

Demographic Structural Change and Its Impact on Thailand's Aggregate Human Capital: Evidence From a Human Capital Valuation Method Toward a Super-aged Society

Narissara Charoenphandhu, Rangsit University, Thailand
Thoedsak Chomtohsuwan, Rangsit University, Thailand

The Asian Conference on the Social Sciences 2026
Official Conference Proceedings

Abstract

Human capital is a crucial driver of economic growth and national development. High-quality human resources, when appropriately supported in both quantitative and qualitative dimensions, contribute to improved quality of life and strengthen a country's capacity for sustainable development. However, Thailand has been an aging society since 2005 and has now entered a complete aged society, with a strong tendency to become a super-aged society in the near future. This situation reflects significant demographic structural change, particularly declining fertility and a shrinking share of the working-age population, which may affect the country's aggregate human capital. This study aims to examine the effects of demographic structural change on the human capital embodied in Thailand's labor force. It calculates the value of human capital across occupational groups in both social science and science fields, and compares past and current demographic structures in order to analyze the impact of population aging on the country's aggregate human capital. The findings indicate that Thailand's transition toward an aged society has affected the aggregate value of human capital in both social science and science occupations. In the initial stage, the country's overall human capital did not decline significantly and, in fact, tended to increase as older individuals remained economically active while younger cohorts continued to enter the labor market. Nevertheless, in the coming decade, the aggregate value of human capital is expected to decline in line with the contraction of the working-age population. These findings highlight the need for urgent public policy responses to address such changes, including fiscal measures and efforts to enhance labor productivity per worker, in order to promote human resource development and sustainable national development.

Keywords: human capital, labor force, demographic structural change, aging society, Thailand

iafor

The International Academic Forum
www.iafor.org

Introduction

Population plays a crucial role in the economy and national development. From an economic perspective, population constitutes human resources that form the country's labor force, and each individual embodies his or her own stock of human capital. If a country possesses high-quality human resources and promotes human capital appropriately in both quantitative and qualitative dimensions, this can lead to improved quality of life and enable human resources to serve as a key driving force for national progress.

However, due to various changes, including economic and social factors, demographic structure has also changed. Thailand entered an aged society in 2005. In 2023, Thailand recorded its highest population at 71,702,435 people, which was also the year in which the country entered a complete aged society, with the population aged 60 years and over exceeding 20% of the total population. Thailand is expected to become a super-aged society in 2033. If Thailand's fertility rate continues to decline, this situation may imply more than a simple reduction in population size; it also raises concerns regarding human resources, human capital, aggregate consumption, and the country's overall development potential.

This study therefore aims to examine the effects of demographic structural change on the human capital embodied in Thailand's labor force. Specifically, it calculates the value of human capital across occupational groups in both the social science and science fields, and compares past and current demographic structures in order to analyze the effects of Thailand's current aged-society status, declining fertility, and the resulting changes in the proportion and number of working-age people, all of which affect the country's aggregate human capital.

Human capital is a key component of economic development because it reflects the knowledge, skills, health status, and productive capacity of the population, all of which are directly linked to economic growth, employment, and national competitiveness (Becker, 1964; Schultz, 1961; World Bank, n.d.). However, the accumulation of human capital does not occur independently of demographic structural change. Declining fertility and population aging inevitably affect the size and proportion of the working-age population in the long run. A report by NESDB and UNFPA indicates that a sustained decline in fertility leads to an increase in the elderly population, while the share of the working-age population declines, which may adversely affect economic growth unless policies are implemented to enhance labor productivity and invest in human capital (NESDB & UNFPA Thailand, 2011).

In Thailand, the demographic transition has occurred rapidly. The country has been classified as an aging society since 2005 and is expected to move toward a super-aged society in the coming decade. Paitoonpong noted that Thailand entered a complete aged society in 2023, when the population aged 60 years and over accounted for 20% of the total population, and that the country is moving toward super-aged society status in the future (Paitoonpong, 2023; World Health Organization, 2023).

Within this context, evaluating the country's aggregate human capital has become increasingly important. Although workers in certain age groups may still possess high levels of experience and productivity, if the total labor force continues to decline, the aggregate value of national human capital may also slow down or decrease. This study therefore seeks to analyze Thailand's aggregate human capital during its peak period, the present period, and the future period under demographic structural change, and to propose policy directions to mitigate the

decline in human capital in the era of a super-aged society, drawing on the human capital return data reported in Chomtohsuwan (2016).

