benefits for widows, orphans, or other dependents. The plan analyzed below is financed completely from contributions, without any governmental subsidies. All contributions are credited to particular workers and serve as the basis for benefit calculations. We assume that these contributions represent the burden of the worker, even though employers may pay part of them. The contribution is calculated as a percentage of his total wage or salary. At any point of time this percentage is the same for all covered individuals, but it may increase or decrease over time. Benefits are treated in a special way in our model in that they are payable in a lump sum at the point of retirement. We make this assumption for analytical purposes. This lump sum can readily be translated into a paid-up annuity and actual payment can be made in the form of monthly benefits, or in any other way. We shall not, however, concern ourselves with this feature.

The eligibility conditions of our plan are very simple. An individual becomes entitled to benefits after he has spent a specified number of years, g years to be exact, in covered employment. It is assumed that the entire work force is occupied in covered employment and that all workers retire as soon as they become eligible. Another assumption we make is that there are no deaths during the working span, so that all workers who earn benefits could collect all of their benefits, regardless of how long they live after retirement.

Our analysis is concerned with a plan that has been in existence long enough to be fully matured, meaning that all current beneficiaries have contributed over g years. We focus our attention on the cohort of individuals entering the system at a given point or period of time. For the sake of convenience we may think of the cohort as representing all individuals entering the system in a given year, although in the limiting case the entry time interval could be reduced so that cohorts represented single individuals. After g years, all individuals in a cohort retire and become entitled to a pension based on previous contributions. The pension system makes a lump-sum payment to the entire cohort. Then the payment is presumably converted into annuity income and other benefits that are distributed among members of the cohort. This conversion of the lump-sum payment into individual benefits may well invlove intracohort redistribution designed to insure that the minimum retirement income in the cohort meets social adequacy criteria. We shall not examine the details of this redistribution. In our model all members of a cohort stay employed continuously once they have entered covered employment. This enables us to treat each cohort as a unit for contribution and benefit calculation.

In the mathematical formulation of our pension system there are two sets of variables which have to be solved for (1) the schedule of tax rates, and (2) the schedule of lump-sum benefit payments due each cohort at retirement. These variables are to be determined so that they satisfy the objectives of the social security system. In our mathematical models, these objectives, or criteria, take on the nature of constraints. Our main general constraints are the following:

A. *Social adequacy.*—Benefit levels should be sufficient to provide retirement income that is no lower than a specified minimum.

B. *Equity.*—The relationship between contributions and benefits should be compatible with accepted standards of social justice. This