Selected Issues on Current International Economics and Macroeconomics

Selected Issues on Current International Economics and Macroeconomics

Edited by
Selim Başar
and Atakan Durmaz

Cambridge
Scholars
Publishing



Selected Issues on Current International Economics and Macroeconomics

Edited by Selim Başar and Atakan Durmaz

This book first published 2019

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Copyright © 2019 by Selim Başar, Atakan Durmaz and contributors

All rights for this book reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright owner.

ISBN (10): 1-5275-1143-X1
ISBN (13): 978-1-5275-1143-X

TABLE OF CONTENTS

Table of Contents i
Preface iii

Patent Counts, Labour Productivity and Economic Growth
Zeynep Karaca 1

Determinants of Growth
Kübra Karakuş and Zeliha Tekin 13

Measurement of Regional Human Capital Adequacy with The Pyramid Model: 2011 and 2018 Comparison for Turkey
Ezgi Baday Yıldız, Yeşim Dindaroğlu and Metin Berber 24

Macroeconomic Effects of Openness
Şaduman Yıldız 44

The Taylor Rule and Turkey Experience
Murat Akdağ and Gürkan Bozma 53

The Relationship between Consumption and Saving
İlyas Kays İmamoğlu and Murat Akça 64

Valuation of Crowdfunding Ahsen Bayraktar 75

The Triple Deficit Hypothesis and Turkey
Ali Altıner and Eda Bozkurt 83

Inflation and Inflation Costs
Esra Dursun 92

An Analysis of the Phillips Curve Relationship ın Turkey by Using Ardl Bounds Tests and Time Varying Causality
Mustafa Kırca 103

Testing the Rationality of Interest Rate Expectations: Evidence from Turkey
Ümit Yildiz and Bülent Günsoy 120

Dutch Disease in the Economy with Different Cases of Countries: A Theoretical Study
Savaş Durmuş 142

The Potential Effect of Industry 4.0 Transformation on Turkey

Dilek Şahin 159

Internal Migration between Regions in Turkey and the Lowry Hypothesis
Nazli Tekman and Kübra Karakuş 170

Poverty, Suicide, Crime and Migration in The Context of Turkey
Serkan Künü and Murat Eren 177

Ethical Trade for Sustainable Green Development
Zeliha Tekin..... 186

Review of Immigrant Entrepreneurship in The Southern European Countries and Its Impact on Economic Growth
Nur Suhaili Binti Ramli 194

The Effects of International Migration on the Host Countries: A Study on the Turkish Labour Market
Atakan Durmaz and Adem Kalça 210

Monetary Policy and Inflation Targeting Strategy
Selda Çakıcı Özkılbaç 222

Unconventional Monetary Policy and Its Challenges
Aris Zoleta 228

Economic Law Enforcement Activities as a Tool for Increasing Economic Efficiency and Productivity in Turkey
Deniz Turan 238

Financial Development and Economic Growth Relationship: 2006-2018 Turkey Sample Ünal Gülhan 251

Turkey's Energy Future and Economic Impact
Sevim Akgül..... 264

Contributors..... 275

PREFACE

The debates on economics, as old as the history of humanity, undergo transformation according to changing and developing conditions. The developments of the Industrial Revolution and its aftermath, especially in the 19th century, brought a different dimension to the discussions of economics. While economic production and income levels reached dimensions that they had never been able to reach before, the distribution of this production and income was seriously impaired. This situation caused economic discussions to focus on these issues.

By the end of the 20th century, discussions were concentrated around the phenomena of liberalization and globalization, including cross-border mobility of production factors. The improvement of economic relations began the process of globalization. Internationally applied policies with the effects of globalization have had a major impact on firms and the financial market. This interaction between economics and finance has enabled the development of branches and interdisciplinary studies. Interdisciplinary studies have enabled the emergence of new theories, with mutual solutions to economic problems. In today's world, branches of social science such as economics, finance, and accounting, have become an integral whole, and have enabled the expansion of theories and assumptions.

In this book, we have addressed the various issues and concepts that we think are influential in the formation and development of the economy. The topics that are discussed were selected either from basic, or from recently developed, approaches. We hope this book will meet the needs of those concerned.

The aim of this collection is to provide a readable, non-technical publication which provides a comprehensive presentation of international and macroeconomic issues, trends, and data.

Editors

MEASUREMENT OF REGIONAL HUMAN CAPITAL ADEQUACY WITH THE PYRAMID MODEL: 2011 & 2018 COMPARISON FOR TURKEY

EZGİ BADAY YILDIZ, YEŞİM DİNDAROĞLU AND METİN BERBER

Introduction

The role and the effect of human capital in the economic development process differ, based on the development levels of countries and regions. The accumulation of human capital at country level is one of the important factors affecting competitiveness in the international arena. When considered on a regional basis, regional human capital accumulation is one of the most important criteria determining the macroeconomic performance of the region. Following the developments in classical-neoclassical economics and internal growth models, studies focusing on human capital, especially examining the relationship between human capital and economic growth, have gained importance. Due to the increasing importance attributed to human capital, the literature has also begun to explore the relationships between human capital and technological development, labour productivity and regional development.

