



# LINKAGES UNDERLYING THE INFLUENCE OF POPULATION AGEING ON ECONOMIC GROWTH AND POLICY IMPLICATIONS TO VIETNAM

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**Abstract:** This paper is in line with a literature review of the ageing society, economic growth to provide a deeper understanding of whether ageing population diminishes or enhances economic growth. Firstly, the paper presents the causes of the negative effects of population ageing on economic growth. The paper reveals that lower fertility, longer life expectancy, low consumption and high public spending on health care lead to aggregate output growth decline in the long run. Secondly, the paper attempts to explain the hypotheses of why ageing can contribute to economic growth. The key issue is the human capital accumulation according to the proposition of replicated economy. The elderly factors affecting economic growth, including the effective labor, knowledge transfer and change in saving patterns are also identified. Accordingly, the conceptual framework is schematically shown with linkages underlying the impact of population ageing on economic growth. This study is expected to be the first research that focuses on the schematic diagram of this relationship and will be useful for planning policy reform of the Vietnamese government. Lastly, after presenting an overview picture of population ageing in Vietnam, some policy implications are provided to take advantage of population ageing and to diminish negative effects of population ageing on economic growth.

**Keywords:** ageing population, economic growth, impacts, policy implications

## 1 Introduction

The 21<sup>st</sup> century is an ageing century, and population aging is a global phenomenon, which is observed everywhere and affecting all nations (United Nations, 2003). The elderly population has increased both in terms of size and proportion due to three factors: declining fertility rates, decreasing mortality rates, and increasing life expectancy. As a result of this demographic change in many countries, the effects of population ageing cannot be ignored and avoided.

There has been widespread concern about the possible effects of population ageing on economic growth. For example, Banister, Bloom, and Rosenberg (2010) indicate that the most important impact of population ageing is the economic consequence of having more retired people than working people. The society is faced with an increase in the dependency burden as well as in healthcare costs. Therefore, it is necessary to reform policies to prevent the effects of ageing population on economic growth. More specifically, countries should be awakened to the need for government policy reform in terms of public expenditure and managing the government budget. Besides, instead of focusing on government policy reform, some countries have shed some light on how to solve these problems through the role of human capital and the role of expanded labor by increased female labor and extended the age of retirement.

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The answers as to whether population ageing positively or negatively affects economic growth until now are ambiguous (Prskawetz and Lindh, 2007). Moreover, although a great deal of research has attempted to clarify the impact of population ageing on economic growth, there has been no comprehensive framework to show the mechanism of population ageing and whether it diminishes or contributes to economic growth.

This paper is in line with a literature review of the ageing society, economic growth and aims to provide a deeper understanding of whether population ageing diminishes or enhances economic growth. In other words, it aims to explore variables related to population ageing that influence economic growth as well as to build a framework illustrating the mechanism of population ageing and whether it has a positive or negative effect on economic growth. This study is expected to be the first research that focuses on the schematic diagram of this relationship. The framework will be useful for planning policy reform of the government of Vietnam in the future. The last part of this paper will present the overview picture of population ageing in Vietnam and suggest some policy implications to take advantage of population ageing as well as to diminish the negative effects of population ageing on economic growth in Vietnam.

## **2 Negative effects of population ageing on economic growth**

According to the United Nation (2002), population ageing is defined as the proportion of the population aged over 60, which is more than 10 percent of the total population or the proportion of the population aged over 65, which is more than 7 percent of the total population. The negative effects of a population ageing on economic growth are both direct and indirect. The direct effect is the scale effect on economic growth with the low output from a low labor supply. The indirect effects are the increasing public expenditure via health expenditures and the low consumption and saving via a high dependency from the elderly population. These effects will be discussed in the following parts.

### **2.1 The scale effect**

Malthus (1998) was the first economist who explored the population issues and its effect on economic growth. He suggested that the population grows at a geometrical rate, while food production at an arithmetic rate. It leads to an increasing population growth that will be our problem in the future because of the scarce resources. Therefore, the increasing population results have no growth in the future, while Prskawetz and Lindh (2007) argue that reduced population diminishes output in the future due to the decreasing labor supply in produce. However, the relationship between population and economic growth is ambiguous. Tsen and Furuoka (2005) indicate that there is no relationship between population and economic growth in the long run in Asia. In the short run, there is bidirectional granger causality between population and economic growth in Japan, Korea, and Thailand, while it has unidirectional granger causality running from population to economic growth in China, Singapore, and Philippines. Thus, the low population growth depresses the economic growth. Similarly, the increase in an ageing population also diminishes economic growth. For instance, Lee and Mason (2007) found that a demographic change in Taiwan is a result of an increase of

the elderly influences on the income growth through the lowest income among three generations. Peng (2008) shows that the population ageing causes lower economic growth because of a decrease in the labor force and in new demand for investment.

