
The Investments in Education and Quality of Life

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A considerable amount of literature has investigated positive economic and social outcomes that learning may have both for individuals and for societies. Better-educated people typically have better health status, lower unemployment, more social connections, and greater engagement in civic and political life. This paper aims to explore the relationship between investments in education and research and the level of quality of life in a country. The investments in education and research are expressed in terms of expenditure on education and research, financial aid to pupils and students and public subsidies to private sector. For the assessment of quality of life there were considered three well-known composite indicators: Human Development Index, Economist Intelligence Unit Quality of Life Index, and Satisfaction with Life Scale. The analysis is done using data on European Union 27 member states, which come from Eurostat database and from specialized institutions' sites. The study shows a positive relation between investments in education and quality of life. It identifies the annual expenditure on public and private educational institutions per pupil/student and the gross domestic expenditure on research and development as being the indicators of investments in education that best predict the level of quality of life in a country.

Keywords: *education; quality of life; investment in education*

Introduction

Education is a key issue in the research studies and in public debates on quality of life (QOL). In the beginning of 2000s, education has been on the list of priorities of the Lisbon strategy in order to sustain the efforts to improve the economic competitiveness and increase the quantity and quality of jobs (Ashiagbor, 2005; Vesán and Bizzotto, 2011, p. 2). More recently, within the Report by the Commission on the Measurement of Economic Performance and Social Progress, education was again among the focused eight key domains when defining well-being (Stiglitz et al., 2009, pp. 14-15).

Education or aspects of education such as literacy, knowledge, and mental development are among the domains of human life considered in the construction of most of the international indexes of development and QOL (Hagerthy et al., 2001) and in most of the governmental social monitoring frameworks (Vesán and Bizzotto, 2011, p. 8). Education is also among the categories considered in most of the multidimensional approaches to human well-being and progress proposed by different authors (Alkire, 2010).

Following the broad interest manifested both in the research literature and among policy-makers for the study of positive effects of education on QOL, the present paper aims to identify and characterize certain relationships that might appear between investments in education and QOL. The analysis is focused on 27 European countries.

The research has been organized as follows: it first presents a short literature review about the positive effects of education on QOL and about the relationship between investments in education and QOL; the next section describes the methodological issues (sample, indicators, method); the paper continues with the presentation of the main results

concerning the way investments in education may predict QOL and ends with concluding remarks.

Literature review

Positive effects of education on quality of life

There is a consensus that education brings a range of returns (monetary and non-monetary) that benefit both the person investing in the education and the community in which they live (Stiglitz et al., 2009, p. 46). Schuller (2007, p. 8) identifies earnings, income, wealth and productivity as possible monetary outcomes of learning for individuals, while monetary outcomes of learning at public level refer to tax revenues, social transfer costs, and health care costs. Schuller (2007, p.8) also suggests positive non-monetary outcomes of learning on individuals in the form of improved health status and life satisfaction. At community and society level, non-monetary outcomes of learning refer to social cohesion, trust, well-functioning democracy, and political stability.

Among the social outcomes of learning Pfeifer (2007) mentions the following: a well-educated person can achieve social and economic progress by herself; wealthier people and higher standards of life are positively correlated with more and better education; poor kids in good schools do better in life. Education empowers a person and it helps people to become more proactive, gain control over their lives, and to broaden the range of available options (UNESCO, 1997, in Khan and Williams, 2006, p. 2).

