Hakemli Yazılar / *Refereed Papers*

*Either Economize on Knowledge or Capitalize on Intellectuality: Educational Challenges for Economic Growth in the Turkish Republic of Northern Cyprus**

Ya Bilgi Üzerine İktisadileş ya da Entelektüalite Üzerine Sermayeleş: Kuzey Kıbrıs Türk Cumhuriyeti'nde Ekonomik Büyüme için Eğitime Yönelik Bir Araştırma

Behiye Çavuşoğlu[**] **ve Mustafa Sağsan**[***]

Abstract

Intellectual capital appears as the most important component of knowledge economy. It is very well known in the knowledge management literature that knowledge has become an engine of social, economic and cultural development in today's world. Thus, education is a vital factor for the accumulation of intellectual capital to reach economic growth. There are thirteen universities in the Turkish Republic of Northern Cyprus (TRNC), and higher education is a major sector. Income generated from the education sector as well as the accelerating number of universities are two important factors which TRNC government should pay attention to in regards to education and knowledge creation activities.

The study aims to emphasize the importance of knowledge economy and to create both public and government awareness particularly for TRNC and for other small economies as well. The Engle-Granger Causality test in VAR model was used to analyse the causal relationship between education and economic growth in TRNC and the results indicate a positive impact of knowledge economy variables on the economy's productivity level. Literacy rate, general and technical high school enrolment rate and higher education enrolment rate is

---

[*] This study is derived from Behiye Çavuşoğlu's PhD dissertation entitled 'Knowledge Based Economy and Intellectual Capital: The Impact of National Intellectual Capital on Economic Growth of the North Cyprus'. Nicosia: Near East University Graduate School of Social Sciences Department of Innovation and Knowledge Management, 2016.

Bu çalışma Behiye Çavuşoğlu tarafından hazırlanan 'Bilgi Ekonomisi ve Entelektüel Sermaye: Kuzey Kıbrıs'ın Ekonomik Gelişmesine Ulusal Entelektüel Sermayenin Etkisi' başlıklı doktora tezinden türetilmiştir. Lefkoşa: Yakın Doğu Üniversitesi Sosyal Bilimler Enstitüsü İnovasyon ve Bilgi Yönetimi Bölümü, 2016.

[**] Lecturer. Near East University. Department of Economics. email: behiye.cavusou@neu.edu.tr

Öğr. Gör. Yakın Doğu Üniversitesi Ekonomi Bölümü.

[***] Assoc. Prof. Dr. Near East University Department of Innovation and Knowledge Management. email: mustafa.sagsan@neu.edu.tr

Doç. Dr. Yakın Doğu Üniversitesi İnovasyon ve Bilgi Yönemi Bölümü.

Received - **Geliş Tarihi**: 29.12.2015

Accepted - **Kabul Tarihi**: 24.03.2016

used as knowledge economy variables. Furthermore, the extended Cobb-Douglas production function is applied for the 1977-2010 period and emphasizes the increasing returns to scale in the production process within a given period in TRNC. Overall results show that the TRNC economy has a potential to become a knowledge economy.

Keywords: *Knowledge economy; intellectual capital; education; Engle-Granger causality test; Cobb-Douglas production function; economic growth; Turkish Republic of Northern Cyprus.*

Öz

Entelektüel sermaye, bilgi ekonomisinin en önemli unsurlarından birisidir. Bilgi yönetimi literatüründe entelektüel sermaye ekonomik ve kültürel kalkınma açısından önemli faktörlerden biri olarak kabul edilmektedir. Bu nedenle, entelektüel sermaye birikimini oluşturan eğitim, ekonomik büyümenin vazgeçilmez bir değişkenidir. Kuzey Kıbrıs Türk Cumhuriyeti (KKTC)'nde eğitim, adada on üç üniversite olması sebebi ile ekonomik büyüme için önem teşkil etmekte, hükümetler tarafından öncü sektör olarak adlandırılmaktadır.

Bu çalışma KKTC'nde bilgi ekonomisinin önemini vurgulayarak vatandaşların ve devletin bu konudaki farkındalığını artırmayı amaçlamaktadır. Söz konusu farkındalığın oluşabilmesi için, öncelikle bilgi ekonomisi değişkenlerinin ekonomik büyümeye olan etkisi ölçülmüş, Engle-Granger nedensellik testi kullanılarak bilgi ekonomisi değişkenlerinin büyümeye neden olup olmadığı araştırılmıştır. Bu bağlamda okuryazarlık oranı, genel ve teknik liselere katılım oranı ve yükseköğretime katılım oranı bilgi ekonomisi değişkenleri olarak kullanılmıştır. Geliştirilmiş Cobb-Douglas üretim fonksiyonuyla geleneksel üretim faktörlerinin yanı sıra, entelektüel sermayenin üretim sürecindeki etkisi 1977-2010 yılları için ölçülmüş ve üretimde artan verimin ekonomik büyümeye olan etkisi vurgulanmıştır. Makalede KKTC ekonomisinin bilgi ekonomisi karakterini taşıyıp taşımadığı, kurulan model ve yapılan testler aracılığıyla denetlenmiş ve KKTC ekonomisinin bilgi ekonomisi olma yolunda potansiyeli olduğu sonucuna varılmıştır.

Anahtar Sözcükler: *Bilgi ekonomisi; entelektüel sermaye; eğitim; Engle-Granger nedensellik testi; Cobb-Douglas üretim fonksiyonu; ekonomik büyüme; Kuzey Kıbrıs Türk Cumhuriyeti.*

Introduction

Economic growth is an increase in the capacity of an economy to produce goods and services from one period of time to another. The most important measure of economic growth is real Gross Domestic Product (GDP) per capita, and the main factor for economic growth is productivity. Lucas (1988) emphasized that economic growth has been attributed to the accumulation of human and physical capital and increased productivity arising from technological innovations.

Theories that describe economic growth date back to the classical period with such scholars as Adam Smith, David Ricardo and Karl Marx (Ekelund and Hebert, 1997). In the history of economic thought classical economists described the capital to labour ratio and diminishing returns. Technological progress is the initiator for changing traditional growth models to modern growth models. According to Solow (1956), technological improvement is an exogenous factor while Romer (1990) advocated that the production process itself produces technology automatically assuming that technology is an endogenous factor. The Cobb-Douglas production function is considered to be the most important existing analysis in both empirical and theoretical studies for growth and productivity. The traditional Cobb-Douglas production function shows the technical relationship that transforms inputs into outputs (Batool and Zulfiqar, 2013) in that the production function is based on constant returns to scale, i.e. the summation of the coefficients of capital and labour should be equal to one (Cobb and Douglas, 1928).