Objectives

- (1) To analyze Thailand's aggregate human capital in the context of demographic structural change toward an aging society.
- (2) To propose policy measures to address and mitigate the decline in Thailand's human capital in the era of a super-aged society.

Literature Review

As many countries around the world transition into aging societies, a growing body of research, both in Thailand and internationally, has focused on human capital, demographic structural change, declining fertility, and population aging.

Human Capital and Its Economic Importance

The concept of human capital is a fundamental framework in economics used to explain how individuals' knowledge, skills, education, training, and experience constitute economic resources that can enhance productivity, earnings, and national growth. Schultz laid the foundation for this perspective by proposing that investment in people, such as education and health, should be viewed as an "investment" rather than mere consumption. Becker further systematized human capital theory by arguing that education and training affect earnings, employment, and differences in returns among individuals. Mincer, in turn, demonstrated the empirical relationship between education, experience, and earnings, which later became a cornerstone of economic analyses of returns to human capital (Becker, 1964; Mincer, 1974; Schultz, 1961).

At the macroeconomic level, human capital is important not only for individual labor productivity, but also for a country's growth potential, competitiveness, and long-term development. Therefore, when a country faces demographic structural change that reduces the size of its labor force, the key question is not merely whether labor becomes "more qualified," but also whether the country can maintain its aggregate stock of human capital.

Approaches to Measuring Human Capital

The literature on human capital measurement has evolved through several approaches, which can generally be classified into index-based, cost-based, and income-based methods. Among income-based approaches, the lifetime income approach has received considerable attention because it attempts to estimate the value of human capital from the present value of expected future labor income. The OECD suggests that this approach is suitable for cross-country and intertemporal comparisons, as it can systematically incorporate demographic structure, age, sex, education, life expectancy, and labor market experience into the measurement framework (Jorgenson & Fraumeni, 1989, 1992; Liu, 2011, 2014).

However, the lifetime income approach generally requires extensive data and involves substantial methodological complexity, particularly in forecasting future earnings, determining discount rates, and separating the components of labor market experience. Consequently, in the context of developing countries, some studies adopt simpler estimation methods, such as using

the average returns of workers by occupational group or educational level as the basis for calculating aggregate human capital. Although such methods may not capture all dimensions of human capital, they offer the practical advantage of being more easily linked to annual labor data and of allowing clearer tracking of macro-level trends over time.

Demographic Structural Change and Human Capital

The literature on demographic structural change suggests that declining fertility and population aging affect the economy through multiple channels, including labor force size, dependency ratios, savings, investment, and human capital. Lee and Mason argue that during demographic transition, a decline in fertility may allow households and governments to invest more in human capital per child, reflecting the quantity–quality trade-off. In other words, a smaller number of children may be associated with higher human capital per person. Nevertheless, this mechanism may compensate for the effects of population aging only partially and may not be sufficient in the long run (Lee & Mason, 2010).

On the other hand, studies on the economic effects of population aging show that aging affects not only the contraction of the labor force, but also labor productivity. Maestas, Mullen, and Powell found that an increase in the share of the population aged 60 and over is associated with a decline in GDP per capita. Approximately one-third of this effect is attributable to slower employment growth, while around two-thirds results from slower labor productivity growth. These findings reinforce the argument that the assessment of aggregate human capital in an aging society should consider both the quantitative dimension of labor force size and the qualitative dimension of productivity (Maestas et al., 2023).

Thailand's Context: Aging Society, Labor Market, and Risks to Aggregate Human Capital

In the case of Thailand, the work of NESDB and UNFPA indicates that demographic change has broad implications for education, labor force participation, migration, and public health. Thailand has already entered a stage in which changes in the population age structure have become a clear long-term policy issue.

Recent studies on Thailand also consistently suggest that the country entered a complete aged society in 2023, based on the criterion that the population aged 60 years and over accounts for 20% of the total population, and that it is moving toward becoming a super-aged society in the coming decade. Although the exact year may differ depending on the criterion applied, such as age 60 and over or age 65 and over, the literature converges on the conclusion that Thailand's demographic structure is shifting in a direction that reduces the share of the working-age population while continuously increasing the old-age dependency burden (NESDC, 2025; Paitoonpong, 2023).