Beyond its effects on people's earnings and productivity, education helps them in achieving a variety of outcomes that matter for QOL. Evidence indicates that individuals who attended school for longer, or who achieved higher educational qualifications, are more likely to report greater subjective well-being (Oreopoulos, 2007; Helliwell, 2008, cited in Stiglitz et al., 2009, p. 166), to enjoy better health and to participate more actively in society. Education may enable people to live

more positively healthy lives (Schuller, 2007, p. 5; Goldberg, J. and Smith, J., 2007, p. 14; Stiglitz et al., 2009, p. 166). Better educated people record lower mortality rates (Mackenbach, 2006), less serious health problems (such as diabetes and high blood pressure) and less common illnesses (such as colds, headaches and aches) (Stone et al., 2008), and increased access to health care (van Doorslaer et al., 2004). Education can foster civic and social engagement (CSE) by shaping what people know; by developing competencies that help people apply, contribute and develop their knowledge in CSE; by cultivating values, attitudes, beliefs and motivations that encourage CSE; by increasing social status (Schuller, 2007, p. 5). Education is also a key to social inclusion as it enables citizens to make use of existing possibilities for full engagement in social and political life as active citizens (Souto Otero and McCoshan, 2005, p. 13).

Investments in education and quality of life

Vast research literature provides evidence of the value of investing in education to develop human capital and of its contribution to economic development and growth (Fasih, 2008, pp. 8-9). In their Final Report for the European Commission entitled Study on Access to Education and Training –Tender No EAC/38/04, Lot 1, Manuel Souto Otero and Andrew McCoshan (2005, p. 8), discussing about the importance of education in the context of Lisbon strategy Europe 2010, underline the crucial role of education and training in achieving economic progress and social inclusion: “Investing in people and developing an active and dynamic welfare state will be crucial both to Europe’s place in the knowledge economy and for ensuring that the emergence of this new economy does not compound the existing social problems of unemployment, social exclusion and poverty” (Council of the European Union, 2000, in Souto Otero and McCoshan, 2005, p. 11).

Since investments in education as other kinds of investment are evaluated in terms of their rates of return, studying them can highlight

public and private investment priorities in resources allocation, with regard to level of study, curriculum type, sector and gender. Social returns could indicate to governments which are priority investment areas among alternative schooling levels and programs (Tansel, 2004, p. 39).

One direct consequence of investments in education is a broadened access to education, either by allowing a greater number of people to receive education or by facilitating access to more competencies, or by both ways.

Aggarwal et al. (2010, p. 14) notices that an increase in spending on education leads to an increase in the propensity for young people to undertake education. Later in the life cycle, the human capital that they have acquired equips these young people to undertake jobs that are qualitatively different from those in which they would otherwise have become employed. That means that more people get better jobs.

Inspired by Mincer earnings' model, which derives directly from the assumption that individuals are paid based on their marginal productivity, Kuepie et al. (2006) suggests that investments in education are an explanatory factor in the distribution of earnings. Under this assumption, a strong implication in terms of economic policy is that if inequalities in income distribution are to be reduced in a given country, the starting point is to reduce inequalities in access to schooling, given that income inequality seems to be higher when education is less equally distributed (Kuepie et al., 2006).

The human capital theory, an economic rationalist approach, focuses on returns to investment in education: education and training (human capital) increase worker productivity and hence the value of educated workers. Thus, individuals who invest time, energy, and money into education do so with the expectation of securing a better job and enhanced lifetime earnings. At the individual level, increasing education (human capital) increases worker productivity and thus garners better employment and income for the individual. At the social or aggregate level, general increments in the stock of human capital are supposed to

increase overall productivity, prosperity, and social cohesion (OECD, 1998, 2001 cited in Edgerton et al., 2012, p. 266).

From a stock based approach to sustainability, investments in education – essentially through expenditure on education and research – are both important and necessary in securing a high quality of life on long-term, since it contributes to the constitution and development of the human capital as a resource that enhances well-being of future generations (Stiglitz et al., 2009, p. 98). Human capital refers to the knowledge, skills and attributes that are embodied in each person and that facilitate the creation of different forms of well-being (Keeley, 2008, cited in Stiglitz et al., 2009, p. 273). The benefits of human capital are both economic and social, and they may accrue both the person making this investment and to the community of which they are part. The economic benefits of human capital investment take the form of higher income and earnings capacity for the individual making this investment. At the aggregate level, investment in human capital is an essential factor for economic growth, as growth is based on technical advances that request workers more skilled and qualified. Investment in human capital also delivers social returns, such as higher life-expectancy for more educated people, lower undesired fertility in less-developed countries, and greater participation in civic and social life. Because of this range of payoffs, the concept of human capital may be approached as a driver of economic growth and innovation; as an investment to secure greater access to jobs, higher income and lower poverty; and as one of the assets that should be preserved and developed to secure sustainable development (Stiglitz et al., 2009, p. 273).