In recent years, economists have accepted that technology has become an endogenous growth factor with increasing returns to scale instead of diminishing returns to scale or constant returns to scale. Many economies are seeking to shift their economies to a technology-based economy. In order to do this, knowledge and information abilities for countries have to be able to produce technology. Knowledge-based economic activities allow countries to create value with increasing productivity of production factors. Thus, the extended Cobb-Douglas production function, which considers both physical capital and intellectual capital and tries to understand the increasing returns to scale within the concept of knowledge economy, comes into play.

This study aims to analyse the impact of knowledge economy variables on economic growth in TRNC as well as identifying the causal relationship between education and economic growth in TRNC. With the help of the Cobb-Douglas production function the study also aims to emphasize the effects of knowledge economy variables (literacy rate, general and technical high school enrolment rate and higher education enrolment rate) on the production process to indicate as to whether the TRNC economy has the potential to be a knowledge economy.

Cyprus is the third largest island in the Mediterranean Sea and located at the crossroad of Europe, Middle East, Asia and Africa. TRNC's strategic location is one of its main attributes with its neighbours. Total land area is 3.355 square kilometres. The coastline is approximately 396 km long. According to 2011 figures of State Planning Organisation, the latest total population is 287,856. Primary sectors are tourism, higher education, specialized- niche investment, high value added agriculture and food, ICT-Software development and telecommunication. One of the major activities in TRNC is providing higher education on an international basis. There are thirteen universities in TRNC and except for one, all are privately owned. The higher education sector is highly competitive and innovative in nature. To raise and maintain quality of education and promote research and development (R&D) activities are the primary responsibilities of the universities. R&D activities of universities also promote technological infrastructures and the development of ICT sector, which in turn stimulates the quality and diversity of the academic programs. The presence of international stakeholders and inflow of foreign direct investment (FDI) in the higher education sector will help TRNC become a centre of excellence in higher education and R&D (YAGA, 2012). The study hopes to be a reference to other small island economies as well.

In recent years, the number of studies conducted on knowledge economy in TRNC has increased. Cavusoglu and Sagsan (2011) investigated the impact of knowledge economy variables on the economic growth of TRNC. The study advocated that, in order to make national strategies for countries, not only the macro-economic indicators but also knowledge economy variables should be considered. In this preliminary study, the authors suggested the construction of a National Knowledge Management Strategy for TRNC by considering knowledge assets. Katırcıoglu, Fethi and Caner (2014) studied the long-run relationship and the direction of causality between higher education growth and real income growth in TRNC through the employment of the Solow growth modelling approach, even though the study is not directly associated with knowledge economy. Their major finding was that higher education sector development precedes a change in real income growth in TRNC. In this context the study of Cavusoglu (2014) is significant, which pointed out that TRNC has an advantage with its young and highly educated population. However, transferring knowledge and information into the production process, which is a necessity for productivity, cannot be seen in the production process. Gülle (2015) defined information society as a society which invests on people, creates a national policy based on knowledge, and converts knowledge and information into the production process which is substantially necessary for productivity. Although the common findings with other researches in this context, originality of study based on the knowledge economy variables which is used as indicators to measure the effects of national intellectual capital on economic growth of the country. Furthermore, the study confirmed the increasing returns to scale in the knowledge variables econometrically.

The empirical part of the study aims to analyse the impact of knowledge economy variables on economic growth of TRNC. The research is divided into two parts. The first part of the research concentrates on identifies the relationship between education and economic growth in the TRNC, with the second part of the study attempting to identify the effects of production factors on the economic growth of the country. While measuring the impact of education on the economic growth of countries, the study uses education variables instead of using the term "education index" which is frequently used in the World Bank's reports, such as literacy rate, general and technical school enrolment and higher education enrolment ratio. Education index has not been used in this study for several reasons. For instance, TRNC is in the transition period for a knowledge economy; therefore, most of the improvements in this issue transition period are still ongoing. Thus, the literature rate, general and technical school enrolment and higher education enrolment ratio is evaluated separately as independent variables in the model. In order to measure the causality between education and economic growth in TRNC, the Engle-Granger Causality test in VAR model is applied for the periods 1977-2010, the data used to have been compiled annually by the State Planning Organisation (SPO), and TRNC Prime Ministry. However, the availability of sufficient data is the main problem in the data collection process.

The study also aims to investigate the sources of productivity growth in TRNC through the use of the Ordinary Least Square (OLS) estimation method using the extended Cobb-Douglas production function. The extended Cobb-Douglas production function is preferred because it considers both physical capital and intellectual capital and tries to understand the increasing returns to scale in knowledge economy.

The Knowledge Economy

Knowledge plays a crucial role as a production factor in a highly competitive environment nowadays. Companies that operate in the service industry have recognized the contribution that knowledge makes to the production process and regard knowledge as a value adding factor that improves their competitiveness. That is, for a knowledge economy, knowledge becomes a profit creating factor in the production process.

According to Chavula (2010) knowledge is at the heart of economic growth, which increases the ability to take advantage of existing technologies and innovations, enhanced competitiveness and productivity. In a knowledge economy a general purpose technology provides a powerful infrastructure that increases productivity and offers new opportunities to any knowledge-driven activity (Foray, 2006). For economic growth, many countries are seeking to shift their economies from an industrial economy to a knowledge-based economy. Tonta and Küçük (2005) investigated the main dynamics of transition from an industrial economy to a knowledge-based economy as well as identifying the differences between industrial society and information society. Industrial society is based on mass production and mass distribution of standardized goods and services. The objective of companies is to reduce the unit cost by producing and distributing the same goods in large quantities cheaper than their competitors. Mass production requires an economic model based on centralization, hierarchical organizational structures and traditional education. Companies act on the basis of 'produce, store and sell'. On the other hand, information society is an indication of a more complex and richer social structure. Information society requires an economic model based on personalization, dynamic and flat organizational structures, and customer focused education. Companies must act on the basis of the logic of 'sell, produce and deliver' (Tonta and Küçük, 2005).

As economies becoming more and more knowledge-based, investment in intangible assets also becomes important (Kajdiz and Bojnec, 2014). Knowledge, as embodied in human capital and technology, has always been an important contributor to economic development. Janecek and Hynek (2010) emphasized that the use of knowledge workers instead of workers in the production process is the most important differences between the knowledge economy and the traditional economy. Powel and Snellman (2004) defined the knowledge economy as production and services based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance.

UNECE (2002) listed the following characteristics of a knowledge-based economy;

- It focuses on intangible resources rather than tangible resources (Edvinsson and Malone,1997)
- It is stimulated by the rapid growth of information technologies (ITs) with telecommunication and networking
- Knowledge is an independent force and the most decisive factor in social, economic, technological and cultural transformation.

