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3.1 INTRODUCTION

The quantities and the types of goods, services, and food available to an individual strongly influence his education, values, health, family size, and life style. Each of these personal characteristics in turn influences the mix of goods, services, and investments he is likely to prefer in the future. Our objective in the capital sector was to provide the basic components of a causal model that would project long-term patterns in the global population's access to material goods, services, and food. We were not concerned with interest rates during the next quarter year nor with the level of unemployment next year, but with shifts in productive capability and personal consumption over the next hundred years.

Economists have surpassed all other social scientists in the production and analysis of formal theories, but their attention has been almost exclusively on short-term problems. For example, in response to a survey of U.S. government forecasting activities, members of the Council of Economic Advisers to the U.S. president stated that the council makes no forecasts beyond the next five years (CEQ 1972). Since World3 involves economic phenomena that evolve over periods of thirty to one hundred years or more, most current economic models were of little use in constructing the capital sector. However, there are common patterns in the aggregated relationships among service output, industrial production, food consumption, investment, and material consumption in different economies around the world and over time. Our purpose in Chapter 3 is to depict those patterns and to describe the set of causal relationships that reproduce them in World3.

In the next section of this chapter we present data on the composition of the GNP of various economies over several decades. The data will illustrate the general behavior patterns we captured in the capital sector of World3. Following the description of those patterns, we discuss the concepts and definitions that were employed to formulate the capital sector (section 3.3). This conceptual discussion is followed by a description of the sector's causal feedback-loop structure (section 3.4), and finally by the precise DYNAMO equations used in the model (section 3.5). The chapter closes with a set of simulation runs of the capital sector driven by exogenous values for population, capital allocated to obtaining resources, unemployment, and food per capita.

3.2 HISTORICAL BEHAVIOR MODES

Measures of historical global productive activity must be derived from indices of the productive activities of individual countries. The most widely used national economic index is gross national product (GNP), a monetary valuation of all the material goods, food, and services produced by a country in a year. The ratio of a nation's GNP to its population, its per capita GNP (measured in dollars per person-year), is for many purposes a convenient index for a comparison of the living standards of different countries. Analyses of time-series and cross-sectional data on the magnitude and composition of GNP per capita for many different countries yield