

T.C.

GEBZE YÜKSEK TEKNOLOJİ ENSTİTÜSÜ

SOSYAL BİLİMLER ENSTİTÜSÜ

AN ANALYSIS ON THE COMPETENCIES AND

DEFICIENCIES OF HUMAN DEVELOPMENT

INDEX:

CONCLUSIONS DRAWN FOR TURKEY

MEHMET TOLGA TANER

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TEZ DANIŞMANI:

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DOKTORA JÜRİ ONAY FORMU

G.Y.T.E. Sosyal Bilimler Enstitüsü Yönetim Kurulu'nun 14/06/2011 tarih ve 2011/25 sayılı kararıyla oluşturulan jüri tarafından 07/07/2011 tarihinde tez savunma sınavı yapılan Mehmet Tolga TANER'in tez çalışması İŞLETME Anabilim Dalında DOKTORA tezi olarak kabul edilmiştir.

JÜRİ

Prof.Dr. Bülent Sezen
(TEZ DANIŞMANI)

:

Doç.Dr. Ramazan Kaynak

:

Yard.Doç.Dr. Avni Zafer Acar

:

Prof.Dr. Lütfihak Alpkan

:

Doç. Dr. Ebru Tümer Kabadayı

:

ONAY

G.Y.T.E. Mühendislik ve Fen Bilimleri/Sosyal Bilimler Enstitüsü Yönetim Kurulu'nun tarih ve/..... sayılı kararı.

İMZA/MÜHÜR

ÖZET

TEZİN BAŞLIĞI: İnsani Gelişmişlik Endeksi'nin Yeterlilikleri ve Eksiklikleri üzerine bir Analiz: Türkiye için Çıkarımlar

YAZAR ADI : Mehmet Tolga TANER

İnsani Gelişmişlik Endeksi (İGE), Yaşam Beklentisi, Yetişkin Okur-Yazarlığı ve Okullaşma, ile kişi başına düşen Gayrisafi Yurtiçi Hasıla olan dört göstergeye bağlı olarak ülkelerin milli refah düzeylerini ölçmektedir. Fakat, insani gelişmişlik, şu an İGE’nde yansıtılandan çok daha geniş bir kavramdır. Dolayısıyla endeksin, toplumsal refahın daha fazla yönünü hesaba katması için teorisi ve hesaplanmasında bir revizyona ihtiyacı vardır. Bunu başarmak için, ülkelerin insani gelişmişliğinin önemli bir belirleyicisi olan işsizlik oranı, orijinal İGE modeline eklenmiştir. Önerilen endeks, “İşsizliğe göre ayarlanmış İGE” olarak adlandırılmış ve İGE-2 ile gösterilmiştir. Bu çalışmada, İGE-2, 1998 ve 2007 arasındaki yıllar için 30 OECD ülkesi için hesaplanmıştır. Ülkeler, İGE ve İGE-2 değerlerine bağlı olarak Kümeleme Analizi ile sınıflandırılmıştır. Bunun akabinde, ülkelerin verimlilik değerlerinin hesaplanmasında, hem İGE modeli, hemde İGE-2 modeli üzerinde Veri Zarflama Analizi (VZA) uygulanmıştır. Sonuçlar, işsizlik oranının İGE’ne yeni bir gösterge olarak eklenmesinin endeksi daha kapsamlı hale getirme potansiyeli ve ülkelerin kalkınma performanslarını değerlendirmede uygun bir yaklaşım olduğunu göstermektedir. Önerilen endeksin İGE’nin alternatif veya tamamlayıcısı olarak kullanımı teklif edilmektedir. Bulgular ışığında, Türkiye için tavsiyeler önerilmiştir.

Anahtar Kelimeler: İnsani Gelişmişlik Endeksi, Boyutlar, Göstergeler, İşsizlik Oranı.