Asgeirsdottir (2006) emphasized four important factors that need to be taken into account when countries and their institutions want to promote their knowledge economy; stable macroeconomic policies, knowledge-based economic activities, globalisation and new organisational form based on investment in information communication technology (ICT), and response to customer demand. Globalisation supported by ICT changes the rules of competitiveness and increases the significance of knowledge (Delina and Drab, 2010). On a company level, Maresova (2010) underlines that the success of firms in global competition depends on their abilities to use knowledge. Globalisation and the liberalisation process in the world economy is a chance for countries or regions to gain a competitive advantage with their endogenous growth factors (Marcin, 2013). Globalisation and severe competition increases the importance of performance and productivity. Globalisation and internalisation which includes global markets, global production, knowledge flows, and global streams of finance are main stimulators of transformation. Wealth of nations depends primarily on organizational performance and workers' efforts. To achieve sustainable economic growth in a competitive world, countries must take into consideration the level of productivity and performance of both individuals and organizations, as well as the four indicators of change; globalisation, economic and market pressure, technological change, and government policies and regulations.

Competitive pressure is a catalyst for organizational change and transformation. Competitiveness is attracting foreign investors to invest in countries with competitiveness being determined largely by the countries' intangible assets. Intangible investments in research and development and innovation are viewed as the most important sources of performance. The development potential of any kind of organization is embedded in its knowledge-based assets. Knowledge is considered as a basic resource for value creation both at the corporate and regional level (Marcin, 2013). The expansion of knowledge-based activities and technological improvements are the two main sources of economic growth and development. According to new economy, knowledge is considered as the most important and productive factor of production. A human brain is the most important factor for innovation and knowledge creation.

The transition to the knowledge economy has been taking place over the last several decades, with new disciplines and areas of study developing in the process. Effective implementation of organizational change combines decisions that are often known as 'hard' and 'soft' areas. The so-called software and installation of new computer networks, the soft side- people side- involves the decisions and actions designed to help employees embrace new methodology, technology, and ways of working. The effects of the hard-side decisions are easily observed, measured and adjusted. Soft-side effects tend to be subtler and harder to observe thus making them more difficult to measure and evaluate (Burdus, 2008).

The term change is defined by Lewin (1947) as the process of moving from one defined state to another. Change management is the process of planning, controlling, coordinating, executing and monitoring changes that affect an IT service delivery environment. Lewin believed that the key to resolving social conflict was to facilitate planned change through learning, and so, enable individuals to understand and restructure their perceptions of the world around them. Lewin proposed a three stage theory of change commonly referred to as Unfreeze, Change (or Transition) and Freeze (or Refreeze) (Sarayreh, Khudair and Barakat, 2013).

Much of the macroeconomic research on knowledge economy has focused on the linkage between technology and labour productivity, defined as the amount of output given a unit of labour input (Powel and Snellman, 2004). If intellectual capital accumulation is reached, the country becomes more productive and then economic growth can be achieved.

Intellectual Capital

A vast array of definitions can be seen in the literature for intellectual capital (IC) but the most popular and earliest definitions come from Edvinsson (1997), Steward (1997), Brooking (1997), Sveiby (1997) and Ross (1998). All can be categorized within the first generation of intellectual capital development, namely 'Raising and Awareness' (Catasus and Chaminade, 2007). The second generation is 'Simplifying' and the third is 'Questioning and Expanding'. The fundamental concept of knowledge assets emerging from IC belongs to the first generation. Seeking a suitable and new place for IC among the social sciences and the classification of the field into three main sections (human, structural/organizational and social/relational capital) is underlined in the second generation. In the third generation IC measurement criteria, considering how it should be applied within organization and society, the main problematic issue, is underlined (Cavusoglu and Sagsan, 2011).

The concept of IC was originally used by Skandia (1996) in order to illustrate and classify different forms of capital on an organizational level. IC is defined as a person's knowledge endowed with applied experience, organizational technology, customer relationships and professional skills that provide a competitive edge in the market (Edvinsson, 1997). IC is a group of knowledge assets that are owned and controlled by an organization that create value (Alipour, 2012). The world is moving rapidly from a production-based economy to a knowledge-based economy (Huang and Wu, 2010). The impact of IC on the general performance of the economy has become a very important issue now more than ever due to globalisation (Ngugi, Gakure, Were, Ngugi and Kabiru, 2012). According to Steward (1997) IC can be seen as intellectual materials: knowledge, information, intellectual property, and experience that can be put to use to create wealth. At the firm level, Malhotra (2003) describes IC as the difference between the firm's market value and the cost of assets. Rajnoha and Dobrovic (2011) pointed out the importance of knowledge and economic value added through the use of knowledge assets within the businesses.

Intellectual capital includes:

- Human capital: anything related to people, employees, their tacit knowledge, skills, experience and attitude, and their ability to listen to one another and build upon one another's competencies.
- Structural capital: represents the intangibles, such as codified knowledge, procedures, processes, goodwill, patents and culture.
- Relational capital: represents the relationship with customers, suppliers and other external stakeholders (Noordin and Mohtar, 2013).

Intellectual capital is essentially different from physical and monetary capital, with the knowledge based economy underlining the growing importance of knowledge for wealth creation. In recent years, value creation is being linked with the intangibles and knowledge has become the most important factor of production. Adamska and Minarova (2014), Keseljevic (2008), Szabo, Soltes and Helman (2013) also pointed out the importance of knowledge and intellectual capital on business, organisations and market with increasing productivity in the production process.

Education as a Major Driver of the Productivity

Hronec, Merickova and Marcinekova (2008) emphasized in the context of education that it is necessary to assess not only individual effects of education, but also its costs and benefits. At the macroeconomic level, economic growth is related to the human factor and the performance of humans at work, which is also the determinant of productivity in the production process. The output of the worker in the production process is directly related to the increases of the worker's occupational level. Involvement of education in economic growth occurs through two mechanisms:

- Creation of new knowledge: Better educated individuals will later become scientists and investors who use knowledge for further investigations through the development of new processes and technologies.
- The transfer of knowledge and information: Schools provide the education essential to understand new information (Suciu and Bratescu, 2010).

The increase of the occupational rate by creating new work places and increasing productivity supports economic growth.

Research Methodology

Testing causality among variables is one of the most important and also one of the most difficult issues in economics (Lin, 2008). Regression analysis deals with the dependence of one variable on other variables. Suppose that two variables are affecting each other with lags, is it possible to say that these two variables are causes for each other? Or is it possible to detect the direction of causality? The causality test tries to find the answer to these questions.

While defining causality, two assumptions are very important to understand:

- The future cannot cause the past but the past can cause the present or future
- A cause contains unique information about an effect not available elsewhere (Gujarati, 1995).

The study uses the Engle-Granger Causality test in VAR model to analyse the cause and effect relationship between education and economic growth. The software program E-views is used to impose Causality test and to conduct the required statistical analysis. The model for this analysis was constructed and imposed only for TRNC on the basis of the availability of data and variables.

