TECHNICAL NOTE ON
THAILAND'S THIRD DEMOGRAPHIC DIVIDEND POTENTIAL

Final Report

December 21, 2022

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ADL	Activities of daily living
BRIC	BRIC countries (Brazil, Russia, India, China)
ESCAP	Economic and Social Commission for Asia and the Pacific
FLFP	Female labour force participation
GDP	Gross Domestic Product
HDI	Human Development INdex
HPP	Health Policy Project
IADL	Instrumental activities of daily living
ILO	International Labour Organization
LFP	Labour force participation
MIPAA	Madrid International Plan of Action on Ageing
NESDC	National Economic and Social Development Council
NTA	National Transfer Account
NTTA	National Time Transfer Account
SOPT	Surveys of Older Persons in Thailand
UN DESA PD	United Nations, Department of Economic and Social Affairs, Population Division
WHO	World Health Organization
WPP	World Population Prospects

1. BACKGROUND AND OBJECTIVES

Guided by the 1994 Programme of Action of the International Conference on Population and Development (ICPD), the United Nations Population Fund (UNFPA) has collaborated with Thailand since 1974. UNFPA Thailand has recently launched its 12th Country Programme (CP12: 2022–2026) which intends to support the Decade of Action and the global vision to achieve three transformative results (ending preventable maternal deaths, ending the unmet need for family planning, and ending gender-based violence and all harmful practices), while aligning with the national priorities outlined in the 13th National Economic and Social Development Plan and the UN Sustainable Development Cooperation Framework (UNSDCF: 2022–2026).

The CP12 responds to current needs in Thailand, including population ageing and low fertility, with around one-fifth of its total population of 71.5 million aged 60 years and older in 2020 (UN DESA PD, 2022). The absolute and relative increase in the working-age population in the past that followed the rapid fertility decline which started in the 1970s served as the key driving force for the first and the second demographic dividend. Faced with labour shortage due to a shrinking working-age population, Thailand needs to explore ways to realize the potential of the increasing number and proportion of older persons over the next few decades. The effective utilization of this demographic could be critical to the future macroeconomic growth of Thailand. At the same time, it is imperative to continue to invest in the human capital of young and middle-aged cohorts, so they can develop and maintain their full potential. This will be for individuals' own benefit and well-being and for the welfare of society overall. These cohorts represent the older Thai population in the future and it is imperative to invest in the education and health of them now in order for them to age healthily. Such life-cycle approach to ageing is built upon the understanding that different life-course phases and events are not independent but that they are linked and that positive as well as negative outcomes can compound (UNFPA, 2021).

The third demographic dividend - with its focus on healthy, active and productive ageing - represents both an excellent opportunity for national social and economic development and a significant challenge because it turns up now and its present and future magnitude depend on a range of factors. Proper policies and interventions to capture the benefits of the third demographic dividend can contribute to the sustainable development of Thai society. In addition, a rights-based life-cycle approach to address various aspects of demographic change can result in more efficient resource allocation as well as increased social welfare through greater access to services and support. Hence, the analysis provided by the third demographic dividend study has the potential to help understand and prepare for the changing demographic situation and to suggest how to harvest the third demographic dividend. It will also provide recommendations on how we can improve Thailand's welfare by increasing human capital, which can be linked to economic growth and a better educated and more productive workforce that is adequately prepared for old age.

This technical report is divided into seven sections, including this introductory Section 1. Sections 2 and 3 offer a comprehensive review of the literature related to demographic dividends, outlining the context in which the report is guided. Section 2 focuses on the definition of the third demographic dividend, along with those for the previous ones. Section 3 provides a brief review of previous studies on the first and the second demographic dividends in the context of Thailand. The section ends with details of the methodology adopted in this report to explore the potential for Thailand to generate the third demographic dividend.

Section 4 then presents the demographic and socio-economic context of the population and the labour market in Thailand, which is imperative to the subsequent discussions of our findings. Section 5 shows results obtained from a detailed examination of the health profiles and the estimated work capacity of older Thai persons, followed by estimates of the potential economic gains from employing additional older workers. Section 6 discusses the political context of demographic dividends in Thailand by focusing on policies that aim at maximizing demographic dividends, as well as other measures/interventions in related areas, including health, education, labour market, and economic/fiscal and social policy. Lastly, Section 7 provides a summary of findings and recommendations on what needs to be done in terms of policy planning and implementation to realize the next demographic dividend to its full potential in Thailand.

2. DEFINITIONS OF THE THIRD DEMOGRAPHIC DIVIDEND

The concept of the third demographic dividend is rather new. In our review of the literature, we came across three definitions of the third demographic dividend. One of these definitions is not fitting the objective at hand, which is to explore and quantify the future productive potential of older adults.

The objective of the analysis by Dufrénot (2018) is to estimate past efficiency losses of economic performance in the context of age-structure change and the first and second demographic dividends. The goal of the present report, however, is not to evaluate how well Thailand made use of the economic opportunities that the demographic transition and age-structure change in the past offered. We are interested in what can still be done, i.e. the size of the productive potential of older adults that can be tapped into with progressive ageing of the population.

Fried (2016a, 2016b), Matsukura et al. (2018) and Ogawa et al. (2021) have introduced two further concepts that will form the basis of how the third demographic dividend is investigated in this report. What both concepts have in common is the focus on the role of health and healthy and productive ageing in societies with increasing shares of older persons.

The concept by Fried represents “the societal benefits from the generative social capital of older adults” (Fried, 2016b, 167) that can be built upon the opportunities that opened up through the second demographic dividend. In order to add a third dividend, investments in three areas are mainly deemed important: education, prevention of disease and promotion of health; and the establishment

of new social institutions. The latter includes possibilities and frameworks within which older persons can unfold their productive potential, be it through paid work or other roles, e.g. volunteering. This would be to the benefit of both the society overall and older adults' well-being. Public health investments and interventions at every stage of the life cycle are crucial for achieving longer and healthier lives and to enable a third demographic dividend. The concept as introduced by Fried (2016a, 2016b) is not about quantifying such dividend but to describe its possible benefits and the policy areas that need attention and investments in order to reap its benefits.

The third demographic dividend as conceptualized by Matsukura et al. (2018) and Ogawa et al. (2021) is based on the National Transfer Account (NTA) framework and "is generated through the use of the untapped work capacity of healthy older persons" (Ogawa et al., 2021, p. 34). It is also referred to as the "Silver Demographic Dividend". The key point here is that there is usually a substantive number of older adults that are in good health that are not part of the labour force. The definition and approach by Matsukura et al. (2018) and Ogawa et al. (2021) allow estimating the size of this potential, based on information on health and labour force status. It is this approach that will be applied in the present report in order to estimate the size of the third demographic dividend for Thailand. The initial application was restricted to Japan (Matsukura et al., 2018), followed by an extension applied to both Japan and Malaysia (Ogawa et al., 2021). To our knowledge, this is the first time it is applied to the Thai context. Details on the methodology and data requirements for this approach are provided in sections 3.3. and 3.4.

3. APPROACHES FOR ANALYZING DEMOGRAPHIC DIVIDENDS

In this section, we provide a broad review of the common approaches that previous studies have used to analyse the first, second and third demographic dividends. We begin by briefly reviewing the methodologies employed to explore the potential benefits of the changing population age structure on economic growth – that is, the first demographic dividend – as well as the effect of cumulative wealth and human capital in case of the second demographic dividend. This is followed by a literature review on the first and second demographic dividends in the context of Thailand, focusing on the methodologies adopted and the results obtained. Next, we provide a review of studies that have specifically investigated the third demographic dividend, followed by a description of the data and methodology adopted in this study to estimate the third demographic dividend for Thailand.

3.1 Common approaches used to analyse the first and the second demographic dividends

According to Oosthuizen and Magero (2021), the analytical approaches used in previous studies to estimate or predict the magnitude or window of the first and the second demographic dividends can be classified into four categories. These include (i) demographic ratios of dependency, (ii) simulated demographic-macroeconomic models, (iii) analyses making use of data and the concept of National Transfer Accounts, and (iv) regression and decomposition analyses. The following subsections

summarise the theoretical frameworks and methodologies of these approaches. Note that further details of these methods – including their ability to address policy considerations – can be found in a comprehensive review by Oosthuizen and Magero (2021).

Demographic ratio of dependency

The dependency ratio approach is recognised as the earliest and probably the simplest tool with which to analyse and explain the demographic dividend. It outlines the levels of economic dependency within populations based on three broad age groups, namely children (0–14 years old), the working-age population (15–60 or 65 years old) and the older population (60 or 65 years old and older). The measure is calculated in terms of the ratio of the economically-dependent population (i.e. children and older persons) to the economically-independent or productive population (i.e. the working-age population) and is commonly referred to as the total dependency ratio. The total dependency ratio can be disaggregated by age into the children dependency ratio and the old-age dependency ratio, based on the number of children and the number of older persons per 100 working-age persons, respectively.

Various studies have used different criteria to determine whether a country has reached the demographic dividend stage based on the dependency ratios. For instance, Cheung et al. (2004) have suggested that the demographic dividend arises when the total dependency ratio is less than 0.5, while Golini (2004) has proposed a cut-off point for the same ratio at 0.66 and below. Komine and Kabe (2009) have advanced another criterion to define the demographic bonus stage based on a continuous fall in the total dependency ratio. The United Nations (2004) has employed the children and old-age dependency ratios to determine the demographic dividend window, which is said to begin when the share of children falls below 30 per cent while the share of older persons aged 65 years and above remains under 15 per cent (UN DESA PD, 2004).

In addition to its quick and simple calculation of the demographic dividend, another advantage of the dependency ratio method lies in its requirement of minimal data for analysis. The method merely requires population estimates or projections by age, which can be easily obtained from the national population census or secondary data sources, such as the UN's World Population Prospects (WPP) or the Wittgenstein Centre's World Population Projections. However, the approach has attracted a number of critiques (Ogawa, 2009; Oosthuizen & Magero, 2021). Among other shortcomings, the method tends to overlook the fact that many factors influence the size of the effective labour force. In other words, a determination of whether an individual is economically active (or in a state of dependency) cannot be made based solely upon age. A range of other information, such as an educational profile for each age group, the employment status of the working-age population, women's labour force participation, age of retirement and labour market structure, must also be considered. In addition, because the calculation is based on population projections, the dependency ratios are heavily dependent on the fertility, mortality and migration assumptions adopted in the

population projection calculations. Moreover, countries with different population age structures may have an identical total dependency ratio. As such, a cross-country comparison based on demographic dividends obtained by this method must be carried out with great caution.

Simulated demographic-macroeconomic models

Another widely used approach to examine the impact of demographic changes on a country's economic growth is based on a simulation of counterfactual scenarios. These scenarios are simulated to reflect different conditions in terms of demographic and socio-economic characteristics (e.g. fertility level, labour force participation, agriculture/industry sectors and urbanisation level) or alternative policy choices (e.g. expansion of family planning programs, investment in education and provision of quality health care). Based on the simulation results, we can see how different conditions and policies can foster or hinder economic growth.

These simulation models can be simple or complex, depending on the 'questions' that policy-makers or researchers wish to address. Simply put, the models are built based on a set of mathematical equations, each explaining the association between two or more variables. These relationships are determined based on demographic, economic and social theories as well as empirical evidence. Since the 1990s, the simulation techniques have been criticised for their inability to provide credible demographic forecasts and to account for potential policy changes during the forecast period. One of the biggest obstacles for users is the impracticality of the input data for these models, in particular in terms of their availability. To facilitate the application of the simulation models, several macro-simulation models have been developed. Among these models are DemDiv (Demographic Dividend Tool) and the Spectrum Policy Modelling System, which have gained popularity among national-level policy makers.

DemDiv was a tool developed by the USAID-funded Health Policy Project (HPP) to assess the potential benefits of the demographic dividend and to design the multi-sectoral policies required to achieve these benefits. DemDiv comprises two sub-models. The first is a demographic model used to project the population age structure and growth rate. Its results are then fed into the second model, which is an economic model using several policy scenarios to project economic outputs, including Gr0ss Domestic Product (GDP) and other social indicators, such as the Human Development Index (HDI) and maternal deaths (Moreland et al., 2014). DemDiv is best suited for high-fertility countries rather than low-fertility countries as the demographic dividend was analysed based on the interaction of policy changes in family planning, education and economic policies (The National Council for Population and Development and Health Policy Project, 2014).

The Spectrum Policy Modelling System – or Spectrum, in short – was designed by the Futures Group International and launched prior to DemDiv. Spectrum integrates previously developed models into a single package, including DemProj, which is used to produce population projections to support

other components. For example, FamPlan projects the family planning requirements necessary to achieve national goals for meeting couples' fertility intentions, and RAPID forecasts the social and economic consequences of high fertility and rapid population growth, such as effects on the labour force, education, health and urbanisation (Stover, 2005). The 2014 version of DemDiv also allows users to transfer the DemProj component of Spectrum to DemDiv for projecting future populations. Jain and Goli (2022) have provided a good example of how to use Spectrum to analyse the demographic dividend for India during the period 2021–2061.

National Transfer Accounts (NTA)

Another technique for analysing demographic dividends employs data from the National Transfer Accounts (NTA) project (UN DESA PD, 2013). NTA provide a system for measuring economic flows across age groups. These flows arise in every society due to the existence of independent members of the population who produce more than they consume (surplus) to support others who consume more than they produce (deficit). Resources from those in surplus age groups can be reallocated to those in deficit age groups through several channels. One of these involves capital markets, in which individuals work and accumulate capital during their working years and rely on capital income – typically in the form of interests, dividends, rents and profits – for their consumption when they no longer work. Other channels include public and private transfers. Public transfers are made through public education, publicly financed health care and public pension programs, to name a few. Private transfers usually occur between family members within a household, but they can also occur between households.

An NTA analysis can provide relevant information on several important issues, including the first and second demographic dividends. According to Andrew Mason (2007), the first demographic dividend arises when the support ratio – the share of effective workers in relation to the share of effective consumers – increases. In other words, the first demographic dividend arises because the population is concentrated by age in such a way that production exceeds consumption. The second demographic dividend arises when the population is aging, and the focus is on how the future consumption of the aging population will be financed. Unlike the first demographic dividend, the second demographic dividend does not arise spontaneously but depends heavily on many non-demographic, macroeconomic factors, including economic and aging policies. As a result, the calculation of the second demographic dividend is not as straightforward as the first one.

While the NTA results can be used to directly derive the first and second demographic dividends, they can also serve as an input for other methods, such as the simulation and regression models. The construction of an NTA system, like that of a simulation model, is a data-hungry process, although it is possible to adjust the system to accommodate the available data. Sources of data generally include household surveys and administrative data, broken down by age in order to construct age profiles of income, consumption, transfers and asset accounts.

We also employ NTA data in our estimates of the third demographic dividend, as suggested by Matsukura et al. (2018) and Ogawa et al. (2021). In particular, we utilise the age-specific 2019 labour income profile for men and women combined as well as disaggregated by sex, as produced by the National Economic and Social Development Council.

Regression and decomposition models

Regression-based and decomposition techniques aim primarily to determine patterns or relationships between economic outcome variables (e.g. GDP per capita, GDP growth rates and saving rates) and a range of demographic and other variables or conditions (e.g. geographical, social and contextual factors) that potentially affect these outcome variables using panel or time-series data. The two commonly employed regression methods are ordinary least squares (OLS) and 2-stage least squares (2SLS), the latter of which is a common form of instrumental variable (IV) analysis. An example of the use of the regression-based approach is the work done by Bloom et al. (2013) to explore economic growth in association with a variety of demographic and contextual factors - such as institution qualities, openness and trade openness - using a cross-country growth model and 40-year time-series data. The results obtained from the model were then used to estimate the future demographic dividends of Sub-Saharan African countries. A more recent study by Misra (2015) investigated economic growth as a function of the demographic dividend – measured simply as the share of the working-age population within the total population – for European and BRICS countries.

Previous studies have adopted the decomposition method to decompose the demographic dividend or economic growth into different components. This enables us to see how, and to what extent, each component operates and contributes to the demographic dividend. The demographic dividend can generally be decomposed into two terms, namely age and education effects. Meanwhile, economic growth can be broken down into three terms, namely the age composition effect, the demographic or economic support ratio and the increase in workers' income. This approach requires historical data over a long period. Previous studies, especially those adopting a general equilibrium overlapping generations model for decomposition (Abío et al., 2017; Sánchez-Romero et al., 2018), have required additional information from the NTA public transfer profiles.