One limit that occurs in the evaluation of impact of investments in education on QOL is the fragility of link between expenditure on education and people's QOL: expenditures relate to the resources that go into the institutions providing educational services, whereas educational attainments are driven by many other factors (Stiglitz et al., 2009, p. 98). Another weakness is that analysis only of education expenditures – as the monetary cost of producing new human capital – ignores depreciation of

human capital and the fact that the same level of expenditures can produce human capital of very different qualities (Stiglitz et al., 2009, p. 253).

Material and method

The analysis of the relationship between investments in education and QOL is done using data on the 27 countries of the European Union for the period 2005-2008.

Within this study, investments in education refer to expenditure on education and research, financial aid to students, and funding of education. Data source used to select the variables that describe investments in education is *Eurostat* database. To describe investments in education the following variables are considered in the analysis: annual expenditure on public and private educational institutions per pupil/student in EUR PPS, based on full-time equivalents, for all levels of education combined (EXP_PUPIL_all) and for each level of education (EXP_PUPIL_I at ISCED level 1, EXP_PUPIL_II at ISCED level 2-4, EXP_PUPIL_III at ISCED level 5-6); total public expenditure on education as % of GDP, for all levels of education combined (T_PUB_EXP_all) and for each level of education (T_PUB_EXP_I at ISCED level 1, T_PUB_EXP_II at ISCED level 2-4, T_PUB_EXP_III at ISCED level 5-6); public subsidies to the private sector as % of GDP (SUBSIDIES); financial aid to pupils and students as % of total public expenditure on education, for all levels of education combined (F_AID_all) and for each level of education (F_AID_I_II at ISCED levels 1-4, F_AID_III at ISCED level 5-6); and gross domestic expenditure on R&D in euro per inhabitant (GERD) and as % of GDP (GERD_GDP).

Three well-known composite indicators were considered for the assessment of quality of life: *Economist Intelligence Unit (EIU) Quality of Life Index* (calculated for 2005), *Satisfaction With Life Scale* (SWLS, available for 2006), and *Human Development Index* (HDI, with annual data for 2005-2008). Each of the three indicators of quality of life totally

covers the sample. Data on QOL indicators come from specialized institutions.

Economist Intelligence Unit (EIU) Quality of Life Index has been developed, in 2005, based on a methodology that links the results of subjective life-satisfaction surveys to the objective determinants of QOL (healthiness, family life, community life, material well-being, political stability and security, climate and geography, job security, political freedom, gender equality) across 111 countries (EIU, 2006, pp. 1-2).

Satisfaction With Life Scale (SWLS). In 2007, Adrian G. White, an analytic social psychologist at the University of Leicester, publishes a meta-study on subjective well-being, in which he presents a table that gives the SWLS score for 178 countries. He used data on SWLS extracted from Marks et al. (2006). White's table served as the data source for selecting the SWLS scores used in our paper.

Human Development Index (HDI) was created and developed through the combined work of the economists Mahbub ul Haq and Amartya Sen in 1990 being published by the United Nations Development Programme since then (www.undp.org). Until the UNDP 2011 report, the HDI combined three dimensions: life expectancy at birth, as an index of population health and longevity; knowledge and education, as measured by the adult literacy rate (with two-thirds weighting) and the combined primary, secondary, and tertiary gross enrolment ratio (with one-third weighting); and standard of living, as indicated by the natural logarithm of gross domestic product per capita at purchasing power parity (http://en.wikipedia.org/wiki/Human_Development_Index). In the paper we considered values of HDI from 2005 - 2008, which are calculated using the old method.