To investigate the causality between education and economic growth, the following model is used for the study:

$$Growth = \alpha + \beta_1 LR + \beta_2 GTHS + \beta_3 HE + u \quad \text{(equation 1)}$$

Where, Growth= growth rate of the economy

LR=Literacy rate

GTHS= general and technical high school enrolment ratio

HE= Higher education enrolment ratio

The study uses literacy rate, general and technical high school enrolment ratio and higher education enrolment ratio as education variables. The model tries to test the cause and effect relationship between education and economic growth in TRNC. Corresponding data was obtained from the SPO from 1977 to 2010.

The second part of the study assumes that the growth of economies mainly depends on the independent inputs which are physical capital, national intellectual capital and labour. Here, the study aims to analyse the effects of the factors of production on total production/output of the economy. The main reason why the study selects the extended Cobb-Douglas production function is to take into consideration the vital explanatory variable: intellectual capital. The original Cobb-Douglas production function is restricted with two factors of production, namely capital and labour. To increase the precision of the model, it is necessary to add new explanatory variables into the model so that it becomes more up-to-date. Because of this, the study uses the extended Cobb-Douglas production function instead of the original one. This function tries to measure the effect of percentage change in labour, percentage change in capital, and percentage change in national intellectual capital on percentage change in the growth rate of GDP of the country. The extended Cobb-Douglas production function is also used to find out the elasticity of the independent variables; capital, national intellectual capital and labour against the dependent variable GDP growth. To investigate the elasticity between variables, the study uses the following model:

$Y=tK^{\beta1}NIC^{\beta2}L^{\beta3}$ ***(equation 2)***

Where, Y= GDP,

K= Physical capital

NIC=national intellectual capital

L=labour

OLS estimation method is based on the linearity assumption which assumes that the model is linear in parameters and variables. Equation 2 is not a linear equation because the logarithm of both sides of the equation has been taken and the following form constructed:

$LnY=lnt+\beta_1 lnK+\beta_2 lnNIC+\beta_3 lnL$ ***(equation 3)***

$Y^*=t^{*+}\beta_1 K^*+\beta_2 NIC^*+\beta_3 L^*$ ***(equation 4)***

Where, Y^*= GDP growth

K^*= growth of physical capital accumulation

NIC^*=growth of national intellectual capital

L^*= growth of labour

β's = corresponding elasticity of variables against GDP growth.

As a result of the above procedure, the model becomes a linear one in both parameters and variables and is ready to put into the OLS estimation process. The necessary data was collected annually from SPO (2013) and the Official Receiver and Registrar Office (ORRO, 2014), The Prime Ministry of TRNC.

Data Analysis and Results

The study uses both Engle-Granger Causality Test and Extended Cobb-Douglas Production function to measure the effects of knowledge variables on economic growth of TRNC.

To test the cause and effect relationship between education and economic growth, the study uses the Engle-Granger Causality test on VAR (vector autoregression) environment. Tables 1 and 2 represent the estimation results of the VAR model with two lags and the VAR Granger Causality with Wald test, respectively. To check the causal relationship between growth and LR, GTHS and HE, it is necessary to check probabilities.

(Table 1): Vector Autoregression Estimates

	GROWTH	LR	GTHS	HE
GROWTH(-1)	0.374956	0.028951	-0.079092	-0.024392
	(0.17907)	(0.03345)	(0.20898)	(0.21482)
	[2.09393]	[0.86546]	[-0.37847]	[-0.11354]
GROWTH(-2)	-0.154630	-0.024369	-0.008032	-0.386057
	(0.18842)	(0.03520)	(0.21990)	(0.22604)
	[-0.82066]	[-0.69233]	[-0.03653]	[-1.70789]
LR(-1)	2.507961	1.105279	0.750713	0.915502
	(1.05164)	(0.19645)	(1.22731)	(1.26161)
	[2.38481]	[5.62615]	[0.61167]	[0.72566]
LR(-2)	-3.029662	-0.390287	1.069982	-0.740695
	(1.11453)	(0.20820)	(1.30071)	(1.33705)
	[-2.71833]	[-1.87455]	[0.82261]	[-0.55397]
GTHS(-1)	0.311397	0.014390	0.931534	0.049985
	(0.17276)	(0.03227)	(0.20162)	(0.20725)
	[1.80249]	[0.44589]	[4.62028]	[0.24118]
GTHS(-2)	-0.255937	0.009775	-0.119967	0.289081
	(0.18626)	(0.03479)	(0.21738)	(0.22345)
	[-1.37407]	[0.28092]	[-0.55189]	[1.29372]
HE(-1)	-0.044560	-0.021827	0.009169	0.706879
	(0.17594)	(0.03287)	(0.20533)	(0.21107)
	[-0.25327]	[-0.66409]	[0.04465]	[3.34905]
HE(-2)	0.080021	0.018159	-0.071405	0.066657
	(0.15599)	(0.02914)	(0.18205)	(0.18714)
	[0.51298]	[0.62317]	[-0.39223]	[0.35619]
C	49.10290	26.75906	-162.7526	-26.62272
	(70.0996)	(13.0951)	(81.8095)	(84.0954)
	[0.70047]	[2.04344]	[-1.98941]	[-0.31658]
R-squared	0.356814	0.796485	0.893506	0.942398
Adj. R-squared	0.133097	0.725698	0.856464	0.922363
Sum sq. resids	689.4365	24.05923	939.0123	992.2211
S.E. equation	5.474989	1.022768	6.389571	6.568109
F-statistic	1.594937	11.25176	24.12178	47.03648
Log likelihood	-94.52825	-40.84256	-99.47152	-100.3534
Akaike AIC	6.470516	3.115160	6.779470	6.834587
Schwarz SC	6.882754	3.527398	7.191708	7.246825
Mean dependent	4.231250	99.15625	72.37500	48.78125
S.D. dependent	5.880281	1.952821	16.86522	23.57245

Determinant resid covariance (dof adj.)	50211.38
Determinant resid covariance	13400.27
Log likelihood	-333.6726
Akaike information criterion	23.10454
Schwarz criterion	24.75349

*Sample (adjusted): 1977-2010

**Included observations: 32 after adjustments

***Standard errors in ( ) & t-statistics in [ ]

Table 2 presents the Wald test results which were used to check Granger Causality on VAR. The Wald test was implemented four times and each time different dependent and independent variables were utilized. This indicates whether a causal relationship exists between the dependent and independent variables as well as between the independent variables themselves.