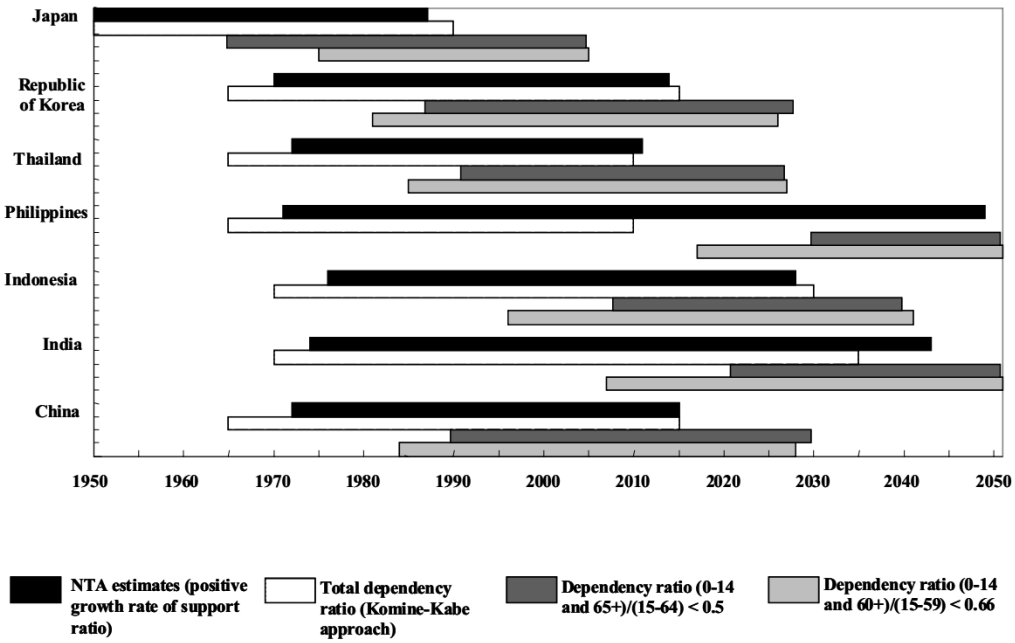
As suggested by Oosthuizen and Magero (2021), the regression and decomposition models have certain limitations. First, as they rely on historical data, the results are retrospective. Second, for many studies relying on multi-country panel data, the results are estimated by averaging the effects of changing population age structures across multiple countries. Finally, unlike the simulation models, these models cannot be adjusted by users, and they do not allow for the analysis of different scenarios.

3.2 Previous studies on the first and the second demographic dividends in Thailand

For Thailand, previous research on the first and second demographic dividends is relatively limited. Kua Wongboonsin et al. (2005) first calculated the window of the demographic dividend using the total dependency ratio. Based on national population projections between 2000 and 2025, the authors predicted the maximum dividend from the demographic transition to occur in 2009, when the share of the working-age population was projected to reach its highest level, accounting for two-thirds of the total population. After 2009, the opportunity window was projected to shrink due to the increase in the proportion of the older population.

In another noteworthy study, Ogawa et al. (2009) conducted a cross-country analysis by examining the first and second demographic dividends for 18 countries within the Asia-Pacific region using an NTA analysis and comparing the results with those obtained using the dependency ratio method. As illustrated in Figure 1, based on the NTA estimates, the window for the first demographic dividend in Thailand opened in 1971 and lasted for 40 years, until 2011, when the country began to transition into the first stage of population aging. As for the second demographic dividend, which corresponds to the growth rate of wealth accumulation and capital stocks, the authors found that Thailand is likely to enjoy a sizeable economic gain – larger than that from the first demographic dividend – if prime age adults can save more for their post-retirement years.

Figure 1 Ogawa et al.'s (2009) estimate of the demographic dividend window based on different approaches, selected countries within the ESCAP region



Source of figure: Ogawa et al. (2009, p. 98).

Although a few other noteworthy studies have examined the first or second demographic dividend in Thailand, these have been excluded from our review due to the difficulty in accessing these documents and the time restrictions of this project. These studies include, for example, Chansarn's (2009) PhD thesis exploring the associations between demographic and economic factors and economic growth using regression methods and time series data from 131 countries including Thailand, his follow-up descriptive study exploring active aging and its implications for the demographic dividend (Chansarn, 2012), and P. Wongboonsin's (2010) study exploring the implications of fertility decline for the second demographic dividend in Thailand.

3.3 Analytical models for the third demographic dividend

Previous analytical studies focusing on the third demographic dividend have mostly relied on the regression-based approach. The regression specifications used include the binary logistic model (Ogawa et al., 2021; Matsukura et al., 2018) and quantile regression and stochastic frontier analysis (SFA) (Dufrénot, 2018).

Matsukura et al. (2018) used the longitudinal data from three waves – 2007, 2009 and 2011 – of the Japanese Study on Aging and Retirement (JSTAR), covering Japanese middle-age and older adults to explore the association between demographic, socioeconomic and health status, and employment in older age groups in Japan. They averaged the estimates from a multivariate binary logistic regression – which is the probability of employment for each individual – and used these to simulate the predicted number of workers aged 60–79 years. They then compared the predicted number with the actual employment probability to identify the population's 'untapped work capacity'. To predict the number of older workers in 2050, they applied the computed age-specific employment probabilities to the 2015 UNWPP population projections. They also used the NTA age profiles of labour income and consumption to estimate the economic support ratio as a result of the increased number of older workers. The authors found that using the untapped work capacity of healthy older adults would generate the silver demographic dividend and constitute a considerable potential for economic growth in Japan.

A more recent study by Ogawa et al. (2021) extended the analysis by Matsukura et al. (2018) by incorporating two more rounds of JSTAR, from 2013 and 2015, into the logistic regression. They carried out a similar analysis for Malaysia using 2011 cross-sectional data from the National Health and Morbidity Survey in order to compare the extent of the impact of the third demographic dividend on macroeconomic growth. The authors concluded that utilising the untapped work capacity among older workers in Japan would have a substantial effect, while it would take several decades for Malaysia to gain comparable benefits.

It is worth mentioning that at the time of completing this report, we came across another publication by Wongboonsin and colleagues (forthcoming) on the third demographic dividend. According to the

article written in the news, they employ the widely recognized behavioural economic theory known as "nudging" to suggest policy options that can enhance the potential for the third demographic dividend in Thailand. The authors indicate that healthy aging is critical to achieving the third demographic dividend and suggest that providing health information alone may not be enough to alter unhealthy behaviours. Instead, they propose that understanding the true nature of human decision-making and leveraging it can effectively modify people's unhealthy behaviours into healthy ones (K. Wongboonsin et al., forthcoming).

3.4 Methodology of the current study

This study adopts the method proposed above by Matsukura et al. (2018) to explore the potential for the third demographic dividend in Thailand. Data used to predict the probability of employment for older adults, defined in this study as 60 years old and above, were drawn from the 2011, 2014 and 2017 Surveys of Older Persons in Thailand (SOPTs), conducted by the Thailand National Statistics Office. The SOPT is a cross-sectional and nationally representative survey, collecting a range of information regarding socio-demographic and health status from individuals aged 50 years and above. From each survey round, only respondents aged 50–59 years were selected and pooled together for the subsequent regression analysis. This resulted in an analytic sample size of 80,081.

A multivariate logistic regression was employed to estimate the probability of employment for individuals aged 50–59 years. The outcome variable is a dichotomous variable, with a value of 1 indicating that the individual was employed in the past 12 months and a value of 0 indicating otherwise. Explanatory variables included in the regression model were (1) the individual's socio-demographic characteristics, namely educational attainment, marital status and location of residence, and (2) health-related variables comprising self-reported health status, functional limitations (i.e. lifting, squatting, walking 200–300 meters and climbing 2–3 stair steps), instrumental activities of daily living (IADL) limitations (i.e. taking a bus or a boat on one's own and counting changes) and sensory organ problems (i.e. vision and hearing). The analyses were carried out separately for men and women and combined for the total sample.

In a next step, the regression coefficients and the actual characteristics of individuals aged 60–79 years were used to estimate the predicted probability of employment for individuals aged 60–79 years. Following Matsukura et al. (2018), it was assumed that persons aged 50–59 years would continue working unless their health became impaired. The individual predicted probabilities for each age were averaged to get sex- and age-specific probabilities and then compared with the age-specific actual employment probability to identify the additional number of potential older workers, or what Matsukura et al. (2018) called the 'untapped work capacity' of older workers.

To estimate the economic impact of these additional older workers, we utilised the age-specific labour income profile from the 2019 NTA data for men and women combined and disaggregated by

sex, produced by the National Economic and Social Development Council. Information was also employed from the Survey of the Informal Labour Force (conducted on a yearly basis by the Thailand National Statistics Office), population projection data by UN DESA PD (2022) and Wittgenstein Centre data on past and future population by educational attainment to supplement the analysis.

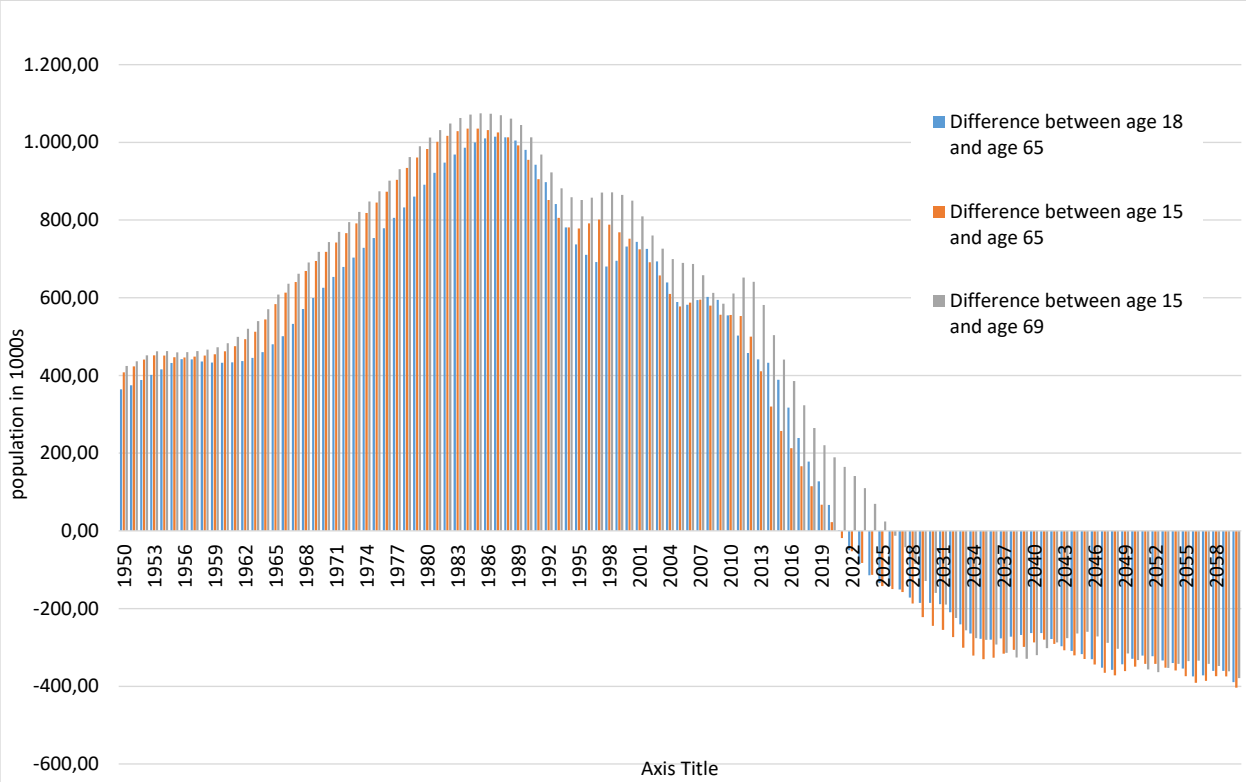
4. DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS OF THE POPULATION AND THE LABOUR MARKET

4.1 Age structure transition and changes in educational attainment

Thailand's population is ageing rapidly, which is the result of previous fast declines in fertility, a by now persistent low level of fertility well below the replacement level, and continuing increases in life expectancy. An illustrative way to capture the changes in age structure and what they mean for potential labour supply is a portrayal of the difference between the size of the cohorts entering the labour market and the size of the cohorts leaving it (Figure 2). For several decades in Thailand, each cohort entering working-age was significantly larger than the older cohorts leaving it. The increases in this difference that are observable since the 1960s have been characteristic for the first demographic dividend.

A major change is happening right now because, from now on, the entering cohorts will always be smaller than the leaving cohorts. This development is happening irrespective of the specification of entry and exit ages with small variances in the year when the difference turns negative. Even significant increases in fertility would increase the number of young adults only with a time lag. Other measures (e. g. increases in female LFP, increases in LFP of older workers, increases in productivity, immigration) would have more immediate effects and contribute towards making up for this difference.

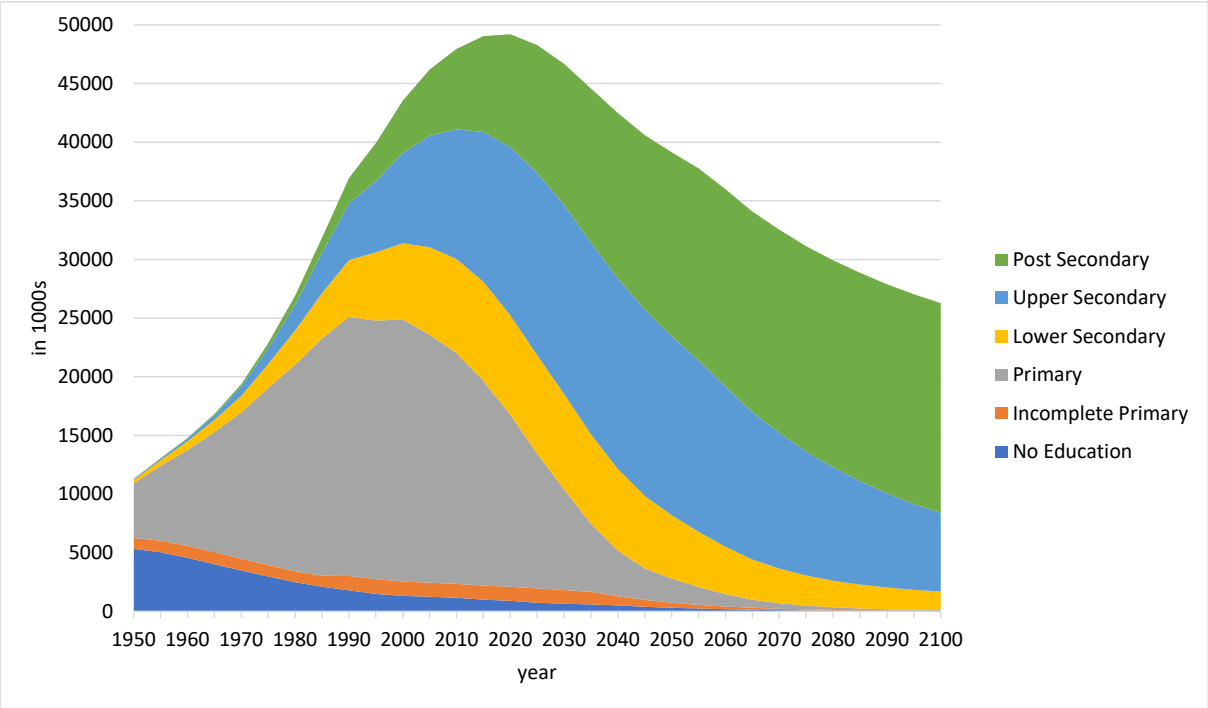
Figure 2 Difference in size between cohorts entering and exiting working ages, based on three definitions of entry and exit ages, 1950-2060



Source: Authors' calculations based on data from World Population Prospects 2012, medium variant (UN DESA PD 2022).

Besides changes in age-structure, significant changes in the education structure of the adult population took place. Focusing on the whole population of working-age (here defined as persons aged 15-64), there has been a dramatic shift in the education structure towards higher education: while in 1980, around 1 of 10 persons of working age achieved upper secondary or higher education, now every other person (around 50 per cent) does (Figure 3). The figure also clearly shows that while the peak in the population of working age is reached about now, the reduction in the size of the potential labour force is going along with a further increase in educational attainment. The standard argument is that this increase in education goes along with increases in productivity, so Thailand will have a smaller but more productive labour force, making up for some of the economic consequences of ageing.