According to this literature, the country or regions which are superior in terms of human capital have relatively high economic growth rates. Therefore, human capital is considered to be one of the most important factors determining the economic gap between regions. For this reason, determining human capital sub-components, and making inter-zone comparisons, are particularly important for policy makers. As well as in international literature, in national literature there are many studies investigating the relationship between human capital and economic growth.

But there is a gap in the national literature due to the inadequacy of the studies on a regional basis. Therefore, the main purpose of this study is to contribute to the elimination of the gap in national literature by finding out the current status of human capital adequacy of Turkey's regions, included in NUTS 1, according to the nomenclature of territorial units for statistics. The other purposes of the study are determining subcomponents of the regional human capital, and making inter-zone comparisons. In accordance with these stated purposes, the study includes six sections. In the first section, the theoretical infrastructure of the subject is presented. In the second section, the Pyramid Model, selected to measure regional human capital adequacy, is introduced. The human capital adequacy valuation index system created by the Pyramid Model, and the variables included in this index system, are presented in the third section. A summary of the literature compiled from national and international studies is introduced in the fourth section. The fifth section is used to introduce principal component analysis, selected as the statistical method. The sixth section includes the findings obtained by the statistical method. The ranking of human capital adequacy index, created for NUTS 1 (12 regions), according to Turkey's nomenclature of territorial units for statistics, and inter-regional comparisons, are also presented in the sixth chapter.

Theoretical Framework

The concept of human capital, the theoretical framework for which was strengthened with the process of transformation into the information society which started after the Second World War, was first examined by classical economists such as Adam Smith and A. Marshall. Adam Smith (1776), writing in relation to human capital, revealed that the return of education should not be less than the return of capital investment. Marshall argued that education, and similar practices that would enhance the quality of human capital, are the most important capital investments. Following the emphasis of classical economists on skilled labour, the theory of human capital has been developed by economists such as Theodore Schultz, Edward Denison, Gary Becker, and Jacob Mincer, and took place within neoclassical economics. As a matter of fact, Schultz, Mincer, and Becker, are accepted as creators of the concept of human capital in the related literature.

According to Schultz (1961), who made the first theoretical contribution to the concept of human capital, it reflects the value of human abilities. Schultz suggests that human, as well as physical, capital is necessary to increase the level of production and quality. Schultz suggests that many factors which are actually called consumption, such as direct expenditure on education, health, and internal migration, are human capital investments, and in this way, he emphasized the importance of investment in human beings. For this reason, he argued that human capital needs to be upgraded through education and improved social benefits, as well as in other types of capital, to improve production and quality (Schultz 1961).

Denison reached the same conclusion as Schultz, who argued that education plays an important role in economic growth in the USA. According to Denison, education investments have had a high impact on economic growth in the USA by increasing the quality of the labour force. Becker (1964) stated that human capital has become more important than physical capital in time, and argued that countries' accumulation of human capital has a significant influence on their economic development.

Mincer (1995) stated that human capital is included in the economic growth process, not only as the cause of economic growth, but also as the cause of the developments resulting from economic growth. Moreover, according to Mincer, the interrelation between human capital and economic growth is also an important key for sustainable development.

The neoclassical growth model, which had a crucial role in the understanding of the growth process but failed to satisfy, ceded its place to endogenous growth theory in the late 1980s. With this theoretical development, human capital has taken its place in endogenous growth theory. Endogenous growth theory, which rejects that technology is external and indigenizes the technology through R&D and human capital, has taken its place in the literature as: Romer's (1990), Grossman-Helpman's (1991), and Aighon-Howitt's (1992) R&D Models; Romer's (1986) Knowledge Spillover Model; Lucas's (1988) Human Capital Model, and Barro's (1990) Public Policy Model. According to these models, which accept human capital as a decision variable, when the accumulation of human capital increases, the return of human capital also rises.

Human capital, considered to be as important as physical capital in economic development, was modelled by Lucas (1988), one of the pioneers of endogenous growth theory. Thus, human capital has been accepted as the

driving force of economic growth in the literature. In Lucas's model, human capital is regarded as a factor of production, just like physical capital. According to Lucas, human capital can often emerge through education, and, at the same time, spontaneously, through learning by doing. In addition, human capital increases not only the efficiency of the individual, but also the productivity of other production factors in the relevant model.

Regional Human Capital Adequacy and the Pyramid Model

Regional human capital adequacy reflects the competitiveness of a region in human capital. According to the Pyramid Model created by Jia et al. (2010), all regional human capital adequacy depends on four main factors. These factors are: regional human capital stock; regional human capital structure; regional human capital performance; and regional human capital attraction. Human capital stock reflects human capital size, scale, and quality of a region. Hence regional human capital stock is considered to be the basis of regional human capital adequacy. Human capital structure represents the career structure of labour and the employment situation in the region. Career structure is influenced by industrial structure. Various career structures represent different levels of economic and technological development. Human capital performance is a comprehensive reflection of human capital contribution to social development, the difference between the efficiency of the labour force, and scientific and technological strength. Human capital attraction reflects regional foreign competition in the labour market. This factor greatly affects the movement of human capital between regions. The level of economic development, the level of urbanization, quality of life, and quality of social security, and so on, are among the factors representing human capital attraction (Jia et al. 2011, 1). The research model of human capital adequacy, called ‘the Pyramid Model’, is shown in Figure 3-1.