With regard to the labor market, the World Bank points out that Thailand's labor force has been declining continuously. Between 2012 and 2019, the labor force shrank by more than 1.2 million people. If age- and sex-specific labor force participation rates remain unchanged, demographic change is projected to reduce Thailand's labor force by approximately 14.4 million people between 2020 and 2060. In addition, the share of the working-age population is expected to decline from 71% in 2020 to 56% in 2060, which has unavoidable implications for aggregate human capital at the national level. Nonetheless, the World Bank also emphasizes that the negative effects of population aging are not inevitable if policies are introduced to

extend working lives, increase female labor force participation, manage migrant labor more effectively, promote lifelong learning, and enhance labor productivity per worker (World Bank, 2021).

Research Gap and Relevance of the Present Study

Although the existing literature has explained quite clearly the relationship between population aging and economic growth, labor force dynamics, and productivity, relatively few studies have assessed Thailand's aggregate human capital on an annual basis under demographic structural change. This is particularly true for studies that link the average human capital value of workers in different occupational groups with the actual number of workers in each year in order to examine trends in the country's aggregate human capital.

In this respect, Chomtohsuwan (2016) is particularly important because it provides data on net human capital returns by occupational group, which can serve as a basis for estimating the human capital value of Thai workers at the macroeconomic level. However, that study did not directly aim to assess the effects of demographic structural change on Thailand's aggregate human capital. The present study therefore seeks to fill this gap by adjusting average human capital values to constant 2023 prices and linking them with the number of workers in each year in order to analyze Thailand's aggregate human capital during its peak period, the present period, and the future period under the context of the transition toward a super-aged society.

Methodology

This study employs an annual estimation approach to measure Thailand's aggregate human capital, comparing three benchmark years: 2005, 2023, and 2033. These years correspond to Thailand's transition into an aged society, a complete aged society, and a super-aged society, respectively.

Aggregate human capital is calculated as the sum of the human capital values of all individuals in the labor force, excluding those outside the labor force. The average human capital value per worker, classified into social science and science occupational groups, is based on the net total returns to human capital reported in Chomtohsuwan (2016). These values are then adjusted into constant 2023 prices. The inflation-adjusted human capital value is multiplied by the number of workers in each occupational group for each selected year, and the resulting values are summed to obtain Thailand's aggregate human capital for each year. The results are subsequently compared across the peak period, the current period, and the future period in order to analyze the effects of Thailand's demographic structural change in the transition toward a super-aged society. The estimation is expressed as follows:

$$HC_{j,2023} = HC_{j,base} \times \frac{PriceIndex_{2023}}{PriceIndex_{base}} \quad (1)$$

$$THC_t = \sum_{j=1}^n HC_{j,2023} \times LF_{j,t} \quad (2)$$

Where:

$HC_{j,2023}$ is the average human capital value of workers in occupational group j , expressed in constant 2023 prices

$LF_{j,t}$ is the number of workers in occupational group j in year t
 THC_t is Thailand's aggregate human capital in year t

This study classifies occupational fields based on Thailand's STEM education framework as follows. The Non-STEM (social science) group consists of unskilled workers, basic workers, public relations specialists, accountants, human resource specialists, transport specialists, economists, architects, and lawyers. The STEM (science) group consists of scientists, medical technologists, nutritionists, computer specialists, nurses, engineers, pharmacists, dentists, and physicians.

Results and Discussion

The estimated human capital values for the Non-STEM (Social science) and STEM (Science) groups are presented in Table 1. The results show that the average net total return to human capital in the Non-STEM group was 8,222,714.78 baht, whereas the corresponding average in the STEM group was 24,000,490.89 baht. This indicates that occupations in the STEM group have a substantially higher average human capital value than those in the Non-STEM group.

Estimates based on data from the National Statistical Office indicate that, in 2005, Thailand had a labor force of approximately 34.6745 million people, comprising about 2.8819 million STEM workers and 31.7926 million Non-STEM workers. In 2023, the labor force increased to approximately 39.6775 million people, including about 4.2446 million STEM workers and 35.4329 million Non-STEM workers. In other words, the share of STEM workers in Thailand's labor force increased from approximately 8.31% in 2005 to 10.70% in 2023, while the share of Non-STEM workers declined from 91.69% to 89.30%, respectively.

