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A game theoretic analysis of public/government interactions in human capital formation

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Abstract

Despite that the influence of the education and innate capabilities of workers on production has always been a principal concern of educational researchers and economists, not all relevant aspects of the topic have been sufficiently covered. For example, the influence exerted by government as the supplier of education and the responses of the public to the government's decisions have not been studied in detail. This paper attempts to fill this gap. The interaction of government and the public is analyzed using an elementary game theoretic model. The empirical validity of the model is evaluated using information from other studies on workers' productivity and education.

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1. Introduction

The analysis of the influence of workers' education and innate capabilities on their productivity has always been and still is one of the main concerns of educational researchers and economists interested in what the latter call the economics of education. In this field the topic is studied from three different points of view: (a) the human capital, (b) the human resources and (c) the screening, sorting or signaling (SSS) approaches. To locate the content of this paper within the field, some observations about these approaches are presented in this section.

The foundation of the human capital and human resources approaches is the assumption that knowledge transmitted by education does contribute to workers' productivity and, as a

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consequence, to their income. This provides a basis for applying concepts and methods of analysis based on the assumption of rational behavior the study of educational decisions. This has been done in studies by [Becker \(1964\)](#) and [Schultz \(1960\)](#), in which the human capital approach was introduced. In these initial studies, the emphasis was on evaluating the contribution of educational transmitted knowledge to workers' productivity. A theoretically more solid foundation was provided some time later by [Ben-Porah \(1967\)](#), who explicitly studied behavior assuming that individuals pursue the maximization of their well being over their lifetimes.

The measurement of the contribution of education to a worker's output and data on the public and private, paid and non-paid costs of education, which by definition are considered as investments in human capital, make it possible to compute the rates of return to those investments. This information provides a basis for policy recommendations. Specifically, if the rates of return to investments in physical capital are larger than those in human capital, society would benefit from transfers from the former to the latter up to the point where the marginal returns to the two types of investment are equal. This means that the human capital approach recognizes that investments in education, like any other type of investment, are subject to decreasing marginal returns although some important implications of this assumption have not been explicitly operationalized in applications of the approach.

The descriptions of the current state of the approach presented by [Correa \(1995\)](#) and [Woodhall \(1995, 2001\)](#) show that the basic assumption, the methods of analysis, and the main objectives of the human capital approach have not been substantially modified since its inception, despite that much progress has been made in

- (a) statistical evaluation of the contribution to labor productivity of all its determinants, including knowledge obtained in education,
- (b) decomposing the overall rates of return to investments in human capital into rates of return for segments of the population defined by innate abilities, age, sex, race, etc., and
- (c) elaborating the approach introduced by Ben-Porah.

Examples of the first type of analysis are presented by [Ashenfelter and Rouse \(2000\)](#) and [Winship and Korenman \(1999\)](#), of the second by [Heckman \(1999\)](#) and [Carneiro and Heckman \(2003\)](#), and of the third by [Killingsworth \(1983, pp. 207–230\)](#), [Rosen \(1977, pp. 3–40\)](#) and [Weiss \(1986, pp. 603–640\)](#).

The human resources approach to the analysis of the relationship between education and economic conditions, despite that it uses the same basic assumption as the human capital approach, does not take into consideration the rational behavior of either suppliers or demanders of education, and does not emphasize measurement of the contribution of education to productivity. Its main objective, as shown in the models presented by [Correa and Tinbergen \(1962\)](#) and [Correa \(1963\)](#), and in the more recent description presented by [Hinchliffe \(1995\)](#), is to determine the number of workers with different levels of education needed to achieve economic objectives, and as a consequence, the number of students that should attend the educational system. This information is intended for the use of planning authorities for integrating education into the overall development policies of a society.

The SSS point of view, initially conceptualized by [Berg \(1970\)](#) and formalized, among other authors, by [Arrow \(1973\)](#), is based on the antithesis of the assumption used in the first two approaches. Its point of departure is the denial that educational knowledge contributes

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