SUMMARY

TITLE : An Analysis on the Competencies and Deficiencies of Human Development Index: Conclusions Drawn for Turkey

AUTHOR : Mehmet Tolga TANER

The Human Development Index (HDI) is a country-level measure of national well-being based on the four indicators, namely Life Expectancy at Birth, Adult Literacy and School Enrolment, and Gross Domestic Product per capita. However, the concept of human development is much wider than what is currently reflected in the HDI. Thus, the index needs a theoretical and computational revision so that it can capture more aspects of social welfare. To achieve this, an important determinant of a country's human development, i.e. unemployment rate, is added to the original model of HDI. The proposed index is called the "Unemployment-adjusted HDI" and denoted by HDI-2. In this study, HDI-2 is calculated for 30 OECD countries between 1998 and 2007. Countries are classified by Cluster Analysis depending on their HDI and HDI-2 values. Thereafter, Data Envelopment Analysis (DEA) is applied both for the HDI and HDI-2 models to calculate the efficiency score of countries. The results show that the addition of unemployment rate to the HDI as a new indicator has the potential to make the index more comprehensive and present a suitable approach for assessing the development performance of countries. The use of the proposed index is offered as an alternative or complementary to the HDI. In the light of the findings, recommendations are suggested for Turkey.

Keywords: Human Development Index, Dimensions, Indicators, Unemployment Rate.

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LIST OF ABBREVIATIONS AND SYMBOLS

ALR:	Adult Literacy Rate
CRS:	Constant Returns to Scale
DEA:	Data Envelopment Analysis
DMU:	Decision Making Unit
EI:	Educational Attainment Index
EMS:	Efficiency Measurement System
ES:	Efficiency Score
ES-1:	Efficiency Score of HDI components
ES-2:	Efficiency Score of HDI-2 components
GDI:	Gender-related Development Index
GDP:	Gross Domestic Product
GDPI:	Gross Domestic Product Index
GER:	Gross Enrolment Ratio
GNI:	Gross National Income
GNP:	Gross National Product
HD:	Human Development
HDI:	Human Development Index
HDI-2:	Unemployment-adjusted HDI
HDR:	Human Development Report
ILO:	International Labor Organization
LE:	Life Expectancy at Birth
LEI:	Longevity Index
MDG:	Millennium Development Goals
OECD:	Organization for Economic Co-operation and Development
PPP:	Purchasing Power Parity
RUI:	Reversed Unemployment Index
SES:	Super-Efficiency Score
SES-1:	Super-Efficiency Score of HDI components

SES-2:	Supper-Efficiency Score of HDI-2 components
SPSS:	Statistical Package for Social Sciences
TÜİK:	Turkish Statistical Institute
UEMP:	Total Unemployment Rate
UNDP:	United Nation's Development Programme
YEN:	Youth Employment Network
i:	input
j:	output
k:	number of clusters
m:	a DMU
n:	number of DMUs
n/a:	not avaiable
u_{mi} :	weight given to input i
v_{mj} :	weight given to output j
x_{mi} :	amount of input i utilised by DMU m
y:	country
y_{mj} :	amount of output j produced by DMU m

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1. INTRODUCTION

1.1. Motivation, Background and Objectives

Measuring human development has long been an objective for scientists and the public alike. The implementation of different indicators to make this assessment is not a new phenomenon and has been in operation especially in the economic sector for many years. These various criteria have made it possible to make satisfactory assessments of the state of the nation and its ability to achieve specific national aims.

The United Nations (UN) has pioneered the approach of combining the previously used individual indicators into a composite format, the most effective form being the the Human Development Index (HDI). The HDI and various other indicators have been used to make comparisons and assessments of countries performance relating to such criteria as income, health and education, and other criteria which are sometimes not so easily quantified (e.g. gender issues etc). These various indicators are increasingly being used to power policy decisions relating to the environment, the economy, or technological development.

HDI as a composite indicator is a mathematical model, the evolution of which requires subjective judgment on the selection of indicators, the incorporation of missing values, the choice of aggregation model, the weighting of the various indicators, etc. The careful selection of these indicators can even be used to fine tune the outcome. For this reason, the selection procedure for subjective criteria and their errors as well as data sources is of extreme importance when assessing the effectiveness of the composite indicator in achieving its role. The criteria applied must be deemed suitable to make an accurate reflection of the human development (HD) performance when ranking the individual countries to which it is being applied.

