The Three-Sector Ramsey Model

This chapter develops a three-sector growth model with three factors of production. One factor is specific to a sector, and one sector’s output is a home-good, meaning it is not traded in international markets. The chapter builds upon the static three-sector model developed in Chapter 2, and the two-sector Ramsey model presented in the previous chapter. The dynamic three-sector model is a convenient point of departure for developing policy models with more sectoral detail, and for studying various other aspects of economic growth that have received attention at least from the time of Arthur Lewis. The seminal work of Lewis (1954), further developed by Fei and Ranis (1961) emphasize the supply of surplus labor from the farm sector to the rest of the economy as an essential part of the growth process. This theme was also emphasized in the work of Jorgenson (1967). In spite of the renewed interest in growth theory in the 1980s, Matsuyama (1992) was among the first to develop a model of endogenous growth with two distinct sectors, agriculture and manufacturing. In a series of papers, Echevarria (1995, 1997, 2000), and more recently, Gollin et al. (2004) develop neoclassical growth models in which agriculture and a home-good are used to show how the sectoral composition of an economy explains an important part of the variation in growth rates across countries.

In the absence of growth in factor productivity, the sector specific factor allows for diminishing returns to labor and capital to occur more rapidly than in the other sectors while the evolution of the price of the home-good relative to traded goods explains the process by which the non-traded sector competes with the traded good sectors for resources. The asset market also receives attention because capital and the sector specific
factor are the two assets held by households. In the process of growth, the decline in the rental rate of capital and the change in the rental rate of the sector specific factor suggest the price of this factor also evolves over time. Although not pursued in this chapter, the model provides a point of departure for studying asset market failures that preclude agents from arbitraging the differences in asset yields.

The basic model is first presented and selected comparative static results are shown. The model is then modified to included Stone-Geary preferences. The appendix uses this modified model to extend Caselli and Ventura’s (2000) representative consumer theory of distribution. The chapter concludes with a numerical example and provides the basis for the next chapter which extends the model to account for intermediate factors of production, composite capital, and government.

4.1 The model environment

The modeled economy is a small, open and perfectly competitive economy that produces and consumes three final goods: an agricultural, manufacturing, and a home-good, indexed, respectively, \( j = a, m \) and \( s \). The economy is initially endowed with \( L(0) \) and \( K(0) \) units of labor and capital, and \( H \) units of land. The land endowment remains constant over time. The manufactured and the agricultural good are traded internationally at fixed prices \( p_m \) and \( p_a \), respectively. The home-good is only traded in the domestic economy at the endogenous price \( p_s \). The services of labor and capital are employed in the production of all three goods, while land is employed only in agricultural production. A land rental market among farmers is presumed to exist so that land can be rented at a rate \( \Pi \). The manufactured good enters final consumption, and contributes to the economy’s stock of capital with any excess supply or demand traded in international markets at the price \( p_m \). The agricultural and the home-good are pure consumption goods. Labor services are not traded internationally and domestic residents own the entire stock of domestic assets.