Different indicators of QOL have been chosen in order to verify if good predictors of QOL are stable regardless of the indicator of QOL. We have also considered in the analysis an indicator of QOL (HDI) with values available for several years so as to find good predictors of QOL which are stable in time.

To identify the investments in education that best predict the QOL, we built for each indicator of QOL and for each considered year several regression models using each indicator of investment at a time as an independent variable. Each time we introduced an indicator of investment in the analysis, we generated 11 different regression models for each indicator of QOL and each year. The 11 models are: Linear, Logarithmic, Inverse, Quadratic, Cubic, Compound, Power, S, Growth, Exponential, Logistic, being available with *Curve Estimation* procedure in SPSS package. The procedure is appropriate when the relationship between the dependent variable(s) and the independent variable is not necessarily linear. These regression models have been then compared and analyzed with regard to R^2 and sig. values. The coefficient of determination, commonly known as R^2 , is a measure of the strength of association between the observed and model-predicted values of the dependent variable. It may be defined as representing the proportion of variation in the response that is explained by the regression model (Jaba, 2002). Mathematically, the general form of this relationship is (Colton and Bower, p. 1): $R^2 = \frac{SSTO - SSE}{SSTO}$, where SSTO is the total sum of squares in the response about the mean, and SSE is the sum of squares in the response about the regression line. R^2 is a proportion (or percentage) and varies between 0 and 1 (i.e. 0% to 100%). 0% indicates that the model explains none of the variability of the response data around its mean, while 100% indicates that the model explains all the variability of the response data around its mean (Frost, 2013). In general, the higher the R-squared, the better the model fits the data. The R^2 statistic can be small, but statistically significant, describing a relationship between predictors and response that may be very important, even though it doesn't explain a large amount of variation in the response (Colton and Bower, p. 5). Sig represents the significance value of the F test of model fit. A significance value of the F statistic smaller than 0.05 means that the variation explained by the model is not due to chance.

Results

The analysis of R^2 and sig. values for the obtained regression models helps to identify those indicators of investments in education that best predict QOL, while ensuring statistically significant relationships.

Results of QOL modeling show that 52.9% up to 74.6% of the variability in EIU-QOL index and 58% up to 72% of the variability in HDI 2005 index may be explained by annual expenditure on public and private educational institutions per pupil/student in EUR PPS, based on full-time equivalents. The same indicator explains between 64.8% and 89.3% of the variance in SWLS and between 50.6% and 65.6% of the variance in HDI 2006. The proportion of explained variation in HDI ranges between 46.7% and 64.9% in 2007 and between 31.2% and 66.7% in 2008. In the case of annual expenditure on public and private educational institutions per pupil/student the models that maximize R^2 values are: Cubic, Power, Logarithmic, Quadratic, S, and Inverse.

Table 1: R^2 and sig. values obtained for the models built with data from 2005

	EIU-QOL (2005)		HDI 2005	
	R^2	Sig.	R^2	Sig.
EXP_PUPIL_all	0.570 - 0.679	= 0	0.668 - 0.712	= 0
EXP_PUPIL_I	0.529 - 0.677	= 0	0.580 - 0.639	= 0
EXP_PUPIL_II	0.543 - 0.746	= 0	0.619 - 0.720	= 0
EXP_PUPIL_III	0.542 - 0.652	= 0	0.628 - 0.677	= 0
T_PUB_EXP_all	0.219 - 0.281	≤ 0.05	0.078 - 0.081	> 0.05
T_PUB_EXP_I	0.008 - 0.132	> 0.05	0.032 - 0.064	> 0.05
T_PUB_EXP_II	0.273 - 0.300	< 0.05	0.047 - 0.138	> 0.05
T_PUB_EXP_III	0.001 - 0.106	> 0.05	0.301 - 0.365	< 0.05
SUBSIDIES	0.001 - 0.106	> 0.05	0.000 - 0.061	> 0.05
F_AID_all	0.000 - 0.056	> 0.05	0.001 - 0.022	> 0.05
F_AID_I_II	0.000 - 0.171	> 0.05	0.009 - 0.213	> 0.05
F_AID_III	0.044 - 0.201	> 0.05	0.042 - 0.301	> 0.05
GERD	0.450 - 0.675	= 0	0.570 - 0.852	= 0
GERD_GDP	0.308 - 0.385	≤ 0.01	0.555 - 0.722	= 0