For the purpose of projection, this study defines a base scenario in which Thailand's labor force declines to approximately 36 million people in 2033, consisting of around 4.8564 million STEM workers (13.49%) and 31.1436 million Non-STEM workers (86.51%).

Table 1
Human Capital Values Adjusted to Constant 2023 Prices

Unit: Baht

Non-STEM (Social Science)		STEM (Science)	
Occupation	Human Capital Value	Occupation	Human Capital Value
Unskilled workers	2,138,991	Scientists	10,091,041
Basic workers	4,347,560	Medical technologists	10,668,076
Public relations specialists	6,314,718	Nutritionists	11,675,803
Accountants	6,796,180	Computer specialists	14,683,863
Human resource specialists	6,866,818	Nurses	15,341,184
Transport specialists	9,660,267	Engineers	15,959,016
Economists	10,815,238	Pharmacists	17,476,664
Architects	13,263,684	Dentists	57,556,258
Lawyers	13,800,977	Physicians	62,552,513

The results indicate that Thailand's labor-force human capital was approximately 330.5885 trillion baht in 2005, increased to 393.2271 trillion baht in 2023, and is projected to decline to 372.6409 trillion baht in 2033 under the base scenario. This decline is projected to occur despite the increase in the share of STEM workers to 13.49%, suggesting that the rising proportion of higher-value STEM labor may not be sufficient to offset the overall contraction in the labor force.

Table 2

Thailand's Human Capital in 2005, 2023, and 2033 at Constant 2023 Prices

Year	Total Labor Force (million persons)			Human Capital (trillion baht)		
	Total	STEM	Non-STEM	STEM	Non-STEM	Total
2005	34.6745	2.8819	31.7926	69.1670	261.4215	330.5885
2023	39.6775	4.2446	35.4329	101.8725	291.3546	393.2271
2033 (Base scenario)	36.0000	4.8564	31.1436	116.5560	256.0849	372.6409

Discussion

The findings of this study clearly demonstrate that demographic structural change has affected Thailand's human capital in both quantitative and structural terms. Between 2005 and 2023, the country's aggregate human capital increased, even though Thailand had already entered an aging society in 2005. During this period, Thailand still maintained a relatively large labor force and continued to benefit from a demographic structure that had previously been characterized by a large working-age population. As a result, the aggregate value of human capital was still able to expand. This finding is consistent with the literature suggesting that, in the early stage of demographic transition, countries may continue to benefit from the demographic dividend, while declining fertility may create opportunities for greater investment in human capital per person during certain periods (Lee & Mason, 2010; NESDB & UNFPA Thailand, 2011).

However, the calculations in this study indicate that, under the base scenario for 2033, although the share of workers in science and technology-related fields (STEM) is projected to increase to 13.49%, the country's aggregate human capital is expected to decline compared with 2023 because the total labor force is projected to shrink to approximately 36 million people. This finding suggests that an improvement in the "structural quality" of the labor force is not sufficient to fully offset the "quantitative contraction" of the total labor force. In other words, although average human capital per worker may increase, the country's aggregate human capital can still decline if the overall labor force base continues to shrink. This is a particularly important issue in the context of a super-aged society.

This finding is also consistent with empirical evidence from the international literature indicating that population aging affects the economy not only through the size of the labor force, but also through labor productivity. Maestas, Mullen, and Powell found that an increase in the share of the population aged 60 years and over is associated with slower growth in GDP

per capita, resulting from both weaker employment growth and slower labor productivity growth. The present study therefore supports the view that the effects of population aging should be assessed in terms of a country's aggregate human capital rather than only the quality of individual workers or the proportion of highly skilled labor.

When considered in the Thai context, these findings become even more significant. Thailand entered a complete aged society in 2023 and is expected to move toward a super-aged society in the coming decade. At the same time, the World Bank has reported that, if age- and sex-specific labor force participation rates remain unchanged, demographic structural change could reduce Thailand's labor force by as much as 14.4 million people between 2020 and 2060. Therefore, the finding of this study that the country's aggregate human capital may decline by 2033 is not merely a case-specific estimate, but is broadly consistent with the demographic and labor market trends identified by both national and international sources.