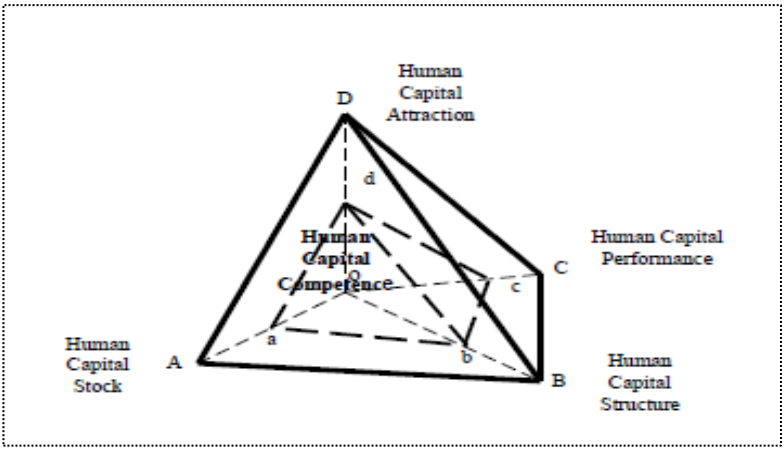


Figure 3-1. The Pyramid Model

In the Jia et al.'s (2011) study, the Pyramid Model is explained as follows: "According to the pyramid model used while conducting regional human capital adequacy research, the human capital adequacy level is determined by these four factors, explained above. The line segment between pyramid centre 'o' and each vertex 'A', 'B', 'C', and 'D', respectively, represent human capital stock, structure, performance, and attraction. The length of 'oa', 'ob', 'oc', and 'od', represent the actual level of human capital stock, structure, performance, and attraction, of one province or region. Four vertexes, 'a', 'b', 'c' and 'd', constitute a small pyramid. The shape of different small pyramids within the great pyramid represent the different situations of regional human capital competence adequacy."

Human Capital Adequacy Valuation Index System

According to the Pyramid Model, a system of valuation indices is established, as shown in Figure 3-2. Four measurement factors are used in order to measure human capital adequacy: i) regional human capital stock; ii) regional human capital structure; iii) regional human capital performance; and iv) regional human capital attraction.

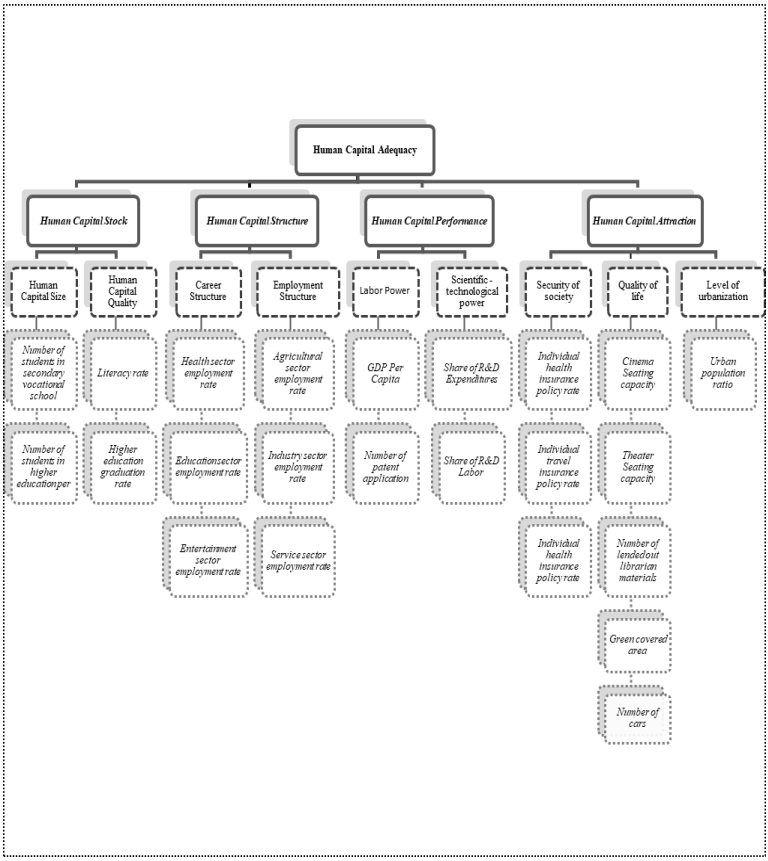


Figure 3-2. Human Capital Adequacy Valuation Index System

Human capital stock has been examined under two subchapters, namely, human capital size, and quality. Four variables which can statistically represent the size and quality of human capital, have been identified. These variables are literacy rate, number of vocational school students, higher education graduation rate, and number of higher education students.

Human capital structure has been investigated in two subchapters, namely, career structure, and employment structure. Six variables which can statistically represent the career and employment structure, have been selected. These variables are: the health sector employment rate; the higher

education sector employment rate; the entertainment sector employment rate; the agricultural sector employment rate; the industry sector employment rate; and the service sector employment rate.