Table 2: R² and sig. values obtained for the models built with data from 2006

	SWLS (2006)		HDI 2006	
	R ²	Sig.	R ²	Sig.
EXP_PUPIL_all	0.856 – 0.893	= 0	0.613 – 0.656	= 0
EXP_PUPIL_I	0.648 – 0.712	= 0	0.506 – 0.536	< 0.05
EXP_PUPIL_II	0.781 – 0.838	= 0	0.550 – 0.643	= 0
EXP_PUPIL_III	0.782 – 0.854	= 0	0.594 – 0.642	= 0
T_PUB_EXP_all	0.175 – 0.241	≤ 0.05, except for Inverse (R ² = 0.149) and S (R ² = 0.145) with sig. > 0.05 and < 0.1	0.042 – 0.056	> 0.05
T_PUB_EXP_I	0.171 – 0.193	≤ 0.05, except for Quadratic R ² = 0.218 and Cubic (R ² = 0.254) with sig. > 0.05 and < 0.1	0.026 – 0.034	> 0.05
T_PUB_EXP_II	0.047 – 0.157	> 0.05	0.011 – 0.016	> 0.05
T_PUB_EXP_III	0.432 – 0.535	< 0.05	0.309 – 0.420	< 0.05
SUBSIDIES	0.086 – 0.199	> 0.05	0.066 – 0.75	> 0.05
F_AID_all	0.006 –	> 0.05	0.024 –	> 0.05

	0.064		0.055	
F_AID_I_II	0.060 – 0.089	> 0.05, except for Cubic ($R^2 = 0.434$ and sig. < 0.05)	0.013 – 0.224	> 0.05, except for Cubic ($R^2 = 0.347$ and sig. < 0.05)
F_AID_III	0.010 – 0.155	> 0.05, except for Cubic ($R^2 = 0.318$ and sig. < 0.05)	0.014 – 0.086	> 0.05, except for Quadratic ($R^2 = 0.254$) and Cubic ($R^2 = 0.316$) with sig. ≤ 0.05
GERD	0.529 – 0.735	= 0	0.528 – 0.814	= 0
GERD_GDP	0.399 – 0.502	< 0.05	0.532 – 0.661	= 0

Both measures of gross domestic expenditure on research and development present a significant relationship with QOL, with GERD in euro per inhabitant having a stronger relation both with EIU-QOL and HDI 2005 than GERD as % of GDP (R^2 of 0.555-0.852 comparing to R^2 of 0.308-0.675). GERD expressed in euro per inhabitant explains a greater amount of the variability in QOL than GERD as % of GDP regardless of the indicator of QOL or the year considered. When using this indicator, the proportion of explained variation in QOL ranges between 52.8% and 82.2% with values of R^2 quite similar for all QOL indicators and years. The models that best fit the data in the case of gross domestic expenditure on research and development are: Power, Logarithmic, Cubic, and Quadratic.

Significant relationships may occur both between total public expenditure on education as % of GDP, for different levels of education

and QOL indicators, but the percentages of QOL variability explained by these variables of investments in education are quite small in most of the cases. A stronger significant relationship occurs between total public expenditure on education as % of GDP at tertiary level when analyzed in relation to HDI. Results show that this indicator could explain 25-42% of the variability in HDI for all the years considered, with higher values of R^2 for Cubic, S, Inverse, and Quadratic models.