(Table 2): VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: GROWTH			
Excluded	Chi-sq	Df	Prob.
LR	7.609007	2	0.0223
GTHS	3.298083	2	0.1922
HE	0.464864	2	0.7926
All	9.423642	6	0.1511
Dependent variable: LR			
Excluded	Chi-sq	Df	Prob.
GROWTH	0.973015	2	0.6148
GTHS	1.568069	2	0.4566
HE	0.445807	2	0.8002
All	3.290419	6	0.7716
Dependent variable: GTHS			
Excluded	Chi-sq	Df	Prob.
GROWTH	0.164501	2	0.9210
LR	4.419301	2	0.1097
HE	0.605020	2	0.7390
All	4.602871	6	0.5957
Dependent variable: HE			
Excluded	Chi-sq	Df	Prob.
GROWTH	3.282611	2	0.1937
LR	0.526601	2	0.7685
GTHS	7.262635	2	0.0265
All	12.47450	6	0.0522

* Sample: 1977-2010
** Included observations: 32

Table 3 summarizes the causal relationship between variables. Engle-Granger causality test result concludes that only the literacy rate causes economic growth. If the other causal relationship between different dependent variables is checked, estimated results only find one-way causality from GTHS to Growth.

(Table 3): Summary of Causality Test

Hypothesis	p-value	Decision	Conclusion
H_o: LR cannot cause Y	2,23%	Reject Ho	LR causes Y
H_1: LR can cause Y	(< 5%)		
H_o: GTHS cannot cause Y	19,92%	Cannot Reject Ho	GTHS cannot cause Y
H_1: GTHS can cause Y	(>5%)		
H_o=HE cannot cause Y	79,26%	Cannot Reject Ho	HE cannot cause Y
H_1: HE can cause Y	(>5%)		
H_o: GTHS cannot cause HE	2,65%	Reject Ho	GTHS causes HE
H_1: GTHS can cause HE	(< 5%)		

System analysis for regression tries to find out the most appropriate equation which identifies the causal relationship between variables. System analysis estimation results can be seen in Table 4. Four equations have been constructed by the system. In each equation the dependent and independent variables differ. Table 3 also presents the results of the least squares estimators of the variables with necessary diagnostic tests.

(Table 4): Least Squares Estimation Method: Regression Analysis

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.374956	0.179068	2.093927	0.0390
C(2)	-0.154630	0.188423	-0.820657	0.4140
C(3)	2.507961	1.051639	2.384811	0.0191
C(4)	-3.029662	1.114530	-2.718330	0.0078
C(5)	0.311397	0.172759	1.802491	0.0747
C(6)	-0.255937	0.186261	-1.374073	0.1728
C(7)	-0.044560	0.175941	-0.253266	0.8006
C(8)	0.080021	0.155993	0.512977	0.6092
C(9)	49.10290	70.09955	0.700474	0.4854
C(10)	0.028951	0.033451	0.865462	0.3890
C(11)	-0.024369	0.035199	-0.692333	0.4905
C(12)	1.105279	0.196454	5.626150	0.0000
C(13)	-0.390287	0.208202	-1.874554	0.0640
C(14)	0.014390	0.032273	0.445892	0.6567
C(15)	0.009775	0.034795	0.280922	0.7794
C(16)	-0.021827	0.032867	-0.664092	0.5083
C(17)	0.018159	0.029141	0.623165	0.5347
C(18)	26.75906	13.09510	2.043440	0.0439
C(19)	-0.079092	0.208981	-0.378466	0.7060
C(20)	-0.008032	0.219898	-0.036525	0.9709
C(21)	0.750713	1.227313	0.611672	0.5423
C(22)	1.069982	1.300710	0.822614	0.4129
C(23)	0.931534	0.201619	4.620282	0.0000
C(24)	-0.119967	0.217376	-0.551888	0.5824
C(25)	0.009169	0.205331	0.044654	0.9645
C(26)	-0.071405	0.182051	-0.392225	0.6958
C(27)	-162.7526	81.80950	-1.989410	0.0496
C(28)	-0.024392	0.214820	-0.113544	0.9098
C(29)	-0.386057	0.226043	-1.707895	0.0910
C(30)	0.915502	1.261607	0.725664	0.4699
C(31)	-0.740695	1.337054	-0.553975	0.5809
C(32)	0.049985	0.207252	0.241180	0.8100
C(33)	0.289081	0.223450	1.293719	0.1990
C(34)	0.706879	0.211069	3.349049	0.0012
C(35)	0.066657	0.187138	0.356190	0.7225
C(36)	-26.62272	84.09542	-0.316577	0.7523
Determinant residual covariance		13400.27		

* Sample: 1977-2010

** Included observations: 32

*** Total system (balanced) observations 128

Equation1: GROWTH = C(1)*GROWTH(-1) + C(2)*GROWTH(-2) + C(3)*LR(-1) + C(4)*LR(-2) + C(5)*GTHS(-1) + C(6)*GTHS(-2) + C(7)*HE(-1) + C(8)*HE(-2) + C(9)			
Observations: 32			
R-squared	0.356814	Mean dependent var	4.231250
Adjusted R-squared	0.133097	S.D. dependent var	5.880281
S.E. of regression	5.474989	Sum squared resid	689.4365
Durbin-Watson stat	1.869501		
Equation2: LR = C(10)*GROWTH(-1) + C(11)*GROWTH(-2) + C(12)*LR(-1) + C(13)*LR(-2) + C(14)*GTHS(-1) + C(15)*GTHS(-2) + C(16)*HE(-1) + C(17)*HE(-2) + C(18)			
Observations: 32			
R-squared	0.796485	Mean dependent var	99.15625
Adjusted R-squared	0.725698	S.D. dependent var	1.952821
S.E. of regression	1.022768	Sum squared resid	24.05923
Durbin-Watson stat	2.240938		
Equation3: GTHS = C(19)*GROWTH(-1) + C(20)*GROWTH(-2) + C(21)*LR(-1) + C(22)*LR(-2) + C(23)*GTHS(-1) + C(24)*GTHS(-2) + C(25)*HE(-1) + C(26)*HE(-2) + C(27)			
Observations: 32			
R-squared	0.893506	Mean dependent var	72.37500
Adjusted R-squared	0.856464	S.D. dependent var	16.86522
S.E. of regression	6.389571	Sum squared resid	939.0123
Durbin-Watson stat	2.102697		
Equation4: HE = C(28)*GROWTH(-1) + C(29)*GROWTH(-2) + C(30)*LR(-1) + C(31)*LR(-2) + C(32)*GTHS(-1) + C(33)*GTHS(-2) + C(34)*HE(-1) + C(35)*HE(-2) + C(36)			
Observations: 32			
R-squared	0.942398	Mean dependent var	48.78125
Adjusted R-squared	0.922363	S.D. dependent var	23.57245
S.E. of regression	6.568109	Sum squared resid	992.2211
Durbin-Watson stat	1.878944		

Table 5 presents the Wald test results for the corresponding variable. The aim of imposing Wald test is to investigate as to whether the education variable with lags causes growth or not. This shows us the cause and effect relationship between lag variables. Table 5 also shows the outcomes of the coefficients of variables and gives us a chance to impose joint test for hypothesis of independent variable (lag 1 and lag 2). The coefficients of the variables are tested jointly with the help of Wald test. The null hypothesis (Ho) is constructed for each variable and tested against alternative Hypothesis (H1) and p-value statistics being used to check causality.

