A large number of papers have been written over the past decade on the factor substitution assumptions of manpower planning activities. The literature includes the theoretical discussions of Anderson and Bowman (1964), Hollister (1964), Hansen (1966, 1970), Blaug (1967), Layard, et al., (1971), Layard (1972), Ahamad and Blaug (1973), and Psacharopoulos (1973), and inter alia the empirical work of Hollister (1966), Bowles (1970), Psacharopoulos and Hinchliffe (1972), Dougherty (1972a, 1972b), and Thomas (1975). The common conclusion of these papers is that projections of manpower requirements produce misleading policy advice because they are predicated on an overly rigid view of the forces responsible for balancing manpower demands and supplies. It is then argued that rate of return analysis is a more suitable approach to the design of human resource investments because such analysis is grounded on a more realistic set of assumptions. For various reasons, this argument has gone unchallenged, making it appear in the literature that the view is dominant, the critique final, and everywhere accepted. Put generally, our aim is to appraise the orthodox case against manpower planning; we will suggest that in certain important respects it is faulty itself and that its recommendations may not be wholly warranted.

More particularly, the objective of this paper is to examine the claim that manpower planning analysis is not a tenable approach to human resource policy questions because it necessarily assumes zero substitution elasticities between diverse pairs of factor inputs. This focus is mandated by the typical point of
departure of the critics' argument. In capsule form, that argument runs as follows. Since both manpower planning and rate of return analysis purport to be useful models for appraising human resource investments, they may be treated literally as close methodological substitutes. As such, they may be judged by the character or validity of their working assumptions. Projections of manpower 'requirements' are noteworthy for their reliance on the assumption of technological rigidities in the production and human resource systems, while rate of return analysis assumes that production relationships are characterized by considerable flexibility. These assumptions are equivalent to basing the analysis on either Leontief or variable proportion production functions. An appropriate working assumption about the form of the production function may be determined empirically by estimating the value of the elasticity of substitution ($\sigma$) – or more correctly, the (McFadden) partial elasticity of substitution ($\sigma^*$) – between diverse factor pairs.\(^2\) Empirical research on this important property of the production function concludes generally that $\sigma^* \neq 0$. This finding suggests that manpower planning analysis is built on the wrong footing and, accordingly, that it should be abandoned.

The critics' argument raises at least two sets of interesting questions, one general and conceptual in nature, the other more technical. First, does the $\sigma^*$ criterion for choosing between analytic constructs have real meaning? In particular, is the estimated value of the elasticity of substitution the only or the most appropriate choice criterion or are there other criteria useful to decisions about methodological approach in this field? If so, how do rate of return and manpower planning analysis stack up against these other criteria? Second, if one decides (for whatever reason) to employ manpower planning analysis, is it an essential precondition in either theory or practice to assume zero substitution elasticities? In applied work, has factor substitutability necessarily been ignored?

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\(^2\) We mean by $\sigma^*$ what McFadden (1963) has called the direct partial elasticity of substitution. It is defined for any pair of factors when output and all other factors are held constant. We note at the outset that a troublesome part of the debate centers on the definition of diverse labor inputs. In particular, it is not clear whether the critics mean the $\sigma^*$ between diverse labor inputs classified by occupational function or classified by the educational qualifications essential to perform those functions. In this sense, there are two 'substitution' elasticities – between pairs of occupations and pairs of preparatory paths leading to the performance of a specific occupational function. We choose in this paper to concentrate on the substitution problem primarily in terms of occupational categories. The reasons are twofold: a) occupational categories provide more robust information to manpower planners for policy purposes; and b) most manpower planning exercises have used the occupational composition of employment as a point of departure. Since in the present context the algebraic signs of the elasticities are expected to be identical, this focus should not detract from our argument. For some novel work that considers the two elasticities jointly and treats them as being opposite in sign, see Tinbergen (1975), especially pp. 84–86.