



Declined effectiveness of fiscal and monetary policies faced with aging population in Japan[☆]



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ABSTRACT

This paper studies how population aging affects economic performance and the effectiveness of fiscal and monetary policies. We develop a New Keynesian dynamic stochastic general equilibrium model with heterogeneous households: workers and retirees. We demonstrate that an increase in the proportion of working population increases aggregate output, consumption, and investment by increasing total labor supply in the long run. It also increases wages and reduces the social security burden of the government. This paper also finds that the effectiveness of fiscal and monetary policies is weakened when the proportion of retirees becomes larger.

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1. Introduction

Japan's economy has suffered from the long-term stagnation after the burst of the bubble of 1990. Fiscal and monetary policies have been implemented to recover the Japanese economy. Specifically, zero interest rate policy and quantitative and qualitative monetary policy were pursued, and large expansionary fiscal packages were implemented. However, a number of studies show that the effectiveness of monetary and fiscal policies has diminished (Nakahigashi and Yoshino, 2016; Yoshino et al., 2017). Moreover, it has been pointed out that the root cause of the Japanese recession relies on aging population and lack of new startups (Yoshino and Taghizadeh-Hesary, 2016).

This paper studies how population aging affects economic performance. Japan is undergoing a sustained process of population aging. As seen in Fig. 1, the working population is diminishing drastically, and the elderly population is growing rapidly. We will show that the necessary policy to cope with an aging population is to keep the old people working by paying marginal product of labor, which reduces the government's social security burden.

This study also assesses the effect of population aging on the effectiveness of fiscal and monetary policies. Recently, some economists are proposing fiscal stimulus to boost the Japanese economy. However, the economic effect of infrastructure investment in Japan has drastically diminished (Nakahigashi and Yoshino, 2016).¹ Furthermore, a huge increase of social security due to population aging made Japan's budget deficit skyrocket (Figs. 2 and 3), making it difficult to expand government spending. This paper addresses a suitable fiscal policy to face the issue of aging population. The paper also addresses the declining effect of monetary policy due to diminished marginal productivity of capital faced with an aging population (Yoshino and Taghizadeh-Hesary, 2016).

In order to study the effects of population aging on economic performance and the effectiveness of fiscal and monetary policies, we develop a dynamic stochastic general equilibrium (DSGE) model with heterogeneous consumers, young and old people. We assume that young people provide labor services and earn wages while old people do not provide any labor services but obtain social security benefits from the government. Thus, in our model, young people are workers and old people are retirees. It is assumed that retirees spend all income for consumption in each period of time, while workers maximize their lifetime utility function subject to a budget constraint. In the model, the proportion of retirees is exogenously determined and by changing the proportion parameter, we can examine the effects of a gradual population aging on the economy.

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¹ Nakahigashi and Yoshino (2016) demonstrate that the effect of public investment in Japan has diminished by using a translog production function.