## 2.2 Public Expenditure

The changing demographic transition is a result of a greater longevity and lower fertility in the population. This imposes pressure on public expenditures such as pension and social security in the long term. Verbič and Spruk (2014) suggest that lower fertility rate and higher life expectancy affect public pension through a higher old-age dependency ratio in the OECD countries and public pension expenditure in the long run will become a burden of these countries. There are similar results in European countries (Elmeskov, 2004) and in the G7 countries (Bongaarts, 2004). More specific, among G7 countries, Japan is expected to have the highest old-age dependency ratio from 2000 to 2050, followed by Italy, Germany, France, Canada, the United Kingdom and the United States. In order to adapt to the increasing elderly trend, Bongaarts (2004) recommends that seven countries will have to increase their public expenditures in the future. Similarly, Elmeskov (2004) posits that European countries need to have higher public pension and healthcare spending.

As a greater number of elderly need more health cares, Hashimoto and Tabata (2010) investigate the relationship between ageing, health, and economic growth by using an Overlapping Generations Model. This study indicates that the population ageing reduces the economic growth in small economies because the rising number of elderly people increases healthcare demands, leading to an increase in labor in the health sector. Whereas, Aisa and Pueyo (2013) report that it has an ambiguous effect. Although a greater number of elderly people affect the shift of labor in the health sector, the role of capital accumulation also shifts the demand in the non-health sector because of the reducing income of elderly and their demand for health care.

Tabata (2005) mentioned that there are negative relationships between welfare, life expectancy, and economic growth. Welfare will not only be lost due to an increase in the public expenditure on health for the future generation but also place pressure on public expenditure. Ono (2003) points out that ageing leads to a deficit budget when government supports the social security, while tax revenue is deficient. The “pay-as-you-go” scheme would be preferred as a solution in this case. However, the fair pension scheme is more suitable for the slow growth economy. Pecchenino and Utendorf (1999) also applied an overlapping generation model to explore that social security such as pay-as-you-go schemes would diminish economic growth in an ageing society.

More importantly, most researchers recommend that it is necessary to reform government policies to prepare for an ageing population in the future. Bongaarts (2004) suggests many policies to solve this problem, including increasing the fertility rate, immigration, labor force participation and retirement age as well as reducing public pension benefits. Furthermore, Elmeskov (2004) argues that the changing of the retirement schemes to have the elderly retire later helps the public budget still be surplus.

### 2.3 Consumption and saving

Leff (1969) indicates that there is an inverse relationship between dependency ratios and saving rates. The demographic change has a negative effect on aggregate saving because the high ratio of dependents to the working age population leads to a lower aggregate saving.

In its turn, saving plays an important role on smoothing consumption in the future. The life cycle hypothesis theory is proposed by Modigliani and Brumberg (1980) and Modigliani (1988) presented a relationship between consumption and saving. Individuals decide on their consumption and saving. To smooth consumption over their life, individuals need to save more; this depends on their current income and their age, and it also affects lower consumption in the current period.

The decision of whether and how much to save depends on their consumption and their dependency burden. The influence of a larger ageing population reduces the saving. IMF (2005) states that an increasing 1 % of elderly dependency ratio leads to reduce saving by 1.5 % of GDP. In addition, Horioka (2009) shows the falling saving rate in households in Japan due to the rapid ageing population. Similarly, the Thornton’s study (2001) indicates that the ratios of young and of old dependents to the working-age population have significant negative influences on private saving rate in the United States in the period 1956–1995. Moreover, a research was conducted in Asia countries by Kim and Lee (2007) also indicates that a greater number of elderly are saving less in order to consume more. Athukorala (2003) finds out the significantly negative effect of Taiwanese household saving rate on economic growth. Another research was conducted by Chao (2011) also finds a negative relationship between old dependents ratio and saving rate in China during the period 1978–2007. He explained that more old-age dependents resulting from population ageing suggest the possibility of more expenditure relative to income in households, and thus less household saving and less national saving. Saving is considered as accumulation capital for increasing economic growth. Therefore, a larger ageing population will diminish economic growth in the future.