The criteria used as indicators of HDI relate to the individual's ability to achieve "a long and healthy life, the ability to be knowledgeable and the ability to have access to the resources needed for a decent standard of living" (HDR, 1990) and these three aspiration goals of the individual are reflected in the current HDI. However, effectively reporting these three criteria for all UN countries in which the HDI values are reported remains a challenge. Over the years, other attempts at producing a broader index have been tried.

HDI in its current form neither captures nor portrays an adequate representation of HD or well-being. It is believed that some fine tuning is still needed to arrive at an index capable of being a more sensitive indicator of HD. The fine tuning might include such considerations as modification of the HDI to adjust the incorrect ranking resulting from inadequate selection factors. This would capture a fuller understanding of HD and well-being and a more trustworthy ranking of the countries. Previous attempts to fine tune HDI outcomes have failed due to the inadequacy of the mathematics that was applied to the complicated nature of HDI measurement.

The United Nations Development Programme (UNDP) has always been seeking to provide a precise definition of HD, which represents the concept of human well-being, connecting it to the design of the HDI. Therefore, this study aims to construct a new composite index that can be used as an alternative or supplement to HDI. To accomplish this, a sample of 30 Organization for Economic Co-operation and Development (OECD) countries is analyzed by adding a fourth indicator, namely the unemployment rate to the calculated HDI. The proposed index is named the Unemployment Adjusted Human Development Index (HDI-2).

First, the HDI-2 performance of 30 OECD countries is measured. New rankings of countries are noted and compared with the HDI rankings. Second, Cluster Analysis is employed to classify the countries. Consequently, efficiency of countries incorporating HDI dimensions and HDI-2 dimensions are determined by means of a non-parametric input oriented, Data Envelopment Analysis (DEA) has employed Constant Returns to

Scale (CRS). Particular focus will be on the analysis and discussion of Turkey's HD performance in light of the data offered by HDRs and use of HDIs. This study also aims to guide researchers towards new ideas and to explore possible advances.

The author considers this study to contribute and complement the current literature on HD. The HDI-2 will particularly attract the users of HDI, namely governments, foreign investors, policymakers, economists, academicians and researchers.

Governments can make use of this new, broader index (HDI-2) in their national strategic plan development processes of health, education, income and employment. The researchers and academicians can utilize this work in their research and teaching curriculum.

To attract foreign investors, high levels of HD are an essential ingredient. The achievements in a country's HD and correct display of its ranking among other countries matters to foreign investors in terms of their choice for appropriate locations of their investment activities. In turn, foreign direct investment leads to higher HD achievements in the host country as foreign investors contribute as employment creation and income generation (Sharma and Gani, 2004).

1.2. Organization of the Thesis

Chapter 1 presents the rationale of this study.

In Chapter 2, the historical background of HDI as well as a review of literature including its competencies, deficiencies and refinements which have been implemented over time is discussed.

Chapter 3 addresses possible criteria for inclusion in the fine tuning of the HDI and the proposed index is introduced with consideration to individual dimensions.

Chapter 4 applies the Cluster Analysis to HDI and HDI-2 and discusses the resulting differences.

Chapter 5 applies the Data Envelopment Analysis to HDI and HDI-2.

Chapter 6 evaluates the current situation of Turkey in terms of human development and presents recommendations for Turkey.

Chapter 7 concludes with a discussion of the results, contributions and the limitation of the research, and the suggestions for future research.

2. BACKGROUND

2.1. The UNDP's Human Development Index

Until the construction of the HDI, GNP per capita, GDP per capita and/or economic growth have long been accepted as the major indicators of development. Many authors noted conceptual problems with using these as measures of human well-being (Kuznets, 1955; Nordhaus and Tobin, 1973; Hicks and Streeten, 1979; Ram, 1982). Thus, the need for a more tangible and broader index, using forces other than income eventually led to the creation of the HDI.

The HDI was first revealed to the public in the United Nations Development Program (UNDP)'s World Development Report in 1990. The central figure during the development of the HDI was Mahbub ul Haq, an economist formerly worked in the World Bank. He worked on the Human Development Report (HDR) project in the UNDP where the HDI was developed. By the launch of the first HDR, UNDP changed the scope of the development theory, measurement, and policy.

