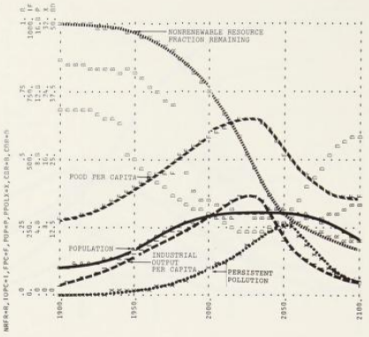

Figure 7-37 Run 7-27: population policy and shift of output choices

A combination of social policies that cause a reduction of growth both in population and in industrial capital is simulated in this run. In 1975 the desired completed family size is reduced to 2 children per family and the amount of services and food per unit of industrial output desired by the population is increased by 50 percent. The resulting behavior is substantially more stable than in the reference run, but the overshoot and decline mode is still evident. In World3, even these reduced levels of population and industrial capital cannot be sustained over the long term; new technological policies must be added to offset the effects of the limits to growth.

less severe than that shown in the reference run (Figure 7-7). The social value changes implemented in Run 7-27 cause population POP and industrial output per capita IOPC to grow at much slower rates than in the reference run. However, Run 7-27 shows that, without additional technological policies, even these lower rates of population and industrial output growth are not sustainable within the time horizon of the model. The lower POP and IOPC still generate a high enough rate of resource usage to deplete nonrenewable resources to the point where resource costs begin to rise. After the year 2030, industrial output and thus IOPC begin to fall. The decreasing industrial output causes shortages in other sectors of the model, and the temporarily stable state degenerates.

This section has examined the effectiveness of several social policies designed to avoid the basic overshoot and decline behavior mode. They reduce the positive pressures toward growth of population and industrial capital in the world system. Although these social changes do tend to improve the stability of the system, it appears that social value changes alone are not sufficient to avoid the unstable behavior mode of the system, just as technological changes alone were insufficient. To stabilize and sustain the model's population and industrial output, the social value changes that reduce the rates of growth of population and industrial output must be augmented by technological policies. The next series of runs examines the behavior of the system when technological and social policies are combined.

7.7 TECHNOLOGICAL AND SOCIAL POLICIES: EQUILIBRIUM

In the preceding sections we have concluded that, of the three possible behavior modes of World3, overshoot and decline seems to be dominant. Under the assumption of a finite world, continued exponential growth is not a realistic option. The third possible alternative, a smooth transition to a state where population and material capital are stabilized and in equilibrium, appears to be the most desirable behavior. What policies or combinations of policies are most likely to move the system toward an orderly transition to equilibrium?

It has been shown in the previous runs that neither technological nor social policy changes *alone* are sufficient to avoid the dominant behavior mode of overshoot and decline. It is the purpose of this section to examine combinations of technological and social value changes that might bring about a smooth transition to a sustainable state of equilibrium. These combinations act to reduce the strength of both the positive feedback loops causing growth of population and industrial output and the negative feedback loops arising from resource depletion, food shortages, and the generation of toxic persistent pollutants. The first run attempts to achieve this behavior by implementing discrete policy changes in 1975; the final runs test the possibilities for arriving at equilibrium by a combination of adaptive technological and social policy changes.

Equilibrium through Discrete Policy Changes Run 7-28 (Figure 7-38) shows one example of an equilibrium state achieved by the following combination of discrete technological and social value changes:

1. Population POP is stabilized by assuming that the desired completed family size is reduced to 2 children in 1975.
2. Growth in industrial capital is controlled in 1990 by reinvesting only enough industrial output in industrial capital to ensure the stabilization of industrial output per capita at a desired level of 350 dollars per person-year.
3. To avoid a nonrenewable resource shortage, resource recycling is increased in 1975 so that the per capita resource usage is reduced to one-eighth of its 1970 value.