

RECENT PROPOSAL FOR THE ESTIMATION OF HOUSEHOLD HUMAN CAPITAL

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1. INTRODUCTION

The concept of Human Capital (HC), formally introduced and quantified by Petty (1690) and Cantillon (1755) and conceptually analyzed by Adams Smith (1776) was further discussed by distinguished economists throughout history such as Pareto, Marshall, Irving Fisher and C. Gini. In the second half of the 20th century, the study of HC acquired a renewed interest. In this period, several economists concentrated on the qualitative analysis of HC, abandoning the quantitative estimation of personal HC and opting for the earning function as a function of years of schooling alone (Mincer, 1958; 1970) or as a function of years of schooling, professional investment in HC and on the job training (Becker, 1962; 1964). Other economists, conscious of the need and the relevance of having quantitative HC estimations, followed the approach of the Retrospective Method (Kendrick, 1976; Eisner 1985). It deals with the cost of production in the tradition of Cantillon (1755) and Engel (1883). The Prospective Method (Jorgenson and Fraumeni, 1989) instead follows the pioneering actuarial contribution of William Farr (1853) and can be defined as the present actuarial value of an individual's expected income related to his skill, acquired abilities, and education (Dagum and Slottje, 2000). The Educational Attainment method (Barro, 1991; Mankiw *et al.*, 1992; OECD, 1998; Mulligan and Sala-I-Martin, 2000; Wößmann 2003) relates the aggregate stock of HC to the highest level of education completed by each adult (OECD, 1998; Le *et al.*, 2003; Wößmann, 2003).

2. CAMILO DAGUM'S CONTRIBUTION TO HUMAN CAPITAL

The work of Camilo Dagum has provided many important solutions to the problem of HC estimation. Dagum's (1994) first major contribution was to purport a recursive model in order to explain the levels and distribution of personal HC, income and wealth and their distribution, and to interpret the causal impact of the estimated matrices upon the explained endogenous variables, by means of the estimated short-term and long-term multipliers.

Table 2 demonstrates explanatory (exogenous and lagged endogenous) and endogenous variables of the recursive model consisting of 17 independent equations. The last equation in *Dagum's recursive model* is the income generating function (Dagum, 1994) $y = \varphi(HC^*, w)$ which determines the level and distribution of income y as a function of estimated HC (HC^*) and total wealth w . It can be expressed in an analytical way as:

$$\log[g_1(y)] = \alpha_1 + \alpha_2 \log[g_2(HC^*)] + \alpha_3 \log[g_3(w)] + u \quad (1)$$

where y , HC^* , w are the n -dimensional vectors of Household income, estimated HC, and wealth, respectively and u the error in equation. The non linear relationship (1), both in variables and in parameters,¹ becomes linear by means of a logarithmic transformation. It plays a central role in linking the functional to the personal distribution of income, which was, for over a century, an unsolved issue in economics. Furthermore, it offers a sound base to substantiate the micro-macro foundations of income distribution.

Secondly, after having proposed the recursive model, Dagum improved the estimation method of HC, demonstrating that previous approaches (Prospective, Retrospective, Educational Attainment) proposed for estimating HC are not completely satisfactory.

The Prospective Method reduces HC investment to its monetary value in terms of assumed and unsubstantiated flow of income. Among other shortcomings, it ignores the amount of investment in education, job training and other investments (Dagum and Slottje, 2000).

The Retrospective Method is insufficient for various reasons, not taking into account social costs, such as public investment in education, the variables concerning home conditions and community environments, and the genetic contribution to HC, including health conditions (Dagum and Slottje, 2000; Le *et al.*, 2003). Moreover, the actual effects of the investment in HC on the income and wealth of the household heads are not considered.

The Educational Attainment Method does not take into account the fact that the impact of one year of schooling on the quantity and quality of the stock of HC can be strongly influenced by several aspects, such as the quality of the educational system, the diverse returns of different levels of schooling, as well as personal characteristics such as intelligence and family background (OECD, 1998; Le *et al.*, 2003; Wößmann, 2003).

