Human capital and growth revisited: a microeconomic approach.

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Abstract

The positive effects of human capital on economic growth have long been recognized and tested, but mostly at the macroeconomic level, while limited emphasis has been placed on the microeconomic side. In this study we examine the impact of human capital on growth rates at the firm level. Using data from Greek manufacturing and panel data techniques, we estimate an empirical model where human capital appears as one of the independent variables. Our results suggest that, after controlling for other variables (including firm size, investment and efficiency), human capital has a positive and significant impact on the growth rate of firms.

1. Introduction

"Knowledge is power": this is a motto widely used in western nations during the last decades, based on the fact that the creation of new knowledge and the implementation of innovative methods in production generate competitive advantages, thereby consisting the main factor of their economic growth development.

In the highly competitive environment of the global market, the role of education became more important since it has been proved that personnel with high level of education is a determining factor of the research and innovation process, thus facilitating improvements in productivity and competitiveness.

Our research focuses on the interplay between companies' growth and the level of education. International studies conducted so far focusing on

education and economic growth, verify a positive long-term relationship and point to a need for increasing investment in human capital.

The paper is structured as follows: The literature review in Section 2, describes the effect of education on economic performance. In Section 3, a description of the methodology and data used is provided. In Section 4, we present an empirical model of firm profitability and relevant estimates using panel data econometric techniques. Finally, Section 5 concludes the paper.

2. Literature Review.

The interest of economists in economic growth increased during the late 1950s. Growth accounting experts, such as Abramovitz (1956) and Solow (1957), found that improvements in the quality of the labour force may be an important part of the explanation in order to account for growth residuals. Other empirical observations validate that part of organizations' growth during the post-war period was due to increases in the educational level of their labour force (Denison, 1967, Griliches 1970).

All the above influenced the perception about the role of education and actually, after World War II, at almost all western economies, an exceptional role was assigned to education, based on the belief that it could be used as a tool to balance social inequalities and improve economic potential along with giving a boost to the growth of living standards Mincer, 1958, Ben-Porath, 1967). Under the influence of this trend, which was characterized as the "social paradigm of education" (Neave, 1989), economists studying the educational field focused on the study of human capital and the research for the benefits of investing in knowledge.

More recently, the theory of endogenous growth stressed the interaction of technological progress and human capital (Romer, 1986, Lucas, 1988 and Scott, 1989). According to this strand of the literature, investment in technological research as well as in education and training strengthens growth by improving labour quality and enhancing productivity (Romer, 1994).

Empirical testing of the endogenous growth theory pointed out that economies with a higher ratio of well educated employees were the ones exhibiting higher rates of technological growth (Romer, 1990). Another finding was that higher labour specialization facilitates technology transfer and adoption (Benhabib and Spiegel 1994) and is associated with higher rates of growth in competitiveness and productivity (Blundell, 1999). Schultz (1993) pointed out that the evolution of knowledge contributed decisively to the growth rates of organizations.

Recent empirical studies verify the relationship between education and firm performance. Employees with specialized knowledge and know-how

perform better in more complicated tasks. These employees possess particular capabilities such as communication, decision-making, problem-solving and team-working skills, as well as higher degrees of adaptation to continuously changing environments while they tend to behave more professionally in their daily tasks (Psacharopoulos and Patrinos, 2004, Agiomirgianakis *et al.*, 2002).

In brief, human capital is strongly related to the development and diffusion of new technologies, which positively affect labour productivity and efficiency. Consequently, educated employees are not only considered as comparatively more productive, but they are also the source of a positive externality contributing to the productivity of their colleagues. It is also important to note that specialisation and learning aptitude often generate new knowledge, which advances existing production processes and assists enterprises to correspond with more flexibility to the increasingly competitive global environment.

3. Data and Methodology

The empirical analysis in this paper is based on a panel of 400 manufacturing firms which were all active in years 2004, 2006 and 2008. The database used is provided by ICAP Hellas, which collects balance-sheet and demographic data for S.A. and Ltd companies in Greece.

Data used include:

* Demographic Statistics (establishment year, Location of the Head office, Legal status, size and sector)
* Economic Statistics (sales, profits, capital, exports)
* Employment Statistics (number of employees in full-time equivalent units - FTE)

The above data were combined with information concerning the educational level of employees, obtained through a telephone questionnaire survey of the above mentioned companies.

The final dataset includes 287 companies for the years 2004 and 2006 (a total of 574 observations) for which all necessary information was acquired. The variables that have been taken into account are:

* Deflated sales growth.
* Age (year t minus establishment year, in logarithmic form)
* Firm Size (natural logarithm of sales).
* Investment (growth rate of gross fixed assets)
* Firm profitability (ROI, net profits before tax divided by sales)
* Export Performance (X, exports as a percentage of sales)
* Assets turnover (Sales divided by total assets)

- Leverage (Debt divided by total liabilities)
- Human Capital (number of employees with university degree as a percentage of total employment)
- Industry concentration (Herfindahl index of the relevant 4-digit industry)
- Athens dummy (Dummy variable taking the value 1 if the firm is located in Athens, 0 otherwise)
- Salonika dummy (Dummy variable taking the value 1 if the firm is located in Salonika, 0 otherwise)

4. The Empirical Model

The empirical model developed is draws from the resource-based view of the firm. According to this approach (see for example Jovanovic, 1982, and Wernerfelt, 1984) the fundamental determinants of company performance are specific firm-level resources and capabilities. Firms follow heterogeneous historical development paths and, as a result, they generate different skills and competences, which are expected to affect their performance more than the characteristics of the environment where they operate.