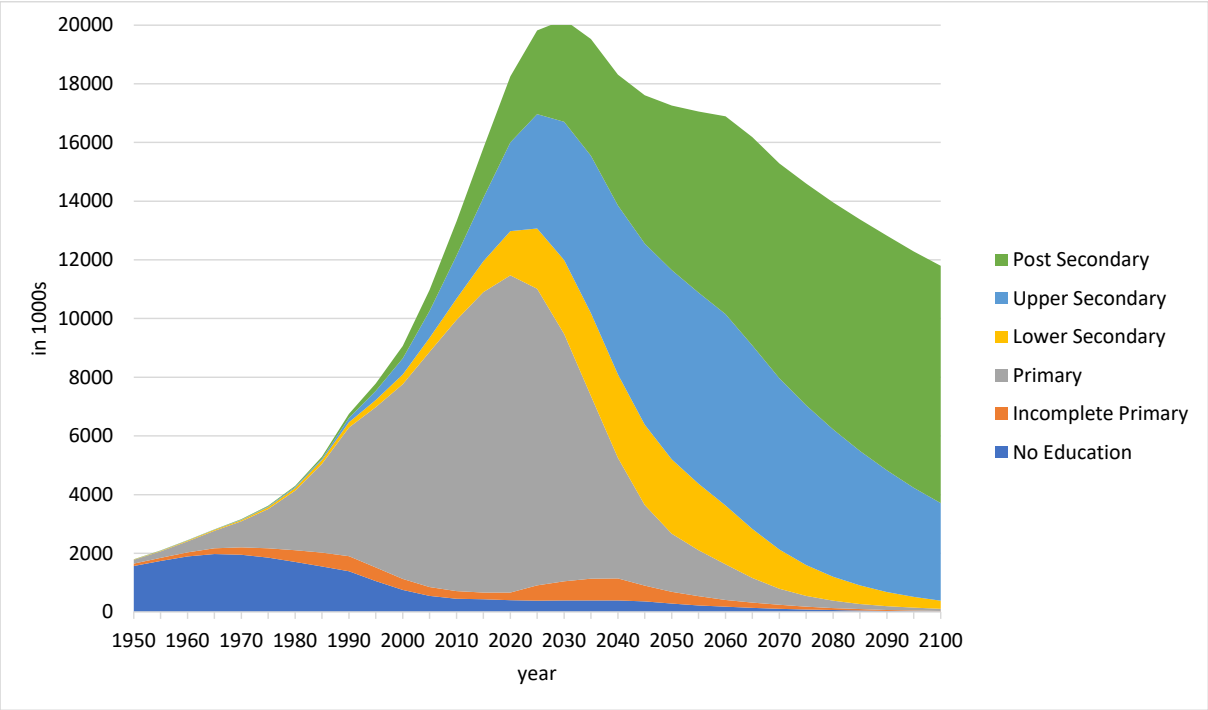
Figure 3 Education composition of the working-age population (15-64), 1950-2100



Source: Authors' calculations based on data from Wittgenstein Centre for Demography and Global Human Capital (2018), medium scenario (SSP2).

The changes in educational structure are happening later but even faster for the whole working population when one focuses on older adults: until now, the great majority of the population aged 50-69 had at most achieved primary education. Due to education expansion in the past, this is changing very quickly as the subsequent (younger) birth cohorts received much more education resulting in a shift in education structure in the age-group 50-69. By 2040, over 50 per cent will have upper or post-secondary education (Figure 4). Given that there is a strong positive correlation between educational attainment and health outcomes, this anticipated development should mean that future older workers will be healthier than current older workers.

Figure 4 Education composition of older adults (50-69), 1950-2100



Source: Authors' calculations based on data from Wittgenstein Centre for Demography and Global Human Capital (2018), medium scenario (SSP2).

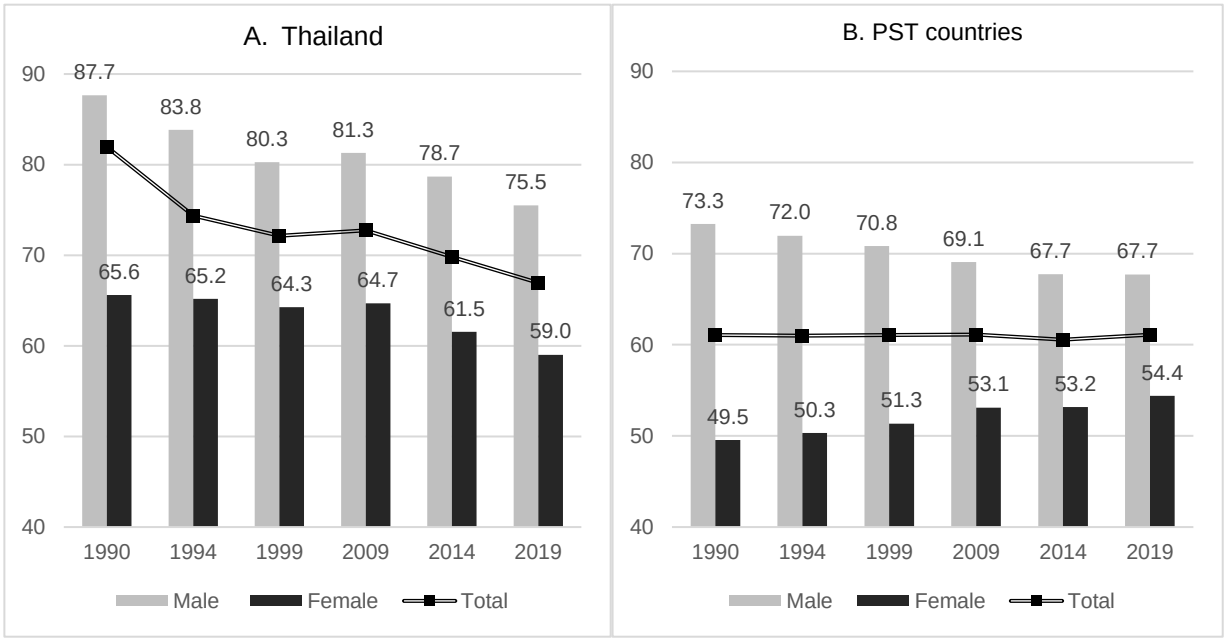
4.2 Profile of the Thai labour force

To better understand Thailand's potential to benefit from the third demographic dividend, it is crucial to look at the current situation of the Thai labour market. This section provides an overview of demographic and educational profiles of the labour force in Thailand, paying special attention to labour force participation in terms of gender, where data are available. In many countries currently facing the challenge of a decline in their working-age population, one of the measures adopted involves integrating more women into the paid labour market (ILO & OECD, 2019). This not only exerts positive effects on overall economic growth but also reduces the gender disparity in labour force participation, thus promoting gender equality in the labour market and society.

Figure 5 shows that the overall labour force participation rate in Thailand has declined by almost 20 per cent over the past few decades, from 81.9 per cent in 1990 to 67.0 percent in 2019. This decreasing labour force participation is largely due to a continuing decline in fertility that began in the late 1960s, which slowed down the growth of the working-age population and made it turn negative in 2012 (data not shown). Similar trends are observed for both males and females. While the male labour force participation rate has declined over the observed period, it remained above 80 per cent for about two decades (1990–2009), before dropping to 75.5 percent in 2019. The female

labour force participation rate has varied slightly, hovering around 65 percent between 1990 and 2019 and then dropping by more than 5 per cent to less than 60 percent in 2019.

Figure 5 Labour force participation rates (age 15+) in Thailand and Post-demographic dividend (PST) countries, total and by sex, 1990–2019



Source: Authors' calculations based on data from ILOSTAT database, retrieved November 2022.

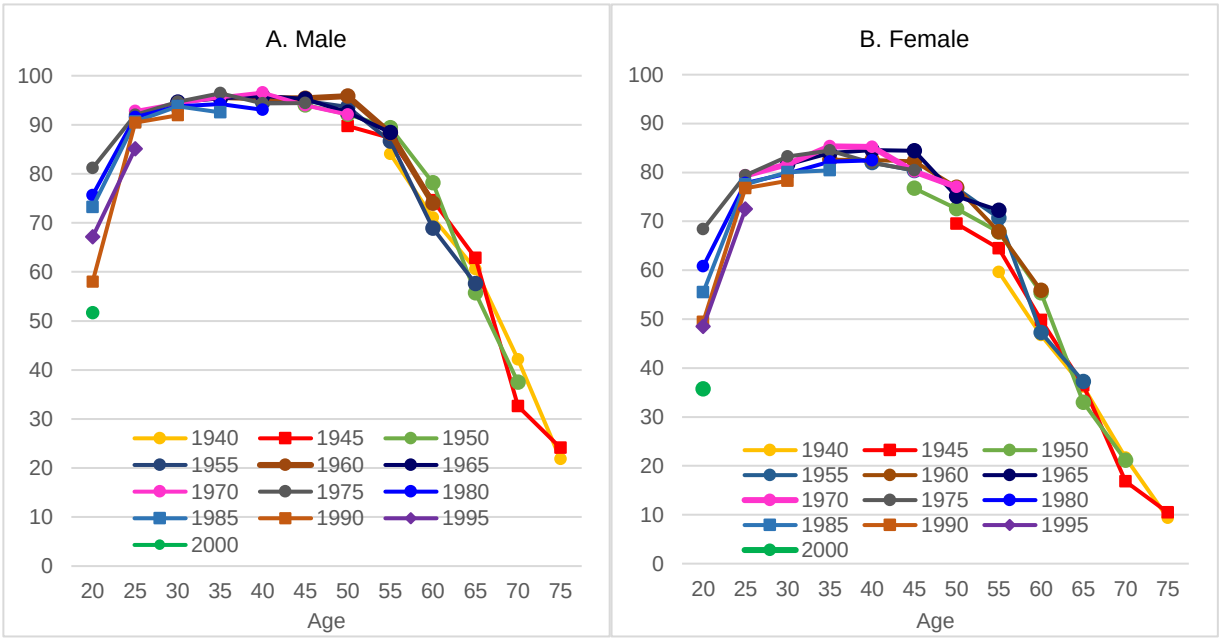
Note: Post-demographic dividend countries mostly comprise high-income countries where fertility rates have fallen below replacement levels.

Figure 5 further shows the trajectories of the average labour force participation rates for males, females and both sexes combined in post-demographic dividend (PST) countries over the same observation period. The labour force participation rates in Thailand, both for the total population and according to gender, are significantly higher than those in PST countries. The average total labour force participation rate in PST countries has remained stagnant at around 61 per cent. The male labour force participation rate in PST countries was around 73 per cent in 1990 and slowly decreased to 68 per cent by 2019. In contrast to female labour force participation (FLFP) in Thailand, only about half of working-age women in PST countries were part of the labour force in 1990. Subsequently, the FLFP rate in PST countries gradually increased to about 55 percent in 2019, and it is likely to catch up with Thailand in the near future. This is probably due to the implementation of policies to promote the female labour supply in these countries. Nonetheless, the share of the older population of most PST countries has reached a higher level than in Thailand, which can distort statistics that are shown for open-ended age groups, like for 15+, to a certain degree. At the same time, labour force participation in these countries is highly sensitive to aging-related policies, such as changes in the retirement age and the pension system (Coile et al., 2017). The interpretation of these differences thus requires caution.

To capture a life cycle pattern of labour force participation of males and females in Thailand, the age and cohort profiles of labour force participation must be further examined. Figure 6 illustrates the percentage of male and female labour force participation by age and by 5-year birth cohorts. The life cycle patterns for male and female labour force participation have consistently followed an inverse U-shape, with females showing lower participation rates across all cohorts and age groups. The male labour force participation rates for all birth cohorts, except for the two youngest ones (1995–1999 and 2000–2004), have remained stable at over 90 per cent during the working ages of 25–50, dropping rapidly after the age of 55. Furthermore, Figure 6A shows a drastic decline in the labour force participation of the younger male cohort, aged 20–24. This likely suggests that younger male adults tend to devote more years to their education before entering the job market, compared to older males.

FLFP rates for all birth cohorts have remained fairly constant for the ages of 25–45, as shown in Figure 6B. FLFP curves drop rapidly after the age of 45, which is earlier than for males. Note that the FLFP curves show a different pattern from the M-shaped ones typically found in more developed countries in Asia, such as Japan and South Korea. Similar to their male counterparts, a delayed entry into the labour market due to longer periods of education is also observed among females, as evidenced by a decline in the labour force participation of females aged 20–24 in the youngest cohorts. However, in older age groups, no significant differences in FLFP are observed across cohorts, as it is the case with older males.

Figure 6 Male and female labour force participation rates by birth cohort and age group



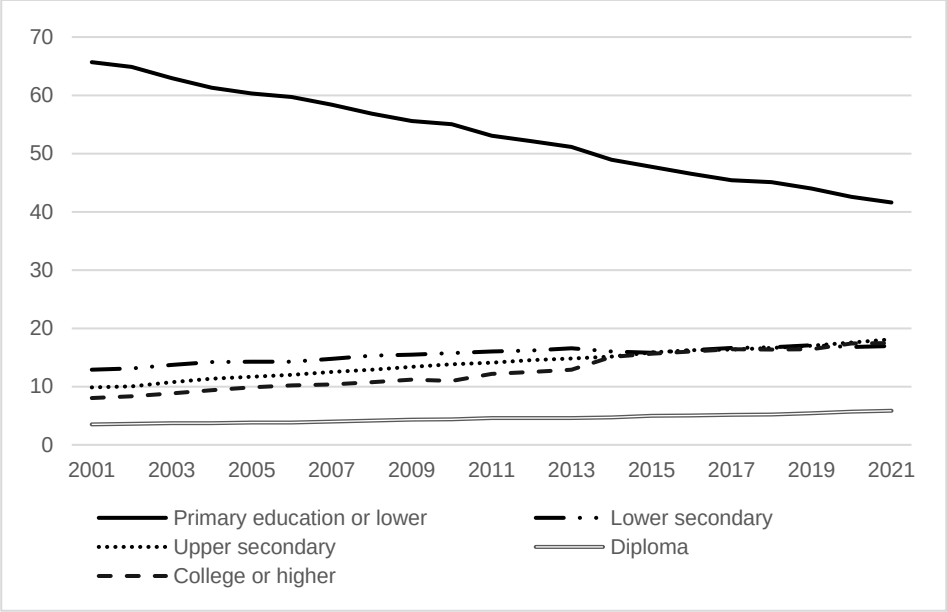
Source: Authors' calculations based on Thai Labour Force Surveys, 2001–2021 (Q3).

Note: (1) The x-axis shows only the minimum age of each 5-year age group.

(2) All 5-year birth cohorts are labelled by their first year only.

As labour force participation can be significantly influenced by education, we now turn our attention to the educational attainment structure of the working-age population in Thailand over time and by gender. Figure 7 shows a significant improvement in the educational attainment of the Thai labour force between 2001 and 2021. The percentage of workers who have attained higher education, particularly at the college level or beyond, has almost doubled during these two decades. In contrast, the percentage of workers with primary education or lower has declined by almost one-third, from about 65 percent in 2001 to 42 percent in 2021. The decreasing proportion of workers with lower education reflects the strengthening of the country's education system over time and indicates that the future cohorts in the labour force will be better educated, due to cohort replacement.

Figure 7 Composition of the labour force by highest level of educational attainment (in per cent), Thailand, 2001–2021

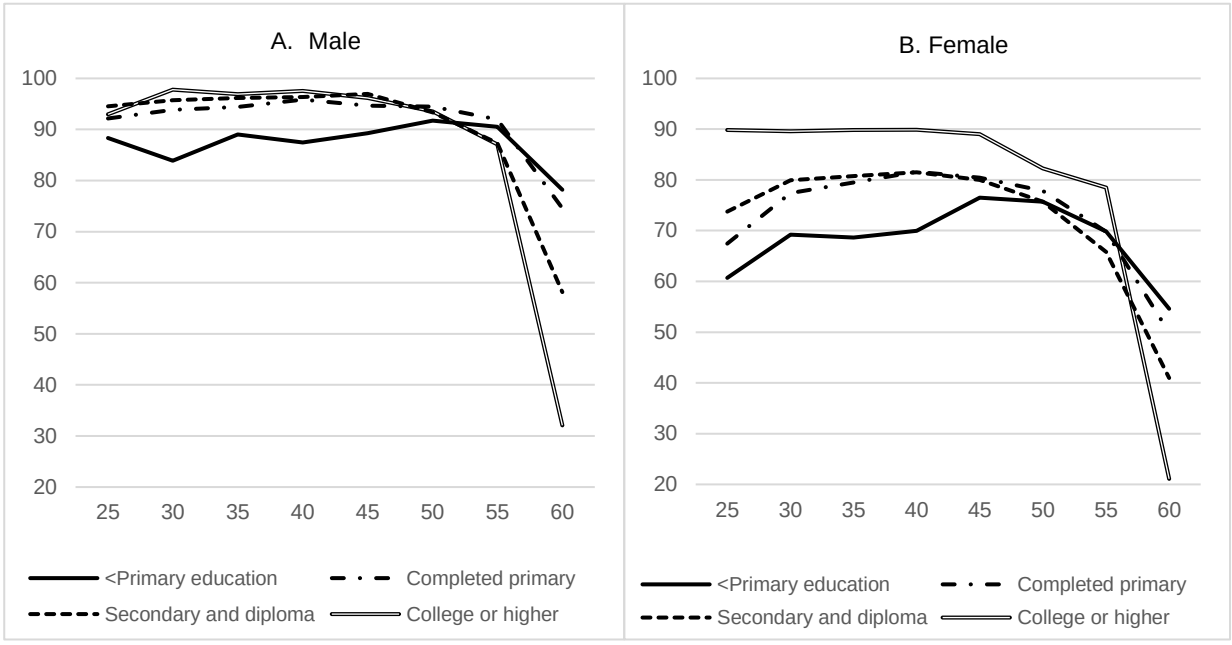


Source: Authors' calculations based on information from the NESDC's Labour Force database, retrieved November 2022.

Figure 8 shows male and female labour force participation in Thailand by age and educational attainment, based on data from the Thai Labour Force Survey conducted in 2021. Overall, no significant variation in educational profiles can be observed in terms of male and female labour force participation. The labour force participation rates are lowest for males and females who have attained primary education or lower across age groups, as compared to more highly educated ones, except for the older age groups of 55 and over. The share of workers who remain in the labour market drops significantly after the age of 55, particularly for those with higher education. After the age of 60, male and female workers who have attained the lowest level of education show the highest rates of labour force participation.

