

Evaluation of the Dagum–Slottje method to estimate household human capital

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Abstract

In Dagum and Slottje's breakthrough contribution of on human capital (2000), the authors combine its microeconomic estimation as a standardized latent variable with the macroeconomic estimation of its average value in the population. The standardized latent variable is obtained applying the partial least squares method after transforming the qualitative indicators considered as investments in human capital and called formative indicators. This approach, however, does not take into account the effects of investing in human capital (reflective indicators), hence ignoring its economic definition. The main purpose of this paper is to introduce an improved statistical method of household human capital estimation as a standardized latent variable which is a function of both formative and reflective indicators. The latter is measured by household earned income, excluding income generated from wealth.

A comparison of the new results with those obtained by Dagum and Slottje [Dagum, C., Slottje, D.J., 2000. A new method to estimate the level and distribution of the household human capital with applications. *Journal of Structural Change and Economic Dynamics* 11, 67–94] using the same data clearly show the advantages of the new approach.

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1. Introduction

The concept of human capital (HC), theoretically and systematically developed over the last 50 years (see e.g. Mincer, 1958, 1970; Becker, 1962, 1964; Schultz, 1959, 1961 and references

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therein) has been traditionally estimated in literature by either the retrospective (Cantillon, 1755; Engel, 1883; Kendrick, 1976; Eisner, 1985) or prospective methods (Farr, 1853; Dublin and Lotka, 1930; Jorgenson and Fraumeni, 1989). In a recent study, Dagum and Slottje (2000) showed that these estimation methods have very serious shortcomings. The first, dealing with the cost of production, does not take into account social costs such as public investment in education, home conditions and community environments, health and other genetic conditions. Furthermore, no consideration is made on the real effects of HC investments on households' income and wealth.

On the other hand, the prospective method uses an actuarial approach, originally introduced by Farr (1853) to estimate individual HC. In this context, HC is defined as the present actuarial value of an individual's expected earned income net of wealth related to his skill, acquired abilities, and education. The prospective method reduces HC investment to its monetary value in terms of only an assumed flow of earned income net of wealth and hence, ignores the amount of investment in education, job training and others.

Le et al. (2003) show in depth the shortcomings of both approaches.

In order to estimate HC, Dagum and Slottje (2000) combine the microeconomic estimation of HC as a standardized latent variable with the macroeconomic estimation of the average HC of a population of economic units. The estimated value of the household HC in the sample survey is obtained by applying the partial least squares method after having transformed the qualitative indicators following Young (1981).

The main purpose of this paper is to introduce a method of estimation of HC as a standardized latent variable (LV) consistent with its economic definition. Hence, HC is treated as a latent variable measured by a set of observed mixed indicators in a path analysis model. The standardized estimates of HC consider the definitions advanced for an LV in a path analysis model with respect to formative and reflective indicators.

Section 2 introduces the new statistical definition of HC as a latent variable. Section 3 briefly discusses existing LV statistical models and points out to their limitations in the present context. Section 4 presents a new method where HC is estimated as a standardized LV which corresponds to its economic definition. First, only quantitative indicators are taken into account, and second, the approach is extended to a mixture of quantitative and qualitative indicators. Section 5 compares the new results with those obtained by Dagum and Slottje (2000) using the same data.

2. The statistical definition of HC

In literature, an LV is defined various ways. In a linear structural model a variable is defined as a latent variable if the equations cannot be manipulated in order to be expressed as a function of manifest (observable) variables (Bentler, 1982). Therefore, an LV is seen as a latent cause of observed indicators and accounts for their variance in a measurement model (typically the factor model). Another common approach is to define a latent variable as “an unobservable composite variable”, meaning as a latent effect resulting from a linear combination of observed indicators measured with errors.

In our case, HC is both a “latent effect” of an unknown function of formative indicators, also called “unknown composite variable” and a “latent cause” of earned income excluding that from wealth.

Given the economic definition of HC in Dagum and Slottje (2000), we distinguish: (i) a set of “formative indicators” F , which generates HC and (ii) a “reflective indicator”, household earned income y which measures the effects of investment in HC. Hence, taking into account only (i),

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