Of the various limitations these methods present, the principal defect common to all of them is that they provide only an aggregate measure of the HC stock. Therefore, what is needed is a new method of HC estimation, which provides a microeconomic estimation of personal and household HC distribution as recommended in the 1998 OECD report on HC (OECD, 1998 p. 89)².

¹ The $g(\cdot)$ are analytical functions of scale and location parameters obtained by fitting empirical distributions to proper Dagum distribution models.

² HC is defined as: "the knowledge, skill, competencies and attributes embodied in individuals that are relevant to economic activity" (OECD report, 1998, p. 4) or, in the most recent definitions:

In order to overcome these problems, Dagum, together with other authors, (Dagum and Vittadini, 1996; Dagum and Slottje, 2000) defined personal HC as the present value of a flow of earned income, throughout an individual life span, generated by his/her ability, home and social environments, and investments in education, that is, the set of working attributes of a person for generating a steady flow of income. This definition takes into account all the methodologies: the Retrospective, Prospective, and Educational Attainment proposals.

Statistically consistent with this point of view, Dagum and Slottje (2000) define HC as a non-observable variable, strictly speaking a latent variable. Therefore, in order to obtain its monetary estimation as a Latent Variable (LV), they utilized an exponential transformation with an actuarial mathematical approach, the Partial Least Squares Method (from here on referred to as PLS), initially purported by H. Wold (1982). PLS defines and estimates the LV HC “by deliberate approximation as a linear aggregate of its observed indicators” (Wold, 1982), the p formative indicators F_0 , connected with the investment in HC in the retrospective and educational attainment methods. We have:

$$HC_{PLS} = F_0 g_{PLS} \quad (2)$$

where the p -dimensional vector of parameters g_{PLS} is obtained by means of simple iterative regressions of each observed indicator f_{0j} on previous estimates of the LV HC (PLS mode B) and the linear combination HC_{PLS} is equivalent to the first standardized principal component of p formative indicators F_0 .

Dagum and Slottje (2000) transformed the estimated standardized LV HC_{PLS} into an accounting monetary value by application of the following transformation:

$$HC^\circ(i) = \exp[HC_{PLS}(i)] \quad (3)$$

with a mean value of:

$$\mu(HC^\circ) = \sum_{i=1}^n HC^\circ(i) f(i) / \sum_{i=1}^n f(i) \quad (4)$$

where $f(i)$ is the number of households in the entire population which the i -th sampled household represents; $HC^\circ(i)$ is the accounting monetary value of HC_{PLS} and n is the sample size. Utilizing an actuarial approach, the authors estimate the real monetary HC upon the idea that the expected mean income at age $x+t$ of a person of age x should be equal to the average earned income of individuals being at the present $x+t$ years old, increased by the average productivity rate r_{x+t} ; therefore, $b(x)$ of the households of age x is the average expected earned income by age of the household heads actualised at a given discount rate, capitalized by

“a complex, multi-faceted concept with various intangible dimensions which are not directly observable and which cannot be measured with precision by a single attribute, a set of attributes, or their combined sum.” (Le *et al.*, 2003)

the average rate of productivity r_x and weighted by the survival probability. Hence, $b(x)$ of the household heads age x is:

$$b(x) = y_x + \sum_{t=1}^{\omega-x} y_{x+t} p_{x,x+t} (1+i)^{-t} \prod_{j=1}^t (1+r_{x+j}) \quad x > x_0 \quad (5)$$

where $\omega - x$ is the age at which the earned income flow stops, x_0 is the starting age for the estimation of the expected flow of income, y_{x+t} is the average (real) income of the household heads of age $x+t$, $p_{x,x+t}$ is the probability of survival at age $x+t$ of a person of age x , i is the discount rate and r is the rate of productivity. Therefore, the estimation of the monetary HC of the population of families in monetary units is the weighted average of $b(x)$:

$$\mu[b(x)] = \frac{\sum_{x=x_0}^{\omega-x} b(x)f(x)}{\sum_{x=x_0}^{\omega-x} f(x)} \quad (6)$$