Female labour force participation across age groups exhibits a clearer educational gradient; that is, a larger gap is found between females with the lowest and highest education levels in terms of entering the labour market as compared to males. No significant difference exists between the labour force participation rates of males and females who have a college education or higher. Around 9 in 10 women who have a college education or higher join the labour force between the ages of 25 and 45, after which the share of female workers drops by almost 10 percent at the age of 50 and then drastically to only about 20 percent at the age of 60.

Figure 8 Male and female labour force participation rates by age and educational attainment, Thailand, 2021

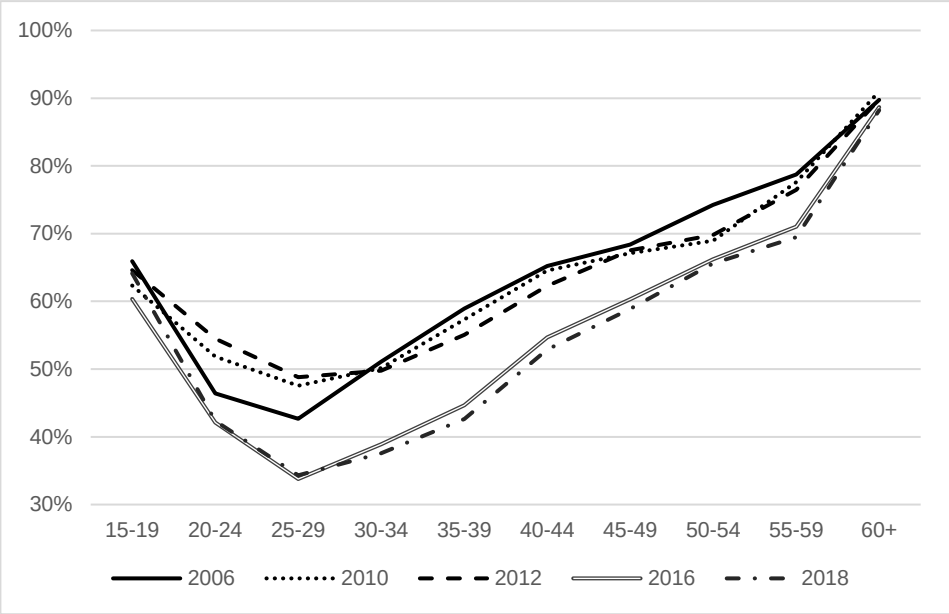


Source: Authors' calculations based on Thai Labour Force Survey, 2021 (Q3).

Another important factor affecting the prospects of the Thai labour market is the informal economy, as Thailand has one of the largest informal employment sectors in the world (Thaiprasert et al., 2020). Significant implications of the lack of formal arrangements include not only poor quality of work and greater exposure to discrimination and abuse, but also workers' financial insecurity in old age. Figure 9 shows trends in the share of informal employment by age between 2006 and 2018. The results illustrate j-curve associations between the shares of informal employment and age groups for all years considered. Informal employment is common among the youngest age group (15–19), with about 6 in 10 adolescents working in the informal sector. With increasing age, the share of informal workers declines rapidly, reaching its lowest level for the 25–29 age group. For workers in their 30s and older, the level of informal employment increases rapidly as they are ageing, reaching its highest level for older workers aged 60 and over at around 90 percent.

A comparison between the percentage of informal workers in 2006 and in 2018 further reveals that Thailand is undergoing a transition from informality to formality, as evidenced by a significant decline in the shares of informal employment across age groups, except for the 60+ group. While this suggests that a larger share of older people is expected to be financially supported by pensions received through formal employment, whether these pensions are sufficient to cover their living expenses warrants further investigation. If not, this could in turn push them back into informal employment at older ages.

Figure 9 Share of informal sector employment by age, Thailand, 2006–2018



Source: Authors' calculations based on NESDC's Labour Force database, retrieved November 2022.

4.3 Age profile of per-capita labour income

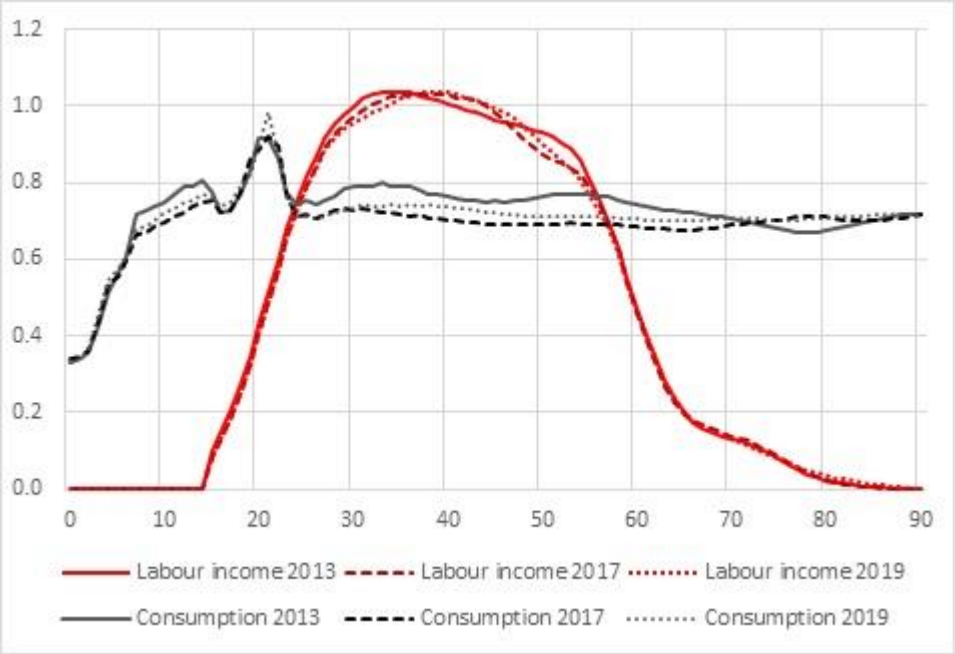
To translate the potential of the third demographic dividend for Thailand into economic values, it is important to understand Thailand's economic life cycle over several generations and to know at which age people become 'effective' producers or consumers. At the time of writing, the NTA team at the NESDC had managed to produce the NTA-based age- and sex-specific labour income profile for 2019. This information provides more significant insights on gender equality in employment in Thailand.

Figure 10 illustrates age-specific profiles of per-capita labour income and per-capita consumption for Thailand in 2013, 2016 and 2019 based on the available NTA reports. To facilitate the comparison across years, the per-capita age-specific values were converted into ratios relative to mean labour income for those aged 30–49 years in each year. Overall, the schedules of per-capita age-specific labour income over the period under observation are very similar. Thais gain a status of economic independence at age 15, the minimum age for employment as stipulated by national law. The labour

income curve skews moderately to the right in 2013 in comparison to the other two years. In 2013, the labour income peaks at age 36, then drops slowly until the age of 55, the common retirement age for most private companies, and then falls abruptly at older ages. Compared to the 2013 curve, the labour income curves for 2017 and 2019 peak at later ages – 38 years and 40 years, respectively – and fall more rapidly at the earlier age of 45 years.

By incorporating the per-capita consumption curves, two important ages can be calculated: the age at which a net consumer become a net producer and the age at which a net producer become a net consumer. This happens when the labour income and consumption curves cross. The difference between these two ages provides an average period indicating how long Thai people produce more than they consume. For 2013, the average age at which Thais changed from net consumers to net producers was 24, while the average age at which net producers became net consumers was 56. This suggests that on average, Thais earn more than they consume for 32 years. A similar calculation yields a slightly longer period of 33 years for both 2017 and 2019.

Figure 10 Per capita age-specific consumption and labour income (relative to mean labour income of population aged 30–49 years), Thailand, 2013, 2017 and 2019

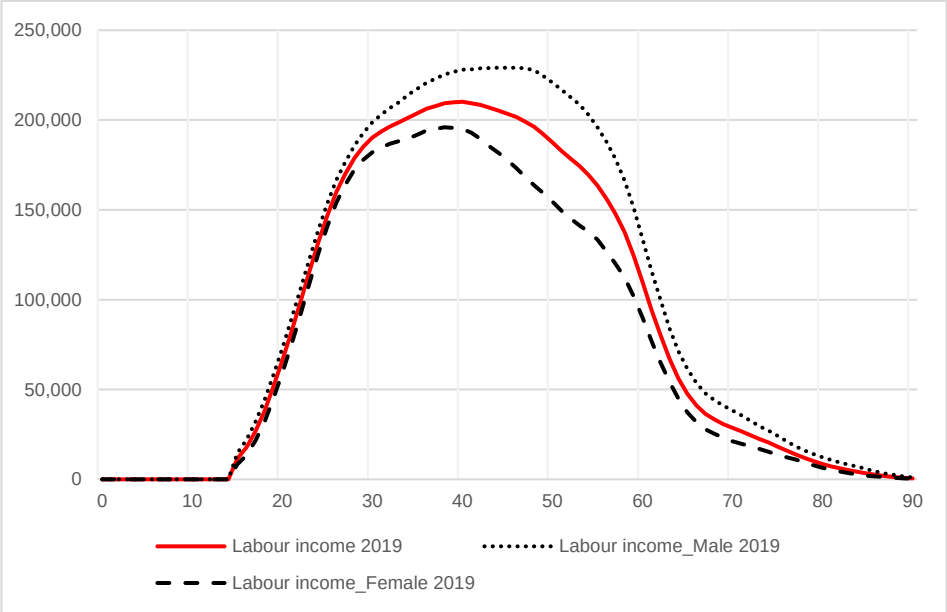


Source: Authors' calculations based on the 2013, 2017 and 2019 Thailand National Transfer Account Reports.

To examine the gender dimension of employment based on the NTA system, the National Time Transfer Account (NTTA) technique may be a suitable tool as it covers unpaid production activities (such as cooking, cleaning and caring for children and other family members) and the distribution of these activities across age and gender. However, due to several limitations in terms of time and resources, as well as the complexity of the NTTA production technique, we decided against using

NTTA data and to rely on the gender-specific NTA data provided by the NESDC instead. Nonetheless, the interpretation of these data warrants some caution. Notably, the difference in labour income between men and women is largely determined by many factors, including age at entry into the labour market, enrolment rates in tertiary education, participation rates in the labour market, childbearing and childrearing.

Figure 11 Per-capita age-specific labour income, overall and by gender, Thailand, 2019



Sources: The 2019 Thailand National Transfer Account Reports.

Figure 11 displays the pattern of per-capita age- and sex-specific labour income across the life cycle for Thailand in 2019. Unlike Figure 10, the per-capital age-specific values for males and females are expressed in nominal units of Thai Baht. The curves show that the labour income profiles for Thai men and women are moderately different, with the curve for women being skewed a bit more to the left. The per capita income peak for women falls between the ages of 38 and 39, while that for men is much later at around 45–46 years. During the early years of employment, labour income for men and women does not significantly differ. The divergence of income emerges at around the age of 30 and becomes substantially wider at age 40, when women's income starts to decline. With the men's income continues to increase, the size of the labour income gap between men and women is largest at around the age of 50. At older ages, the gender gap in income remains apparent, although smaller, as older men are more likely to continue working than older women.

For women, the left-skewed curve suggests that younger Thai women engage more in the formal sector with higher wages, while older women are more likely to be employed in agriculture and the informal sector, where wages are much lower. The labour income curve for Thai men is consistent with the curve in developing countries, which is characterised by a rightward shift at more mature

ages and a peak labour income falling at the pre-retirement age (defined as 45 years and older) (Hammer et al., 2015). This indicates that Thai men are on average employed in higher positions and receive higher wages than women.

4.4 Changing demand for labour

It is not only the composition of the population and characteristics of labour supply that have been changing over time and are expected to change further during the next decades. The ongoing Fourth Industrial Revolution entails many technological changes, for example through increasing levels of automation and digitalization in the workplace. This leads both to changes in skill demands of existing jobs and the creation of new jobs with new skill demands altogether. Skill demands are changing faster now than in the past and many jobs will require upskilling and reskilling. In East Asia and the Pacific region in general, there is increasing demand for higher-level cognitive skills and skills in teamwork and communication, rather than basic skills. Also in Thailand, manual and physically demanding tasks are partly being replaced by jobs increasingly requiring cognitive skills (Moroz et al., 2021). Part of this shift goes along with increased automation. This means that more and more jobs that are not physically demanding will be able to be performed by older workers, provided they have the required skills. The described expected change in the education composition of the working-age population in general - and of older adults in particular - are an important factor in preparing the country for these changes in labour demand. Further megatrends besides technological change (the Fourth Industrial Revolution) and an ageing labour force that are shaping labour demand are environmental and climate change and the quest for a greener economy (ILO, 2019). Covid-19 has accelerated opportunities for remote working for those jobs that are not bound to be performed at a specific location.

Presently, Thailand is faced with labour shortages for workers with any kind of skills. Demand for certain medium and high skills in the manufacturing and assembly sector is higher than its supply. At the same time, there are unemployed persons with advanced degrees, meaning that there is a mismatch between medium and high skilled labour supply and demand and that re-skilling is required (NESDC News, 2022). When it comes to labour shortages of workers with low skills, the expectation is that many of these jobs will also in the future be performed by migrant workers from neighbouring countries. A sector with demand for workers of any skill level that will partly have to be filled with migrant workers is the care sector: In this sector, labour shortages are present already today and are expected to increase (Moroz et al., 2021). Another aspect of labour demand is the (mis)match between workers' qualifications and the characteristics of the job they hold. The present mismatch in Thailand between job requirements in terms of qualification level/field and the qualification of job holders results from the fact that job creation in the past happened mostly in low-skill occupations: in 2018, more workers were overqualified for their occupation than underqualified (34 vs. 7.9 per cent, respectively) (Vandeweyer et al., 2021).

5. THE THIRD DEMOGRAPHIC DIVIDEND POTENTIAL FOR THAILAND

The negative correlation between age and labour force participation among older adults reveals that the participation of older adults in the labour force declines. Health is the main positive correlator with participation in the labour force. Therefore, in studying the untapped work capacity among older people (cf. Ogawa et al., 2021), it should be made clear that there are a variety of health variables that are of key concern.

In this section, three main topics are investigated. First, we examine in detail the health profiles of older persons in Thailand. Second, based on their health status, we estimate work capacity and potential workers of older Thai adults, following previous work of Ogawa et al. (2021). Third, we use our results for potential older workers to investigate the potential economic gains from having more older Thais that are productively employed.

5.1 Health profiles of older persons and changes across cohorts

Overall health profile

Figure 12 illustrates the age-specific prevalence of Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL) disability and functional limitations in surveys by sex from 2011, 2014, and 2017. Figure 12A shows the age-specific prevalence of ADL disability for men (left) and women (right). Between 2011–2017, the average prevalence of ADL disability among older men was approximately 4.9–6.8 per cent. The prevalence of ADL disability increased with age, from 0.4 per cent at age 50 to 0.6 per cent at age 59. Particularly in 2011, the prevalence of ADL disability among older men increased rapidly, to a reported 6.3 per cent at age 79. The trends for 2014 and 2017 are similar. However, there is a difference in ADL disability development by age group, as men aged 50–59 years showed less change compared to older men aged 60–79 years.

Similarly, for IADL disability and functional limitations, as shown in Figure 12B and 12C, the prevalence of both measures increased with age. The prevalence of IADL disability and functional limitations were 17.2–22.6 per cent and 16.4–18.6 per cent, respectively. The developmental disability among older men in the age group 50–59 years was slower compared to the age group 60–79 years. However, the occurrence of IADL and functional limitations among older men was greater than ADL disability among older men.