Human capital performance has been examined in two subchapters, namely, labour power, and scientific and technological power. Four variables have been chosen to represent labour ability and scientific and technological power. These variables are: GDP per capita; share of research and development (R&D) expenditures; share of R&D personnel; and number of patent applications.

Finally, human capital attraction has been investigated in three subchapters, namely, security of society, quality of life, and level of urbanization. Nine variables have been chosen to represent these subchapters statistically. These variables are: individual health insurance policy rate; individual travel insurance policy rate; individual illness insurance policy rate; cinema seating capacity; theatre seating capacity; the amount of material lent out by libraries; the number of cars; and urban population ratio.

Literature

There are many theoretical and empirical studies examining the relation between human capital and regional development in the process of transformation into an information society. The issue of this study is the measurement of human capital adequacy in the regional development process, due to the lack of the studies in the relevant literature. In this section, some studies investigating regional human capital adequacy have been examined chronologically.

Human capital index calculations have been carried out regularly since 1993 by the United Nations Development Program (UNDP). Although the UNDP changes its variables and calculation method from time to time in HDI calculations, it mainly uses three indicators, namely, health, education, and income. In the last Human Development Report, published in 2016, Turkey's rank was 71, with an index value of 0.767 among 105 countries, with high human development.

The last HDI ranking for the provinces of Turkey by the UNDP took place in the 2004 report. According to the Report, Kocaeli, Yalova, İstanbul, Bursa, İzmir, Muğla, Sakarya, Bolu and Tekirdağ have high human

development levels. The provinces with the lowest human development levels are Hakkari, Bingöl, Bitlis, Muş, and Ağrı. The human capital and quality of life index has also been calculated as a sub-index in the Inter-Provincial Competitiveness Index (2009-2010) study, carried out by the Institution of International Competition Researches. The study is based on Turkey's provinces. In addition, fourteen variables are used for the index. According to the results of the study, Ankara, Istanbul, Eskisehir, Izmir, and Isparta, have the top five rankings, respectively. Hakkari, Muş, Ağrı, Mardin, and Şırnak have the lowest human capital and quality of life index.

Compared with the national literature, studies which measure the quality or adequacy of human capital in the international literature are more popular. The study of Jia et al. (2010), supported by the Humanities Foundation of Shaanxi educational committee, in China, is one of the most important studies in international literature. In the study, the authors have created a regional human capital adequacy model called 'the Pyramid Model', and have calculated the human capital adequacy of Chinese provinces by principal component analysis. As a result of the study, they have found that human capital adequacy is generally high in China's south-eastern coastal provinces, and low in the western regions.

Stephan (2001) used a partial adjustment approach to measure the contribution of public infrastructure to local private production for 327 counties in Germany. In the first step of the empirical analysis, they applied a principal component analysis. In the first stage, indicators were created by principal component analysis, in order to measure transport and human capital infrastructure, and in the second stage the output of different sectors regressed on these indicators. The main finding of the study was that long-term productions of cities with better transportation and human capital infrastructures are higher. Moreover, it is emphasized that transportation and human capital infrastructures have a complementary effect in the study.

Villarroya (2007) emphasized that economic growth and human capital are the most important factors in the process of catching each other, in her study, which focused on the factors behind convergence between 18 Latin American countries during the period 1950-2000. The author created the human capital index by principal component analysis, and used five variables. These variables are: primary and secondary school enrolment rates; number of patients per doctor; life expectancy; infant mortality rate' and dependency ratio. According to the study, countries with high value in

the ranking of human capital index are rich countries, such as Argentina, Chile, Mexico, Uruguay, and Venezuela. Another important consequence of the study is that a standard deviation increase in the human capital index would lead to an increase in the growth rate of nearly 0.2%.

Dreger et al. (2009) investigated alternative measures of human capital at the level of EU NUTS1 and NUTS2 regions, with a comprehensive analysis. They also discussed composite indicators. Besides, univariate data measuring human capital analysis has shown that building techniques have a significant impact on the quality of indicators. According to the results of the study, while the composite indicators and labour income indicate the same impact direction, their correlations are not overwhelmingly high. In addition, the authors emphasized that popular indicators should have been used with caution. It has also concluded that schooling and human resources in science and technology could explain some of the regional human capital stock, but couldn't explain the bulk of the experience.

Statistical Method: Principal Component Analysis

In this study, Principal Component Analysis (PCA) was preferred as the statistical method, because PCA is a multivariate statistical technique used to reduce the number of variables in a data set into a smaller number of 'dimensions'. In mathematical terms, from an initial set of n correlated variables, PCA creates uncorrelated indices or components, where each component is a linear weighted combination of the initial variables (Vyas and Kumaranayake 2006, 460). For example, from a set of variables X_1 through toX_n,

$$PC_1 = a_{11}X_1 + a_{12}X_2 + \cdots + a_{1n}X_n$$
$$\vdots$$
$$PC_m = a_{m1}X_1 + a_{m2}X_2 + \cdots + a_{mn}X_n$$

where a_{mn} represents the weight for the *m*th principal component and the *n*th variable.