When modeling QOL using public subsidies to the private sector as % of GDP, results show low values of R^2 regardless of the chosen statistical model, with sig. values greater than 0.05 which express a non-significant relationship between the indicators of QOL and their model-predicted values using investments in education in the form of this type of subsidies.

In most of the cases, R^2 and sig. values don't identify financial aid to pupils and students (as % of total public expenditure on education) as a good predictor of QOL. However, when modeling QOL using Cubic or Quadratic functions significant relationships (sig. < 0.05) might occur, with financial aid to pupils explaining 31% - 47.9% and financial aid to students explaining 25.4% - 34.5% of the variability in QOL.

Table 3: R^2 and sig. values obtained for the models built with data from 2007 and 2008

	HDI 2007		HDI 2008	
	R^2	Sig.	R^2	Sig.
EXP_PUPIL_all	0.588 - 0.645	= 0	0.602 - 0.667	= 0
EXP_PUPIL_I	0.467 - 0.561	< 0.05	0.338 - 0.512	< 0.05
EXP_PUPIL_II	0.495 - 0.649	= 0	0.312 - 0.612	< 0.05
EXP_PUPIL_III	0.595 -	= 0	0.607	= 0

	0.627		- 0.626	
T_PUB_EXP_all	0.050 - 0.090	> 0.05	0.061 - 0.067	> 0.05
T_PUB_EXP_I	0.052 - 0.104	> 0.05	0.021 - 0.54	> 0.05
T_PUB_EXP_II	0.026 - 0.179	> 0.05	0.001 - 0.138	> 0.05
T_PUB_EXP_III	0.250 - 0.290	≤ 0.05, except for Cubic (R ² = 0.289 with sig. > 0.05 and < 0.1)	0.261 - 0.327	< 0.05
SUBSIDIES	0.076 - 0.157	> 0.05	0.068 - 0.134	> 0.05
F_AID_all	0.052 - 0.228	> 0.05	0.051 - 0.151	> 0.05
F_AID_I_II	0 - 0.014	> 0.05, except for Quadratic (R ² = 0.310) and Cubic (R ² = 0.440) with sig. < 0.05	0.002 - 0.005	> 0.05, except for Quadratic (R ² = 0.315) and Cubic (R ² = 0.479) with sig. < 0.05
F_AID_III	0.074 - 0.076	> 0.05	0.077 - 0.293	> 0.05, except for Quadratic (R ² = 0.284 and sig. < 0.05)
	0.163 - 0.345	≤ 0.05 for Logarithmic, Inverse, Quadratic, Cubic, Power, S		
GERD	0.530 - 0.805	= 0	0.543 - 0.822	= 0
GERD_GDP	0.529 - 0.649	= 0	0.538 - 0.664	= 0

Conclusions

Positive effects of education both on individuals lives and on communities and societies are many and diverse. Better-educated people typically have better health status, lower unemployment, more social connections, and greater engagement in civic and political life. There is a consensus that education brings a range of returns (monetary and non-monetary) that benefit both the person investing in the education and the community in which they live. At the individual level, investing time, energy, and money into education contributes to securing better employment and income for the individual. At the social or aggregate level, investments in education contribute to the constitution and development of the human capital as a resource that enhances well-being of future generations as general increments in the stock of human capital are supposed to increase overall productivity, prosperity, and social cohesion.

Relying on the idea that education represents an important dimension of individuals' life, the paper tried to explore the extent to which one can identify good predictors of quality of life among the indicators of investments in education. Results of a series of regressions, using different statistical models, with indicators of QOL as dependent variables and various indicators of investments in education as explicative variables identify the annual expenditure on public and private educational institutions per pupil/student and the gross domestic expenditure on research and development as being the indicators of investments in education that best predict the level of QOL in EU countries. The findings tend to support the hypothesis that investment in education would generate positive economic and social outcomes which would in turn improve quality of life. However, the link between expenditure on education and people's quality of life is tenuous as expenditures relate only to resources that go into educational institutions and not necessarily to educational attainments, too.

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