Since 1990, HDRs have been produced nearly every year. They have applied the HD concept to diverse themes (See Appendix 1). HDRs have provided country-level data for a wide range of well-being indicators for many countries in its statistical annex. Since 1990, UNDP have also published eight National Human Development Reports (NHDRs) for Turkey (See Appendix 2).

The HDI is currently composed of three components: the capabilities of leading a long and healthy life (longevity), being knowledgeable (educational attainment) and having a decent standard of living (income) (Figure 2.1). Various other indicators are used to measure these components at national, regional or municipal level. For each country, arithmetic mean of the three components is calculated, giving its HDI value for the year.

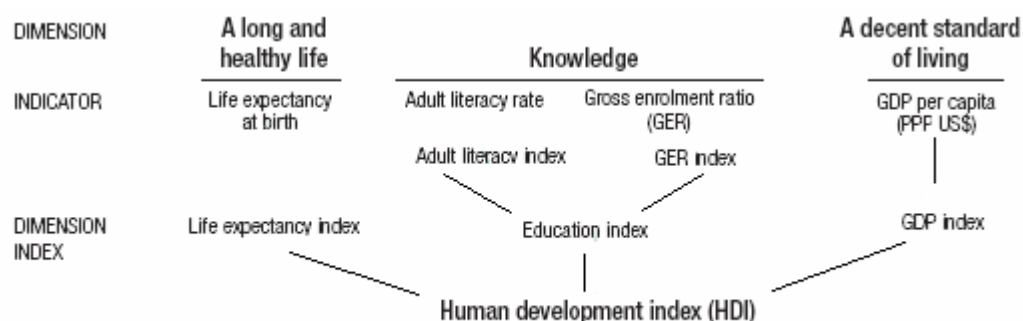


Figure 2.1. Construction of the HDI (HDR, 2005)

The HDI has changed the global debate on development and influenced public policy around the world. It challenged the GDP per capita as a measure and target of development by acting as a tool to popularize HD as a measure/yardstick of well-being.

The HDI is prescriptive, descriptive and analytical both as a final input and an input. The governments make use of it as a tool to assess their performance one year after another. It is particularly used as an international comparative measure to rank and compare countries. It is also commonly used by scholars, policy-makers, and development professionals to compare levels of development among nations and to gauge each nation's progress in development. It helps countries to focus on planning, analyze alternative development strategies and reflects the impacts of such public policies (Raworth and Stewart, 2003).

In HDRs, there is a common definition of HD as a process of “enlarging people’s choices”. Although the particular wording (enlarging vs. expanding, people’s choices vs. freedoms and capabilities) varies over time, this is the most common single definition of HD (Table 2.1).

HDI is reasonably well-defined, established, understood and to a great extent accepted and defended at the theoretical level. However, it can still be improved.

Table 2.1. Short Definitions of Human Development

1990	a process of enlarging people's choices.
1991	to increase people's choices.
1992	a process of enlarging people's choices.
1993	involves widening [people's] choices.
1994	to create an environment in which all people can expand their capabilities.
1995	a process of enlarging people's choices.
1996	a process of enlarging people's choices.
1997	the process of enlarging people's choices.
1998	a process of enlarging people's choices.
1999	the process of enlarging people's choices.
2000	a process of enhancing human capabilities.
2001	about expanding the choices people have to lead lives that they value.
2002	about people, about expanding their choices to lead lives they value.
2003	to improve people's lives by expanding their choices, freedom and dignity.
2004	the process of widening choices for people to do and be what they value in life.
2005	about building human capabilities - the range of things that people can do, and what they can be.
2007/8	about expanding people's real choice and the substantive freedoms - the capabilities - that enable them to lead lives that they value.
2009	the expansion of people's freedoms to live their lives as they choose.

Source: Alkire (2010)

Since 1990, HD has been described as “enlarging people's choices”. The author retained that fundamental motivation, however, added one further feature. Thus, the author's statement of HD is the following: “Human Development is a process of broadening people's choices by providing greater access to health, education and income with efficient use of human resources.”

