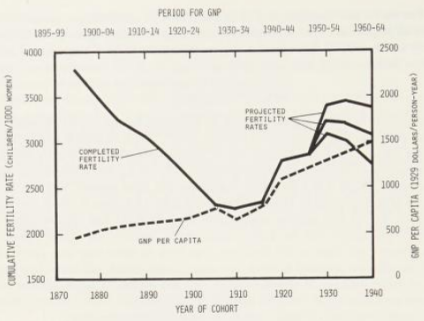

Figure 2-72 Total fertility versus GNP per capita, United States, 1870–1940
Source: C. V. Kiser, W. H. Grabill, and A. A. Campbell, *Trends and Variations in Fertility in the United States*, Cambridge, Mass.: Harvard University Press, 1968. Copyright © 1968 by the Harvard University Press.

income on fertility is cited in the exhaustive literature survey of Mason et al. (1971), who reached the following conclusion about the relation between family wealth and fertility:

> . . . for the least developed nations the tendency of the relationship was inverse; for transitional societies the tendency of the relationship was one of inconsistency; while for developing nations the tendency is for a direct relationship. [Mason et al. 1971, p. x]

The behavior of the fertility rate in the United States as the population passed through these three stages in industrial development is shown in Figure 2-72.

Fertility Control Effectiveness FCE Traditionally, birth control effectiveness has been defined in terms of specific contraceptive methods and specific populations of users. For any given method the most simple measure of use-effectiveness is the "Pearl pregnancy rate"—the number of accidental pregnancies divided by the total months of contraceptive use, usually multiplied by 1,200 to give pregnancies per 100 woman-years of use (Pearl 1939). More sophisticated measures of use-effectiveness based on life table statistical techniques have also been calculated (Potter 1966).

Fertility control effectiveness FCE in World3 refers not to any specific contraceptive method but to the average effectiveness of the entire spectrum of means actually used by the population to control family size. These means could include any

of the Davis and Blake (1956) "intermediate variables" that can be considered subject to voluntary or societal control, namely:

1. Age of entry into sexual unions
2. Extent of permanent celibacy

3a. Unions broken by divorce, separation, desertion

4. Voluntary abstinence
6. Coital frequency
8. Use of contraception
9. Voluntary sterilization

11. Induced abortion

Operationally, fertility control effectiveness FCE is defined as the aggregate ability of the population to achieve its average desired total fertility DTF rather than the maximum total fertility MTF that is biologically possible. If a population actually desires to reproduce at a maximum rate, the effectiveness of fertility control available to that population is unimportant in determining its fertility. The greater the difference between desired total fertility and maximum total fertility, the more necessary and important the effective practice of fertility control becomes.

How can the overall effectiveness of a population in controlling its fertility be measured? Unfortunately, none of the standard family-planning data (for example, Pearl pregnancy rates, number of IUD acceptors, or percentage of target population contacted) can be translated directly into the summary of general fertility control effectiveness needed for the World3 equations. Two possible ways of approaching the estimation of fertility control effectiveness FCE are discussed here: a macro point of view, based on actual observed fertility, and a micro point of view, based on knowledge of the acceptability of individual methods in a given society. We did not attempt to compile a complete table of FCE values for real-world populations by either approach, since very little of the necessary information is available without further field studies specifically designed to gather such data. Rather, we made sample calculations to indicate the general range and direction of the relationships needed for the model. Further empirical and statistical studies in this area would be quite useful.

The macro approach to estimating FCE follows directly from the equation for total fertility TF given earlier in this chapter:

$$TF = MTF(1 - FCE) + DTF(FCE)$$

or

$$FCE = \frac{MTF - TF}{MTF - DTF}$$

Thus the fertility control effectiveness FCE of a population equals the difference between the maximum possible fertility MTF and the actual observed fertility TF, divided by the difference between the maximum fertility MTF and the desired fertility DTF. According to this equation, if the actual total fertility is exactly equal to the desired total fertility, FCE = 1.0. If the actual total fertility equals the maximum, FCE = 0. If the desired fertility equals or exceeds the maximum, FCE is a meaningless concept, since no control will be practiced or needed.