A Three-Sector Spatial Growth Model of a Small Open Economy with Capital Accumulation

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Abstract

This paper presents a growth model of a small open economy with economic geography. The economy has three - industrial, services and housing - sectors. The economy is located along a line segment and land is for residential use. The model synthesizes the four well-known models in neoclassical growth theory and urban economics - the Solow growth model, Uzawa’s two-sector model, the Alonso urban model, and the Muth housing model - in the context of a small open economy. We analyze the dynamics of a spatial economy and simulate the model over time and space. We show how changes in some parameters, such as the rate of interest and domestic preference, can affect economic structures and land use of the small economy. For instance, the simulation results show that as the rate of interest is increased in the global market, the domestic wage rate, the output levels per worker of the industrial and service sectors, the capital intensities of the three sectors, the capital employed by the three sectors, the national output are reduced, the price of services, the consumption levels of goods, services and housing, the wealth per capita are increased. The labor employment of the industrial sector is reduced and the labor employment of service sector is increased. The housing rent is increased and the land rent is reduced due to the rise in the rate of interest.

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I. Introduction

There are close interactions between economic development and economic geography. Economic growth, for instance, encourages demand for housing and affects prices and availability of land for housing. On the other hand, changes in the housing market will affect economic growth. For instance, as demand for housing is increased, demands for different services and goods and prices for different services and goods will be affected. Nevertheless, there are few economic models which deal with the interdependence with micro-behavioral foundation, though the study of the economic growth with housing and economic geography has increasingly caused attention in urban economics and regional science. Yet, urban economics has not succeeded in explaining spatial evolution and growth with capital accumulation. As pointed out by Baldwin and Martin (2004: 2675-6), “Many of the most popular economic geography models focus on labor. … These are unsuited to the study of growth.” Capital accumulation is seldom modeled with land use pattern and land markets in the literature of urban economics. Fujita and Thisse (2002: 389) state the current situations of spatial economic growth as follows: “Clearly, space and time are intrinsically mixed in the process of economic development. However, the study of their interaction is a formidable task. … Not surprisingly, therefore, the field is still in its infancy, and relevant contributions have been few.” This study attempts to make a contribution to solving the long standing puzzle of modeling economic growth with space by developing an economic growth model with economic geography, basing on the four key models in the neoclassical growth theory and new urban economics within the context of growth theory of small open economies. The four models are the Solow growth model and Uzawa two-sector growth model in the neoclassical growth theory and the Alonso urban model and Muth housing model in the new

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1 As reviewed by Zhang (2008a), there are many spatial models built on microeconomic foundation in the recent literature of the new economic geography. However, almost all these models are static and neglect capital accumulation. We refer the comprehensive surveys on the literature to Leung (2004), Henderson and Thisse (2004) and Capello and Nijkamp (2004) for the literature of the new economic geography.