Multiplying $HC^o(i)$ by the ratio between its mean values $\mu(HC^o)$ and $\mu(b)$ given in (3) and (5), respectively, the vector $HC^s(i)$, of the sample observations in national monetary units, with real mean and variance becomes:

$$HC^s(i) = HC^o(i) [\mu(b(x)) / \mu(HC^o)] \quad i=1,2,\dots,n \quad (7)$$

Dagum and Slottje (2000) utilize such methodology for the estimation of the 1983 American Household HC. The formative indicators proposed for HC estimation are shown in Table 1:

TABLE 1
Formative indicators for HC estimation (Dagum and Slottje, 2000)

x_1 = Age of H
x_2 = Region
x_3 = Marital Status of H
x_4 = Gender of S
x_5 = Years of Schooling of H
x_6 = Years of Schooling of S
x_7 = Number of Children
x_8 = Years of Full-Time Work of H
x_9 = Years of Full-Time Work of S
x_{11} = Household Total Wealth
x_{12} = Household Total Debts

3. RECENT IMPROVEMENTS IN THE HC ESTIMATION METHOD

In (2) HC estimated by means of PLS method only considers its formative indicators F_0 equivalent to the old retrospective economic definition which does not take into account the return of the investment in HC measured by the reflective indicator income y_0 . In this direction, Vittadini and Lovaglio (2007), in line with Dagum and Slottje's aforementioned definition of HC (2000), while also taking into account the definitions of latent variables proposed by Wold (1982) and

Bentler (1992),³ suggest that from the statistical point of view, HC can be defined as a multidimensional non observable construct of formative indicators F_0 and, simultaneously as a multidimensional latent cause of the reflective indicator y_0 which measures its effects. As a result we have:⁴

$$HC = F_0 g \quad g' F_0' F_0 g = 1; \quad (8)$$

$$y_0 = HC b + v; \quad E(v) = 0; \quad E(vv') = \Omega \quad (9)$$

where HC is a zerodimensional latent variable, F_0 is a (n, p) matrix of centered formative indicators, g is a $(p, 1)$ vector parameter which expresses the effects of the formative indicators F_0 on HC ; y_0 is the $(n, 1)$ of the net earned income, b is a scalar which expresses the effect of HC on earned income y_0 , v is the n -dimensional of the errors of equations with the variance-covariance Ω .

TABLE 2
Exogenous and endogenous variables in the recursive Dagum model

<i>a)</i> Exogenous variables
x_1 = Age of the Household Head (H)
x_2 = Gender of H
x_3 = Race of H
x_4 = Marital Status of H
x_5 = Age of the Spouse (S)
x_6 = Gender of S
<i>b)</i> Endogenous variables
y_1 = Years of Schooling of H
y_2 = Years of Schooling of S
y_3 = Number of Children
y_4 = Years of Full-Time Work of H
y_5 = Years of not Full-Time Work of H
y_6 = Years of Full-Time Work of S
y_7 = Years of Not Full-Time Work of S
y_8 = Job Status of H
y_9 = Occupation of H
y_{10} = Industry of H
y_{11} = Job Status of S
y_{12} = Occupation of S
y_{13} = Industry of S
w = Household Total Wealth
d = Household Total Debt
HC = Household Human Capital (estimated latent variable)
y = Household Income

Therefore the unobservable multidimensional construct HC is approximated by the linear combination of its formative indicators F_0 which better fits the only reflective indicator y_0 .

Hence, substituting equation (8) into equation (9), we have:

$$y_0 = F_0 g b + v = F_0 d + v \quad (10)$$

³ Bentler (1992) says that a LV is as a multidimensional construct which causes, and therefore is indirectly measured by means of observed indicators.

⁴ In the measurement model of HC the error term is not specified because it is empirically indistinguishable from the error in equation of the reflective indicator equation.

