Yet, by encouraging continued exponential growth in resource consumption, they hasten the day when substitutes or recycling technologies will be needed.

Run 5-4 (Figure 5-29) shows the effects of implementing a resource-conserving technology in 1975 that reduces by a factor of four the amount of resources used per capita. This technology is modeled by changing the nonrenewable resource utilization factor NRUF from its normal value of 1 to 0.25 in 1975. Such a policy postpones the decline in industrial output for about 40 years.

It is apparent from Runs 5-3 and 5-4 (Figures 5-28 and 5-29) that cost-reducing and resource-conserving technologies are effective in postponing a decline in industrial output, but they are unable to prevent such a decline altogether in this simplified model. A resource shortage may be prevented within the time horizon of this model, however, by combining a policy of improving resource technologies with socioeconomic policies that affect other sectors of the model. For example, Run 5-5 (Figure 5-30) shows the behavior of the sector with both cost-reducing and resource-conserving technological advances and with zero population growth in 1975. In this run the stabilization of population reduces the growth in resource usage, allowing industrial capital IC and industrial output IO to continue to grow unhindered during the model run. The behavior of the

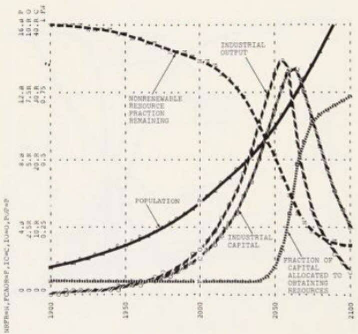

Figure 5-29 Run 5-4: the effects of resource-conserving technologies on the behavior of the nonrenewable resource sector

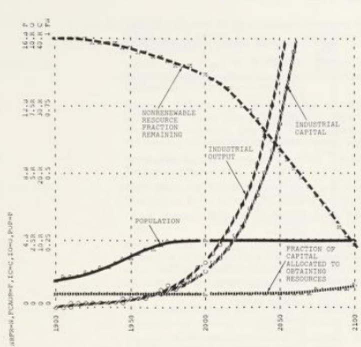

Figure 5-30 Run 5-5: The effects of zero population growth and advanced technological policies on the behavior of the nonrenewable resource sector

nonrenewable resource sector would be further stabilized if policies limiting the growth in industrial capital IC were implemented in this run. As will be shown again in Chapter 7, the long-term decline in industrial output IO caused by the increased cost of nonrenewable resources can be avoided only through a combination of technological and growth-reducing policies.

APPENDIX: PROGRAM LISTING

```
           RESTR

           *      NONRENEWABLE RESOURCE SECTOR WITH EXOGENOUS INPUTS
           NOTE
129        L      NR.K=NR.J+(DT)(-NRUR.JK)
           N      NR=NRI
           C      NRI=1E12
130        R      NRUR.KL=(POP.K)(PCRUM.K)(NRUF.K)
131        A      NRUF.K=CLIP(NRUF2,NRUF1,TIME.K,PYEAR)
           C      NRUF1=1
           C      NRUF2=1
132        A      PCRUM.K=TABHL(PCRUMT,IOPC.K,0,1600,200)
           T      PCRUMT=0/.85/2.6/4.4/5.4/6.2/6.8/7/7
133        A      NRFR.K=NR.K/NRI
134        A      FCAOR.K=CLIP(FCAOR2.K,FCAOR1.K,TIME.K,PYEAR)
135        A      FCAOR1.K=TABHL(FCAOR1T,NRFR.K,0,1,.1)
           T      FCAOR1T=1/.9/.7/.5/.2/.1/.05/.05/.05/.05/.05
136        A      FCAOR2.K=TABHL(FCAOR2T,NRFR.K,0,1,.1)
```