This approach stresses that success is not a result of a simple investigation of the external environment for market needs and opportunities, but mainly results from the creation and development of certain advantages of the enterprise. Consequently, success is connected to specific resources that are unique for the enterprise and difficult to be imitated by other enterprises. Such measurable characteristics include financial resources (own funds, borrowed funds), natural resources (size of the enterprise, capitalization) and intangible resources (human capital and innovation, which are approximated by the educational level of the personnel, and commercial resources such as trade marks, reputation etc. which are approximated by advertising expenses and export activities).

Based on the theory and empirical findings in the relevant literature, an effort was made to include in the empirical model indicators (proxies) for all the above mentioned three categories of resources, given our data limitations. We also included the industry concentration variable in order to test for the effect of competition on growth rates. The empirical model we estimated (with the panel data cross-sectional weights technique) is specified as follows:

GROWTH = **f (Size, Age, Investment, Human Capital, Assets Turnover, Leverage, Exports, Profitability, Concentration, Athens dummy, Thessaloniki dummy)**

Regression results for this model are presented in Table 1 below.

Table 1: Determinants of growth

	No. of observations: 574	No. of observations: 574
	(a)	**(b)**
SIZE	−0.0004***	−0.0004***
	(2.633)	(2.824)
AGE	−0.0031***	−0.0039***
	(3.025)	(3.442)
INVESTMENT	0.0002***	0.0028***
	(7.602)	(7.514)
HUMAN CAPITAL	0.8164***	0.8734***
	(6.108)	(6.832)
ASSETS TURNOVER	0.0003***	0.0004***
	(4.914)	(5.235)
LEVERAGE	−0.0502	−0.0433
	(1.023)	(0.982)
EXPORTS	0.2323***	0.2545***
	(3.435)	(3.811)
PROFITABILITY	0.4921***	0.5625***
	(4.359)	(4.755)
CONCENTRATION	0.1204	0.0936
	(0.958)	(1.293)
DUMATH	0.2423***	–
	(7.581)	–
DUMTHES	0.0682	–
	(1.135)	–
Adj. R^2	**0.807**	**0.753**

    *   Significant at the 10% level (two-tailed test).
    ** Significant at the 5% level (two-tailed test).
    *** Significant at the 1% level (two-tailed test).
    t ratios are in parentheses. Standard errors are White heteroskedasticity consistent.
    All equations include 2-digit sectoral dummies to control for heterogeneity among 2-digit industrial sectors.

The above results are in line with other studies, either for the Greek economy or internationally (Voulgaris *et al.* 2005, Agiomirgianakis *et al.* 2006, Heshmati 2001, Fu *et al.* 2002). The estimated coefficients have the expected signs and the overall explanatory power of the model is high. We discuss below the results for each variable:

- The size of enterprises: as we can see in Table 1, the size of enterprises affects growth negatively. This means that small enterprises grow faster than larger ones, contrary to the Gibrat's law of proportionate effect but in accordance with the empirical literature.

- The age of enterprises: age is found to be a significant determinant of growth with a negative sign. It seems that young firms are more dynamic than older ones since the latter, being in the market for a longer period, are closer to their long-run equilibrium scale of operation.

- New investment affects positively the growth of enterprises. This result confirms that investing in new capital is one of the most reliable options for any firm in order to increase its growth performance.

- The assets turnover variable, which is a proxy for managerial efficiency, is a significant positive determinant of firm growth. This result validates the Jovanovic theory, according to which efficient firms grow and survive while inefficient firms decline and fail.

- Exports: the effect of the export activity on the growth of enterprises is positive and significant. Export orientation is a strategy which gives firms opportunities to expand (and take advantage of scale economies) through the penetration into large international markets.

- Profitability also affects significantly growth rates. Internally generated funds allow firms to invest in capital equipment and R&D activities, thus leading to growth.

- The regional dummies: the information from the estimation of equation (a) shows that the location in the broader Athens area offers larger growth opportunities than any other region in Greece. This should be due to the concentration of activities and public and other services in Athens and the positive external economies that this fact implies.

- The concentration variable is insignificant. This is an indication in favor of the resource-based view of the firm, since it shows that, after properly controlling for the individual resources of firms, industry characteristics, such as the degree of competition, may not be significant in determining firm performance.

- Last but not least, human capital, which is the focal point of our study; moreover, its role has not been investigated up to now in other relevant studies of firm growth (at least for Greece). Human capital has a positive and particularly significant effect on the growth rates of firms, after controlling for the effect of all other relevant variables. This result stresses the importance of the

highly specialized personnel (and the high levels of productivity that it implies) for the successful performance of an enterprise.

5. Conclusions

In this study we attempted to investigate the relationship between the educational level of human resources and the economic performance of enterprises as this is depicted by growth rates.

We developed and estimated an empirical model based on a random sample of 287 Greek enterprises. The econometric results showed the positive and significant effect of human capital on the development paths of Greek enterprises, in addition to the confirmation of the importance of certain factors that have been investigated by other researchers.

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