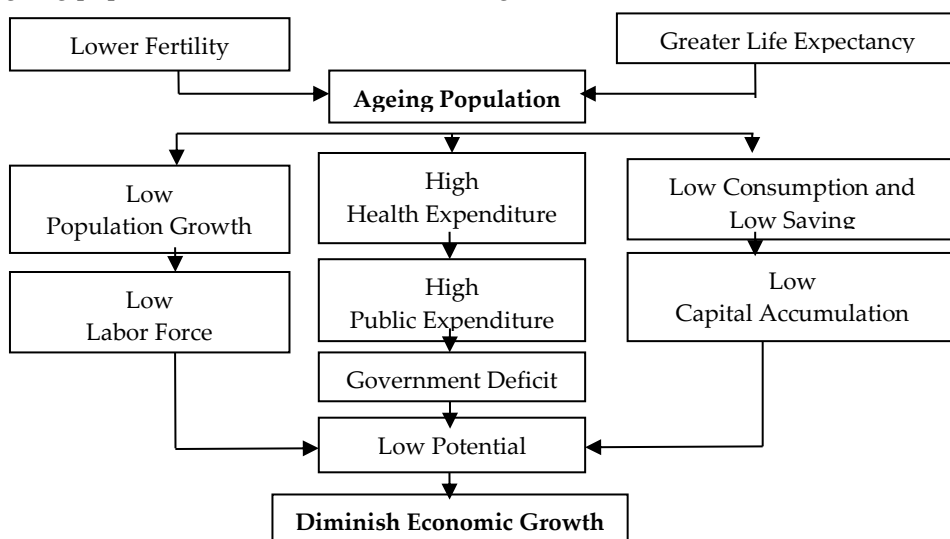


Figure 1. The negative effects of population ageing on economic growth framework

### 3 Positive effects of population ageing on economic growth

Although the number of elderly is expected to increase, it may not always have a negative effect on the economy if the elderly invest in the human capital early in their life. The following part reviewed literature that concerns the positive impact of population ageing as well as how it enhances economic growth.

#### 3.1 Human capital investment

The declines in mortality and fertility lead to an increase of the ageing population. The population may influence on economic growth through human capital investment. There are a number of theoretical studies that use the Overlapping Generations Model (OLG) to examine the relationship between mortality and human capital accumulation in the process of economic growth. The greater longevity will increase the period of schooling because investment in education will earn a greater return over a longer time period.

Gradstein and Kaganovich (2003) find a positive impact of population aging on economic growth when increasing longevity results in an increase in public education funds. Osang and Sarkar (2007) indicate that a mix of public and private spending on education maximizes welfare. Parents must decide how to divide their income between consumption and education spending. In addition, Lee and Mason (2010) focus on the allocation via the number of children in a family as well as the level of education they attain. The low birth rate leads to a higher human capital expenditure per child through more education for a fewer number of children.

More precisely, human capital investment is not only learning in school, but also job training (Clark, Matsukura and Ogawa, 2013). Training enhances the level of opportunities for workers to gain experience through participation in the labor market, which is another key to sustaining effective labor. Furthermore, Prettner (2013) used an endogenous growth model and discovered that an increasing longevity can promote the capita output through the technological change and Research Development (R&D) which has a positive effect on economic growth.

In addition to education, health is also an important issue to investigate. Chakraborty (2004) points to a greater longevity and lower mortality rate as a result of improved health. Issa (2005) indicates that health contributes directly to the growth process because good health has a good job performance.

Overall, investment in schooling, training, Research and Development (R&D) and health has a positive effect on the stock of human capital because an increase in human capital accumulation has been recognized as a vital factor in the long-run economic growth. A large number of empirical evidences have focused on the process of population ageing and economic growth (Bloom, Canning and Fink, 2010).

#### 3.2 Life satisfaction and experiences transfer

According to Chen, Wang, and Lin (2011), there are many extended families which consist of at least three generations living together in Taiwan. The family's life satisfaction increases when

the elderly members assist in taking care of their grandchildren. Apart from this, the elderly people foster learning by sharing their knowledge, which then leads to more experience transfers in these families. For economic reasons, younger family members gain more experiences and thus increase their skills, which leads to a greater human capital accumulation. Consequently, this helps to drive Taiwan’s economic growth.

### 3.3 The change of consumption and saving patterns

The economic lifespan of all individuals consists of two periods: working and retirement periods. In the first period, working people spend their money and time on education and training to improve their skills, which in turn lead to more productivity and result in effective labor. When people become older, they may decide to save more money during the working period in order to have adequate funds for their retirement. As global life expectancy increases, the life cycle consumption and saving patterns of the elderly change. Increasing longevity requires more saving and consumption in old age (Freitas and Martins, 2014). From a theoretical background and empirical studies, Loumrhari (2014) confirms the importance of private savings to finance an economy and its long-term growth. The demographic change results in a positive saving rate as greater life expectancy leads to more retirement consumption (Velarde and Herrmann, 2014).

The studies mentioned above indicate the positive impact of population ageing on economic growth. These results show the evidence of demographic transition change for a decrease in mortality and fertility rates as well as an increase in human capital investment that also increase productivity and output. The role of human capital is an important input factor that directly stimulates economic growth as shown in Figure 2.

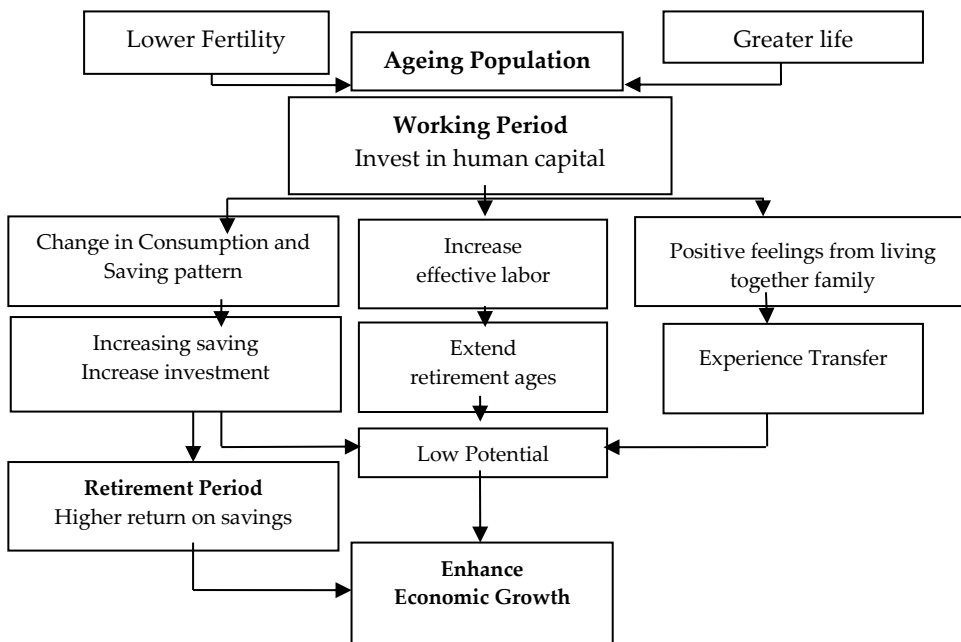


Figure 2. The positive effects of population ageing on economic growth framework

## 4 Some policy implications to Vietnam

### 4.1 Overview of the rapid population ageing process in Vietnam

The annual population survey by Vietnam General Statistics Office (2011) showed that Vietnam has entered the so-called “ageing phase” since 2011. The increasing rate of ageing population in Vietnam is very high and will potentially be higher than that in developed countries. More specifically, Western countries took a hundred years to complete the demographic transition, Thailand and Japan – the two countries having been considered as the fastest ageing in the region took 22 years and 26 years, respectively, to transit from an “ageing” to an “aged” phase, while Vietnam only spent 20 years to finish (United Nations Population Fund [UNFPA], 2011). In addition, the proportion of the elderly at the age of 60 – plus in Vietnam was 8.69 % in 2009 and is expected to increase to 11.78 % in 2019 and 26.10 % in 2049, that is much higher than the world ageing figure (21 % in 2050). In line with the rapid increase in the ratio of ageing population, the ratios of young people under 15 and of working age population decreased after a period of rapid growth in Vietnam in the past decade. The reason for this phenomenon stems from many causes, with the leading ones being a sharp drop in the total fertility rate (TFR), and the increase in life expectancy of people in Vietnam (Vietnam General Statistics Office, 2011).

