

MATHEMATICAL APPROACHES TO THE MACROECONOMICS AND PLANNING OF OLD-AGE PENSION SYSTEMS

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I. INTRODUCTION

The American social security system has become a vast undertaking which affects the present or future welfare of nearly every citizen. By the end of 1965 over 163 million people had been issued social security account numbers. Today OASDHI is paying benefits to some 23 million people and collecting contributions from about 70 million employees and self-employed persons. Most striking is the fact that over the last 15 years income and expenditures of social insurance have risen over twice as fast as gross national product.¹ Macroeconomic magnitudes of this order inevitably raise questions about the long-run stability of the system. It is obvious, for example, that social insurance expenditures cannot indefinitely increase faster than the gross national product. Much less obvious, however, is the rate of benefit increase that can be sustained in the long run and the characteristics of a plan consistent with this rate. The objective of this paper is to work out mathematical approaches that may assist social security planners in dealing with such problems in a rigorous analytical manner.

The question of permanently sustainable increases, or in a more general sense of permanently sustainable rates of benefits, is highly important because of its obvious policy implications. It involves both micro and macro economic issues. The micro issue has to do with the proportion of current income individuals are willing to forgo for the sake of future pensions. In this paper we will not be able to deal with this issue.² The macroeconomic problem is concerned with the rates of benefit and contribution that are consistent with such macro variables as the growth of national income and of the work force. We are primarily concerned with this bundle of problems.

One aspect of these problems involves the solvency and burden of social security. Since the inception of the social insurance program, critics have raised doubts in the popular mind about its solvency and issued ominous warnings about its ultimate burden. There seems to be implicit in such warnings the view that later generations will bear

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¹ For data, see Social Security Bulletin, Annual Statistical Supplement, 1965.

² For a theoretical treatment of this problem, see Gaston V. Rimlinger, "A Theoretical Integration of Wages and Social Insurance," *Quarterly Journal of Economics*, vol. LXXVII, August 1963, pp. 470-484.