(Table 5): Wald Test

	Value	St-Error	Chi-Square	Df	Prob(P-value)
C(3)	2,507961	1,051639	7,609007	2	0,0223
C(4)	-3,029662	1,114530			
C(5)	0,31397	0,172759	3,298083	2	0,1922
C(6)	-0,255937	0,186261			
C(7)	-0,044560	0,175941	0,464864	2	0,7926
C(8)	0,080021	0,155993			

* Normalized Restrictions (=0)

The estimation results mean LR (lag 1 and lag 2) can cause growth. On the other hand, if we check the causality from growth to LR, p= 61,48% tells us Growth cannot cause LR. Test result of causality between GTHS and Growth shows us there is no causality between them. There are no causalities between HE and Growth as well. The study also tests the causal relationship between education variables themselves. There is only one causal relationship between GTHS and HE.

Statistical analysis identifies the causal relationship between literacy rate and economic growth but this relationship is one directional, only literacy rate causes economic growth in TRNC. The overall results of the econometric analysis suggest that the growth rate of TRNC is affected by the literacy rate of the country. At this point, we analyse the impact of knowledge variables and their relationship with economic growth, as this study also tries to identify the effects of the production factors on economic growth of the country. To measure the impact of those independent input variables on economic growth of the TRNC the study uses Ordinary Least Square (OLS) estimation method with the extended Cobb-Douglas production function. Physical capital, national intellectual capital and labour are used as an explanatory variable which explains economic growth of the country. Data collected from both SPO and ORRO is used. Instead of physical capital, capital stock of the country is used. The national intellectual capital of the country is calculated using the formula given by the World Bank (www.worldbank.org/kam) Knowledge Assessment Methodology (KAM), which is equal to the summation of real market value of patents and trademarks in the country.[1] The total number of the labour force of the country is used as a labour variable in the model. The investigated period is restricted to 14 years (2000-2013) because of lack of statistics. Table 6 presents the estimation results after the use of the extended Cobb-Douglas production function with OLS estimation method with necessary time series data.

(Table 6): Regression Results of Extended Cobb Douglas Production Function

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.268903	3.692286	0.885333	0.3968
L*	0.377577	0.176812	2.135471*	0.2025
KNIC*	0.212203	0.100172	2.118386*	0.1079
K*	0.523417	0.037029	14.13525**	0.0000
R-squared	0.964462	Mean dependent var		9.436354
Adjusted R-squared	0.953801	S.D. dependent var		0.223125
S.E. of regression	0.047958	Akaike info criterion		-3.002011
Sum squared resid	0.023000	Schwarz criterion		-2.819423
Log likelihood	25.01408	Hannan-Quinn criter.		-3.018913
F-statistic	90.46398	Durbin-Watson stat		1.810061
Prob(F-statistic)	0.000000			

(* =significant at 5% significance level, ** = significant at 1% significance level)

T-critical (0.01) = 2.718, T-critical (0.025) =2.201, T-critical (0.05) =1.796,

T-critical (0.10) =1.363

* Dependent Variable: LY / Method: Least Squares / Date: 01/04/15 Time: 11:58 / Sample: 2000-2013 / Included observations: 14

[1]National intellectual capital$_t$ = (registration fee*number of patents$_t$)+registration fee*number of trademarks$_t$)+ (registration fee* geographical brand$_t$).

Summary of regression results presented as the following estimated equation.

Y*= 3,26+0,52K*+ 0,21NIC*+0,37L* (equation 5)

(standard error) (3,69) (0,03) (0,10) (0,17)

(t-statistic) (0,88) (14,13**) (2,11) *(2,13) *, R^2= 0,96

Where Y^*= GDP growth

K^*= growth of physical capital accumulation

NIC^*=growth of national intellectual capital

L^*= growth of labour

β's = corresponding elasticity of variables against GDP growth.

The above model shows statistically significant variables with low standard errors and high R-squared. Each of the independent variables is statistically significantly different from zero. This is because t-values exceed the critical t-values at given significance level. R squared= 0,96 means, 96% of the variation of GDP growth can be attributed to the physical capital, national intellectual capital and labour input together, so the goodness of fit of the model is quite well.

OLS estimation method assumes series are stationary and there is no autocorrelation, heteroscedasticity and multicollinearity problems within the variables. Test results are presented on Table 7, 8 and 9 to check if any of the above problems exists in the study.

The unit root test imposed on each of the explanatory variables separately so as to see whether the series were stationary or not. According to the test results series are stationary (see Table 7, 8 and 9).

(Table 7): Unit Root Test for Labour

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.482461	0.0309
Test critical values:	1% level	-4.200056	
	5% level	-3.175352	
	10% level	-2.728985	

* Null Hypothesis: D(LL) has a unit root

** Exogenous: Constant

*** Lag Length: 1 (Automatic based on SIC, MAXLAG=2)

(Table 8): Unit Root Test For Capital

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.059103	0.1478
Test critical values:	1% level	-4.121990	
	5% level	-3.144920	
	10% level	-2.713751	

* Null Hypothesis: D(LK) has a unit root

** Exogenous: Constant

*** Lag Length: 1 (Automatic based on SIC, MAXLAG=2)

(Table 9): Unit Root Test for National Intellectual Capital

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.563008	0.0014
Test critical values:	1% level	-4.200056	
	5% level	-3.175352	
	10% level	-2.728985	

* Null Hypothesis: D(LKNIC) has a unit root

** Exogenous: Constant

*** Lag Length: 1 (Automatic based on SIC, MAXLAG=2)

Durbin Watson (DW) statistics give us information as to whether an autocorrelation problem exists. Calculated DW=1,81. If the DW value is above the critical DW= 1,779 the Hypothesis which assumes a serial autocorrelation exists (D_L=0,767 and D_U =1,779 with n=14 and k=3) can be rejected (see Table 4). This study indicates that there is no autocorrelation problem. The White test measures whether there is a heteroscedasticity problem or not. According to the test results presented in Table 10, observation times R squared=4,78 is greater than the Chi-square=0,78. Therefore, the study rejects that there is a heteroscedasticity problem which means error terms has a unique variance, homoscedastic error terms, and no heteroscedasticity problem. The multicollinearity problem can be seen in the case of high R squared and low t-statistics. Yet the study directly cancels the multicollinearity problem with high R squared and high t-values.

(Table 10): Heteroskedasticity Test: White Test

F-statistic	0.324604	Prob. F(8,5)	0.9235
Obs*R-squared	4.785637	Prob. Chi-Square(8)	0.7802
Scaled explained SS	2.382742	Prob. Chi-Square(8)	0.9670

According to the above statistical analysis, the regression is stationary and there is no heteroscedasticity, autocorrelation and multicollinearity problem. Therefore, the model can be used with high confidence.