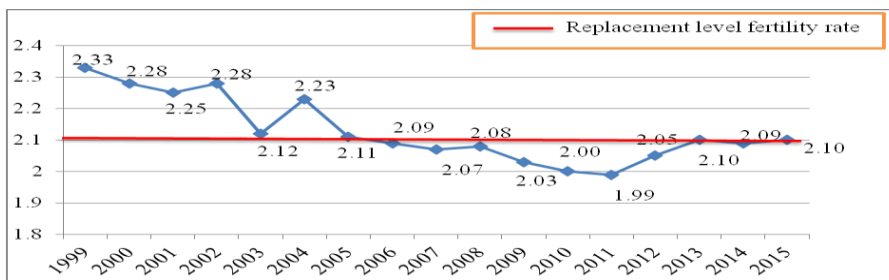


Figure 3. TFR of Vietnam during 1999 – 2015 (Unit: children/woman)

Figure 3 indicates that even though the total fertility rate (TFR) of Vietnam during the period 2001–2006 had fluctuated over the years but still clearly exhibits a downward trend. In 2006, Vietnam officially announced that it had reached its replacement level with a TFR of approximately 2.1 children per woman. However, from 2006 to 2015, the TFR of Vietnam remained hovering just below the replacement rate, or around over 2 children per woman (Statistical Handbook of Vietnam 2010 and 2015).

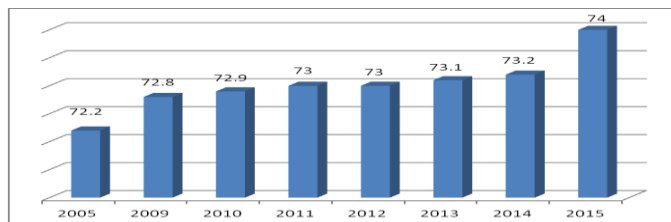


Figure 4. Average life expectancy of Vietnamese people during 2005–2015

The average life expectancy of people consistently increased over the years, from 72.2 years in 2005 to 73 years in 2011 and 74 years in 2015. Given the current average life expectancy and the continuing upward trend in the coming years, it is obvious that the average life expectancy in our country is much higher than the overall average of developing countries which stands at around 68 (Statistical Handbook of Vietnam 2010 and 2015).

#### **4.2 Some policy implications to Vietnam in case of the fast-growing aging population**

The fast growing aging population in Vietnam has generated both opportunities and risks for the economic growth. Without solid research to confirm variables related to population ageing influencing on economic growth and answer whether ageing population diminishes or enhances economic growth of a country, it is difficult for Vietnamese government to reform policies to be more suitable in the coming decades. As mentioned above, four key risks are associated with population ageing that most countries will face with since the society is ageing, including developing the human capital of people, the shortage of skilled labor, the health and elder-care services as well as well-being of older people, and investments in pension systems. Corresponding to these risks are policies that are recommended as follows in order to diminish the negative effects of population ageing on economic growth.

##### **The policies for developing education and training**

The government of Vietnam has to focus on improving and developing the current education system to develop the human capital of people with the aim of creating the abundant and highly qualified human resources in the labor market in the future. "Getting old before getting rich" has become a big challenge for developing countries such as Vietnam to respond to the shortage of labor force because of population ageing and to ensure the sustainable economic growth in the future. Firstly, Vietnamese government needs to take advantage of a "golden population" opportunity from now because this generation will become an aging population in the future. The preparations for the younger generation both physically, mentally and intellectual resources not only create a good quality human resource in the future but also drive the economic growth before entering the aging stage of the population. With a higher income in the working period, older people could base on savings to remain their living standard after retirement, reducing the pressure on social security of the government. Therefore, the priority for education and training is one of the most proper measures to limit the negative effects caused by the aging. Secondly, the effective strategies of education and training for younger workers should be in line with the high competitive environment that can help them create sustainable jobs even in the extensive integration and increasing international competition.

