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The Investigation Of Relation Between Technology And Economic Growth In EU-28 Countries Using By Technology-Capital (AK) Model

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Extensive Summary

Nowadays, technological capability is the most important factor determining competitiveness of country in the international arena. Rebelo (1991) advocated that technological developments support to economic growth. In this study, the relation between economic growth and technology in EU-28 countries investigated using by AK endogeneous growth model proved by Rebelo (1991). A, represents all factors that will affect the level of technology, K, represents capital formation. It has been applied number of internet user suggested by Mussa (2000) and scientific and technical journal artical suggested by Han (2007) as technology proxy variable.

Bassanini et al. (2000) investigated that the relation between productivity and R&D expenditure. They found that new technology and knowledge and information technology have a positive effect on productivity. Freund and Weinhold (2004) examined that the relation between internet and trade using by panel and cross-section regression models. They found that developments in the field of internet positively impact on economic growth. Czernich et al. (2011) researched the effect of broadband infrastructure investments for high-speed internet on economic growth for 1996-2007 in OECD countries. They found that broadband prevalence has a positive impact on GDP per capita.

Jin and Jin (2013) proved that the number of article in the field of basic sciences and engineering have a positive impact on economic growth. Gholizadeh et al. (2014) investigated that the relationship between the number of research article, internet usage and economic growth for the period of 1996-2011 in Asian countries and ten capital countries. They found that positive relation between research article, internet and economic growth.

This study covers by EU-28 countries and the period of 1990-2014. EU-28 countries include; Avustria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia,

Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom. In this study, it has been used the number of internet user (100 per capita) and the number of scientific and technical journal artical as a technology proxies. It has been used gross capital formation (%, GDP) for capital accumulation proxy and GDP growth (annually, %) for economic growth proxy. Data was collected from World Bank.

We follow AK model developed by Rebelo (1991).

$$Y = AK$$

A, represents tecnological level, K, represents capital accumulation. Panel regression model based on the AK model is below.

$$GDP_{it} = \alpha_{0it} + \beta_{1it}GCF + \beta_{2it}ART + \beta_{3i}IUSE + \varepsilon_{it} \quad (2)$$

Each EU-28 countries have been represented by i=1,…,N. GDP, represents Gross Domestic Product Growth (annually, %); GCF, represents Gross Capital Formation (% GDP); ART, represents the number of scientific and technical journal article, IUSE, represents the number of internet user (100 per capita), $\alpha_0, \beta_1, \beta_2, \beta_3$, represent parameters, ε_t represents error term.

Firstly, we will test whether there is cross-sectional dependence. There are different cross-sectional dependence tests depending on the size of N and T. In this study, it has been used Pesaran (2004) cross-sectional dependence test formed for N>T was applied. (deHoyos and Sarafidis, 2006). Pesaran (2004) cross-sectional test statistics is below.

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i-1}^{N}\rho_{ij}\right)$$

Table 1 shows that Pesaran (2004) cross-sectional dependence test results. Results denoted that the null hypothesis of “There is no cross-sectional dependence” is rejected. In this case, it will be used unit-root and cointegration test allowed cross-sectional dependence. Pesaran (2003, 2007) CADF panel unit-root test allowed cross-sectional dependence has been used. According to the CADF test results, the null hypothesis of a unit-root is rejected. Westerlund (2007) panel cointegration test was used. The null hypothesis of “There is no cointegration” is rejected. As a result of this, economic growth, gross capital formation, scientific and technical journal article and internet user variables are cointegrated, namely, all variables have a long-term equilibrium relation.

For the purpose of investigation the short and long-term causality relationship between variables, it has been applied two stage method developed by Engle and Granger (1987). This method was used for both full sample and individually for each country.

As a result of Equation (3a), gross capital formation and internet user variables have a positive impact on economic growth in short term for full sample. Error correction term is statistically insignificant.

As a result of the study for each countries, it was observed that there is a positive causality relationship from research article and internet user to economic growth for Cyprus, Denmark, Lithuania, Latvia, Slovenia, Malta, Luxemburg, Estonia, Sweden

and Polonia in both short and/or long-term. Our results are consistent with Choi and Yi (2009), Gholizadeh et al. (2014) and Czernich et al. (2011). Consequently, the precautions to increase internet user and science and technical journal article will encourage to economic growth in EU-28 countries.