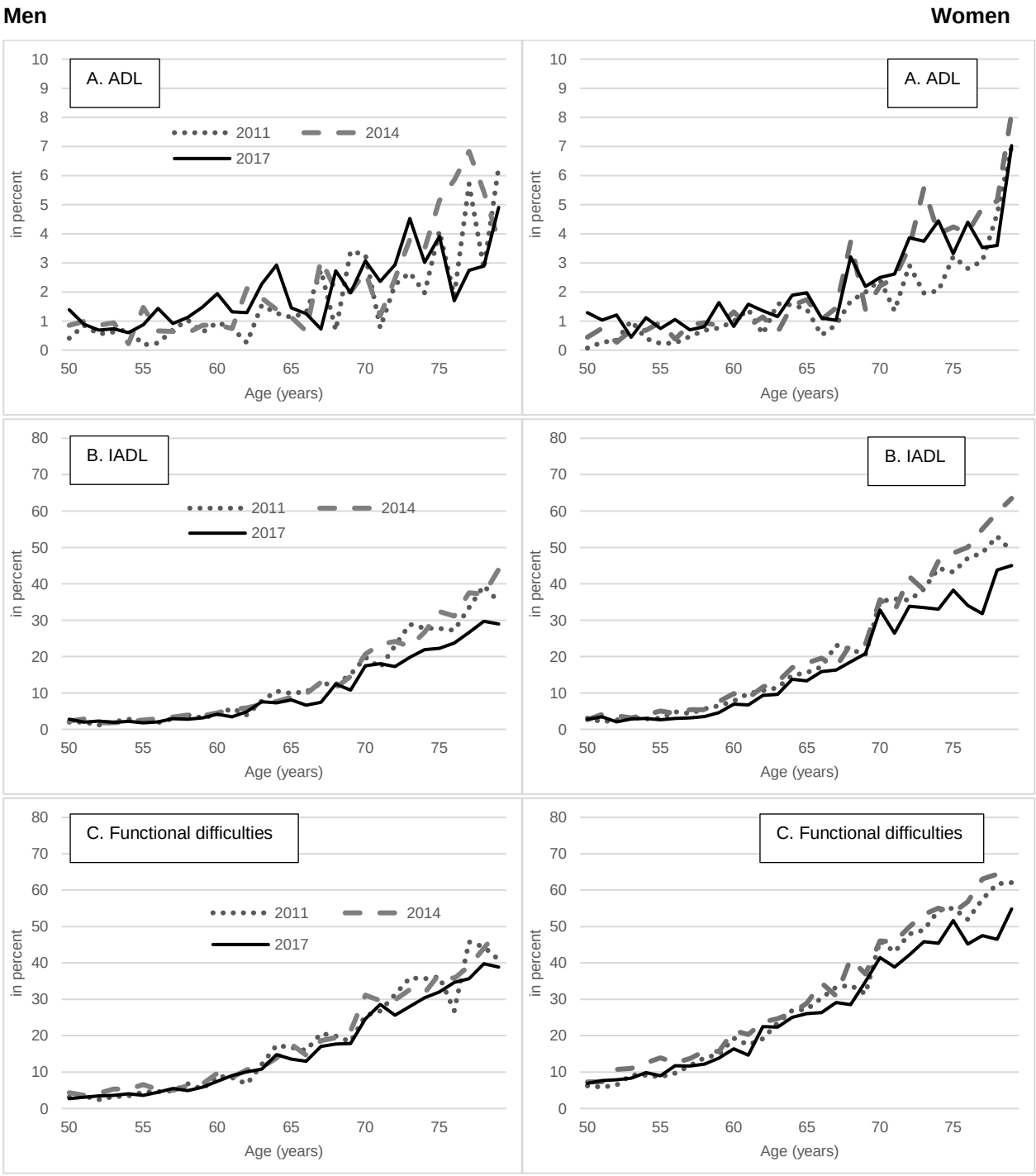
Likewise, for women, the prevalence of the three measures increased with age. There was a similar pattern between older woman and older men with ADL, IADL disability and functional limitations. However, women experienced more significant disability than men at the same age in terms of ADL, IADL disability and functional limitations.

While the prevalence of ADL increased consistently among people aged 50–64, those aged 75–79 experienced a prevalence of ADL with a decreasing trend over time. People aged 65–64 experienced

a fluctuating prevalence of ADL over time without discernible trends. The prevalence of IADL disability and functional difficulties decreased significantly among men aged 65–79 and women aged 55–79. However, men aged 50–64 and women aged 50–54 experienced fluctuating prevalence of IADL disability and functional difficulties over time without significant trends.

Although ageing is associated with increases in the degree of ADL, IADL, and functional limitations among older adults, these changes were consistent. The prevalence of the three measures was relatively low among adults aged 50–59, but after that the prevalence of all measures increased significantly. Moreover, older adults belonging to more recent birth cohorts are more physically active than their counterparts in previous years. This demonstrates the increasing potential to find older adults with the capacity to take part in the labour force.

Figure 12 Age trajectory in the prevalence of ADL disability, IADL disability and functional difficulties by sex in Thailand, 2011–2017.

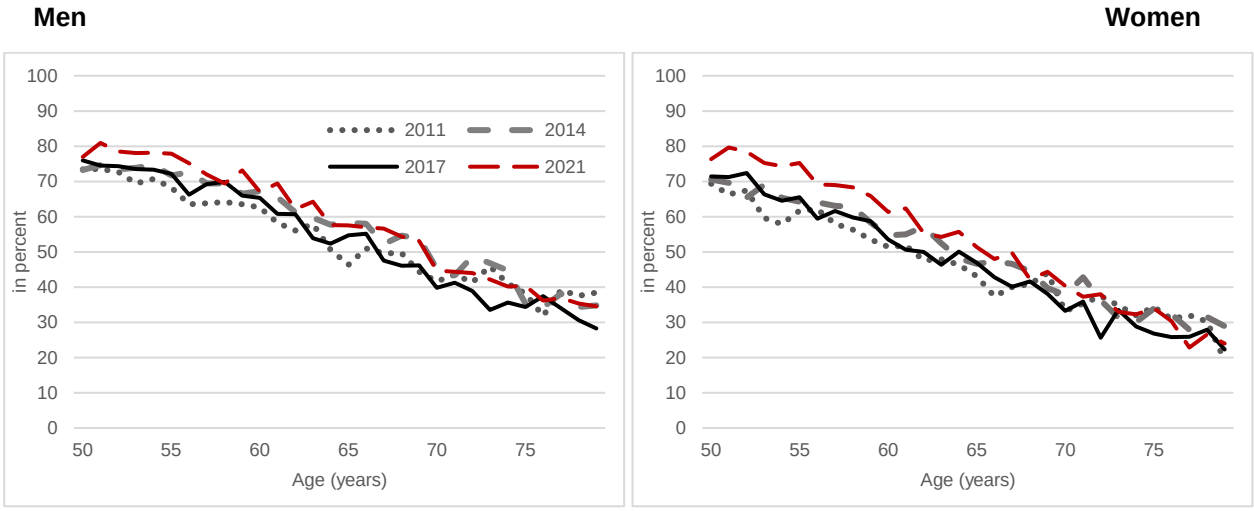


Source: SOPT from 2011, 2014, 2017, and 2021. Authors' calculation.

Figure 13 shows the prevalence of self-rated good health in 2011–2021 by sex. As expected, self-rated health declines with age in both older men and women. Between 2011 and 2021, the prevalence of self-rated good health among older men ranged from 53.6–58.6 percent, which is higher than for older women (ranging from 46.1–52.5 percent). While the proportion in good health

increased consistently among people aged 50–69, other ages reported good health over time without a discernible trend.

Figure 13 Age trajectory in the prevalence of self-rated good health by sex in Thailand, 2011–2021.



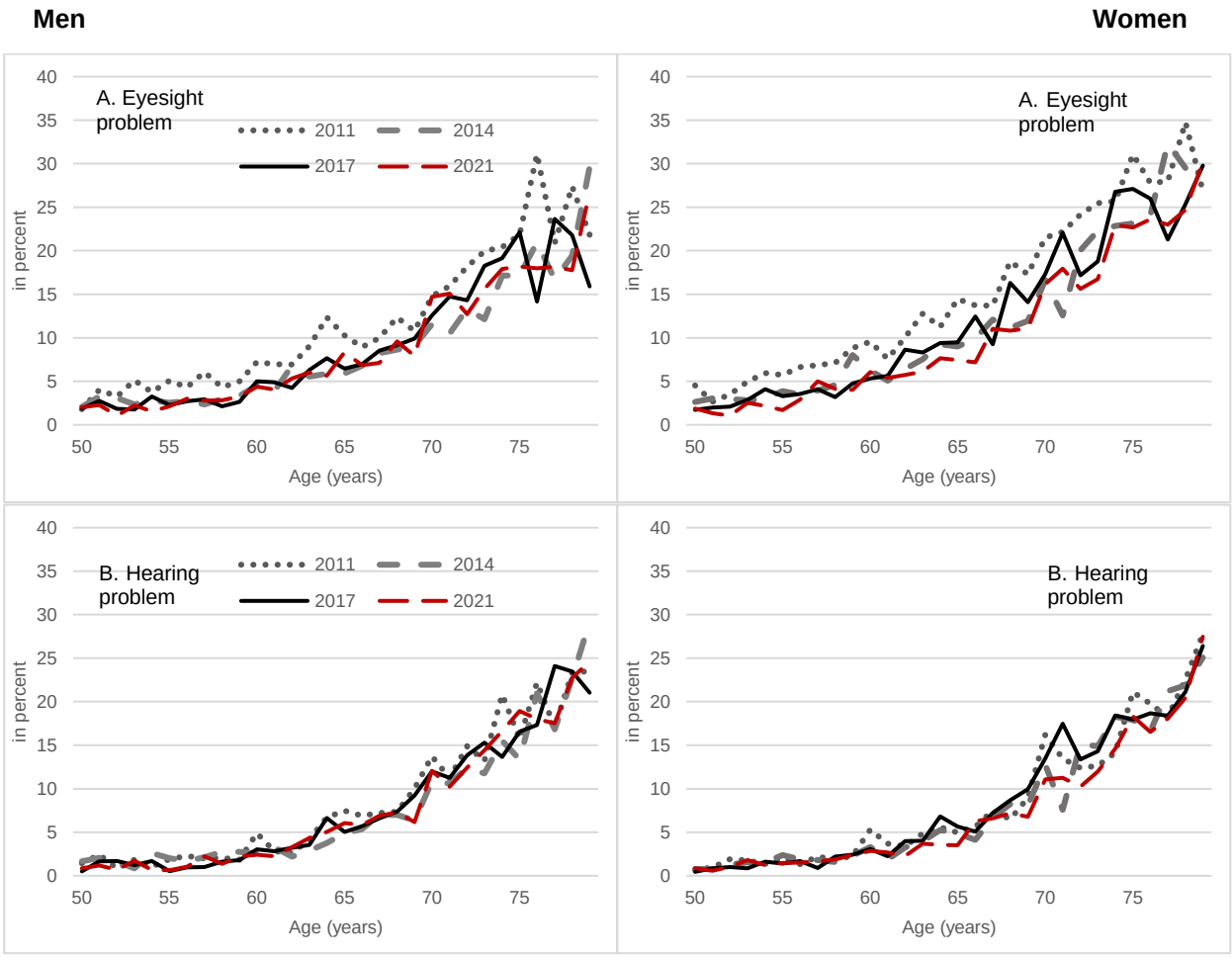
Source: SOPT from 2011, 2014, 2017, and 2021. Authors' calculation.

Figure 14 illustrates eyesight and hearing problems in 2011–2021. Older male adults reported eyesight problems at a rate of 8.8–11.7 per cent. The proportion of men who reported eyesight problems among those aged 50–59 (1.8–5.1 percent) was significantly lower than those aged 60–79 (6.0–31.1 per cent). When they reached age of 60, age-related eyesight problems became more prevalent with increasing age. The pattern for females was similar to that of males but older female adults had a higher proportion of eyesight problems at 10.6–15.1 percent, which was more significant than that of their male counterparts.

Compared with eyesight problems, older Thai adults experienced fewer hearing problems. In 2011–2021, they reported hearing problems at rates of 7.7–8.5 percent for males and 7.3–8.4 percent for females. Both male and female adults aged 50–59 had a significantly lower rate of hearing problems (0.5–2.4 percent) than those aged 60–79 (1.9–27.8 percent).

The proportion of eyesight problems in 2011 was greater than that of other years among older males and females. After 2014, the proportion of eyesight problems by age showed a similar trend. Age-related hearing problems each year also had a similar trend.

Figure 14 Age trajectory in eyesight and hearing problems (in per cent) by sex in Thailand, 2011–2021.



Source: SOPT from 2011, 2014, 2017, and 2021. Authors' calculation.

Education and health

Education is positively correlated with health. In this study, education is classified into four groups: lower than primary, completed primary education, secondary and diploma; and college or higher. Age-standardised prevalence estimates for all health measures were established. The age-standardised prevalence estimates of all health measures were obtained by using the age structure of male and female older adults in 2017 as a standard population.

Figure 15 illustrates the age-standardised prevalence estimates of ADL disability, IADL disability and functional limitations by sex and education from 2011–2017. It reports that the prevalence of ADL, IADL and functional difficulties among adults who have college or higher education decreased from 2014–2017 compared to 2011, excepting the prevalence of ADL among older males in 2011. The enormity of the effect varies between indicators and periods of time.

Regarding ADL disability, the prevalence of ADL disability and education level among older males fluctuated from 2011–2017. The pattern is similar between older males and older females. The only difference is that the education level was positive among older females from 2014–2017. It indicates that the prevalence of ADL disability among older females who have college or higher level decreased from 2014–2017 by 0.4 per cent.

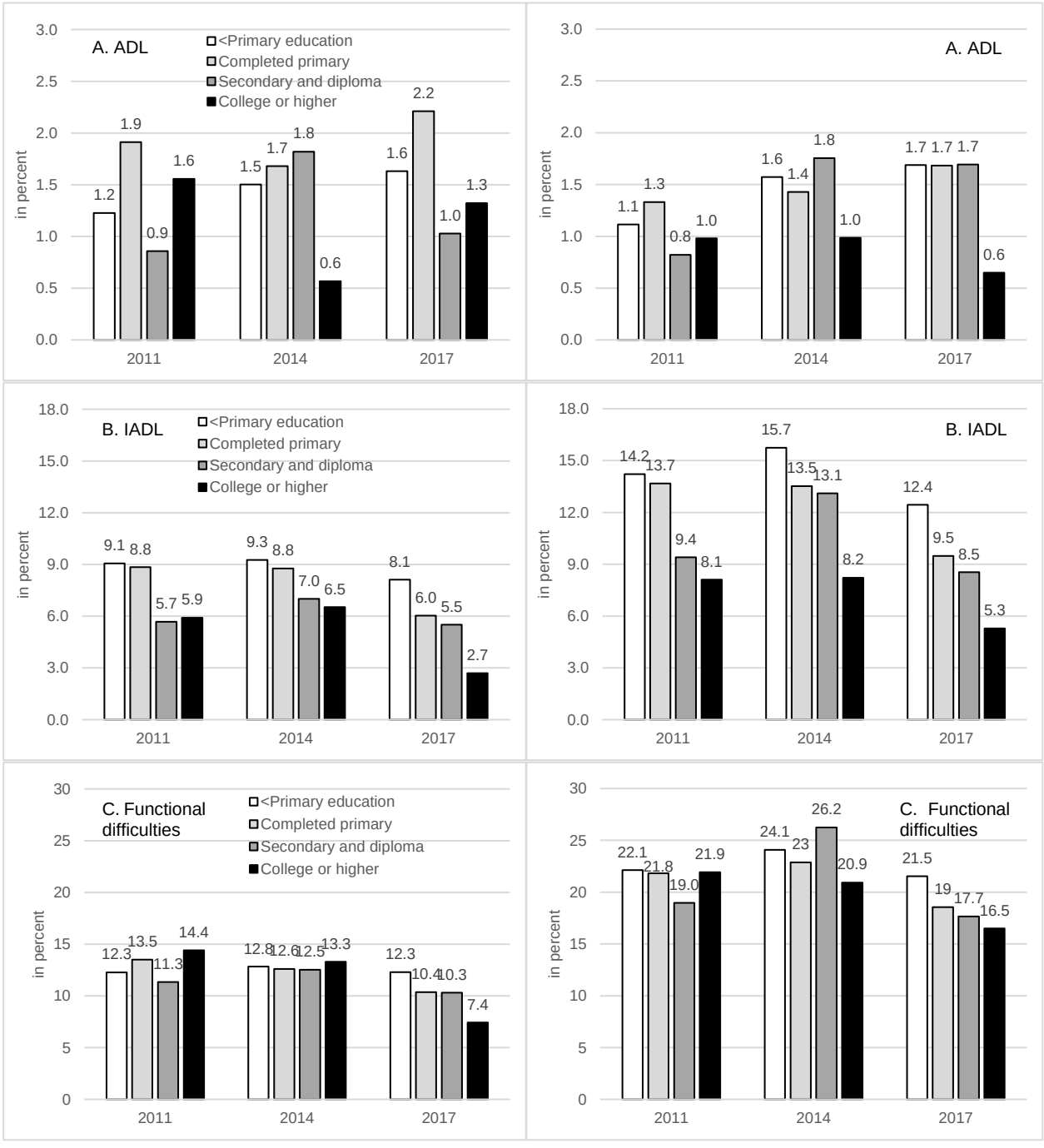
In terms of IADL, older males had a lower prevalence of IADL than older females in all education levels. There was no clear direction of education level among males in 2011, while there was a negative correlation between the prevalence of IADL disability and education levels from 2014–2017. The pattern for females revealed a negative correlation between the occurrence of IADL disability and education level over the period observed.

In the case of functional difficulties, older males had a lower prevalence of functional difficulties than older females in the studied education levels and time periods. There was also no clear association in terms of education level for both older males and older females in the years 2011–2014. However, there was a positive correlation between education levels and functional disabilities across both sexes in 2017.

The education–health patterns for ADL are not clear. However, females with college or higher education show a positive impact on ADL in 2017. For IADL, the pattern for both older males and older females demonstrated a similar development: the negative association between education levels and IADL starts later. The education–health patterns for functional difficulties are also not consistent over time; however, the negative association is noticeable in 2017. Focusing on 2017, the education level shows the clearest association for IADL, followed closely by functional difficulties and ADL, respectively.

Figure 15 Prevalence of ADL disability, IADL disability and functional difficulties for persons 50+, by sex and education, standardised for age, from 2011–2017.