##### **The policies for labor and employment**

Population ageing will have significant implications for the labor market. This occurs because participation rates in the labor market among persons above the statutory retirement age have increased. Therefore, it is critical for Vietnamese government to have policies to facilitate and create jobs for the elderly who have the ability and desire to work in response to expectations of greater longevity. More flexible old-age pension arrangements combined with increases in the



official retirement age would encourage prolonged workforce participation. Legal and cultural efforts to discourage age discrimination by employers may also be required. Moreover, it is necessary to diversify across industries and promote the quality of the labor-intensive industries to enhance the contribution to the economy. The maximum use of the human resource in terms of a labor participation rate decrease is essential. Migration is also the most important element of labor mobility. Labor mobility plays a key role in an increase in the labor productivity of industries, in particular, and the whole economy, in general. Training to improve skills and special knowledge along with the appropriate labor distribution policy for sectors, especially comparative advantage sectors will promote the job creation, enhance worker's productivity, increase the growth of the sector and thereby motivate economic growth. Furthermore, it is necessary to have a development policy for small and large urban areas to catch the flow of migration and distribute labor suitable for the demand in each region.

### **The health-related policies**

Investment in improving the health status of those aged 60 or over is a further policy option for the Vietnamese government. This approach reduces the burden on health care and social security systems and enables people to work for longer in their life. According to the World Bank (2015), public expenditure on health care in Vietnam is high, as of 2015 accounted for approximately 9.43 % of total government spending, nearly double that of 2004. Moreover, in most high- and middle-income countries, on average, out-of-pocket expenditure on health care is only a third of the total annual expenditure. However, while Vietnam remains among the lower middle-income countries, whose current GDP per capita is similar to that of Malaysia in 1988, Thailand in 1993, Indonesia in 2008, the Philippines in 2010, and South Korea in 1982, but about 50 % of its total health care spending is paid from the pockets of its citizen. This ratio is considered to be quite high compared to the average (An Ngoc, 2015).

In order to implement this policy, Vietnamese government should build and expand elderly care services with active participation from all sectors in order to improve national capacity with regard to elderly care. First, it is important to emphasize health education and improvement of awareness and knowledge of healthy aging, to avoid illnesses and disabilities in later life. An elderly-friendly living environment is very much needed. Second, building and enhancing networks for health care and elderly care are important. Third, the government should strongly support elderly care activities at public social assistance centers and private elderly shelters. Elderly care at the social assistance centers needs to be combined with community-based elderly care, whereas home care for the elderly should also be encouraged. Priority should be given to investment in and development of the gerontology system nationwide. A unified network of elderly nursing centers needs to be developed and managed, based on the actual needs and conditions of each locality.

### **The social security policies**

The most important source of the elderly income is the pension from the contributions during their work period. Therefore, the pension systems should be more invested and consistently developed with the development of financial situation and should focus on the efficiency. The Vietnamese government needs to change the operation mechanism of the pension system to

ensure the more realistic relationship between contribution and benefit of employees when they take part in social insurance. Public old-age pension systems should be introduced to reduce the risk of poverty and income insecurity in later life. Associated with this policy, it is necessary to diversify the types of insurance in order to enhance the accessibility of the population. This policy is one of important policies because the participation of employees in the pension scheme was low at only about 22.05 percent of the labor force in 2015 (Vietnam Social Insurance 2015).

A further important policy consideration for the Vietnamese government is addressing the funding gap caused by the intergenerational transfers implicit in pay-as-you-go health and pension systems. In an aging society, pay-as-you-go systems mean that increasingly small cohorts of working age people will make transfers to increasingly large cohorts of elderly. Policies that can help reduce old age dependency include adjusting premiums and benefits or making a transition to full funding or a system of private accounts, whereby individuals effectively draw at least part of their pensions from investments made during their time in work. Fully funded systems mean that older workers who continue working benefit by having a larger sum to draw on when they eventually retire. Moving toward such a system would require robust institutions that can both attract sufficient savings and invest them productively and safely, as well as financial reserves to pay the transition for the older generation with insufficient private savings.