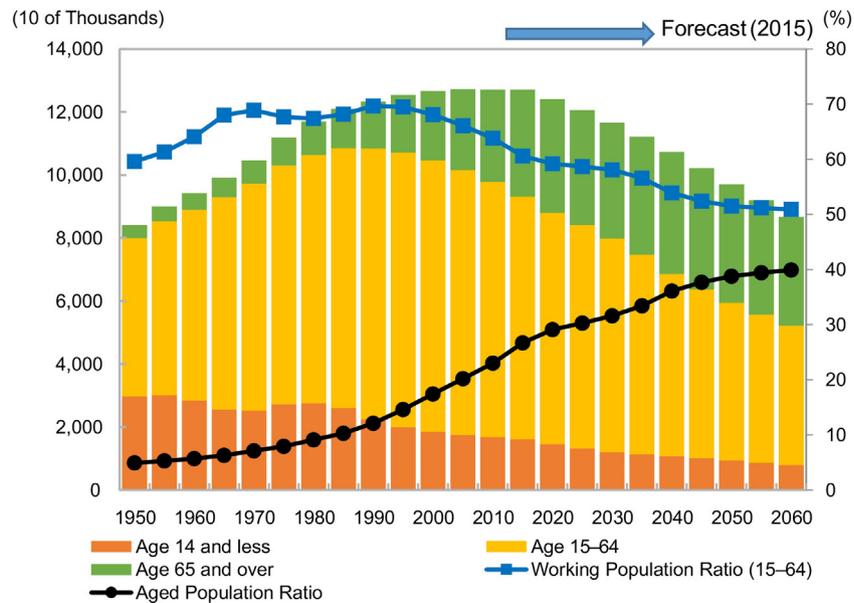


Fig. 1. Population aging of Japan. Source: Ministry of Internal Affairs and Communication.

We demonstrate that population aging reduces output and aggregate consumption in the long run due to the decline in total labor supply. In the economy, retirees receive pension benefits that are financed by taxes imposed on workers and issues of government bonds. Given a fixed amount of pension benefits per retiree, population aging raises the tax paid by each worker. This reduces consumption of a worker due to a negative wealth effect. Although this negative wealth effect increases each worker's labor supply, a decline in working population pushed down the total labor supply, decreasing output. Our model shows that the decline in working population also reduces aggregate investment.

The striking finding is that population aging weakens the effectiveness of fiscal policies. By comparing the dynamic responses to fiscal policy shocks in an economy with a small working population (aging economy) with those in an economy with a large working population, we find that *qualitatively* the effects of fiscal policy shocks are the same between the two economies. However, we find that *quantitatively*, the effects are mitigated as the proportion of working population decreases. This is mainly due to lower total labor supply.

Our quantitative analysis also shows that population aging weakens the effect of monetary policy on aggregate consumption. Given the fact that consumption accounts for about 60% of gross domestic product (GDP) and the impact of monetary policy on investment is weakening (Yoshino et al., 2017), this result implies that monetary policy is becoming less effective due to population aging.

Our results suggest that a necessary policy to cope with the aging population is to keep the old people working by paying wages at the level of marginal productivity of labor.² In the long run, making old people continue to work will bring higher output, which brings a higher level of consumption. If old people keep on working, they do not rely so much on social welfare, which brings a

lower level of tax, and thus the tax burden of the younger generation declines. Disposable income of the young generation rises and their consumption will rise.

A number of studies are related to this paper. Fujiwara and Teranishi (2008) examine how demographic changes affect the dynamic response of an economy to a monetary policy shock by using a dynamic New Keynesian life cycle model. Wang (2016) assesses the effects of demographic changes on the transmission of a monetary policy to consumption by using a life cycle model. While these papers focus on the effect of demographic changes on the effectiveness of monetary policy, we study not only the effects of demographic changes on the transmission of the monetary policy but also that on the fiscal policy. Furthermore, we develop a tractable DSGE model that enables us to analyze the effects of demographic changes on the economy without assuming life cycle of agents. This is the novelty of the current paper.

Iman (2013) demonstrates that the effectiveness of a monetary policy weakens as society is graying, by analyzing the panel data of advanced countries. Although his focus is on the effects of monetary policy on unemployment and inflation, which is not our focus, our view that population aging weakens the effectiveness of a monetary policy is consistent with his findings.

The remainder of the paper is organized as follows. In Section 2, we extend the standard New Keynesian model by allowing the presence of retired workers. Section 3 calibrates the model. Section 4 examines how the demographic structure affects the performance of the economy and the effects of macroeconomic policies. In Section 5, we discuss how assumptions on social security benefits and taxes affect our results. Section 6 concludes.

2. The model

The economy consists of two types of households, a continuum of firms producing differentiated intermediate goods, a perfectly competitive final good firm, and a government in charge of monetary and fiscal policies. Except for the presence of heterogeneous households, our model structure is similar to a standard DSGE model with staggered price setting à la Calvo (1983).

² According to the survey conducted by the Bank of Japan, only 22% of the people want to retire immediately. About 67% of the people want to work longer after 60 years old. Some want to work even after 80 years old.

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