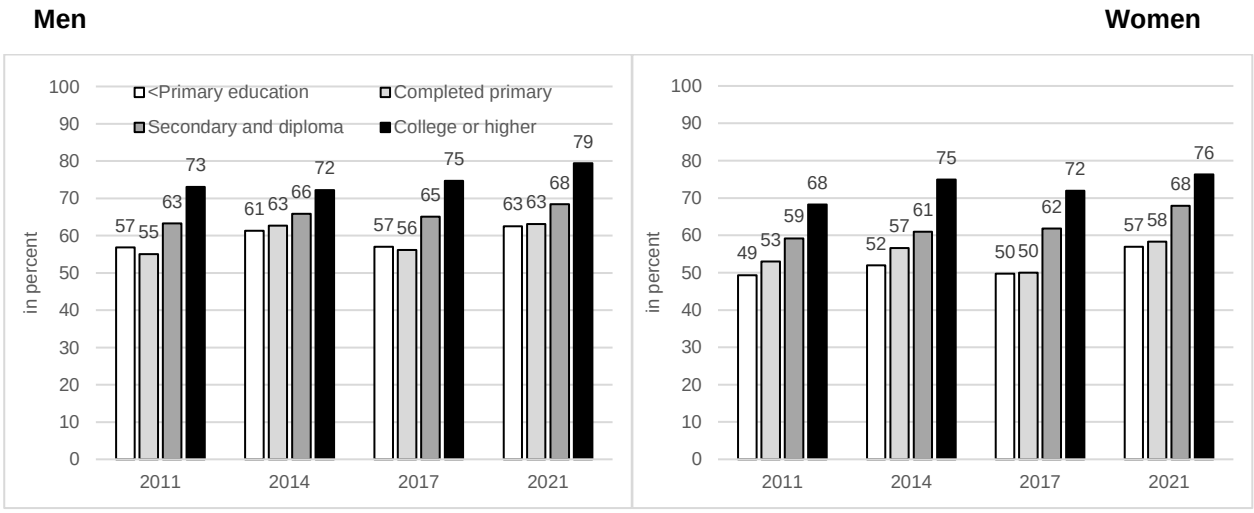
Men **Women**



Source: SOPT from 2011, 2014, 2017, and 2021. Authors' calculation.

Figure 16 demonstrates the prevalence of self-rated good health for persons aged 50+ by sex and education, standardised for age, from 2011–2017. It indicates that the prevalence of self-rated good health among adults aged 50 years or above differs based on education levels. The pattern is similar between males and females, indicating that a higher education level has a greater prevalence of self-rated good health than a lower education level.

Figure 16 Prevalence of self-rated good health for persons 50+, by sex and education, standardised for age, from 2011–2021.

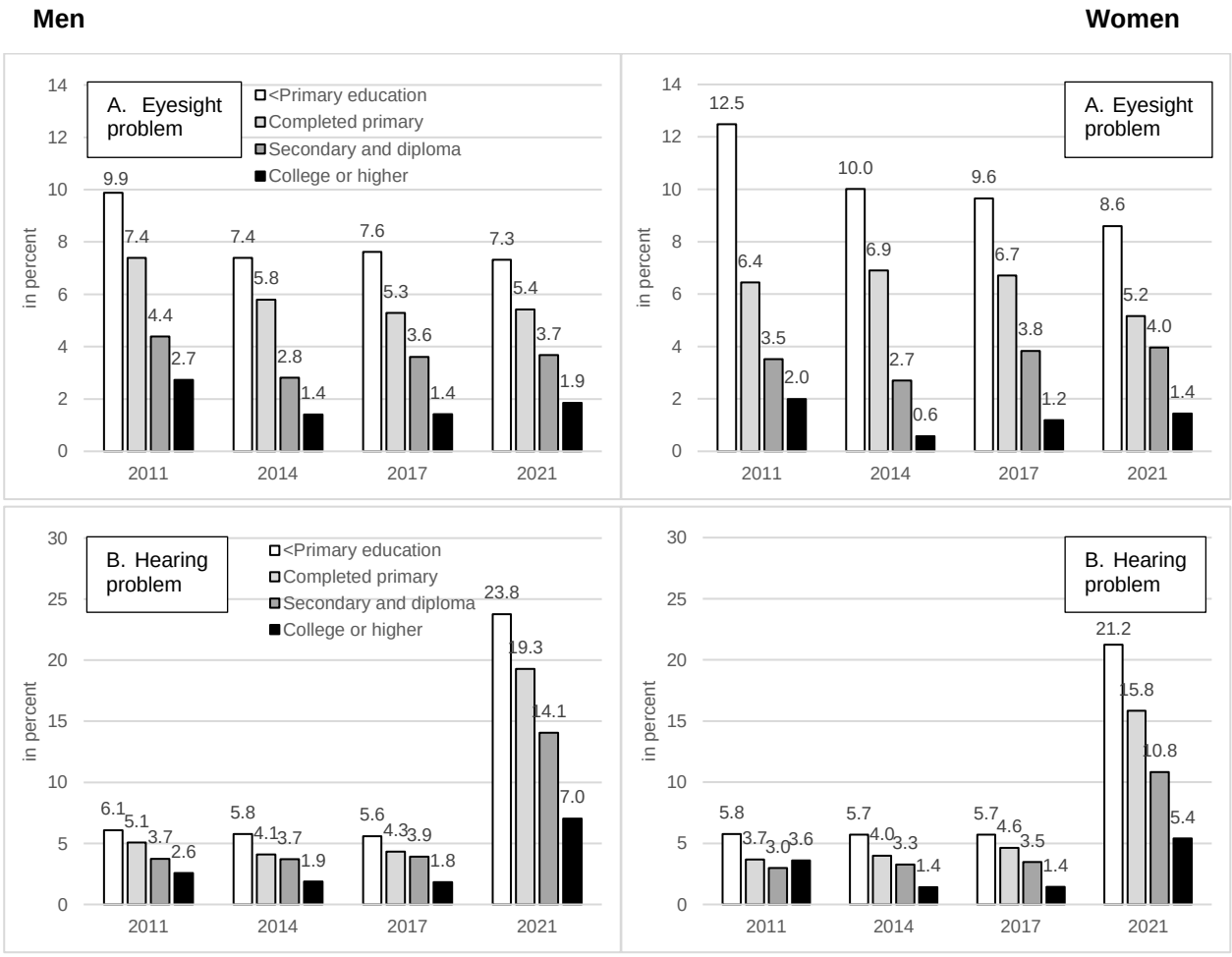


Source: SOPT from 2011, 2014, 2017, and 2021. Authors' calculation.

Figure 17 demonstrates the prevalence of eyesight and hearing problems for persons aged 50+, by sex and education, standardised for age, from 2011–2021. It indicates that the prevalence of eyesight and hearing limitations among adults aged 50 years old or above differs according to education level. People with primary education level or less have a greater prevalence of eyesight and hearing issues than those with higher education levels.

The differences among males in eyesight limitations fluctuated. There was a negative correlation between eyesight and education level in 2021. The pattern for females demonstrated a negative correlation between the occurrence of eyesight limitations and education level from 2014–2021. The prevalence of hearing limitations from 2011-2017 slightly declined, while it increased significantly in 2021. In addition, there was a negative correlation between the prevalence of hearing limitations and education among males and females.

Figure 17 Prevalence of eyesight and hearing problems for persons 50+, by sex and education, standardised for age, from 2011–2021.



Source: SOPT from 2011, 2014, 2017, and 2021. Authors' calculation.

5.2 Potential Work Capacity

To estimate the untapped labour force capacity in Thailand in terms of health and education for those aged 60–79, a logistic regression model was employed where we regressed on a binary variable of employment, controlling for non-health and health variables. Detailed results are provided in the Appendix Table S-1.

First, regarding the education variable, the coefficient of education revealed that males with a secondary education level or a bachelor's degree or above were less likely to be employed compared to those with some primary level, by 44 percent and 59 percent, respectively. Females with a secondary level of education were less likely to be employed, by approximately 18 per cent, but females with a bachelor's degree or above were more likely to be employed, accounting for 42 per cent.

Second, the health variables studied included self-rated health status, functional limitation (e.g., carrying heavy objects, squatting, walking 200–300 meters, transportation, and handling money) and sensory organs (e.g., eyesight and hearing problems). Both men and women who rated their own health level higher than fair were more likely to be employed: 55–87 percent for men and 23–25 percent for women. Functional limitations, including carrying heavy objects, transportation and handling money, were significant for men, while carrying heavy objects, walking 200–300 meters and transportation were significant for women. The significant variables showed negative effects, indicating that older people with functional limitations tend to be less likely to be employed than those without functional limitations, by 16–69 percent. Finally, both eyesight and hearing problems were statistically non-significant. In summary, older Thai adults who are employed are likely to be healthy but those with a higher education tend to leave the labour force when they reached retirement age.

The 'untapped work capacity' is conceptualised as the difference between the actual number of older workers and the estimated potential number of older workers. Table 1 reports the estimated number of older workers, the actual numbers of workers and untapped workers in 2017. These data indicate that the total estimated potential number of older workers is 6,353,810, which is composed of 3,455,559 males and 2,898,251 females. The total actual number of older workers is 3,847,050, consisting of 2,260,421 males and 1,586,629 females. Therefore, the number of unutilised older workers – i.e. the 'untapped work capacity' – aged 50–79 in Thailand is 2,506,760, or 1,195,138 males and 1,311,622 females.

Table 1 Estimated number of male and female workers aged 60–79 years based on the regression results, the actual number of workers and untapped work capacity, in 2017.

	Male ('000)	Female ('000)	Total ('000)
Estimated number of older workers	3,456	2,898	6,354
Actual number of older workers	2,260	1,587	3,847
Untapped work capacity	**1,195**	**1,312**	**2,507**

5.3 Potential economic impact

In this section, we attempt to quantify the impact of untapped work capacity, presented in the previous section, on macroeconomic growth. Based on the analytical strategy of Ogawa et al. (2021), the latest NTA profiles on per-capita labour income in 2019 (in total and disaggregated by men and women) is utilized to estimate the potential income of these untapped older workers if they were employed. This case is used as a baseline, which is referred to as Case I. For Case II, we assume

that if these additional workers were employed, they would earn a minimum wage of 45 Baht per hour as prescribed by the Ministerial Regulation of Ministry of Labour in 2019.[1]

To prepare Thailand better for capturing the third demographic dividend, it is necessary to estimate the economic impact that takes education into account. In doing so, we predict the probability of employment by education for individuals aged 60–79 years in a similar manner as previously described in Section 3.4. Different educational levels are categorized into some primary or no education, completed primary education, secondary education and post-secondary education. Changes in the educational composition of the population in general over the period of 2030-2050 are derived from the population projections by education for Thailand produced by the Wittgenstein Centre for Demography and Global Human Capital (2018). These changes are applied to the population projections by UN WPP to estimate the number of potential older workers with respect to their educational attainment.

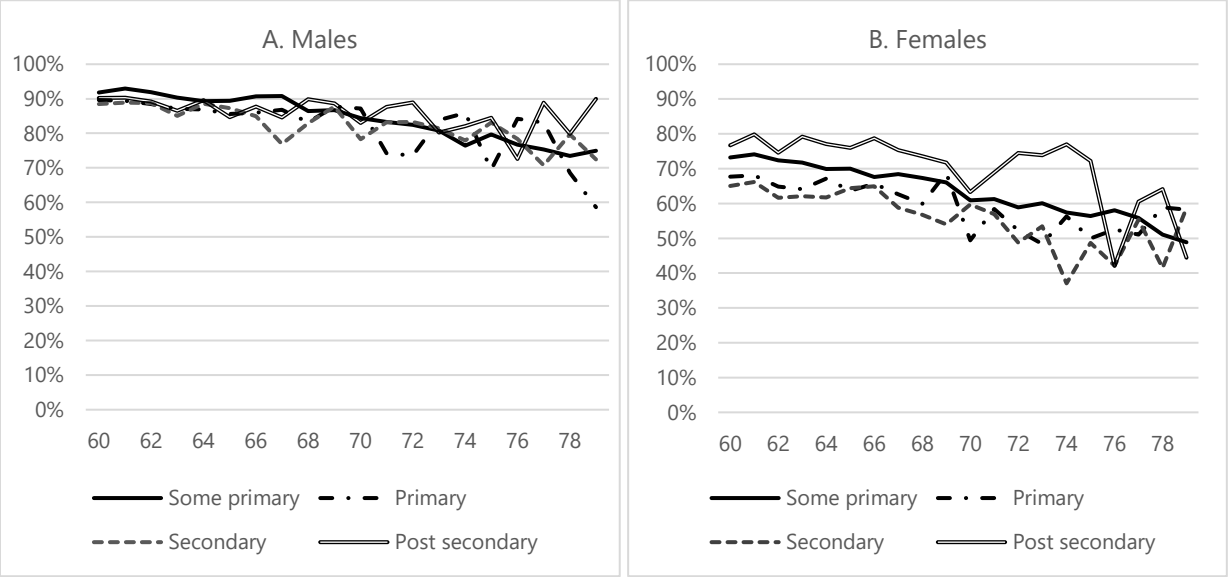
Cases III, IV and V are formulated along the same line as the above scenarios to account for the change in educational composition. Case III assumes untapped older workers to be employed and earn their labour income in accordance with the 2019 NTA income profiles (Figure S1). Meanwhile, Case IV assumes the government's minimum wage for untapped older workers. Finally, Case V uses a linear regression model to estimate wages for untapped older workers based on their educational attainment, using data from the 2019 Labour Force Survey. Hourly wages are derived from the model, while controlling for age, gender, work status, region, and area of residence (Tables S-2 and S-3). All results are presented in both absolute values and relative to the Gross Domestic Product (GDP) for Thailand in 2019.

The simulation results are presented as follows, beginning with the predicted probability of employment by education for individuals aged 60-79 years. Note that the results are obtained based on a regression analysis of individuals aged 50-59 years (Table S-1) and the actual characteristics of individuals aged 60–79 years (Table S-4). Next, we show the educational composition of Thai population for the 60+ age group over the next 30 years. This is followed by our estimates of potential older workers and additional GDP gains for Cases I-V.

[1] The Ministerial Regulation to promote and support the employment of older persons, dated on March 8, 2019. https://www.mol.go.th/wp-content/uploads/sites/2/2019/03/prakaasphuusuungaayu.pdf

Figure 18 shows the age- and education-specific employment rates for older males and females. The probability of employment is higher for males, compared to females, in all ages. For both males and females, the employment rate declines as their age increases. There are no significant variations in employment rates for young older males with respect to their education, until the age of early 70s, where some differences can be observed and become clearer after the age of 75. The probability of employment among females is highest for those with post-secondary education for almost all ages, except for the ages of 76 and 79. It is interesting to see that the probability of employment is lowest among females with secondary education, but not those with primary or some primary education.

Figure 18 Estimated employment rates for males and females aged 60-79 years, by education



The education composition of the Thai older population over the next 30 years is presented in Table 2. In 2030, slightly more than half of older Thai population still completed only primary education (58.6 per cent). The share of older persons with primary education is projected to drop to 20.8 percent by 2050. The gender differences in education are noticeable, with higher shares of older women with primary or lower education compared to older men. Meanwhile, fewer older women have secondary or higher education compared to older men. By 2050, these differences are projected to almost disappear, where almost three-quarters of older men and women will have

at least secondary education. Moreover, the share of older women with college education or higher will become larger than that of older men.

Table 2 Education composition of the 60+ population in Thailand (in per cent), 2030, 2040 and 2050, overall and by sex.

Education level	2030			2040			2050		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Less than primary education	3.1	4.0	3.6	5.0	5.2	5.1	6.0	5.9	6.0
Primary education	54.5	61.8	58.6	38.8	42.8	41.0	21.4	20.3	20.8
Secondary education	28.7	22.3	25.2	38.4	34.4	36.2	48.3	47.5	47.9
Bachelor education and higher	13.7	11.9	12.7	17.8	17.7	17.7	24.3	26.2	25.3

Source: Wittgenstein Centre for Demography and Global Human Capital (2018), the Medium Scenario (SSP2).

Table 3 shows the estimated total and untapped work capacity based on their educational profiles over the next 30 years. If older adults behave in accordance with the regression results, the total work capacity of older people will almost double by 2030, as compared to 2017 (data shown in the previous section). The total work capacity continues to increase slowly until 2040 and then declines in 2050. There are slight differences in the total number of older workers with respect to gender, where the male-to-female ratio is 1.07: 1 in 2030 and increases to 1.13: 1 in 2050. It should be noted that the calculations in this report are based on actual employment rates in 2017, which are used to estimate a temporal trend in the total work capacity only. As such, interpretation of the results must be done with caution.

Table 3 Estimated number of older workers and untapped capacity, overall and by sex, 2030-2050

	2030 ('000)			2040 ('000)			2050 ('000)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Estimated number of older workers	6,289	5,644	11,934	6,598	5,915	12,513	6,634	5,706	12,340
Untapped older workers	3,063	3,358	6,421	3,551	3,865	7,416	3,818	3,928	7,746

Our simulation results for GDP gains show that if the number of older workers increased, Thailand's GDP would have increased between 0.61 percent (Case I) and 1.26 percent (Case II) in 2017. When the future population structures are applied to the results, the GDP will likely increase by 1.14 percent to 2.76 per cent in 2030, and slightly further to between 1.16 percent and 3.01 percent in 2040. However, the GDP gains are expected to drop in 2050 due to a decline in older female workers in the 60-69 age group. Our simulation results in Cases III, IV and V that account for the education-employment association show increasing GDP gains with time. While the GDP is expected to increase by only 2.97 percent 2050 in Case II, it is expected to increase by 3.90 percent in Case IV, and 9.16 percent in Case V. In comparison to the GDP growth in 2019, Case V could be almost 300 percent higher (Table 4).