Initially we estimate d by means of Generalized Least Squares (GLS) by regressing $Ty_0=y$ on $TF_0=F$ with T known matrix which contains corrections for non sphericity of errors.⁵ The estimated parameters d^* of $d=gb$ are the effects of the formative indicators F on earned income y . In fact:

$$d^* = S_{F^{-1}} F' y \quad (11)$$

where $S_F = F' \Omega F$ is the variance-covariance matrix of F . Premultiplying (11) for F we obtain:

$$F d^* = F S_F^{-1} F' y = P_F y \quad (12)$$

where the (n, n) matrix $P_F = F(F'F)^{-1}F'$ is a projector on the space spanned by F . Given the restriction that $\text{Var}(HC)=1$, we obtain:

$$\text{var}(F d^*) = \text{var}(F g b) = b^2 \text{var}(F g) = b^2 \text{var}(HC) = b^2 \quad (13)$$

From (12) and (13) we obtain b^* , the effect of HC on earned income y :

$$b^* = [y' P_F y]^{1/2} \quad (14)$$

Therefore, from (11) and (14) we obtain the parameters g^* :

$$g^* = d^* / b^* = [y' P_F y]^{-1/2} S_F^{-1} F' y \quad (15)$$

and the estimation of HC scores:

$$HC^* = F g^* = T F_0 g^* \quad (16)$$

The model can be extended with more (q) reflective indicators measuring the effects of the LV HC . In that case, naming the original (non transformed) indicators as columns in the (n, q) matrix Y° and F° without loosing generality with Y and F , model (10) becomes:

$$Y = HC b' + V = F g b' + V \quad \text{Vec}(V) \sim (0, I_n \otimes \Omega) \quad (17)$$

where Vec stacks the columns of V .

The solution of eq. (17) can be obtained by the Redundancy Analysis Model (van den Wollenberg, 1977), which maximizes the sum of squared correlations (cor) between each reflective variable (y_j) and Fg (Redundancy index):

$$\sum_j \text{cor}^2(Fg, y_j) \quad j=1, \dots, q \quad (18)$$

with respect to g , under the restriction of the HC variance unit for the Fg combination:

⁵ Usually the errors are strongly heteroskedastic due to the weights of each sampled household drawn from the population.

$$g'F'Fg=1. \quad (19)$$

The estimate of HC coincides with the first redundancy component of the formative indicators F with respect to the reflective indicators Y or can be obtained within a more general framework, even in presence of concomitant indicators (Lovaglio, 2007).

It has been established that by using Lagrangian multipliers the maximization (17) under (18) is achieved with the largest λ eigenvalue and corresponding g^* eigenvector of the matrix $F^{\#'}Y\Omega^{-1}Y'F^{\#}$ with $F^{\#}$ matrix obtained by Gram-Schmidt orthogonalization on F and Ω^* an estimation of Ω , obtained by means of a SURE approach (Johnston, 1984) or covariance structure methods (Lovaglio, 2004).

It should be noted that several indicators of HC, such as region, gender, and marital status are categorical, and hence the formative indicators in F are of mixed type. To deal with this situation, this method can be extended to the case of formative mixed indicators. In that case, eq.(8) is expressed as follows:

$$HC=F_g g' b'_i + F_q g_q b'_q \quad (20)$$

where the matrix $F=(F_c, F_q)$ of formative indicators is partitioned into matrices F_c and F_q , of qualitative and quantitative variables, respectively. The parameter vectors g and b are also partitioned into two components $g=(g_c, g_q)$ and $b'=(b'_i, b'_q)$, respectively.

Therefore, we look for algorithms of optimal scaling which generalize classical multivariate techniques such as principal components, multiple regression, and canonical correlation. Our preferred choice is the application of linear models in the context of ALSOS (Alternating Least Squares with Optimal Scaling) methods, which sequentially estimates the parameter vector g_c and quantifies the categorical indicators f_{j_c} (contained in F_c) by means of a unique iterative algorithm which respects the simultaneity required, as shown in equations (8)-(11), continuing until the values of b_c, g_c, F_c, HC^* converge (Young *et al.*, 1976). In this way, the case of mixed indicators is extended to the case of quantitative indicators achieving the final scores of HC^* by simultaneously estimating it as an unobservable multidimensional construct by utilising mixed formative and reflective indicators.