The regression results of the OLS estimation on three variables with necessary diagnostic tests indicate that the model is statistically significant with conventional levels of significance. The results show that there is a positive relationship between capital growth, national intellectual capital growth and labour growth with GDP growth. The capital growth has the highest impact on GDP growth; this means that a 1 % change in capital input will increase GDP by 0,52%. A 1% change in labour will cause 0,37% and a 1% increases in NIC will cause 0,21% increases in GDP respectively. The summation of coefficients ($\beta1+\beta2+\beta3$) gives us information about returns to scale which equals 1,11 (0,52+0,37+0,21) and represents increasing returns to scale. In a knowledge economy, one of the important identification for an economy is increasing returns to scale. If the knowledge variables are used in the production process, then the increases in output will be more than the increases in inputs.

The result of the analysis suggests that TRNC economy is not a knowledge economy yet, but the main knowledge variables of education and national intellectual capital have a positive effect on the GDP growth of the country.

Conclusion and Recommendations

Knowledge economy variables such as education and national intellectual capital have played an important role in the development of the TRNC economy in the last decade. The regression results presented in the study show that knowledge economy variables have a positive impact, and the economy's productivity level upgrading with increasing returns to scale is evidence that the economy of TRNC has the potential to be a knowledge economy.

The insufficient number of professionals in knowledge management is a weakness of the country. TRNC also has other exogenous obstacles such as the existence of isolations, an inadequate domestic manufacturing industry, and a lack of technology-based production techniques.

To overcome these problems, TRNC should immediately construct its National Knowledge Management Strategy (NKMS) and has to:

- Create awareness on the knowledge-based economy on both government and public level
- Improve the demand for domestic goods which supports production
- Increase the demand for knowledge workers in each level of production
- Accumulate intellectual capital through education
- Support technology-based production
- Support possible solutions to the isolation problem which will allow the country to freely trade with other countries

Once the NKMS has been generated it will then be necessary to construct the National Transformation Strategy (NTS) in order to convert the economy to a knowledge-based economic system. The NTS aims to increase the efficiency in the production process to attain economic development. To do this, the study suggests that countries construct their NTS with long run plans and programs designed for the respective countries. The study constructs NTS for TRNC, which directly adapts Lewin's 3-Step Model (Burnes, 2004) as below:

- Unfreezing: creating awareness of importance of knowledge economy by the help of NKMS and prepare people to change and willing to make first step.
- Transition (Change): changing the way of doing business and reshaping production techniques with knowledge variables.
- Refreezing: once the change has been made, new production techniques and way of business expanding for more stable economies.

Although it may seem like NKMS and NTS are not directly related with knowledge economy variables however sustainable economic growth can be achieved only the consideration of knowledge and intellectual capital which is effected by policy implementations. It could be said that the effects of knowledge economy variables of knowledge and intellectual capital applications are directly related to the national strategies. Each year TRNC prepares development plans, strategy papers, and plans of action to achieve development goals. Today, the wealthiest and the most competitive countries are known as knowledge economies. The study suggests that TRNC authorities should transform their economy to a knowledge-based economy immediately. Also, a new education model emphasizing the importance of NKMS and NTS can be formulated for national development programs. Inevitably it is necessary to create an economic environment that is conducive to enhance the level of knowledge, and hence, the economic growth in TRNC.

References

Adamska, M., Minarova M. (2014). Role of learning organization in building consumer confidence. *E & M Ekonomie a Management,* 17(1), 62-72.

Alipour, M. (2012). The effects of international capital on firm performance: An investigation of Iran insurance companies. *Measuring Business Excellence,* 16(1), 53-66.

Asgeirsdottir, B. (2006). OECD work on knowledge and knowledge economy. In Kahin B. Foray D. (Ed.). *Advancing Knowledge and the Knowledge Economy.* (pp. 1-9). Cambridge: MIT Press.

Batool, A., Zulfiqar S. (2013). Analyzing the input output relationship of small and medium enterprises in Pakistan: An econometric approach. *International Journal of Business and Economic Development,* 1(1), 66-73.

Burdus, E. (2008). Management schimbrii organizationale. In Sarayreh B. H., Khudair H., Barakat E. (2013), Comparative Study: The Kurt Lewin of Change Management. *International Journal of Computer and Information Technology*, 2(4),1.

Burnes, B., (2004). Kurt Lewin and planned approach to change: a re-appraisal. *Journal of Management Studies.* 41(6), 972-1002.

Catasus, B. and Chaminade, C. (2007). Intellectual capital: paradoxes and expansions. In *Intellectual capital revisited: paradoxes in the knowledge intensive organization*, (pp. 1-7). Northampton: Edward Elgar Publishing.

Cavusoglu, B. (2014). Intellectual capital as an engine of growth: analysis of causality for North Cyprus economy. In *Proceedings of the 15th European Conference on Knowledge Management* (pp. 1137-1145). Santarem, Portugal: Academic Publishing.

Cavusoglu, B., Sagsan M. (2011). National knowledge management strategy for the TRNC: recommendations for small island economies. In *Proceedings of the 12th European Conference of Knowledge Management* (pp. 190-198). University of Passau. Germany: Academic Publishing.

Chavula, H. K. (2010). The role of knowledge in economic growth. The African perspective. In: *ICT, Science and Technology Division (ISTD),* (pp. 1-26). Ethiopia: United Nations Economic Commission for Africa (UNECA).

Cobb, C. W. and Douglas P. H. (1928). A Theory of production, *American Economic Review*. 18(1), 139-165.

Delina, R. and Drab, R. (2010). Socio-economic aspects of trust building for the electronic business platforms. *E&M Ekonomie a Management.* 13(4), 110-122.

Edvinsson, L. (1997). Developing intellectual capital at Skandia. *Lang Range Planning,* 30(3), 366-73.

Edvinsson, L. and Malone, M. (1997). Intellectual capital. New York: Harper Business.

Ekelund, B. R. and Hebert F. R. (1997). *A history of economic theory and method*. 4th ed., Singapore: McGraw-Hill.

Foray, D. (2006), Optimizing the use of knowledge. In: *Advancing knowledge and the knowledge economy* (pp: 9-15). England: MIT Press.

Gujarati, D. N. (1995). *Basic econometrics*. 3rd edition. Singapore: McGraw-Hill.

Gülle, M. T. (2015). Is it possible for Turkey to be an information society?. *Turkish Librarianship*, 29(1), 57-62.

Hronec, S., Merickova B., and Marcinekova Z. (2008). The medicine education investment evaluation methods. *E&M Ekonomie a Management,* 11(2), 89-98.

Huang, Y. C. and Wu, Yç, C., (2010). Intellectual capital and knowledge productivity: Taiwan biotech. *Industry Manage Decision,* 48(4), 580-599.