HD is multidimensional. The dimensions that are mentioned in the HDRs each year vary, but, nevertheless there is some consistency among them (Table 2.2).

Table 2.2 shows that health, education and living standards were mentioned in all HDRs; while work and employment only appeared as “creativity and productivity”, and were mentioned altogether only for five years (Alkire, 2010).

Many authors suggested the use of other dimensions in the HDI including nutritional status and autonomy (Murray, 1991), culture (Khatib, 1994), uncertainty/unpredictability and mobility (Ryten, 2000), freedom from crime and violence (Rao, 1991), self-respect and the opportunity to be creative and productive (Rao, 1991). Hopkins (1993) proposed the use of a ten-dimensional HDI with the dimensions of environment, food security, job security, housing, personal security, political freedom, transport and communication, safe water and health, education and real income.

2.2. Review of the Literature

From the outset of its introduction in 1990 by UNDP, the HDI has caught the attention of academics and researchers. In this section, the HDI literature is given in chronological order.

Trabold-Nübler (1991) was the first academician to suggest a modified HDI. He said that the HDI should be redesigned technically and calculated every year with the latest data available. Although he said that the structure of the HDI should not be changed in order to assure comparability over time, he was in favor of refining the HDI into a more comprehensive index reflecting more aspects of HD and inequalities within a country in the long run. Desai (1991) favored the use of HDI as a theoretical approach and quantitative measure. He concluded that HDR promised future for improving the development theory and policy. Kelley (1991) studied the choice of range of

components with respect to weights and claimed that the developed countries would make little or no improvement in HDI.

Table 2.2. Dimensions mentioned in the Human Development Reports (1990-2009)

	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	07/8	09
Long healthy life	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Knowledge	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Resources for decent standard of life	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Political freedom	X	X						X							X			X
Guaranteed Human Rights	X					X		X		X	X							
Self Respect	X					X		X		X	X							
Good physical environment		X	X		X													
Freedom of Action and Expression			X															
Participation				X	X								X					
Human Security					X		X											
Political, Social & Economic Freedoms						X		X	X	X								
Being creative						X		X	X	X	X							
Being Productive						X		X	X	X	X							
Freedom							X	X										
Democracy							X											
Dignity and Respect of others								X										
Empowerment									X		X							
A sense of belonging to a community									X	X	X							
Security											X							X
Sustainability											X							
Enjoying political and civil freedoms to participate in the life of one's community														X				
Cultural liberty															X			
Social and Political Participation																X		
Civil and Political Rights																	X	

Source: Alkire (2010)

McGillivray (1991) questioned the usefulness of the HDI and concluded that it failed to provide insights to inter-country comparisons. Slottje (1991) worked on the weighting schemes for HDI components. Chowdhury (1991) concluded that HDI was correlated with GDP per capita and added that he recommended the use of PPP adjusted real income per capita weighted by the distribution of income instead of HDI. Hopkins (1991) welcomed the HDR and favored the use of HDI instead of GNP per capita but was against the use of unweighted means for components. Rao (1991) reviewed and made an assessment of the first HDR. Bhanojirao (1991) suggested some directions and coverage of the future editions of HDR.

Lind (1992) stated that HDI was potentially a powerful tool for world social development and was consistent with public objectives. Rati (1992) found that the inequality measures revealed dramatically different results although there was very high positive correlation between real GDP per capita and HDI. Ram (1992) claimed that inequality among countries was not taken into consideration.

Smith (1993) favored UNDP's modification of HDI and stated that the modified HDI represented a potentially useful measurement for the available statistics. McGillivray and White (1993) investigated the difference between the 1990 and 1991 versions of the HDI. They concluded that the way HDI treated income was inappropriate. They added that the HDI lacked year-to-year comparability. Anand and Ravillion (1993) examined the HDI level in Sri Lanka.