From a policy perspective, the findings suggest that Thailand should not focus solely on increasing the share of STEM workers. Although such measures are important for improving labor productivity and raising human capital per worker, the country will continue to face the risk of declining aggregate human capital if the total labor force continues to contract. Appropriate policy responses should therefore involve a "policy mix," including improving labor quality through education and lifelong learning, expanding labor force participation among women and older persons, extending working lives in a productive and meaningful way, enhancing productivity among Non-STEM workers, and managing migrant labor more effectively. These approaches are consistent with the World Bank's recommendations regarding Thailand's labor market in an aging society.

In another sense, this study suggests that Thailand's main challenge in the coming years may not simply be that it has "too few STEM workers," but rather that "the total labor force is shrinking faster than improvements in the quality of some workers can compensate for." Therefore, if Thailand aims to preserve its aggregate human capital over the long term, it will need to adopt integrated policies spanning population, labor, education, and productivity, rather than relying on any single policy instrument in isolation.

Nevertheless, several limitations of this study should be acknowledged. First, the estimation of aggregate human capital is based on the average human capital values of two broad labor groups, namely STEM and Non-STEM. While this approach provides a clear macro-level picture, it does not fully capture variations within individual occupations. Second, the 2033 estimate is based on a base scenario that relies on assumptions regarding labor force size and the STEM/Non-STEM composition. If significant changes occur in policies, technology, or employment patterns in the future, these estimates may also change. Future research should therefore develop multiple scenarios, such as optimistic, base, and pessimistic scenarios, in order to examine the sensitivity of aggregate human capital under different demographic and labor market trajectories.

Conclusions and Policy Implications

The findings of this study indicate that Thailand's demographic structural change has had significant implications for the country's aggregate human capital. Between 2005 and 2023, aggregate human capital increased from approximately 330.59 trillion baht to 393.23 trillion baht at constant 2023 prices. This suggests that Thailand continued to benefit from a relatively large labor force base during its transition into an aging society. However, under the base

scenario for 2033, although the share of science and technology-related workers (STEM) is projected to rise to 13.49%, the country's aggregate human capital is expected to decline to approximately 372.64 trillion baht, due to a contraction of the total labor force to around 36 million people. These findings suggest that an increase in the proportion of highly skilled workers alone is not sufficient to fully offset the long-term effects of a shrinking overall labor force.

This conclusion is consistent with Thailand's broader demographic trajectory, as the country entered a complete aged society in 2023 and is expected to move toward a super-aged society in the coming decade. At the same time, World Bank estimates indicate that the share of Thailand's working-age population is projected to decline from 71% in 2020 to 56% in 2060, and that, under baseline assumptions, Thailand's labor force may shrink by as much as 14.4 million people between 2020 and 2060. The estimates produced in this study are therefore broadly consistent with the larger pattern of demographic and labor market transformation in Thailand.

Another important finding is that, although aggregate human capital is projected to decline after 2023, average human capital per worker is expected to increase. This reflects a gradual shift in Thailand's labor structure toward a higher proportion of workers with greater average human capital value, particularly in the STEM group. This pattern is consistent with the literature suggesting that, during demographic transition, a decline in population size may occur simultaneously with improvements in the quality of human capital per person. However, at the national level, gains in average quality may still be insufficient if the overall labor force contracts too rapidly.

In summary, this study suggests that Thailand's major challenge in the era of a super-aged society may not simply be a shortage of STEM workers, but rather the growing pressure on the country's aggregate human capital resulting from the decline in the total labor force. Sustaining Thailand's long-term growth potential will therefore require not only improvements in labor quality, but also efforts to slow the contraction of the labor force base.

Policy Implications

The first policy implication is that Thailand should shift its perspective from developing human capital only at the individual level toward preserving and strengthening the country's aggregate human capital. Policies aimed solely at increasing the share of STEM workers or expanding higher education, while important for improving individual productivity and earnings, will not be sufficient if the total labor force continues to decline. The government should therefore adopt integrated labor and population policies that address both the quantity and quality of human resources simultaneously.

