

The Effects of Demographic Structure on the Economic Growth in Aging Societies

Hiroshi Futamura
Department of Economics
Hiroshima University
1-2-1 Kagamiyama,
Higashi-Hiroshima, 739 JAPAN
011-81-82-424-7281 (Office)
011-81-82-424-7212 (FAX)
futamura@hiroshima-u.ac.jp

Abstract

Many industrialized countries experience increasing old-to-young population ratio due to prolonged life span and lower birth rate. Because of this, how to design a sustainable social security system becomes one of the biggest issues in public economics. However, there is another concern from the view point of economic growth theory with respect to the accelerating aging process. Many industrialized countries also experience expanding share of service sector in GDP (Petty-Clark's Law). If older people prefer services to manufactured goods, in comparison with younger people, then the increasing old-to-young population ratio may enhance the expansion of service sector relative to manufacturing sector.

Because the growth rate of labor productivity in service sector tends to be lower than manufacturing sector, the expansion of the service sector's share in GDP relative to manufacturing sector may have negative effects on the aggregate performance of economy. In addition, the diminishing share of manufacturing sector may also affect physical capital investment, and hence, per-capita welfare level of economy. The main objective of this research is to investigate the effects of demographic change on economic growth and welfare level through the analysis of two-sector overlapping generations models which have the properties with respect to technologies and preferences described above. In the model, there are two sectors: a-sector (manufacturing) and b-sector (service). We would like to capture the properties of manufacturing sector and service sector by imposing the following assumptions on the technologies of a-sector and b-sector; (i) the TFP growth rate of a-sector is higher than b-sector, (ii) the capital intensity of a-sector is higher than b-sector, and (iii) a-sector produces consumption goods and investment goods, while b-sector produces only consumption goods. Each individual in the model lives two periods. In the first period of life, the individual prefers a-type goods (manufactured goods) to b-type goods (services). In the second period, the individual's preference changes. She/he prefers b-type goods to a-type goods.

We solve the model for general equilibrium under different scenarios with respect to demographic structure. The main findings are summarized as follows. The increasing old-to-young population ratio, in general, causes capital and labor shift from manufacturing sector to service sector. As a result, the share of service sector in GDP increases, and the growth rates of aggregate variables decrease because of the lower TFP growth rate of service sector relative to manufacturing sector. On the other hand, the growth rates of per-capita variables increase, and the welfare level of each

successive generation improves because of capital-deepening generated by the demographic change and the TFP growth.

The degree of deterioration in aggregate performance, and the degree of improvement in per-capita performance depend on the parameter values of the model. Through the numerical simulation analysis, we found four major forces that affect the general equilibrium resource allocation. First, a faster increase in the old-to-young population ratio causes a faster shift of capital and labor from manufacturing sector to service sector. Second, if the elasticity of substitution between manufactured goods and services is large, capital and labor may shift from service sector to manufacturing sector because of the faster productivity growth of the latter. In this case, the quantitative expansion in either manufactured goods or services is more important than a balanced expansion between the two because they are close substitutes in the households' preference. On the other hand, if the elasticity of substitution is small, then capital and labor may shift from manufacturing sector to service sector to offset the slower productivity growth of the latter. Third, if the intertemporal elasticity of substitution between young consumption and old consumption in each individual's lifetime utility function is large, capital and labor may shift from service sector to manufacturing sector so as to induce faster quantitative expansion. On the other hand, if the intertemporal elasticity of substitution is small, capital and labor may shift from manufacturing sector to service sector because the balanced expansion between young consumption and old consumption (consumption smoothing) is more important than mere quantitative expansion. Finally, when the ratio of wage to interest rate increases due to the increase in capital-labor ratio, capital and labor are reallocated between the two sectors. If the factor substitutability in manufacturing sector is more elastic than service sector, capital may shift from service sector to manufacturing sector, while the labor may shift the opposite direction.