The components are ordered so that the first component (PC_1) explains the largest possible amount of variation in the original data, subject to the constraint that the sum of the squared weights is equal to one ($a_{11}^2 + a_{12}^2 +$

$\cdots + a_{1n}^2 = 1$). The second component (PC_2) is completely uncorrelated with the first component, and explains additional, but less, variation than the first component, subject to the same constraint (Vyas and Kumaranayake 2006, 460-461).

In PCA, PCs can be calculated based on covariance or correlation matrices. When all measurements are in the same units, it is thought that the covariance matrix might be more appropriate. However, if all variables are desired to be treated on an equal footing, the use of the correlation matrix should be preferred (Jolliffe 2002, 65), because the covariance matrix gives greater weight to larger, and less weight to smaller, measurements.

Data Set and Variables:

In this study, PCA has been performed, based on NUTS-I (12 regions), according to Turkey's Nomenclature of Territorial Units for Statistics, and components have been calculated according to the correlation matrix between 23 variables. For this reason, the application is performed for 23 variables and 12 regions, so the size of the data matrix is (23 × 12). All of these variables are selected in parallel with the work of Berber at al. (2013) in order to observe the changes in human capital adequacy of regions between 2011 and 2018. Used variables in the PCA analysis are shown in Table 3-1.

Table 3-1. Used Variables in Research

Year	Variable Definition	Code	Source
	HUMAN CAPITAL STOCK		
2017	Literacy rate (6 years and over)	X1	TSI-ABPRS
2016-17	Number of students in secondary vocational school	X2	MNE
2017-18	Higher education graduation rate (15 years and over)	X3	TSI-ABPRS
2011	Number of students in higher education per 100,000 population	X4	CoHE
	HUMAN CAPITAL STRUCTURE		
2016	The ratio of employed personnel in health institutions to total employed	X5	TSI-Health St
2017	The ratio of employed personnel in higher education institutions to total employed	X6	TSI-Education St.
2010	The ratio of employed personnel in TV and radio institutions to total employed	X7	TSI-Labour Force St.

2017	The ratio of employed personnel in agriculture to total employed	X8	TSI-Labour Force St.
2017	The ratio of employed personnel in industry to total employed	X9	TSI-Labour Force St.
2017	The ratio of employed personnel in service to total employed	X10	TSI-Labour Force St.
	HUMAN CAPITAL PERFORMANCE		
2014	GDP per capita	X11	TSI-National Accounts
2016	Share of R&D expenditure in the total R&D expenditure of the country	X12	TSI-R&D St.
2016	Share of R&D personnel in the total R&D personnel of the country	X13	TSI-R&D St.
2017	Number of patent applications	X14	Turkish Patent Institute
	HUMAN CAPITAL ATTRACTION		
2017	Individual health insurance policy rate	X15	IIMC
2017	Individual travel insurance policy rate	X16	IIMC
2017	Individual illness insurance policy rate	X17	IIMC
2017	Cinema seating capacity per 10,000 population	X18	TSI-Culture St.
2017	Theatre seating capacity per 10,000 population	X19	TSI-Culture St.
2017	Number of lent out library materials	X20	TSI-Culture St.
2015	Green covered area as % of completed area	X21	GDF
2017	Number of cars per 1,000 people	X22	TSI-Transportation St.
2017	Urban population ratio	X23	TSI-ABPRS

TSI Turkish Statistical Institute
ABPRS Address Based Population Registration System
MNE Ministry of National Education
CoHE Council of Higher Education
IIMC Insurance Information Monitoring Center
GDF General Directorate of Forestry

Findings

Eigenvalues obtained from the correlation matrix, and explained variances of principal components, are exhibited in Table 3-2. As seen in Table 3-2, the variance of five of the 23 principal components obtained is greater than one. These components account for 94.05 percent of total variability. The first principal component alone could explain 60.63 percent of the total variance. This percentage is high enough for social science, so it is thought that the remaining 22 variables can be represented by the first principal component.

Table 3-2. Eigenvalues and Explained Variances of Principal Components

Principal Components	PC1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9	PC 10
Eigenvalues	**13.94 47**	**2.4 441**	**2.0 499**	**1.7 687**	**1.4 252**	0.5 525	0.5 031	0.1 741	0.0 938	0.0 322
Proportion %	**60.63**	**10. 63**	**8.9 1**	**7.6 9**	**6.2 0**	2.4 0	2.1 9	0.7 6	0.4 1	0.1 4
Cumulative Proportion %	**60.63**	**71. 26**	**80. 17**	**87. 86**	**94. 05**	96. 46	98. 64	99. 40	99. 81	99. 95

When the weights of the variables in the first principal component are examined, it can be seen that the regional human capital adequacy (RHCA) is defined mainly by which elements. This ranking is shown in Table 3-3. The first remarkable result is that the weight of agricultural employment (X8), which is conceptually known to interact with human capital adequacy in reverse, is a negative sign. The weights of the other 22 variables are positive signs. This implies that agricultural employment has adversely affected human capital adequacy, while the other variables have affected the positive direction.

According to the ranking in Table 3-3, the variables with the highest weight within the first principal component are higher education employment (X6), cinema seating capacity (X18), and income per capita (X11). In addition, it has been determined that 'human capital performance' is the most important factor in terms of human capital adequacy. Indeed, all variables reflecting human capital performance (X11, X12, X13 and X14) are located in the top ten. The variables with the lowest weight in the first principal component are the number of library materials (X20), and the number of higher education students (X4). Their weights in the first principal component are close to zero, although positive.