## 5 Conclusion

The relationship between the ageing society and economic growth has been reviewed. Both positive and negative approaches have been discussed. The first findings are stated as follows: (i) the ageing population causes the lower economic growth, (ii) the ageing population will be the burden of government spending in the future and then public policies such as retirement schemes, fertility policy have to be reformed, (iii) the rapid ageing population causes household saving rate to go down. However, the other results pointed out interesting issues. More specifically, the theoretical research indicated that expansion of life expectancy leads to the accumulation of human capital and thus enhances the long-run growth due to the length of schooling and training. Furthermore, the positive longevity effect dominates the negative fertility effect according to the endogenous growth model. Besides, the elderly can contribute to economic growth through knowledge transfer. More importantly, the contributions of this research are that the conceptual framework schematically showed the linkages underlying the impact of the ageing population on economic growth, and it is considered as a direction for deeper researches relating to the relationship between population ageing and economic growth. Then, in the case of the fast-growing aging population in Vietnam, this study is urgently necessary and will be useful for planning policy reform of Vietnamese government. Accordingly, some policies are suggested to take advantage of as well as lessen negative effects of population ageing on economic growth in Vietnam. However, the limitation of this study is that it only focused on the theories. Thus, it is critical to implement other empirical research to examine the impact of population ageing on economic growth in Vietnam in the future.

## REFERENCES

1. An Ngọc (2015), *Vietnam's GDP per capital fall short of Singapore and Malaysia*, Retrieved from: <http://cafef.vn/vi-mo-dau-tu/thu-nhap-binh-quan-nguoi-lao-dong-viet-nam-thua-singapore-malaysia-vai-chuc-lan-20151226161303159.chn>.
2. Aisa R., Pueyo F. (2013), Population aging, health care, and growth: a comment on the effects of capital accumulation, *J. Popul. Econ.*, 1285–1301.
3. Athukorala P., PangLong T. (2003), Determinants of household saving in Taiwan: Growth, demography and public policy, *The Journal of Development Studies*, 39(5), 65–88.
4. Banister J., Bloom D.E., Rosenberg L. (2010), *Population Aging and Economic Growth in China*, PGDA Working Paper, No.53. Retrieved from: [http://www.hsph.harvard.edu/pgda/WorkingPapers/2010/PGDA\\_WP\\_53.pdf](http://www.hsph.harvard.edu/pgda/WorkingPapers/2010/PGDA_WP_53.pdf)
5. Bloom D. E., Canning D., Fink G. (2010), Implications of population ageing for economic growth, *Oxford Review of Economic Policy*, 26(4), 583–612.
6. Bongaarts J. (2004), Population Aging and the Rising Cost of Public Pensions, *Population and Development Review*, 30(1), 1–23.
7. Chakraborty S. (2004), Endogenous lifetime and economic growth, *Journal of Economic Theory*, 116, 119–137.
8. Chao Z. (2011), China's Savings and Current Account Balance: A Demographic Transition Perspective, *Modern economy*, 2(5), pp.1–73.
9. Chen S., Wang S., Lin P. (2011), *The Relationship between the Living Arrangement and Life Satisfaction of the Elderly – A discussion for 4 regions in Taiwan*, Enhr Conference, Toulouse, pp. 1–21.
10. Clark R., Matsukura R., Ogawa N. (2013), Low fertility, human capital, and economic growth: The important of financial education and job retraining, *Demographic Research*, 29(32), 865–884.
11. Elmeskov J. (2004), Aging, Public Budgets, and the Need for Policy Reform, *Review of International Economics*, 12(2), 233–242.
12. Freitas N. M., Martins J. O. (2014), Health, pension benefits and longevity: How they affect household savings?, *The Journal of the Economics of Ageing*, 3, 21–28.
13. General Statistics Office of Vietnam (2011), *Fertility and mortality rates in Vietnam: Current status, trends and differences/exceptions*, The Statistics Publishing House: Ha Noi.
14. General Statistics Office of Vietnam, *Statistical handbook in 1994, 2005, 2010, 2015 (Summary)*, The Statistics Publishing House: Ha Noi.
15. Gradstein M., Kaganovich M. (2003), Aging population and education finance, *Journal of Public Economics*, 1–19.
16. Hashimoto K., Tabata K. (2010), Population aging, health care, and growth, *J. Popul. Eco.*, 23, 571–593.
17. Horioka C. Y. (2009), Past and Future Trends in Japan's Household Saving Rate and the Implications Thereof for Japan's Current Account Balance, *Japan and the World Economy*, 3(4), 307–330