Table 4 Additional GDP gains in million Baht, and as a percentage of the 2019 GDP[a], and relative to the 2019 GDP growth[b]

		2017			2030			2040			2050		
		Amount	%GDP[a]	% of GDP growth[b]	Amount	%GDP[a]	% of GDP growth[b]	Amount	%GDP[a]	% of GDP growth[b]	Amount	%GDP[a]	% of GDP growth[b]
Case I	Men	60,363	0.36	11.63	110,065	0.65	21.20	113,363	0.67	21.84	113,662	0.67	21.90
	Women	42,756	0.25	8.24	83,200	0.49	16.03	83,412	0.49	16.07	79,674	0.47	15.35
	Total	**103,119**	**0.61**	**19.87**	**193,265**	**1.14**	**37.23**	**196,775**	**1.16**	**37.91**	**193,336**	**1.14**	**37.25**
Case II	Men	100,878	0.60	19.43	211,242	1.25	40.70	233,718	1.38	45.03	232,484	1.38	44.79
	Women	112,484	0.67	21.67	255,757	1.51	49.27	283,870	1.68	54.69	269,671	1.6	51.95
	Total	**213,362**	**1.26**	**41.10**	**466,998**	**2.76**	**89.97**	**517,588**	**3.06**	**99.71**	**502,155**	**2.97**	**96.74**
Case III	Men				143,079	0.85	27.56	158,370	0.94	30.51	174,785	1.03	33.67
	Women				104,001	0.62	20.04	112,662	0.67	21.70	117,368	0.69	22.61
	Total				**247,080**	**1.46**	**47.60**	**271,033**	**1.60**	**52.22**	**292,152**	**1.73**	**56.28**
Case IV	Men				257,307	1.52	49.57	297,511	1.76	57.32	320,452	1.90	61.74
	Women				287,977	1.70	55.48	332,153	1.97	63.99	337,545	2.00	65.03
	Total				**545,284**	**3.23**	**105.05**	**629,664**	**3.73**	**121.31**	**657,997**	**3.90**	**126.76**
Case V	Men				547,810	3.24	105.54	691,621	4.09	133.24	843,495	4.99	162.50
	Women				451,758	2.67	87.03	481,261	2.85	92.72	703,234	4.16	135.48
	Total				**999,568**	**5.92**	**192.57**	**1,172,882**	**6.94**	**225.96**	**1,546,728**	**9.16**	**297.98**

Note: [a]The Gross Domestic Product (GDP) for 2019 is equal to 16,892,410 million Baht (NESDC). [b]The economic growth of the Gross Domestic Product (GDP) from 2018 to 2019 is equal to 519,070 million Baht (NESDC).

6. POLICIES RELATED DIRECTLY AND INDIRECTLY TO ACHIEVING AND MAXIMIZING THE THIRD DEMOGRAPHIC DIVIDEND IN THAILAND

Policy areas that are connected to achieving maximization of the third demographic dividend overlap a lot with those policy areas that generally come into play when talking about policy reactions to population ageing, for example health, education, labour market, economic/fiscal and social policy. From a broad perspective, the “Madrid International Plan of Action on Ageing” (MIPAA) which was adopted in 2002 contains recommendations in many policy areas whose implementation helps countries and societies to prepare for population ageing. The three priority directions within which more specific policy suggestions are subsumed are: older persons and development, advancing health and well-being into old age; and ensuring enabling and supportive environments. Within these three areas, issues that are directly linked to labour market outcomes of older adults include work and the ageing labour force, access to knowledge, education and training, eradication of poverty, income, social protection/social security and poverty prevention, health promotion and well-being throughout life, older persons and disability; and images of ageing (UN, 2002). Following through on improvements in these fields is considered as crucial prerequisites to prepare countries with low fertility and increasing life expectancy for ongoing and foreseeable demographic changes.

As demonstrated in the previous chapters, older adults’ health status is a vital component of the concept of the third demographic dividend as established by Ogawa et al. (2021). Furthermore, as Fried (2016a) points out, healthy ageing rests upon a life cycle approach when it comes to preventing diseases and promoting good health up to higher ages. Hence, the declaration of the ‘UN Decade of Healthy Ageing’ and its four areas of action represent important policy aspects of productive population ageing and the maintenance of older persons’ wellbeing (WHO, 2020). An important point that applies almost universally to every policy area is the awareness that labour force participation at older age is shaped by individuals’ whole life cycle. For example, by the education they did (or did not) receive at young age and later in life; the health care they received at any point during their lives, not just when they were older. For women, it can be their labour market attachment during childrearing years or while taking care of older family members that can have repercussions on their opportunities for employment later in life. These examples show that preparation for longer working lives must begin early and that actions in many policy areas are involved.

Thailand has already taken actions and introduced or changed policies that are linked to labour markets and population ageing. Policies and measures that directly aim at extending working lives and hence, increase the pool of potential older workers, can be broadly classified into two categories, namely those facilitating the extending of working lives and those focused on promoting lifelong learning skills and training. The first category includes financial incentives to motivate private companies to hire and retain older workers. Since 2017, the companies that hire persons aged 60 or over can claim a corporate income tax exemption equal to 100% of the amount of the expenditure paid for hiring the older employees, but not exceeding 15,000 baht per person monthly.[2] For those in the public sector, the government has planned to raise the compulsory retirement age for public sector workers from 60 to 63 years by 2024. However, the implementation of this policy has been postponed due to the economic fallout of the COVID-19 pandemic and it remains uncertain when it will be reconsidered. In 2022, the Department of Employment under the Ministry of Labour initiated a pilot program to employ senior workers within their department with the aim of setting an example and motivating other government agencies to hire older workers.[3]

Other noteworthy strategies in the first policy category include the development of diverse employment services to assist unemployed senior workers in re-entering the workforce and obtaining employment opportunities that are suitable for their conditions. These measures are, for example, (i) conducting a survey of the needs of older individuals who are willing and able to work, which provides insights into the challenges and requirements of older workers seeking to remain in the workforce, (ii) establishing a senior expert registration database that offers a platform for senior experts to showcase their skills and connect with potential employers or clients who require their services[4], and (iii) providing financial services in the form of loans for business start-ups among older individuals who wish to become entrepreneurs (ILO, 2019, p. 55).

---

[2] The Revenue Department, Ministry of Finance. Tax benefits for hiring older workers. https://newstartup.rd.go.th/taxdeduct/index_qanda.jsp. Accessed on March 4, 2023.

[3] The Department of Government Public Relations. 2022. “Ministry of Labour expanding employment for the elderly, creating employment opportunities, meanwhile, providing tax deductions for entrepreneurs”. https://www.prd.go.th/th/content/category/detail/id/33/iid/123613 Accessed on March 4, 2023.

[4] Ibid.

The second policy strategy involves promoting lifelong learning, which has been identified as a crucial measure to enhance the productivity of potential labour supply by countries facing more advanced aging than Thailand (such as Japan and Singapore). This strategy has explicitly been adopted as one of the six key components of the recently implemented long-term Population Development Policy (2022-2037), which provides guidance for policy actions by present and future governments. Significant initiatives include supporting the establishment of elderly schools nationwide to offer up-skill and re-skill training activities and to develop life-long learning skills for older persons[5]. Other initiatives encourage higher education institutions to take more part in promoting life-long learning skills through offering training modules or non-degree programmes to non-student/college people, including older persons, which provide more flexible and accessible pathways to education and training. Recently, the government - through the Ministry of Higher Education, Science, Research and Innovation - has developed the national credit bank, which is a system that allows individuals to accumulate and transfer credits earned throughout their life via various channels including non-traditional learning experiences.[6] To keep pace with Thailand's vision of becoming the digital economy, various governmental agencies, in collaboration with the private sector, have offered a variety of training programmes aimed at enhancing digital literacy among older adults and, consequently, increasing employment opportunities and entrepreneurship prospects. One such successful initiative is the "Grab Wai Kao" (Grab for seniors) initiative in 2022 through the collaboration between the government's Digital Economy Promotion Agency (DEPA) and Grab Thailand, a multinational technology company that provides transportation, food delivery and digital payments services.[7]

Furthermore, there are other broad policy initiatives in place in Thailand that are not specifically designed to address challenges related to the intersection between labour market and population aging, but have significant impacts on the availability of potential workers of any age. These policies focus on enhancing social protection and income security, which are critical to supporting individuals in different ways with regard to employment opportunities.

---

[5] H Focus and Thai Public Health Foundation. 2018. Government Aims to Establish 2,600 Elderly Schools Nationwide in Next Three Years. https://www.hfocus.org/content/2018/01/15334

[6] The Ministry of Higher Education, Science, Research and Innovation. 2022. The national credit bank. https://www.mhesi.go.th/index.php/all-media/infographic/7374-650520general.html

[7] "Digital economy agency partners Grab to launch scheme for seniors". The Nation Thailand. May 26, 2022

For instance, the Thai government has implemented measures to support children, including a universal childcare allowance of 600 Baht per month for children from poor families from birth to three years old and a fifteen-year universal access to free education to ensure that all children have a good start in life. For working-age individuals, various social assistance and social insurance programmes have been established to safeguard workers' abilities, such as pensions, unemployment protection, maternity protection, employment injury protection, and disability benefits.[8] To address gender disparities, the government has enacted laws to safeguard the rights of women and prevent discrimination against vulnerable populations, including women, in all aspects of employment and occupations (ILO, 2014). For older persons, the universal access to healthcare and the development of a long-term care system will likely enable them to continue working, while the implementation of a minimum wage of 45 Baht per hour and recommended working hours for older workers helps safeguard them against exploitation by employers.

7. CONCLUSION AND RECOMMENDATIONS

Ageing and changes in age-composition are about to reach a new phase in Thailand. While the population has been ageing for a while, as measured by the continuous increase in the share of the population above age 65, there have always been more young people entering working age than older adults reaching retirement age. This is about to change, with smaller birth cohorts entering working-age from now on. This change is the result of persistent low levels of fertility and increases in life expectancy.

In this demographic setting, how to react to foreseeable labour shortages and to accommodate the needs of an increasing number of older adults is a fundamental question. However, the population in Thailand is not only ageing, it is also becoming more educated, given past and ongoing shifts in educational attainment towards higher qualifications. This significant change can have far-reaching positive implications for future labour supply and health outcomes.

While the government should begin to pay attention on creating quality and productive jobs and developing labour market infrastructure and governance for more-educated labour of the future, the recommendations listed below aim at strengthening the health, well-being and employability

[8] Thailand: ILO Social Protection Platform.

https://www.social-protection.org/gimi/gess/ShowCountryProfile.action?iso=TH Accessed on March 2023.

of older adults so that they have the chance to remain healthy and active in the labour market. This is where the focus of the third demographic dividend as defined by Ogawa et al. (2021) is set. Taking a broader perspective, as conceptualized by Fried (2016a, 2016b), being productive at an older age is not restricted to labour market attachment but includes a wide range of other engagements, for example volunteering. The recommendations overlap to a great deal, irrespective of which of the two definitions of the third demographic dividend is employed. Some points presented below are elaborated on from a broader perspective and in more detail by ESCAP (2022).

Strengthen social protection and public health throughout the life cycle

While economic growth in Thailand has created a large number of employment opportunities in the past decades, many of them have been in the informal economy. In order to prepare workers for longer productive working lives, it will be crucial to transition towards more decent jobs that provide universal social protection throughout the life cycle. The amendment to Section 40 of the Social Security Act in 2020 extended social protection to informal workers aged 60-65 years old who were previously not covered under the act. Nonetheless, only approximately 60% of informal workers, equivalent to 10.7 million workers, are insured under Section 40 as of May 2022[9]. Therefore, redesigning Section 40 of the Social Security Act to better accommodate the diverse needs of the workforce, such as by increasing and adjusting social security benefits, is necessary.

Affordable health-care systems are a core component of social protection and a key prerequisite for maintaining health throughout the life cycle and for healthy ageing. While health is a crucial aspect of well-being of older persons, providing individuals with access to affordable and quality health care at any stage of the life cycle has strong implications for populations overall and for maximizing the third demographic dividend. Thailand has implemented a universal healthcare system to ensure access to healthcare services for all citizens, including the Universal Coverage Scheme (UCS), Civil Servant Medical Benefit Scheme (CSMBS), and Social Health Insurance Scheme (SHI), which offer varying reimbursement rates. The differences in payment mechanisms may result in disparities in healthcare service and treatment utilization among patients covered

[9] https://www.thaigov.go.th/news/contents/details/54360

by different medical schemes. Therefore, harmonizing payment mechanisms is necessary to ensure equitable distribution of health outcomes in the provision of medical care.

Based on observations in other countries, increases in educational attainment have been associated with decreases in informal and increases in formal employment. This general trend should also apply to Thailand. Still, this is not an automatic process but requires supporting social and labour market policies. As has been shown, age-specific shares of informal employment have been on the decline in Thailand for all ages, except for workers aged 60 years and older. Thailand has relatively high levels of labour force participation among older adults as it is. While there is still room to increase it, the crucial points are how to increase the share of older workers that work in the formal economy with social security coverage.

Promote life-long education and training

High-quality education and life-long learning will promote older adults' employability. Focusing on education at the beginning of the life-course, a recent assessment of Thailand's education system concluded that improvements are particularly needed when it comes to accessibility to schooling, the training of teachers and the competitiveness of higher education institutions (Vandeweyer et al., 2021). In addition to differences in access to education between urban and rural areas, access to education for students from disadvantaged backgrounds should be improved further, starting at pre-primary education.

With ongoing labour market changes like digitalization and the transition towards green economies, it is of utmost importance to equip persons of any age with up to date education and training that prepares them for labour markets with quickly changing skill demands. The fact that Thailand still has a large share of its workforce engaged in the informal economy requires that education and training policies are designed for both groups, formal and informal workers. In order to make investments in older workers' skills more attractive, some countries have started to reduce the cost of such training for employers. On the employees' side, targeted career counselling can support workers in their decisions to invest in education and training (OECD, 2019). Both measures can lead to longer working lives. As described in section 6, Thailand has already taken actions in various areas to promote life-long education and training, some of which focus on older persons (e.g. elderly schools for re- and up-skilling and courses at higher education institutions that cater towards older persons).

Remove barriers to work

There are various existing barriers to remain in or to take up paid work. Discrimination based on age (ageism) or other characteristics of workers hinders access to employment opportunities and needs to be abolished. Employers need to be better educated about the advantages of older workers' decades of experience and expertise. The extension of working lives in the context of population ageing requires both the improvement of incentives to work from the worker's perspective (e.g. by the provision of age-friendlier work places) and the removal of barriers to retain and hire older workers from the employer's perspective (e.g. the removal of seniority-based pay schemes; in Asia, the Republic of Korea and Japan are among the countries that are reforming wage-setting practices). Examples of policies to address labour market issues of population ageing, including the removal of barriers to work, in ASEAN+6 countries comprise various legal formats: strategies, (action) plans, laws, regulations and acts (ILO, 2019).

In the case of Thailand, barriers to work from the perspective of older workers include care responsibilities for family members, health problems and age discrimination (Moroz et al., 2021). For those in formal employment, contributory pension schemes can offer incentives to leave the labour market. For this group of workers, raising the retirement age can lead to the extension of working lives.

Take a life-cycle approach

The call to take a life-course approach applies to all policy areas that are touched upon when preparing Thailand's workers for longer working lives in good health and is a central element of MIPAA. Since advantages but also disadvantages accumulate over the life cycle, the social and economic situation of older persons is largely the result of what occurred earlier in their lives, starting from childhood and throughout working ages. For example, social protection during working age is crucial for older persons' health status, their income situation and the possible extension of working lives. Since life cycles of men and women differ when it comes to, for example, the amount of paid and unpaid work they perform, their abilities and possibilities for continued work at advanced ages can differ as well. Taking these differences in life-course trajectories of men and women into account when designing policies for ageing populations can improve empowerment and well-being of women, not just at older ages but already earlier in their life cycle.

A modified version of the traditional life-cycle model that is more practical for actual policy making has been suggested and applied to the Thai context by UNFPA (2021). It is more holistic than the traditional approach and builds upon experiences in climate science. As in a climate science model, policies relating to adaptation, mitigation and resilience are at the core of this framework. Adaptation refers to any action that improves the well-being of persons of any age in need today. Mitigation, on the other hand, refers to those that are already ageing and has the objective to improve their well-being and situation overall. This can have positive effects for e.g. the levels of dependency in the Thai population. Finally, resilience describes the long-term capability of individuals and society to better deal with ageing and focuses on the early phases of life. Key for strengthening resilience early on are investments in human capital (education and health), investments that will pay-off later during working life and into old age. All three of these concepts have the potential to address the special needs and situation of sub-groups of the population, be it demographically, socio-economically or geographically.