Second, Thailand should accelerate efforts to expand labor force participation among groups whose productive potential remains underutilized, particularly older workers, women, and individuals who could re-enter the labor market through reskilling and upskilling. The World Bank has clearly suggested that Thailand can partially mitigate the pressures of population aging by extending working lives, increasing female labor force participation, promoting lifelong learning, and improving the management of migrant labor. Such measures would not only help sustain the size of the labor force, but also contribute to preserving the country's aggregate human capital in the long run.

Third, greater policy attention should be given to improving the productivity of Non-STEM workers alongside expanding the STEM workforce. Although the findings show that STEM workers have a substantially higher average human capital value, the majority of Thailand's labor force still remains in the Non-STEM group. Therefore, enhancing the productivity, digital skills, and adaptability of this much larger segment of the workforce could have a broader effect on aggregate human capital than increasing the number of STEM workers alone. This implication is consistent with the literature showing that the economic effects of population aging operate not only through labor supply, but also through labor productivity.

Fourth, in the long term, Thailand should adopt population and family policies aimed at slowing the contraction of the future labor force base. Although such policies do not produce immediate results, they are essential for maintaining the country's human capital potential over time. Demographic research has shown that fertility change is closely linked to human capital accumulation and long-term economic growth. Policies that support childbearing, reduce the costs of raising children, improve the quality of children's education and health, and create a family-friendly environment should therefore be regarded as part of human capital policy rather than as a separate policy domain.

Finally, the findings of this study support the need for more extensive scenario-based policy planning by the government. At a minimum, policymakers should consider optimistic, base, and pessimistic scenarios in order to assess the sensitivity of aggregate human capital to changes in labor force size, occupational structure, and labor productivity. Given that Thailand is undergoing a rapid demographic transition, relying on a single policy assumption may be insufficient for coping with uncertainty in the coming decades.

References

- Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. National Bureau of Economic Research.
- Chomtohsuwan, T. (2016). *The study of relationship between return on human capital and education: Thailand case study*. Rangsit University.
- Jorgenson, D. W., & Fraumeni, B. M. (1989). The accumulation of human and nonhuman capital, 1948–1984. In R. E. Lipsey & H. S. Tice (Eds.), *The measurement of saving, investment, and wealth* (pp. 227–282). University of Chicago Press.
- Jorgenson, D. W., & Fraumeni, B. M. (1992). The output of the education sector. In Z. Griliches (Ed.), *Output measurement in the service sectors* (pp. 303–341). University of Chicago Press.
- Lee, R., & Mason, A. (2010). Fertility, human capital, and economic growth over the demographic transition. *European Journal of Population*, 26(2), 159–182. <https://doi.org/10.1007/s10680-009-9186-x>
- Liu, G. (2011). *Measuring the stock of human capital for comparative analysis: An application of the lifetime income approach to selected OECD countries* (OECD Statistics Working Papers No. 2011/06). OECD Publishing.
- Liu, G. (2014). Measuring the stock of human capital for international and intertemporal comparisons. In D. W. Jorgenson, J. S. Landefeld, & P. Schreyer (Eds.), *Measuring economic sustainability and progress* (pp. 493–518). University of Chicago Press.
- Maestas, N., Mullen, K. J., & Powell, D. (2023). The effect of population aging on economic growth, the labor force, and productivity. *American Economic Journal: Macroeconomics*, 15(2), 306–332. <https://doi.org/10.1257/mac.20190196>
- Mincer, J. A. (1974). *Schooling, experience, and earnings*. National Bureau of Economic Research.
- National Economic and Social Development Board, & United Nations Population Fund Thailand. (2011). *Impact of demographic change in Thailand*. United Nations Population Fund Thailand.
- Paitoonpong, S. (2023). Promotion of active aging and quality of life in old age and preparation for complete aged society in Thailand. *TDRI Quarterly Review*, 38(3), 3–13.
- Schultz, T. W. (1961). Investment in human capital. *The American Economic Review*, 51(1), 1–17.
- World Bank. (2021). *Aging and the labor market in Thailand*. World Bank.
- World Health Organization. (2025, July 22). *Bueng Yitho: First Thai municipality to join the WHO Global Network for Age-friendly Cities and Communities*.

Contact email: narissara.c@rsu.ac.th