Chapter 5 pointed out the importance of extending the basic three-sector model to accommodate (i) intermediate inputs of production, (ii) a stock of capital defined as a composite of various sector outputs, and (iii) government consumption and revenues. This chapter takes up the task of combining these extensions into a single model—the outcome of which is a model more suited to a broad array of policy analyses. Combining each of these features into a single model, however, has the cost of introducing a number of complications that make presenting and specifying the model more challenging.

To better facilitate the presentation of the extended model, and at the cost of some repetition of material in previous chapters, we begin with the household’s problem, introduce government, and follow with the firms’ problem. Then, following the same pattern as in previous chapters, we deal with the intra-temporal equilibrium, and conclude with the presentation of inter-temporal equilibrium. We also point out aspects of the model that were omitted in previous chapters, such as the no-arbitrage condition between capital and land, and determinants of the price of land. The last major section deals with fitting this more complex model to data. We also draw upon the empirical results to discuss additional features of the model that are otherwise difficult to obtain from the theory alone.

6.1 The model

As in Chapters 4 and 5, the environment is a small open economy that produces and consumes two traded goods—a manufacturing good, an agricultural good, and a non-traded home-good. Each of the three goods are produced by perfectly competitive
firms. The manufactured and home-good sectors employ intermediate inputs and the primary factors of labor and capital, while agriculture employs intermediate inputs along with labor, capital and land. A share of all three goods is allocated to final household and government consumption, reinvested to increase the economy’s stock of capital, and employed as intermediate inputs. Any surplus or deficit of the manufacturing and agricultural good is traded internationally. Labor services are not traded internationally, and there is no foreign ownership of capital. Government spends a constant share of GDP, and the share of government spending across goods is constant over time. These expenditures are balanced by indirect taxes on production, taxes on foreign trade and lump-sum transfers from households.

6.1.1 Households

As in the previous chapters, households are treated as an infinitely lived dynasty. The population of each household grows at a constant positive rate \( n \). We assume a constant inter-temporal elasticity of substitution felicity function defined over a composite index \( q \) per worker. The representative household maximizes the discounted present value of future flows of utility given by

\[
\int_0^\infty \frac{q(t)^{1-\theta}e^{(n-\rho)t}}{1-\theta} dt
\]

where \( 1/\theta \) is the elasticity of intertemporal substitution, \( \rho \) is the rate of time preference, and we assume \( \theta > 0, \rho > n \). Households receive income by providing the services of labor, capital and land in exchange for factor payments \( w, r, \) and \( \pi \) per worker, respectively, and pay lump-sum taxes \( T_{gov} \) to government. Capital and loans are assumed to be perfect substitutes. Unspent income accumulates as an asset for future consumption. The flow budget constraint of the representative household, expressed in per worker terms, is given by

\[
\dot{p}_k k + p_k \dot{k} = w + (r - n) p_k k + \pi H + T_{gov} - \epsilon
\]