4. EDUCATIONAL AND JOB HUMAN CAPITAL

The previous approach can be extended to the case of HC of dimension two, composed of the educational dimension (EduHC, ξ) and working experience dimension (JobHC, η) underlying the process of determination of earned income and capital income, specifying a measurement model, shown in Figure 1 which is consistent with received economic theory.

The indicators which describe the force of contributing to the formation of HC (formative indicators) can be divided into four groups: indicators involving information about Household, Head (H), Spouse (S) and Parents of H and S. The

formative indicators are the Household net wealth - decomposed in three terms: real assets (**wreal**), financial assets (**wfin**), total debt (**debt**), and two blocks regarding the block of educational variables (Z) and the block of (working) experience indicators (F).

The life span return of HC is described by the dependent variables y_1 and y_2 , representing the Net disposable labour income and Net disposable capital income respectively. Once **EduHC** and **JobHC** are estimated as the best linear combination (of rank one) of their formative indicators, in coherence with the supposed path (Lovaglio, 2007), we can estimate the structural model by treating the model shown in Fig. 1 as a system of three simultaneous linear equations.

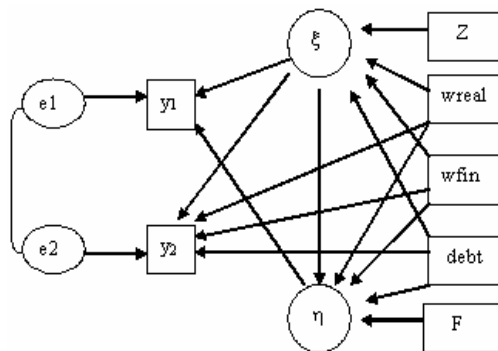


Fig. 1 – Path diagram of bidimensional HC model.

5. A COMPARISON BETWEEN ITALY AND USA

First, the model is utilized for estimating the 2004 distribution of American household HC (Dagum *et al.*, 2007).

We use the 2004 Survey of Consumer Finances (SCF) (Bucks *et al.*, 2006), which contains detailed information regarding income, wealth and socio-demographic information on American households. The data is composed of over 4,500 households, representative of more than 110 million American families. For each household we consider indicators involving household Head (H) and Spouse (S). No adult skills or parental characteristic indicators useful for the estimation of household HC can be obtained from SCF, whereas we use household earned income as the only reflective indicator.

Table 3 gives the formative indicators (and relative weights estimates) which were found significant (based on F values and significance, Sign) for determining the standardized HC.

The results confirm the expectations of economic theory, which assumes that in the process of HC formation the largest weights are found for those variables related to education and job training such as: years of schooling and job status of the head of the household, household debt, years of full time job and type of occupation. Among demographic indicators, it is important to note that gender has

more weight than age and race, and within family characteristics, marital status is more important than the number of children.

TABLE 3
Formative Indicators (and statistical significance) of the HC estimation for US Families

Factors	Indicators	F value	Sign.
Training on the Job	H Job Status	4502.5	<.0001
Educational Attainment	Household Debt	2590.8	<.0001
Training on the Job	H Type of Occupation	1679.6	<.0001
Educational Attainment	H Years of Schooling	1042.9	<.0001
Training on the Job	S Job Status	1006.1	<.0001
Training on the Job	H Years Full-Time Job	999.6	<.0001
Training on the Job	H Sector	905.4	<.0001
Demographic	H Gender	635.8	<.0001
Educational Attainment	S Years of Schooling	538.3	<.0001
Demographic	H Age	515.7	<.0001
Educational Attainment	Educational Debt	457.6	<.0001
Demographic	H Race	379.1	<.0001
Training on the Job	H Part-Time Job	27.1	<.0001

Secondly, the model is utilized for estimating the 2000 distribution of Italian household HC. We use the 2000 Italian Sample Survey (Banca d'Italia, 2002) with 8,001 households, 22,268 individuals and 13,814 income-earner persons, as a representative stratified sample of 16,509 million Italian households.⁶ Table 4 presents the most important formative indicators specified in equation (7). This equation, jointly with equation (8), estimates the standardized latent variable HC. The statistical significance of the indicators is evaluated by means of the test F (we consider indicators with F - p values <0.0001); in effect qqplot test reveals, for both samples, strong normality in the residuals (earned income) distribution.