REFERENCES

Abío, G., Patxot, C., Sanchez-Romero, M., & Souto, G. (2017). The welfare state and demographic dividends. *Demographic Research*, *36*, Article 48, 1453–1490. https://doi.org/10.4054/DemRes.2017.36.48

Bloom, D. E., Humair, S., Rosenberg, L., Sevilla, J. P., & Trussell, J. (2013). *A Demographic Dividend for Sub-Saharan Africa: Source, Magnitude, and Realization*. Iza Discussion Papers (No. 7855). Bonn. Institute of Labor Economics (IZA). http://hdl.handle.net/10419/90049

Chansarn, S. (2009). *A capitalization of demographic dividend: A cross-study empirical study (in Thai)* [Doctoral Dissertation]. Chulalongkorn University, Bangkok, Thailand.

Chansarn, S. (2012). Active ageing of Thai elderly people, the demographic dividends and Thailand's economic prospect in an ageing society. *Srinakharinwirot Research and Development*, *4*(7), 201–214.

Cheung, S. L. K., Yip, P., Chi, I., Golini, A [Antonio], & Robine, J.-M. (2004, May 10). *Change in demographic window in low fertility countries*. Beijing, China.

Coile, C., Milligan, K., & Wise, D. A. (2017). Health Capacity to Work at Older Ages: Evidence from the United States. In D. A. Wise (Ed.), *Social Security Programs and Retirement around the World: The Capacity to Work at Older Ages* (pp. 359–394). University of Chicago Press. http://www.nber.org/chapters/c13749

UN DESA PD. (2004). *World Population to 2300*. New York. United Nations, Department of Economic and Social Affairs, Population Division.

UN DESA PD. (2013). *Measuring and Analysing the Generational Economy: National Transfer Accounts Manual*. New York. United Nations, Department of Economic and Social Affairs.

UN DESA PD. (2022). *World Population Prospects: The 2022 Revision*. New York. United Nations, Department of Economic and Social Affairs, Population Division.

Dufrénot, G. (2018). *The Third Demographic Dividend: Measuring the" demographic Tax" in the Arab Countries in Transition*. Working Papers 2018-15. CEPII research center.

ESCAP. (2022). *The future of work in the context of population ageing in Asia and the Pacific.* Economic and Social Commission for Asia and the Pacific, United Nations.

Fried, L. P. (2016a). Building a Third Demographic Dividend: Strengthening Intergenerational Well-Being in Ways That Deeply Matter. *Public Policy & Aging Report*, *26*(3), 78–82. https://doi.org/10.1093/ppar/prw015

Fried, L. P. (2016b). Investing in Health to Create a Third Demographic Dividend. *The Gerontologist*, *56*(2), 167-77. https://doi.org/10.1093/geront/gnw035

Golini, A [A.]. (2004, May 10). *A domestic and an international view from a demographic window*. Beijing, China.

Hammer, B., Prskawetz, A., & Freund, I. (2015). Production activities and economic dependency by age and gender in Europe: A cross-country comparison. *The Journal of the Economics of Ageing*, *5*, 86–97. https://doi.org/10.1016/j.jeoa.2014.09.007

ILO. (2014). *Equality and discrimination*. Bangkok. ILO Country Office for Thailand, Cambodia and Lao PDR. https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/publication/wcms_239483.pdf

ILO. (2019). *Preparing for the future of work: national policy responses in ASEAN+ 6*. Bangkok, Thailand. Regional Economic and Social Analysis Unit; International Labour Organization (ILO). https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---sro-bangkok/documents/publication/wcms_717736.pdf

ILO & OECD. (2019). *Work in G20 countries: Progress and Policy Action since 2018. A paper prepared under the Japan's G20 presidency meeting, 22-24 April 2019, Tokyo, Japan.* https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_713373.pdf

Jain, N., & Goli, S. (2022). Potential demographic dividend for India, 2001 to 2061: A macro-simulation projection using the spectrum model. *SN Social Sciences*, *2*(9), 171. https://doi.org/10.1007/s43545-022-00462-0

Komine, T., & Kabe, S. (2009). Long-term Forecast of the Demographic Transition in Japan and Asia. *Asian Economic Policy Review*, *4*(1), 19–38. https://doi.org/10.1111/j.1748-3131.2009.01103.x

Mason, A [Andrew]. (2007). Demographic Dividends: The Past, the Present, and the Future. In A. Mason & M. Yamaguchi (Eds.), *Contributions to Economic Analysis. Population Change, Labor Markets, and Sustainable Growth - Towards a New Economic Paradigm* (Vol. 281, pp. 75–98). Elsevier. https://doi.org/10.1016/S0573-8555(07)81004-2

Matsukura, R., Shimizutani, S., Mitsuyama, N., Lee, S.-H., & Ogawa, N. (2018). Untapped work capacity among old persons and their potential contributions to the “silver dividend” in Japan. *The Journal of the Economics of Ageing*, *12*, 236–249. https://doi.org/10.1016/j.jeoa.2017.01.002

Misra, R. (2015). Impact of Demographic Dividend on Economic Growth. *International Studies*, *52*(1-4), 99–117. https://doi.org/10.1177/0020881717714685

Moreland, S., Madsen, E. L., Kuang, B., Hamilton, M., Jurczynska, K., & Brodish, P. (2014). *Modeling the Demographic Dividend: Technical Guide to the DemDiv Model*. Washington, D.C.

Moroz, H. E., Naddeo, J. J., Ariyapruchya, K., Jain, H., Glinskaya, E. E., Lamanna, F., Laowong, P., Nair, A., Palacios, R. J., Tansanguanwong, P., Viriyataveekul, S., Walker, T., & Yang, J. (2021). *Aging and the Labor Market in Thailand : Labor Markets and Social Policy in a Rapidly Transforming and Aging Thailand (English)*. Washington, D.C. World Bank Group. http://documents.worldbank.org/curated/en/428491622713258312/Aging-and-the-Labor-Market-in-Thailand-Labor-Markets-and-Social-Policy-in-a-Rapidly-Transforming-and-Aging-Thailand

The National Council for Population and Development and Health Policy Project. (2014). *Demographic dividend opportunities for Kenya: Results from the DEMDIV Model*. https://www.healthpolicyproject.com/pubs/384_KenyaDemDivBrief.pdf

NESDC News. (2022). *Thailand Social’s Outlook of Q2/2022*. https://www.nesdc.go.th/nesdb_en/article_attach/article_file_20220826093526.pdf

OECD. (2019). *Working Better with Age, Ageing and Employment Policies.* OECD Publishing, Paris. https://doi.org/10.1787/c4d4f66a-en.

Ogawa, N. (2009). Comment on “Long-term Forecast of the Demographic Transition in Japan and Asia”. *Asian Economic Policy Review*, *4*(1), 39–42. https://doi.org/10.1111/j.1748-3131.2009.01104.x

Ogawa, N., Chawla, A., & Matsukura, R. (2009). Some New Insights into the Demographic Transition and Changing Age Structures in the ESCAP Region. *Asia-Pacific Population Journal*, *24*(1), 87.

Ogawa, N., Mansor, N., Lee, S.-H., Abrigo, M. R., & Aris, T. (2021). Population Aging and the Three Demographic Dividends in Asia. *Asian Development Review*, *38*(1), 32–67. https://doi.org/10.1162/adev_a_00157

Oosthuizen, M., & Magero, J. (2021). *Modelling the Demographic Dividend: A Review of Methodologies.* UNFPA, DPRU and AFIDEP.

Sánchez-Romero, M., Abio, G., Patxot, C., & Souto, G. (2018). Contribution of demography to economic growth. *SERIEs*, *9*(1), 27–64. https://doi.org/10.1007/s13209-017-0164-y

Stover, J. (2005). *AIM: A Computer Program for Making HIV/AIDS Projections and Examining the Demographic and Social Impacts of AIDS: Spectrum System of Policy Models*. Washington, D.C. Futures Group International.

Thaiprasert, N., Leurcharusmee, S., Jatukannyaprateep, P., & Sirisrisakulchai, J. (2020). Determinants of Labor Force Participation and Wages in Thailand: What is the Role of the Informal Sector? *Asian Economic Journal*, *34*(3), 301–326. https://doi.org/10.1111/asej.12219

UN. (2002). *Political Declaration and Madrid International Plan of Action on Ageing*. Second World Assembly on Ageing, Madrid, Spain. 8-12 April. New York. United Nations.

UNFPA. (2021). *Comprehensive Policy Framework: A Life-cycle Approach to Ageing in Thailand 2021*. Bangkok. https://thailand.unfpa.org/en/life-cycle-approach

Vandeweyer, M., Espinoza, R., Reznikova, L., Lee, M., & Herabat, T. (2021). *Thailand's education system and skills imbalances: assessment and policy recommendations* (ECO/WKP(2020)49).

WHO. (2020). *Decade of Healthy Ageing 2020–2030.* World Health Organization.

Wittgenstein Centre for Demography and Global Human Capital. (2018). *Wittgenstein Centre Data Explorer Version 2.0*. http://www.wittgensteincentre.org/dataexplorer

Wongboonsin, K [K.], Wongboonsin, P., & Piromsawat, P. (forthcoming). Thailand's Phase 3 Demographic Dividend: Opportunities from an Aging Society Created by Behavioral Economics.

Wongboonsin, K [Kua], Guest, P., & Prachuabmoh, V. (2005). Demographic change and the demographic dividend in Thailand. *Asian Population Studies*, *1*(2), 245–256. https://doi.org/10.1080/17441730500317493

Wongboonsin, P. (2010). Fertility decline: Implications on the second demographic dividend in the era of risk society (in Thai). *Journal of Demography*, *26*(2).

APPENDIX

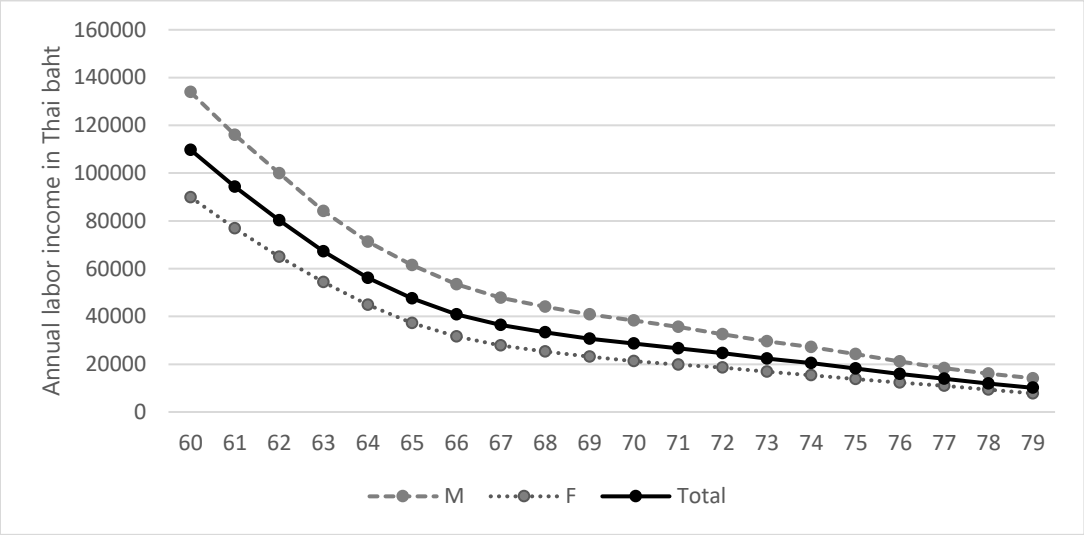
Table S-1 Estimated logistic regression results, individuals aged 50-59, pooled 3 surveys (2011, 2014, 2017) (N=80,081)

Explanatory variables	Male			Female		
	β	OR	Z-value	β	OR	Z-value
Educations (%)						
Some primary	--	--	--	--	--	--
Primary	-0.145	0.865	-1.58	-0.045	0.956	-0.97
Secondary	-0.443	0.642	-5.25***	-0.180	0.835	-3.36**
Bachelor	-0.586	0.557	-5.05***	0.416	1.516	5.95***
Marital status (%)						
Currently not married	--	--	--	--	--	--
Currently married	1.127	3.086	15.17***	0.075	1.078	1.92
Region (%)						
Bangkok	--	--	--	--	--	--
Central	0.214	1.238	2.06*	0.389	1.476	6.17***
North	0.900	2.460	7.80***	0.965	2.624	14.86***
Northeast	1.129	3.091	9.91***	1.279	3.594	19.43***
South	1.111	3.036	8.98***	0.688	1.989	10.05***
Self-rated health status (%)						
Excellent	0.869	2.386	5.91***	0.231	1.260	2.69**
Good	0.551	1.734	7.54***	0.254	1.290	6.72***
Fair	--	--	--	--	--	--
Poor	-1.077	0.341	-9.38***	-0.504	0.604	-7.54***
Very poor	-2.184	0.113	-6.96***	-0.964	0.381	-4.75***
Functional limitations						
Lifting	-1.028	0.358	-6.66***	-0.505	0.604	-8.25***
Squatting	0.194	1.214	0.88	-0.149	0.862	-1.58
Walking 200-300 meters	-0.448	0.639	-1.67	-0.365	0.694	-3.02**
Climbing 2 or 3 stairs	0.282	1.325	0.95	-0.013	0.987	-0.10
Taking bus or boat on own	-1.821	0.162	-10.85***	-0.803	0.448	-8.40***
Counting changes	-0.531	0.588	-2.58*	0.066	1.068	0.42
Sensory organs						
Vision	-0.131	0.878	-0.87	-0.199	0.820	-2.58*
Hearing	-0.355	0.701	-1.86	-0.285	0.752	-2.44*
Year of survey						
2011	--	--	--	--	--	--
2014	-0.054	0.948	-0.67	-0.061	0.941	-1.45

Explanatory variables	Male			Female		
	β	OR	Z-value	β	OR	Z-value
2017	-0.191	0.826	-2.35*	-0.233	0.792	-5.49***
Constant		3.585	10.17***		1.696	7.24***

Source: SOPT from 2011, 2014, and 2017. Authors' calculation.

Figure S- 1 Age-specific per-capita labour income for individuals aged 60-79 years, for total and by gender 2019, Thailand



Source: The 2013, 2017 and 2019 Thailand National Transfer Account Reports.

Table S- 2 Estimated linear regression results, individuals aged 60-79 years (N=2,304)

Explanatory	β	SE	P-Value
Education			
Some primary education	--	--	--
Primary education	0.061	0.043	0.151
Secondary education	0.458	0.062	0.000
Bachelor and over	1.485	0.113	0.000
Age	-0.028	0.005	0.000
Sex			
Men	--	--	--
Women	-0.309	0.034	0.000
Region			
Bangkok	--	--	--
Central	-0.235	0.059	0.000
North	-0.447	0.061	0.000
Northeast	-0.422	0.067	0.000
South	-0.705	0.066	0.000
Area			
Urban	--	--	--
Rural	-0.080	0.034	0.019
Work status			
Government officers	--	--	--
State enterprise	0.287	0.304	0.344
Private employee	-0.195	0.060	0.001
Many contractors	-0.475	0.063	0.000
Constant	**6.043**	**0.331**	**0.000**

Source: LFS from 2019. Authors' calculation

Table S- 3 Estimated hourly wage by educational level based on linear regression results.

	Some primary education	Primary education	Secondary education	College and over
Men	47	51	77	214
Women	35*	38*	58	166

Note *In the simulation results used the minimum wage of 45 Baht per hour.

Table S- 4 Characteristics of older samples, 2017

Explanatory variables	Men	Women
Sex (%)		
Female	45.80%	54.20%
Educations (%)		
Some primary	45.50%	56.60%
Primary	19.70%	17.50%
Secondary	24.40%	15.90%
Bachelor	10.30%	10.00%
Marital status (%)		
Currently not married	13.60%	25.40%
Currently married	86.40%	74.60%
Region (%)		
Bangkok	12.20%	11.80%
Central	27.40%	27.80%
North	19.60%	20.10%
Northeast	28.70%	28.40%
South	12.10%	11.80%
Self-rated health status (%)		
Excellent	8.60%	6.10%
Good	63.80%	59.90%
Fair	23.70%	29.40%
Poor	3.60%	4.20%
Very poor	0.30%	0.40%
Lifting 5 kg. (%)		
Cannot do	2.90%	7.80%
Can do	97.10%	92.20%
Squatting (%)		
Cannot do	2.00%	4.00%
Can do	98.00%	96.00%
Walking 200-300 meters (%)		
Cannot do	1.70%	2.40%
Can do	98.30%	97.60%
Climbing 2 or 3 stairs (%)		
Cannot do	1.50%	2.10%
Can do	98.50%	97.90%
Taking bus or boat on own (%)		
Cannot do	2.10%	2.80%
Can do	97.90%	97.20%
Counting changes (%)		
Cannot do	1.00%	0.90%
Can do	99.00%	99.10%

Explanatory variables	Men	Women
Eyesight (%)		
Not good	2.30%	3.10%
Good	97.70%	96.90%
Hearing (%)		
Not good	1.10%	1.20%
Good	98.90%	98.80%
Work status (%)		
Currently not working	8.10%	25.30%
Currently working	91.90%	74.70%
Observations	13,037	15,406

Source: SOPT from 2017. Authors' calculation.