Table 3-3. The Weights of the Variables in the First Principal Component

Variable Code	X6	X18	X11				**Positive and high effect on RHCA**
Weight in PC 1	0.256804	0.2553	0.2518				
Variable Code	X3	X17	X5	X14	X10	X12	**Positive effect on RHCA**
Weight in PC 1	0.242924	0.2414	0.2409	0.239	0.237661	0.236325	
Variable Code	X23	X15	X16	X2	X22	X1	**Positive effect on RHCA**
Weight in PC 1	0.219585	0.2191	0.2180	0.217	0.214167	0.205164	

Variable Code	X9	X7	X19	X13	X21		**Positive effect on RHCA**
Weight in PC 1	0.177859	0.167371	0.160	0.148	0.1082		
Variable Code	X20	X4					**Positive but low effect on RHCA**
Weight in PC 1	0.033708	0.0181					
Variable Code	X8						**Negative effect on RHCA**
Weight in PC 1	-0.2459						

Human Capital Adequacy Ranking of Regions

The regional human capital adequacy index values obtained from the first principal component and the human capital adequacy ranking of the regions are exhibited in Table 3-4 and Figure 3-3. When Figure 3-3 is examined, it is seen that, except for Aegean and East Marmara, the other regions' indexes are quite different from each other. This result implies that there is a wide variation in human capital adequacy among regions. The region with the highest human capital adequacy is the Istanbul region. This result is not surprising, since Istanbul is always in first place in the socio-economic development orders of the Ministry of Development.

In the ranking of regional human capital adequacy, the Western Anatolia region, which includes Ankara, Konya, and Karaman, is located in second place. Ankara also has a high socio-economic index value in the socio-economic development ranking of the Ministry of Development. Therefore, Ankara, which has high socioeconomic development index value, has increased the human capital adequacy ranking of Western Anatolia. The Aegean region, covering İzmir and Denizli, which have high socioeconomic development index values, is settled in the third place in the ranking of human capital adequacy.

The West Blacksea (TR8), Southeastern Anatolia (TRC) and East Blacksea (TR9) regions have both low and close RHAC index values. In terms of human capital adequacy, there is no significant difference between these regions. The regions at the end of the RHAC ranking are the Middle East Anatolia (TRB) and Northeast Anatolia (TRA) regions. These regions are also located at the end of the socio-economic development ranking. This result implies that human capital adequacy is closely related to socio-economic development. As a matter of fact, regional human capital adequacy, and socio-economic development, support and influence each

other. In other words, the human capital adequacy of developed regions is higher than that of underdeveloped regions.

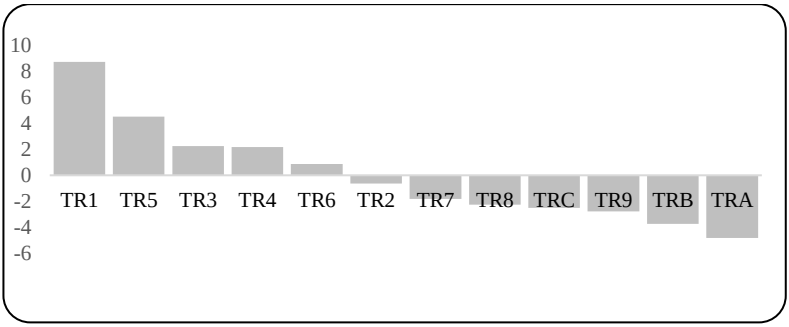


Figure 3-3. Human Capital Adequacy Index of Regions (2018)

Table 3-4. Human Capital Adequacy Ranking of Regions (2018)

Rank	Region Code	Region Name	Index
1	TR1	Istanbul	8.738221444
2	TR5	West Anatolia	4.513851927
3	TR3	Aegean	2.255737429
4	TR4	East Marmara	2.172556493
5	TR6	Mediterranean	0.87185254
6	TR2	Western Marmara	-0.633490196
7	TR7	Middle Anatolia	-1.818734393
8	TR8	West Blacksea	-2.257232892
9	TRC	Southeastern Anatolia	-2.502658929
10	TR9	East Blacksea	-2.772199502
11	TRB	Middle East Anatolia	-3.745892101
12	TRA	Northeast Anatolia	-4.822011821

Another remarkable result in the RHAC ranking is related to the spatial distribution of human capital adequacy. While regions with low human capital adequacy are located in the east of Turkey, regions with high human capital adequacy are located in the west of Turkey.

Comparison of 2011 RAHC Ranking and 2018 RAHC Ranking

In this section, the 2018 RHCA ranking is compared to the 2011 RHCA ranking of Berber et al (2013). Due to using the same variables and the same methods, it is thought that the two rankings are comparable. When Table 3-5 is examined, there is no significant change in the human capital adequacy of the regions over a period of approximately seven years. It is observed that only two regions changed ranking. According to this, while the Aegean Region rises one, the East Marmara Region declines one. The reason for the rise of the Aegean is, in particular, a superior human capital performance. As a matter of fact, the values of the Aegean region have increased in all of the variables reflecting human capital performance. Besides, in this region, the increase in the higher education employment, which has a higher weight in the first principal component, can be shown as another reason.