The most important indicator contributing to the levels of HC is years of full time work of S which can be considered as a proxy of professional training. After this variable, in order of importance follow the variables household total wealth, years of schooling of H, years of full time work of H, and years of schooling of S. The significance of region of residence reveals the differences in HC distribution between the different regions of Italy. Moreover, on the whole, household HC is determined more by the household head than by the spouse, and even more by the years of full time job than by years of schooling.

TABLE 4
Formative Indicators (and statistical significance) of the HC estimation for Italian Families

Factors	Indicators	F Test	Sign.
Training on the Job	Years of Full-Time Work of S	472.4	<.0001
Training on the Job	House Total Wealth	99.0	<.0001
Educational Attainment	Years of Schooling of H	83.9	<.0001
Training on the Job	Years of Full-Time Work of H	78.9	<.0001
Educational Attainment	Years of Schooling of S	43.3	<.0001
Demographic	Region of Residence	39.0	<.0001
Training on the Job	Occupation of H	38.7	<.0001
Educational Attainment	Household Total Debt	28.8	<.0001

⁶ The sample is representative of the household population because H and S are the 85% components and possess the 95% of the Total Income of the Banca d'Italia whole sample.

Applying the actuarial method proposed by Dagum and Slottje (2000), under particular hypotheses⁷, we obtain the expected flow income in the cycle span for Italian household head.

The mean, median and Gini ratio of the distributions of the household Total Wealth, Net Wealth, Income, Total Debt and the monetary estimated American and Italian household distributions of HC are presented in Table 5. The HC average is more than sixteen times higher than the average income of American families and ten times higher than Italian families. Moreover, the HC average is slightly higher than the average total wealth for Italy and ten times as high for the United States. Finally, for both countries, the Gini ratio shows that the inequality of the HC distribution presents a Gini ratio greater than the income inequality and smaller than the total and net wealth inequality. These results are consistent with the results of previous research (Dagum and Slottje, 2000).

TABLE 5
Statistics of HC, Income, Wealth and Debts (€ and \$)

Country	Indicator	Monetary HC	Total Income	Total Wealth	Net Wealth	Total Debt
US	Median	\$ 982,401	\$ 34,000	\$ 175,150	\$ 103,050	\$ 24,200
ITALY	Median	€ 101,556	€ 14,771	€ 99,160	€ 94,770	€ 0
US	Mean	\$ 852,533	\$ 53,245	\$ 577,066	\$ 498,237	\$ 81,638
ITALY	Mean	€ 186,493	€ 17,472	€ 177,207	€ 170,668	€ 6,538
US	Gini	0.656	0.501	0.760	0.811	0.705
ITALY	Gini	0.522	0.353	0.628	0.631	0.920

Regarding the estimated short term multipliers, the main results are:

- respect to the Income Generating Function, one year increase of HC, given wealth, contributes to an increase of income of 0.162\$ and 0.056 euro, in the U.S. and in Italy, respectively;
- in the U.S. (Italy) one dollar (euro) increase of total debt and total wealth contributes to an increase of \$0.136 (0.009 euro) and of 0.035\$ (0.0034 euro) of household HC, respectively;
- in the U.S. (Italy) the marginal increase of HC resulting from a one year increase in schooling of the household head (H) and spouse (S) are \$27,092 (512 euro) and \$1,262 (450 euro) respectively confirming that the level of education plays a significant role in monetary HC, more in the U.S. than in Italy;
- in the U.S. (Italy) one year increase of full -time employment contributes to an increase of \$1673 (190 euro) of household head (H) HC.