Janecek. V. and Hynek, J. (2010). Incentive system as a factor of firms' efficiency improvement. *E&M Ekonomie a Management,* 13(1), 76-90.

Kajdiz, R. and Bojnec, S. (2014). Determinants of public expenditures for medicinal products in non-hospital consumption in Slovenia. *E+M Ekonomie a Management,* 17(3), 27.

Katırcıoglu, S., and Fethi S., Caner, H. (2014). Testing the higher education-led growth hypothesis in a small island: an empirical investigation from a new version of the solow growth model. *Quality & Quantity*, 48(1), 729-744.

Keselevic, A. (2008). Going beyond the derogative attitude towards knowledge within particular scientific communities. *E & M Ekonomie a Management,* 11(3), 73-84.

Lewin K. (1947). Frontiers in group dynamics II. Channels of group life; social planning and action research. *Human Relations,* 1(3), 143-153.

Lin, J. L. (2008). Notes on testing causality. *Institute of Economics, Academia Sinica, Department of Economics*. National Chengchi University, 3-22. Accessed: http://faculty.ndhu.edu.tw/~jlin/files/causality.pdf

Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics,* 22(1), 3-42.

Malhotra, Y. (2003), Measuring knowledge assets of a nation: knowledge systems for development. Research paper prepared for the invited keynote presentation delivered at the United Nations Advisory meeting of the Department of Economic and Social Affairs: Division of Public Administration and Development Management, Ad Hoc Group of Experts Meeting. Knowledge Systems for Development, United Nations Headquarters, New York, 4 – 5 September. Accessed: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.6.878&rep=rep1&type=pdf.

Marcin, K. (2013). Intellectual capital as a key factor of socio-economic development of regions and countries. *Procedia Economics and Finance*, 6(1), 288-295.

Maresova, P. (2010). Knowledge management in Czech enterprises. *E&M Ekonomie a Management,* 13(1), 131-144.

Ngugi, J. K., Gakure, R., W., Were, M., S, Ngugi, P., K and Kibiru, C. R., (2012). The influence of intellectual capital on growth of small and medium enterprises in Kenya. *Journal of Business Management and Corporate Affairs,* 1(1), 11-19.

Noordin, M. A. and Mohtar, S. (2013). An exploratory of the intangible assets: Methods of measuring intellectual capital. In: *3rd International Conference on Business, Economics, Management and Behavioural Sciences (ICBEMBS'2013), April 29-30 2013* (pp.311-315). Singapore: Academic Publishing.

Official Receiver and Registrar Office (ORRO), (2014), *Annual report.* Nicosia: TRNC Prime Ministry.

Powel, W. W. and Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology,* 30, 199-220.

Rajnoha, R., Dobrovic J. (2011). Simultaneous management of economics and business processes by added value knowledge. *E & M Ekonomie a Management,* 14(1), 53-69.

Romer, P. (1990). Endogenous technological change. *Journal of Political Economy*, 98(5), 71-102.

Ross, J. (1998). Intellectual capital: Navigating in the new business landscape. New York: NY University Press.

Sarayreh, B. H., Khudair and H., Barakat, E. A., (2013). Comparative study: The Kurt Lewin of change management. *International Journal of Computer and Information Technology,* 2(4), 1-4.

Skandia (1996). Power of innovation: intellectual capital. *Supplement to Skandia's 1996 Interim Annual Report.* Stockholm: Skandia.

Solow, R. (1956). A contribution to theory of economic growth. *Quarterly Journal of Economics,* 70(1), 65-94.

State Planning Organisation (SPO) (2011). *Macroeconomic indicators.* Nicosia: TRNC Prime Ministry.

State Planning Organisation (SPO) (2013). *Economic and social indicators.* Nicosia: TRNC Prime Ministry.

Steward, T. A. (1997). Intellectual capital. New York: Bantam Doubleday Dell Publishing Group.

Suciu, M. C. and Bratescu, A. G. (2010). Intellectual capital, innovation and creativity as key drivers for long-run sustainable development in the context of the creative economy and knowledge based society. In: *Proceedings of 5th WSEAS International Conference on economy and Management Transformation*, Romania, V. 2 (pp. 464-469).

Sveiby, K. E. (1997). The new organizational wealth: Managing and measuring knowledge-based assets. San Francisco, CA: Berrett-Koehler Publishers.

Szabo Z. K., Soltes M. and Helman E. (2013). Innovative capacity & performance of transition economies: Comparative study at the level of enterprises. *E & M Ekonomie a Management,* 16(1), 52-68.

Tonta Y. and Küçük, M. E. (2005). Main dynamics of the transition from industrial society to information society. *Turkish Librarianship*, 19(4), 1-14.

UNECE (2002). Towards knowledge based economy. *Regional assessment report*. New York: United Nations.

World Bank (2012). Knowledge assessment methodology. Accessed: www.worldbank.org/kam

Investment Development Agency (YAGA) (2012), *Investor guide*. Nicosia: TRNC Prime Ministry.

Summary

Economic growth is an increase in the capacity of economy to produce goods and services from one period of time to another. Productivity is the most important factor for economic growth. In recent years, knowledge becomes an essential production factor. Globalization and technological improvements are two important accelerators of economic growth. Because knowledge positively effects labor productivity and increases output for a given unit of labor input, it links with growth, wealth creation and the employment level of country. The study aims to analyse the impact of knowledge economy variables on economic growth of the Turkish Republic of Northern Cyprus (TRNC) and tries to identify the causal relationship between education and economic growth. It also aims to emphasize the effects of knowledge economy variables on the production process so as to judge the potential of TRNC to be a knowledge economy.

Cyprus is the third largest country in the Mediterranean Sea and provides higher education on an international basis. Higher education is one of the major businesses of the country and economy has an advantage to become a knowledge based economy. For this reason, TRNC has been selected as the unit of analysis in this study which used the Engel-Granger causality test for analyzing the cause and effect relationship between education and growth. This study used literacy rate, general and technical high school enrolment ratio and higher education enrolment ratio as education variables. Regression analysis showed that only literacy rate causes economic growth in TRNC. Furthermore, general and technical high school enrolment ratio causes higher education in the country. The study also tried to measure the impact of physical capital, national intellectual capital and labor on economic growth of country and pointed out the positive effects of them economic growth. The results showed that the returns to scale in production process represent increasing returns to scale in TRNC.

The regression results indicated that knowledge economy variables have a positive impact and the economy's productivity level upgrading with increasing returns to scale is evidence that the economy of TRNC has the potential to be a knowledge economy in the future.

According to the findings of the study, it could be suggested that both national knowledge management strategy and national transformation strategy which includes e-government services should be created by the governmental level by integrating them with the educational plans and programs. All these knowledge management activities should be reflected the five years' development plans.