy: Concepts and Approaches. OECD Journal on Budgeting, 5(1). <https://www.oecd.org/gov/budgeting/43481125.pdf>.
- Sheiner, L. 2017. The Effects of Low Productivity Growth on Fiscal Sustainability prepared for the Peterson Institute of International Economic Conference on the Policy Implications on Sustained Low Productivity Growth. <https://www.piie.com/system/files/documents/3-2sheiner20171109paper.pdf>.

- Sirivunnabood, P. 2020. Achieving Fiscal Sustainability in the Face of Demographic Change. Asia Pathways. Accessed on 1 September 2020, <https://www.asiopathways-adbi.org/2020/05/achieving-fiscal-sustainability-face-of-demographic-change/>.
- Tujula, M., and G. Wolswijk. 2004. What Determines Fiscal Balances? An Empirical Investigation in Determinants of Changes in OECD Budget Balances. European Central Bank Working Paper Series No. 422. European Central Bank. <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp422.pdf>.
- United Nations. 2019. World Population Prospects 2019 Highlight. UN, New York.
- . 2020. Policy Brief: The Impact of COVID-19 on Older Persons. Accessed on 22 May 2020, https://www.un.org/sites/un2.un.org/files/un_policy_brief_on_covid-19_and_older_persons_1_may_2020.pdf.
- Xu, K., P. Saksena, and A. Holly. 2011. The Determinants of Health Expenditure: A Country-Level Panel Data Analysis. World Health Organization Working Paper. https://www.who.int/health_financing/documents/report_en_11_deter-he.pdf?ua=1.

APPENDIX: AGE-RELATED POLICY MEASURES IN SELECTED EAST AND SOUTHEAST ASIAN COUNTRIES

Country	Policy Measures
Brunei Darussalam	<ul style="list-style-type: none"> • Senior citizen activity centers • Action plan emphasizing the rights and protection of the elderly
Cambodia	<ul style="list-style-type: none"> • National Aging Policy 2017–2030 • Training institute for elderly care nurses was opened in 2018
Indonesia	<ul style="list-style-type: none"> • National Action Plan for the Elderly 2016–2019, focus on elderly's improvement for healthy, independent, active, productive, and efficient elderly population
Japan	<ul style="list-style-type: none"> • Social Security System for Elderly People • Long-term care insurance (LTCI) system in 2000
Lao PDR	<ul style="list-style-type: none"> • National Committee for the Elderly was established in 2005 • Sequences of the legislation to support elderly health and welfare • Declaration of Application of the National Policy towards the Elderly
Malaysia	<ul style="list-style-type: none"> • Private Aged Healthcare Facilities Act and the National Health Policy for Older Persons • Private Health Facilities and Services Act 1998
Myanmar	<ul style="list-style-type: none"> • Ministry of Social Welfare, Relief and Resettlement Elderly care scheme since 1992 • Older People Law in 2016
Singapore	<ul style="list-style-type: none"> • Pioneer Generation Package • Enhancement for Active Seniors • Silver Support Scheme
Thailand	<ul style="list-style-type: none"> • Establishment of ASEAN Center for Active Ageing and Innovation under Thailand's ASEAN Chairmanship • 12 Social Welfare Development Centers for Older Persons
Viet Nam	<ul style="list-style-type: none"> • 153 Social Protection Establishments in 2015

Sources: Korwatanasakul et al. (2020) and Japan Ministry of Health, Labor, and Welfare, (2016).