As regarding the bidimensional HC model (shown in Figure 1) we have estimated, for Italy alone, the HC* latent scores and, by means of a Three Stage Least Squares approach, the causal parameters. In Table 6 we show the estimated standardized regression coefficients of structural equations regarding the causal

⁷ The following hypotheses are proposed: the age of entrance in the labour market is 24, the income ceases at 70 years, a discount rate of 5% (approximately equal to Treasury bonds interest) for the U.S. and of 8% for Italy to actualize future earnings, the productivity rate takes its maximum value $r=3\%$ at age 24, with a constant decrement in time until the age of 64, when $r=0$, the survival probability for males are obtained from the American life tables for males (NVSRS 2000) from U.S. and from the 2001 Italian Population census for Italy.

links of ξ , η , y_1 , y_2 , household debt and gross wealth: the t-values, the R-squared (for the two stage step) for each equation.

The main results of this analysis are:

- the contribution of **EduHC** is two times as high as the contribution of Work experience **JobHC** to the formation of the Net disposable labour income;
- the net disposable capital can be described as a function of net wealth in its different aspects (debt, real and financial wealth) more than of Educational HC;
- **EduHC** shows strong impact on the process of accumulation of **JobHC**.

TABLE 6
Estimation of parameters of bidimensional HC model

Endogenous Variables	Exogenous Variables			Fit R^2_{2SLS}
	ξ (EduHC)	η (JobHC)	Debt Gross W (Wreal+Wfin)	
η (JobHC)	0.6890 ($t=50.57$)			0.543
y_1	0.4720 ($t=25.44$)	0.2826 ($t=15.22$)		0.586
y_2	0.1507 ($t=12.78$)		-0.4119 ($t=-20.23$)	0.705
			0.5277 ($t=36.43$)	

6. CONCLUSION

Economic development cannot be described by only the gross domestic or the gross national product. The amount of investments in HC and Wealth, and their levels and distributions are the main forces shaping growth with social justice, hence, the social welfare of a national economy. It can be shown that these investments, through the Income Generating Function (Dagum 1994a, b), determine a less unequal, hence, a more equitable income distribution.

The socioeconomic policies aiming at increasing the income levels and reducing the inequalities in the distribution of HC and Wealth must necessarily be structural economic policies, because they purport to achieve a target economic structure that would be able to generate economic processes of sustained growth with social equity. Furthermore, these policies will contribute to the achievement of a dynamic path toward generating a steady decrease of poverty. Instead, income transfer policies, when not supported by a clear and well designed structural policy, become a palliative that compound, instead of relieve the poverty of nations. The use of the income transfer policy alone not only does not solve the plight of the poor, it also supports a time path that reproduces poverty from generation to generation.

The proper accumulation of personal HC, that is, an increase of the amount, hence the mean and a decrease of its inequality, jointly with the investments in socioeconomic infrastructures, plays the most essential role in the generation of economic growth and social equity. In addition, an appropriate reform of the financial system is needed to support the entrepreneurial initiatives sustained by the endowment of HC.

Given the central role played by HC in the generation of endogenous economic development, we need a sound and robust method of personal and national HC estimation in order to measure personal HC levels and distribution, as well as methods for the use of this estimation in a model explaining the levels and distributions of HC, Income and Wealth, and their associated inequalities. The creation of this estimation, and its application to the Italian and U.S. sample survey of income and wealth, were the goals of this research.

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RIASSUNTO

Un confronto tra capitale umano italiano e americano

Dagum e Slottje (2000) hanno stimato il capitale umano come variabile latente integrando un approccio attuariale per la sua stima monetaria. Il presente lavoro introduce un nuovo metodo di stima del capitale umano che integra indicatori formativi e riflessivi coerentemente con gli assunti della teoria economica e delle evidenze empiriche. Il capitale umano monetario stimato per le famiglie italiane (2000) ed americane (2004) viene infine utilizzato in un modello ricorsivo per esplorare il ruolo del capitale umano nella macroeconomia di un paese.

SUMMARY

Recent proposal for the estimation of household human capital

Dagum and Slottje (2000) estimated household Human Capital (HC) as a Latent Variable (LV) proposing its monetary estimation by means of an actuarial approach. This paper introduces an improved method for the estimation of household HC as LV by means of formative and reflective indicators in agreement with the accepted economic definition of HC. The monetary HC distribution, estimated for Italian (2000) and US (2004) household, is used in a recursive causal model to explore the role of HC in macroeconomy.

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