Table 3-5. Comparison of 2011 RAHC Ranking and 2018 RAHC Ranking

Region Code	Region Name	2018 Rank	2018 Index	2011 Rank	2011 Index	Changing of Rank
TR1	Istanbul	1	8.73822	1	7.85846	0
TR5	West Anatolia	2	4.51385	2	4.94506	0
TR3	Aegean	3	2.25573	4	2.14884	1
TR4	East Marmara	4	2.17255	3	3.16568	-1
TR6	Mediterranean	5	0.87185	5	-0.17750	0
TR2	Western Marmara	6	-0.63340	6	-0.89720	0
TR7	Middle Anatolia	7	-1.81874	7	-1.21140	0
TR8	West Blacksea	8	-2.25723	8	-2.30330	0
TRC	South-eastern Anatolia	9	-2.50269	9	-2.81500	0
TR9	East Blacksea	10	-2.77220	10	-3.14710	0
TRB	Middle East Anatolia	11	-3.74582	11	-3.22550	0

TRA	Northeast Anatolia	12	-4.82202	12	-4.3406	0

Another remarkable case of comparing two rankings is the difference between the RHAC indices of regions (Figure 3-4). While the difference between the RHAC indexes of the Aegean (TR3) and East Marmara (TR4) regions in 2011 is quite large, this difference is almost close to zero in 2018. This means that the differences in human capital adequacy between the two regions has decreased over time. Another example is the change in the index value of the East Black Sea (TR9) region. The index value of this region has become very close to the index value of the south-eastern Anatolia (TRC) region, which is in the upper row. In other words, with the increase in the human capital adequacy of the TR9 region, the difference between the TR9 and TRC regions decreased over time.

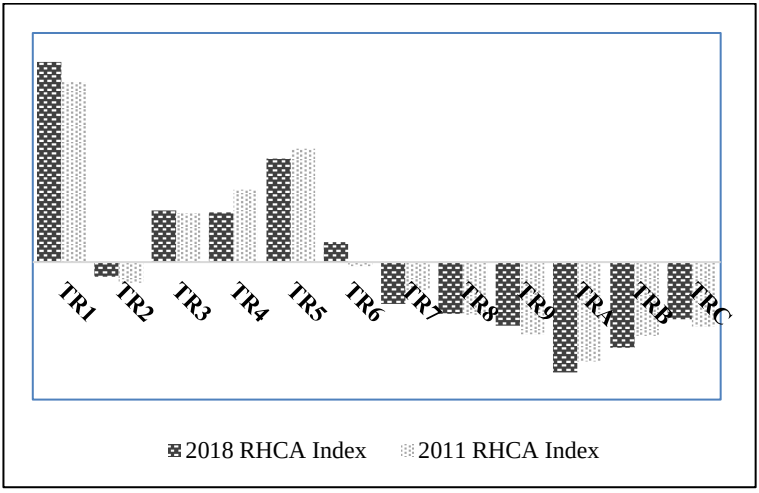


Figure 3-4. Comparison of 2011 RAHC Index &2018 RAHC Index

Conclusion and Recommendations

In this study, under the heading of the Pyramid Model, regional human capital adequacy ranking has been performed for NUTS-I (12 regions) according to Turkey's Nomenclature of Territorial Units for Statistics.

While the human capital adequacy index has been established, the Principal Component Analysis, which is frequently used in competition analyses in recent years, has been preferred. In the analysis, 23 variables were selected according to the four main factors determined in the Pyramid Model. The principal components have been calculated according to the correlation matrix and regional human capital adequacy indexes which have been established. Finally, the findings obtained have been compared with the findings of Berber et al. (2013), so that the changes in the human capital adequacy of the regions from 2011 to 2018 have been evaluated. Therefore, the results obtained from the study have been summarized under two headings: i) findings regarding 2018 regional human capital adequacy; and ii) findings regarding comparison of 2018 and 2011 regional human capital adequacy.

i) Findings regarding 2018 regional human capital adequacy:

- Agricultural employment has adversely affected human capital adequacy, while the other variables have affected the positive direction.
- The higher education employment (X6), the cinema seating capacity (X18), and the income per capital (X11), variables have the highest effects on human capital adequacy.
- It has been determined that 'human capital performance' is the most important factor in terms of human capital adequacy.
- There is a wide variation in human capital adequacy among regions. The region with the highest human capital adequacy is the Istanbul region (TR1), and the regions at the end of the RHAC ranking are the Middle East Anatolia (TRB) and Northeast Anatolia (TRA) regions.
- Human capital adequacy is closely related to socio-economic development. Regional human capital adequacy and socio-economic development support and influence each other. In other words, the human capital adequacy of developed regions is higher than that of underdeveloped regions.
- Regional human capital adequacy is also related to spatial distribution. While regions with low human capital adequacy are located in the east of Turkey, regions with high human capital adequacy are located in the west of Turkey.

ii) Findings regarding the comparison of 2018 and 2011 regional human capital adequacy:

- There is no significant change in the human capital adequacy of the regions over a period of approximately seven years. It is observed that only two regions in the ranking changed. According to this, while the Aegean region rises by one, the East Marmara region declines by one.
- Another remarkable case of comparing two rankings is the difference between RHAC indices of regions. While the difference between the RHAC indexes of the Aegean (TR3) and East Marmara (TR4) regions in 2011 is quite large, this difference is almost close to zero in 2018. This means that the differences of human capital adequacy between the two regions has decreased over time.
- Another example is the change in the index value of the East Black Sea (TR9) region. With the increase in the human capital adequacy of this region, the difference between the East Black Sea (TR9) and south-eastern Anatolia (TRC) regions decreased over time.