18. IMF. (2005), Chapter II: Global Imbalances: A Saving and Investment Perspective, pp. 93–124.
19. Issa H. (2005), Human Capital Demographic Transition and Economic Growth, *Journal of Economic Development*, 30(2), 49–65.
20. Kim S., Lee J. (2007), Demographic Changes, Saving and Current Account in East Asia, *Asian Economic Paper*, 6(2), 22–53.
21. Lee R., Mason A. (2010), Fertility, Human Capital and Economic Growth over the Demographic Transition, *Eur J Population*, 26, 159–182.
22. Lee S. H., Mason A. (2007), Who Gains from the Demographic Dividend? Forecasting Income by Age, *Int J Forecast*, 23(4), 603–619.
23. Leff N. H. (1969), Dependency rates and savings rates, *The American Review*, 886–896.
24. Loumrhari G. (2014), Ageing, Longevity and Savings: The Case of Morocco, *International Journal of Economics and Financial Issues*, 4(2), 344–352.
25. Malthus T. R. (1998), *An Essay on the Principle of Population*, Printed for J. Johnson in St. Paul's Church-Yard in 1798: London, Electronic Scholarly Publishing Project, pp. 156–186.
26. Modigliani F. (1988), The role of intergenerational transfers and life cycle saving in the accumulation of wealth, *Journal of Economic Perspectives*, 2(2), 15–40.
27. Modigliani F., Brumberg R. (1980), *Utility analysis and aggregate consumption functions: an attempt at integration*: in Andrew Abel, ed., *The Collected Papers of France Modigliani: Vol. 2, The Life Cycle Hypothesis of Saving*, Cambridge, MA. The MIT Press.
28. Ono T. (2003), Social security policy with public debt in an aging economy, *J Popul Econ*, 16, 363–387.
29. Osang T., Sarkar J. (2007), Endogenous mortality, human capital and economic growth, *Journal of Macroeconomics*, 1–23.
30. Pecchenino R. A., Utendorf K. R. (1999), Social security, social welfare and aging population, *J Popul Econ*, 12, 607–623.
31. Peng, X. (2008), Demographic Shift, Population Ageing and Economic Growth in China: A Computable General Equilibrium analysis, *Pacific Economic Review*, 13(5), 680–697.
32. Prettnner K. (2013), Population aging and endogenous economic growth, *J Popul Econ*, 26, 811–834.
33. Prskawetz A., Lindh T. (2007), *The Relationship Between Demographic Change and Economic Growth in the EU*, Vienna Institute of Demography, Austrian Academy of Sciences, Research Report 32, Retrieved from: <http://www.oeaw.ac.at/vid/download/FB32.pdf>
34. Tabata K. (2005), Population aging, the costs of health care for the elderly and growth, *Journal of Macroeconomics*, 27, 472–493.
35. Thornton J. (2001), Age Structure and the Personal Savings Rate in the United States, 1956–1995, *Southern Economic Journal*, 68(1), pp.166–170.
36. Tsen W. H., Furuoka F. (2005), The Relationship between Population and Economic Growth in Asian Economies, *ASEAN Economic Bulletin*, 22(3), 314–330.
37. United Nation (2002), *World population ageing, 1950–2050 (No.207)*, New York: United Nations.

38. United Nations (2003), *World Population Prospects: The 2002 Revision*, New York: United Nations.
39. United Nations Population Fund [UNFPA] (2011), *The Ageing Population in Vietnam: Current Status, Prognosis, and Possible Policy Response*, Hanoi: UNFPA.
40. Vietnam Social Insurance (2015), Additional fund to maintain the social security fund: raising retirement age needs scientific evidence, Retrieved from: [http://duthaonline.quochoi.vn/DuThao/Lists/TT\\_TINLAPPHAP/View\\_Detail.aspx?ItemID=1437](http://duthaonline.quochoi.vn/DuThao/Lists/TT_TINLAPPHAP/View_Detail.aspx?ItemID=1437)
41. Velarde M., Herrmann R. (2014), How retirement changes consumption and household production of food: Lessons from German time use data, *The Journal of the Economics of Ageing*, 3, 1–10.
42. Verbič M., Spruk R. (2014), Aging Population and Public Pensions: Theory and Macroeconometric Evidence, *PANOECONOMICUS*, 3, 289–316.
43. World Bank (2015), *Vietnam 2035 report*, World Bank Group.