

Adaptive Technological Policies—The Effects of Costs of Technological Development and Implementation	529	
Adaptive Technological Policies—The Effects of Delays and Costs of Technological Development and Implementation	533	
Adaptive Technological Policies—The Effects of Delays and Costs, with a Bias for Continued Growth in Industrial Output per Capita IOPC	534	
<b>7.6 Social Policies</b>		<b>537</b>
Reduction of the Desired Completed Family Size DCFS	538	
Increase of Industrial and Service Capital Lifetimes ALIC and ALSC	538	
Shift in the Choice of Output Forms	539	
Population Policy and Shift of Output Choices	541	
<b>7.7 Technological and Social Policies: Equilibrium</b>		<b>543</b>
Equilibrium through Discrete Policy Changes	543	
Equilibrium through Adaptive Policies	545	
Stabilization Policies Introduced in the Year 2000	548	
<b>Appendix: Listing of World Model Equation</b>		<b>549</b>
<b>References</b>		<b>558</b>

## 7.1 INTRODUCTION

The previous five chapters have described in detail the assumptions and equations that comprise the World3 model. The equations were chosen to represent the major interactions within and among five important sectors of the world system: population, capital, agriculture, nonrenewable resources, and persistent pollution. In this chapter a computer is used to simulate the behavior of the complete model and to test the effects of various possible policies.

Computer simulation ensures that the behavior of the model over time is a direct consequence of the model's assumptions described in the five sector chapters. Therefore, the model's behavior *per se* should not be disputed. Instead, criticism should be directed at the assumptions that generate the model's behavior. Through the use of computer simulation one can examine the effects of alternative assumptions on the model's behavior.

The simulation runs shown in this chapter are accurate predictions of global development only if (1) no important assumptions were omitted from the model, and (2) all the included assumptions are completely accurate and will continue to be accurate in the future.

Since neither of these conditions can be fully met by any model of a social system, no such model can ever predict the future precisely. Like every other model, World3 is subject to possible errors of omission or misspecification. The relationships assumed in World3 focus primarily on the material aspects of growth and their long-term side effects. It is conceivable that other social, political, or institutional aspects of growth may be as important as the material-related aspects modeled in World3 and we therefore would encourage further research to examine the extent to which the addition of social, political, or institutional factors would alter the model's behavior.

To determine the effects of possible misspecification of relationships, we conducted hundreds of tests to examine the sensitivity of the model to changes in different parameters. This chapter includes only a few of those tests as examples of the model's sensitivity to exact numerical assumptions; other sensitivity tests have been included in the sector chapters.

The thirty simulation runs presented here were chosen to promote an understanding of the dynamic properties of the world model and to demonstrate the effectiveness of alternative policies. Section 7.2 compares the behavior of the principal model variables over the period 1900 to 1970 with the historical development of the world system. The model is then run from 1900 to 2100 in section 7.3 to determine its behavior mode for later reference. Section 7.4 shows that the reference behavior mode is insensitive to significant changes in the underlying parametric assumptions.

Sections 7.5 and 7.6 test the effects of changes in technology and in social values on the reference behavior mode. The final set of simulation runs (see section 7.7) combines technological and social value changes as a means of achieving a sustainable equilibrium behavior mode.

For every simulation except the historical ones we present an output plot of the behavior of the seven most important system variables over time: