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The Relationship between Economic Growth and Entrepreneurship

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Abstract

In this paper, we investigate the relation between entrepreneurship and innovation and economic growth. For this purpose, we investigated the data related to 76 countries throughout the world in 2008 by using endogenous growth model. In this model, we set domestic gross production as a function of entrepreneurship and innovation, physical capital and labor based on Cobb-Douglas Form. Estimated elasticity of domestic gross production included 0.80, 0.62, and 0.24 as compared to entrepreneurship and innovation, physical capital and labor, respectively. They all have high statistical significances. The results indicate positive effect of entrepreneurship and innovation on the economic growth. In other words, increase of entrepreneurship and innovation coefficient will increase domestic gross production. The positive effect of physical capital and labor on the domestic gross production is another result of this study.

JEL Classification: Z13, O40, R11, P36, Z19

Keywords: Entrepreneurship and Innovation, Physical Capital, Manpower, Endogenous Growth Model, Cobb-Douglas Function, Economic Growth

Introduction

In this paper, we investigate the effect of entrepreneurship and innovation on economic growth. Entrepreneurship is a concept which has been investigated so far from different views. Everybody believes that it is motive power for the economic growth of developed and developing countries. Three important reasons that countries address entrepreneurship include wealth production, technology development and generative employment.

At the end of 1970s, a wave of small businesses and self-employments were created in most of the advanced countries due to changes in the values and tendencies of society as well as demographical changes. Several studies have been made in this regard from 4 viewpoints as the result of deep changes of that. The critical question that has occupied the minds of economists and other policymakers is that why always some countries have high and some other have low

economic growths and why some countries are rich and some other are poor. In the recent years, growth models have been somehow changed and other factors such as human capital have been included in them. Most economists put an emphasis on establishment of physical and human capital as the main determinant of economic growth and development. Capital is one of the most important determinants of economic growth. Improvement of the quality of tools and machineries increases labor productivity and in this way it improves welfare as well. But capital has not just a physical aspect. Human capital which is fulfilled in the forms of skills, education, and training may also indicate a better condition of human capital in that country. Therefore, we may consider entrepreneurship and innovation as a replacement for human capital variable.

The present study aims to investigate the influence of entrepreneurship and innovation on the economic growth of 76 countries under study in 2008. The main question of this study is that if there is a positive and significant relation between entrepreneurship and innovation and economic growth. On this basis, this article consists of 7 parts. After introduction and in the second part, we explain the concept of entrepreneurship and innovation and the common definitions and meanings for them as well as the method of their measurement and calculation. In the third part, experimental studies made in this regard are dealt with. In the fourth part, theoretical fundamentals and the model used in this paper are explained. Experimental data and findings are investigated in the sixth part and finally a summary and conclusion will be provided in the seventh part.

2. The Concept of Entrepreneurship and Innovation and their Measurement

The word “Entrepreneurship” has been derived from the French word “Entreprendre” which means “To Undertake”. In summary, entrepreneurship is the process of providing value through establishment of a unique complex of resources in order to enjoy opportunities. By “Innovation”, it is meant to provide a new and useful idea and its immediate transfer to market and to use it in the organization in order to produce cheaper and better products or to obtain more efficient support of customers. In fact, innovation means to make practical those thoughts arising from creativity and creativity is to use mental capabilities to provide a new thought. Despite the long record of investigation of entrepreneurship as well as much effort of researchers, like other concepts of human science, it is difficult and even impossible to provide a certain definition for that. Addressing the evolutionary process of this concept includes interesting points. Several elements such as risk susceptibility, innovation, etc. have been added to the entrepreneurship concept during its evolutionary process.

We used the calculations and estimations of an authentic British research center called **Legatum Institute** in order to obtain the statistics and data related to entrepreneurship and innovation which is the most important part of this study and the relevant calculations which are specifically difficult. This institute calculates standards each year for most of the countries called **The Legatum Prosperity**. One of the variables considered for calculation of this standard is Entrepreneurship and Innovation. In that institute, entrepreneurship and innovation are calculated for each country by using some variables and then a score ranging from zero (0) to 100 is considered for each country based on the performed calculations. The country with a higher score will have a higher entrepreneurship and innovation as well. As it can be seen in

table 1, USA and Central Africa have the highest and lowest coefficients of entrepreneurship and innovation, respectively based on the calculations.

Ten variables have been used for calculation of entrepreneurship and innovation which is in fact one of the sub-standards used for obtaining the success and prosperity index. These variables are as follows:

(1) Personal Computers: The number of personal computers, per 100 capita
(2) Secure Internet: Servers secure servers are servers using encryption technology in internet transactions, per one million people.
(3) Research and Development (R&D): Expenditure for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development, as a percentage of GDP. For missing values, we imputed missing values from a set of explanatory variables not used in the sub-index itself.
(4) Internet Bandwidth: The contracted capacity of international connections between countries for transmitting internet traffic. Megabits per second (Mbps).
(5) Royalty Receipts: Royalty and license fees are payments and receipts between residents and non-residents for the authorized use of intangible, non-produced, non-financial assets and proprietary rights (such as patents, copyrights, trademarks, industrial processes, and franchises) and for the use, through licensing agreements, of produced originals of prototypes (such as films and manuscripts).
(6) Value Added in Service Industry: Value added in wholesale and retail, transport, and government, financial, professional, and personal services such as education, health care, and real estate services, as a percentage of GDP.
(7) Information and Communication Technology (ICT) Exports: Information and communication technology exports as a percentage of total goods exports.
(8) High-tech Exports: High-technology exports as a percentage of manufactured exports. Logged value.
(9) New Businesses Registered: The number of new firms, defined as firms registered in the current year of reporting.
(10) Business Start-up Costs: The number of procedure required for setting up a business. Logged value.

Each of the above variables has defined weight. Their average weight gives a figure which indicates entrepreneurship and innovation index for the concerned country. Of course, since no unit may be considered to explain entrepreneurship and innovation, the obtained figures don't indicate a comparison between the countries regarding entrepreneurship and innovation. The calculated index for the country with higher entrepreneurship and innovation will be larger. Figures 100 and zero will be allocated to the two countries with the highest and lowest coefficients of entrepreneurship and innovation among the countries, respectively. Final results about the calculations of this index are shown in table 1.

Table 1: Calculation of Innovation & Entrepreneurship Coefficient based on the 10 defined variables

Entrepreneurship & Innovation	Country	Entrepreneurship & Innovation	Country	Entrepreneurship & Innovation	Country
0.3072	Mongolia	0.5942	Cambodia	1	USA
0.30592	Kuwait	0.59088	Poland	0.96341	England
0.29486	Ecuador	0.58133	Slovenia	0.91342	Sweden
0.29344	Panama	0.57383	Brazil	0.91	Canada
0.29335	El Salvador	0.57617	China	0.90434	The Netherlands
0.29051	Guatemala	0.56707	Thailand	0.89706	Denmark
0.2815	Belarus	0.56042	Romania	0.87934	Japan
0.27147	Jordan	0.54498	The Philippine	0.8759	Germany
0.26801	Bolivia	0.54474	Russia	0.85899	Finland
0.26192	Pakistan	0.53547	Greece	0.85145	Hong Kong
0.25906	Sudan	0.52905	UAE	0.85127	Singapore
0.25782	Arabia	0.49397	Bulgaria	0.84504	Ireland
0.24367	Sri Lanka	0.49302	South Africa	0.83887	Switzerland
0.24335	Kenya	0.48918	Chile	0.8257	France
0.23262	Zimbabwe	0.47036	Argentina	0.81044	Australia
0.22325	Venezuela	0.4683	Belize	0.79374	South Korea
0.21911	Bangladesh	0.44514	Morocco	0.78787	Norway
0.20843	Uzbekistan	0.43259	Jamaica	0.76986	New Zealand
0.20672	Honduras	0.42029	Moldavia	0.75815	Austria
0.20615	Senegal	0.41967	Uruguay	0.75165	Belgium
0.17034	Dominican	0.41822	Tunisia	0.7492	Taiwan
0.16551	Nicaragua	0.41415	India	0.74676	Hungary
0.16317	Botswana	0.40837	Turkey	0.73845	Israeli
0.16211	Nepal	0.39346	Colombia	0.73279	Estonia
0.16003	Nigeria	0.39213	Trinidad	0.70356	Spain
0.1591	Algeria	0.3902	Ukraine	0.70095	Italy
0.14517	Cameroon	0.38376	Vietnam	0.68244	Czech Republic
0.1443	Yemen	0.38256	Peru	0.65362	Malaysia
0.13138	Southeast Africa	0.36869	Kazakhstan	0.64357	Mexico
0.12242	Mali	0.36233	Indonesia	0.63773	Slovakia

0.07451	Tanzania	0.35313	Namibia	0.63746	Portugal
0.07195	Zambia	0.33932	Egypt	0.61865	Latvia
0.05565	Ghana	0.33841	Lebanon	0.60825	Costa Rica
0	Central Africa	0.33066	Macedonia	0.59476	Croatia
		0.3106	Iran	0.33726	Paraguay

3- Experimental Studies

Much of studies have been done on the effect of entrepreneurship and innovation on economic growth, most of which used different variables such as human capital, physical capital, research and development costs, etc. in order to show the effect of entrepreneurship and innovation on economic growth. In some of these studies, however, the entrepreneurship and innovation has not been directly pointed out, but the variables used by those studies are variables which show the amount of entrepreneurship and innovation index.

Rabiei (1388) have analyzed the effect of entrepreneurship and innovation on Iranian economic growth, using Romer Endogenous Growth Model, and considered a model for the Iranian economic growth which analyzes the effect of variables of labor, physical capital, human capital, research and development, and machinery import in proportion to the total machinery. The results of this study shows that intermediate goods, labor, human capital, physical capital, and machinery import, respectively, cause an increase in production in Iranian economy.

Minniti et al, 2010, has studied the effect of different kinds of entrepreneurship on economic growth. In this study, they focus on research costs, so that they have divided the entrepreneurship into two types of imitation-based entrepreneurship and research-based entrepreneurship. In their view, the current growth models have a strong focus on research and development costs. However, the economic growth observed in the past year in some countries such as China, in which the costs of research and development are not practically high, was significant, but in Japan that the costs of research and development are high, was not significant. They achieved to the result that when the costs of research and development are low, for example in new-found economics, presence of imitator entrepreneurs causes competition and sufficient production for economic growth; and economic growth is not so related to the type of entrepreneurship based on research or imitation-based entrepreneurship as well as research and development costs.

Nystrom (2008), in his study, reviewed the relationship between the economic freedom and entrepreneurship. He showed new evidences of factors effective on entrepreneurship, comparing 23 countries of OECD during the period 1972-2002. In this study, entrepreneurship was measured by measuring the amount of self-employment, and economic freedom was measured by five indexes of size of government, legal and security structure of ownership right, access to sound money, international business freedom and regulations related to the credits, manpower, and business. The experimental findings of this studies show that a smaller governmental section, a better ownership right, legal and security structure, and credits regulations, and less manpower and business cause an increase in entrepreneurship.

King et al, 1993, have studied the relationship between economic growth, entrepreneurship, and finance. In this study, he reviewed the effect of finance system on economic growth. They

have used an endogenous growth model in which the forward-looking entrepreneurs' financial systems and equipping savings are evaluated so that the activities, having most probability of efficiency, are financed. This study comes to the conclusion that the better financing systems enhance the probability of creativeness success; thus they improve the economic growth, and similarly distortions of financial systems decrease the economic growth rate through decreasing creativeness rate.

4- Econometrics Patterns:

The importance of human capital, generally, and training, particularity, in growth theories, had been focused in developed neo-classical model (MRW) and endogenous growth models, in the 1980s and 1990s. In the developed neo-classical model, the human capital is input to the model as an additional data, so the countries with the faster training growth, enjoy the higher rate of economic growth and income. In the endogenous growth model, training is considered as a process which changes the production technology, facilitates the conformity with the external technology, and makes the transfer of resources easy through the most dynamic and technologic sections (Farjadi 1388).

One of the methods for quantitative estimation of such a research is using a production function, which is necessary for estimating interests of the costs incurred for training and increasing the human capital. There is, however, no special or definite method of how to apply human capital variable in the production function.

In this study, we consider the production function as the Cobb-Douglas Function, in which the real production is a function of labor, inventory of the physical capital, entrepreneurship, and innovation:

$$Y_i = AK_i^{\alpha} L_i^{\beta} V_i^{\gamma}$$

where:

Y_i= Gross Domestic Production

L_i= Labor

K_i= Physical Capital

V_i= Entrepreneurship Coefficient

$_i$= Innovation of the Country

A= Technology Parameter and reflecting the production technology of each country and this fact that how each country can convert inputs to output.

α, β, & γ = productive elasticities of physical capital, labor, and entrepreneurship and innovation, respectively, which are obtained as follows:

$$E_{Y_i,K_i} = \frac{dY_i}{dK_i} \cdot \frac{K_i}{Y_i} = A\alpha K_i^{\alpha-1} L_i^{\beta} V_i^{\gamma} \cdot \frac{K_i}{Y_i} = A\alpha K_i^{\alpha-1} L_i^{\beta} V_i^{\gamma} \cdot \frac{K_i}{AK_i^{\alpha} L_i^{\beta} V_i^{\gamma}} = \alpha$$

$$E_{Y_i,L_i} = \frac{dY_i}{dL_i} \cdot \frac{L_i}{Y_i} = A\beta K_i^{\alpha} L_i^{\beta-1} V_i^{\gamma} \cdot \frac{L_i}{Y_i} = A\beta K_i^{\alpha} L_i^{\beta-1} V_i^{\gamma} \cdot \frac{L_i}{AK_i^{\alpha} L_i^{\beta} V_i^{\gamma}} = \beta$$

$$E_{Y_i,V_i} = \frac{dY_i}{dV_i} \cdot \frac{V_i}{Y_i} = AK_i^{\alpha} L_i^{\beta} V_i^{\gamma-1} \cdot \frac{V_i}{Y_i} = A\alpha K_i^{\alpha-1} L_i^{\beta} V_i^{\gamma} \cdot \frac{V_i}{AK_i^{\alpha} L_i^{\beta} V_i^{\gamma}} = \gamma$$

The estimation of productive elasticities has the most useful indications for us which represent the manner and amount of effectiveness of the productive inputs on production and consequently in economic growth. But the Cobb-Douglas Function is not a linear function, so, for estimating the productive elasticities, it should be converted to a linear function. For this purpose, we compute the logarithm of two members of this function:

So, our production function is converted to a linear function that the possibility of estimating their coefficient is obtained by using Ordinary Least Squares (OLS). The estimated coefficients are the productive elasticity of different inputs.

5- Research Data & Findings:

In this research, the library method has been used for collecting statistics, figures, and historical documentaries, and used statistics is the sectional data complex related to 76 countries for the year 2008, all of which, except entrepreneurship and innovation, have been extracted from the global bank website. The statistics of entrepreneurship and innovation have been obtained from studies and researches of England Legatum Research Center, which described before. It has been tried to select countries from all areas and continents, developed, developing, and underdeveloped countries, so that a better and well-reasoned comparison could be done. The most important limitation in selecting countries, of course, is the accessibility to the related statistics of those countries. Among 104 countries, which their statistics of entrepreneurship and innovation mentioned in Table 1, only 76 countries were studies, because there were no statistics and information for other countries related to other variables in the model.

The starting point of our econometrics analysis based on the theoretical and experimental fundamentals is the following model:

$$LogY_i = LogA + \alpha LogK_i + \beta LogL_i + \gamma LogV_i$$

Where:

GDP_i= Gross Domestic Production, represents the products of a country, and shows the value of final produced goods and products in each country at the fixed price of the year 2000.

GFC_i= Gross Fix Capital, represents the inventory of the physical capital, and shows the value of factories, machinery, building, purchase and construction equipment, and other infrastructure, at the fixed price of the year 2000.

EP_i= Labor, shows the employed population of a country

EI_i= represents the index of entrepreneurship and innovation of each country

C_i= is a disruption sentence.

The estimated coefficients could be interpreted as the production elasticity, it means that these coefficients show the percent of changing gross domestic production occurred due to one percent change in each described variables.

The results of estimating the model, based on Ordinary Least Squares, have been showed in Table 2. As shown in this Table, given the statistic of –t student, all estimated coefficients are statistically meaningful and the estimated equation is obtained as follows:

$LogGDP_i = 3.394+0.624LogGFC_i+0.244\ LogEP_i+0.802\ LogEI_i$

Based on the estimated coefficients, the obtained Cobb-Douglas Functions could be re-write based on the data of this study, as follows:

$Y_i=3.394K_i^{0.624}L_i^{0.244}V_i^{0.802}$

As specified in this function, all productive elasticities of the production inputs are positive. Therefore, the productive elasticity of the physical capital is 0.624, and it means that a 1 percent raise in physical capital causes 0.624 percent raise in gross domestic production. Also, the productive elasticity of labor is 0.244 and it means that a 1 percent raise in employed population would lead to a 0.244 percent raise in gross domestic production, and, finally, the productive elasticity of entrepreneurship and innovation is 0.802 and it means that a one percent raise in entrepreneurship and innovation coefficient would lead to a 0.802 percent raise in gross domestic production. In other words, a raise in the entrepreneurship and innovation positively effects on economic growth and it approves the theoretical fundamentals of this research.

Table 2: Estimated Coefficient

T Calculation Statistics	Estimated Coefficients	Dependent Variables
4.681	3.394	C_i
10.608	0.6248	GFC_i
4.289	0.244	EP_i
5.713	0.802	EI_i
D-W = 2.04	*F= 338.567*	R^2*= 0.93*

Resource: Research Findings

Also, F-Test (regression total meaningfulness test) indicates the model total meaningfulness in a level of 95 percent. The coefficient level of R^2 is 93 percent. This coefficient level indicates that about 93 percent of changes in gross domestic production could be explained by the variable introduced in the model. Durbin-Watson (D-W) statistic, which represents the presence or non-presence of autocorrelation, enjoys a suitable status, and the obtained number shows that there is no autocorrelation in the model.

6- Conclusion:

In this paper, we are finding a relationship between economic growth and entrepreneurship and innovation in 76 countries, using endogenous growth model. The obtained results show that there is a meaningful relationship between entrepreneurship and innovation and economic growth. The economic growth increases through raising entrepreneurship and innovation, in a manner that a one percent raises in the entrepreneurship and innovation coefficient would lead to a 0.80 percent raise in economic growth. Also, the obtained results show that the rate of economic growth increases through raising the physical capital and employed population, in a manner that a one percent raise in physical capital would lead to a 0.624 percent raise in

gross domestic production and a one percent raise in the employed population would lead to a 0.244 percent raise in gross domestic production. In other words, productive elasticity of entrepreneurship and innovation, physical capital and labor is 0.80, 0.62, and 0.24, respectively. The coefficient level of R^2 is 93 percent. This coefficient level indicates that about 93 percent of changes in gross domestic production could be explained by the variable introduced in the model.

The results of this research, regarding the presence of a meaningful positive relationship between entrepreneurship and innovation and economic growth, are similar to the results of the most of studies, and are mentioned in the literature of the research.

Based on the results of this paper, in addition to increasing physical capital and employment, the economic policymakers of the country should have an attention to the entrepreneurship and innovation as well as establishing conditions and suitable grounds in order to develop it, so the activities to be done for improving and promoting the entrepreneurship and innovation character should be considered as a useful investment which will result to an increase in economic growth and society welfare.

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