When all these results are evaluated together, the following suggestions are proposed:

- Since the most important factor in human capital adequacy is determined as human capital performance, local managers and policy makers should pay more attention to the sub-components (GDP per capital, R&D expenditures, R&D personnel, and patent applications) of this factor.
- Since regional human capital adequacy and socio-economic development are closely related to each other, regulations aimed at increasing socio-economic development will also increase human capital adequacy.
- Since regional human capital adequacy is also related to spatial distribution, it is suggested that more resources should be transferred to the eastern regions, in order to reduce regional disparities.

References

Aghion, P. & Howitt, P. (1992). A Model of Growth through Creative Destruction. *Econometrica*, 60(2), 323-351.

Baday Yıldız, E., Sivri, U. & Berber, M. (2010). Socio-Econonomic Development Ranking of Provinces in Turkey. (2010). In E. Klavuz, F. Şeker, F. Çiftci, & Y. E. Akdoğan (Eds.), *International Symposium of*

Regional Development Proceedings Book (pp. 693-706). Yozgat: Bozok University Publications

Barro, R. J. (1990). Government Spending in a Simple Model of Endogenous Growth. *Journal of Political Economy*, 98(5): 103-125.

Becker, G. S. (1964). *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*. New York. NY: National Bureau of Economic Research,

Denison, E. (1962). Education, Economic Growth and Gaps in Information. *The Journal of Political Economy*, 70(5), 124-128.

Dinçer, B., Özaslan, M., Kavasoğlu, T. (2003). "*Socio-Economic Development Ranking Survey of Provinces and Regions (2003)"*. Ankara, Turkey: DPT 2671.

Dreger, C., Erber, G. & Glocker. D. (2009). Regional Measures of Human Capital in the European Union, *IZA Discussion Paper Series,* No.3919

Grosman, G. M. & Helpman, E. (1991). *Innovation and Growth in the Global Economy*. Cambridge, MIT Press

Institution of International Competition Researches. (2013, January 1). Inter-Provincial Competitiveness Index (2009-2010). Retrieved from http://www.deloitte.com/assets/DcomTurkey/Local%20Assets/Documents/turkey_tr_finansalhizmetler_rekabetcilikendeksi_290411.pdf

Jia, Y. & Weifeng Wu, N. Z. (2010). The "Pyramid Model" and Measurement on Regional Human Capital Competence. *International Conference on Management and Service Science*. China: Wuhan, doi: 10.1109/ICMSS.2010.5577189

Jolliffe, I. T. (2012). *Principal Component Analysis, Second Edition*. New York. USA: Springer, Verlag

Lucas, R. E. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22(1), 3-42.

Mincer, J. (1995). Economic Development, Growth of Human Capital and the Dynamics of the Wage Structure. *Journal of Economic Growth*, 1, 29-48.

Ministry of Development (2013, January 1). Socio-Economic Development Ranking Survey of Provinces and Regions (2011). Retrieved from http://www.dpt.gov.tr/DocObjects/view/14197/BASIN_AÇIKLAMASI-sege_2011-v6.pdf

Ministry of National Education. (2018, June 20). Statistics and Information Systems. Retrieved from http://sgb.meb.gov.tr/www/resmi-istatistikler /icerik/64.

Romer, P. M. (1986). Increasing Returns and Long Run Growth. *Journal of Political Economy*, 94(5), 1002–1037.

Schultz, T. W. (1961). Investment in Human Capital. *The American Economic Review*, 51(1), 1-17.

Smith, A. (1776). *The Wealth of Nations*. Chicago: University of Chicago Press.

Stephan, A. (2001). The Contribution of Transport and Human Capital Infrastructure to Local Private Production: A Partial Adjustment Approach". *Review of Regional Research*, 21(1), 91-108.

Turkish Statistical Institute. (2018, June 20). Regional Statistics. Retrieved from https://biruni.tuik.gov.tr/bolgeselistatistik/anaSayfa.do?dil=en

United Nations Development Programme (UNDP). (2013, January 1). Human Development Report, Turkey 2004. Retrieved from http://hdr.undp.org/en/reports/national/europethecis/turkey/ turkey_2004_en.pdf

United Nations Development Programme (UNDP). (2018, June 15). Human Development Report 2016. Retrieved from http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf

Vyas, S. & Kumaranayake, L. (2006). Constructing Socio-Economic Status Indices: How to Use Principal Components Analysis. *Health Policy Plan*, 21(6), 459-68.

Villarroya, I. S. (2007). Human capital convergence in Latin America: 1950–2000. *Revista de Historia Económica*, 25, 87-122.