Acharya and Wall (1994) proposed an alternative HDI that included discounting income by natural logarithm. Streeten (1994) favored the use of simple averaging method and added that improvement in HDI values favored higher productivity, reduced poverty, higher democracy, greater social stability, reduced civil disturbances and higher political stability. Srinivasan (1994) emphasized the importance of improving the HDI data. Ogwang (1994) claimed that the data used to calculate the HDI are unreliable due to infrequent collection and inaccurate reporting. Akder (1994) suggested the use of regionally disaggregated HDI. Aturupane, Glewwe and Isenman (1994) emphasized the

elimination of measurement errors. Thapa (1994) computed HDI for Nepal's 75 regions and found that 70 of them were below the low level of HD and only the district of Kathmandu had a high level. Dossel and Gounder (1994) made inter-country comparisons and concluded that the differences between the absolute values and the ranking characteristics of the three components of HDI would be important if HDI was used as an explanatory variable in economic analyses.

Nübler (1995) claimed that the HDI could not guarantee the validity of the measurements regarding HD. Corrie (1995) measured the quality of life of the Dalit child in India by HDI and concluded that HDI could serve as social progress indicator although the country did not fulfill equality for all citizens. Luchters and Menkhoff (1995) investigated whether the HDI provided more information than the GDP per capita itself. Islam (1995) examined the relationship between real GDP per capita and the HDI in high, medium and low HD countries and found that the sensitivity of the HDI to changes in per capita GDP was highest in low HD countries. Ul Haq (1995) elaborated on the raised criticisms made against the HDI, suggested possible refinements to the HDI. The same article was reproduced in 2003.

Paul (1996) proposed a modified HDI and concluded that the relative ranking of countries based on that modification was significantly different from that of HDI's.

Agostini and Richardson (1997) examined a cross-city HDI for 25 U.S. cities. Lee et al. (1997) paper concluded that the HDI was a useful predictor of infant and maternal mortality rates. Ravallion (1997) concluded that economic growth would not guarantee all people in a country where the access to market and non-market goods needed to lead fulfilling lives were lacking. Sharma (1997) concluded that UNDP should disaggregate their data of employment, income, mortality, education, consumption and shelter by sex. Crafts (1997) stated that the traditional measure of economic growth greatly understated the rate of improvement in living standards of 16 advanced economies since 1870. Pillarisetti (1997) examined the inter-country inequality in real income per capita and the HDI and concluded that the difference in the degree of

inequality in those two highly correlated indicators was found to be high. Hicks (1997) proposed an Inequality-Adjusted HDI. Sagar and Najam (1997) claimed that the HDI focused almost entirely on national performance and ranking, but failed to pay much attention to HD from a global perspective.

Noorbakhsh (1998a) suggested a set of alternative indices based on the same components with the HDI, for measuring HD to test HDI's components and structure. Noorbakhsh (1998b) compared the ranks yielded by employing arithmetic mean, principal component analysis, and Borda methods. He found that all these different methods yielded similar ranks.

Indrayan et al. (1999) investigated the 30-year trend of HDI in India's major states and noted the noticeable differences. Ivanoca, Arcelus, and Srinivasan (1999) stated that the HDI only carried useful information about a country's current HD, but gave no evidence for the future. To overcome this, they suggested that refinements in its construction and theory as a quantitative measure were needed.

Lai (2000) made use of the weighted principal component analysis to measure and analyze the progress of HDI in the countries. Chakravarty (2000) developed an additive technique that enabled to calculate and add the percentage contributions of individual components to yield an overall HDI. Ogwang (2000) compared the degree of inter-country inequality in the HDI, the Gender-Related Development Index and the Gender Empowerment Measure and found that the Gender-Related Development Index and Gender Empowerment Measure both showed higher degrees of inter-country inequality than HDI did. Sen (2000) evaluated the first 10-years of the HDI. Thereafter, Anand and Sen (2000) examined the more effective use of HDI's income component to fine tune the inequalities. Raab, Kotamraju and Haag (2000) evaluated the HDI's role in measuring children's quality of life. Luchters and Menkoff (2000) stated that HDI provided an established distribution-sensitive measure of HD. Ranis, Stewart and Ramirez (2000) examined the relationship between economic growth and HDI.

Bhatnagar (2001) discussed the changes made in the HDI during its first decade of use. Mahlberg and Obersteiner (2001) applied the DEA to HDI components and claimed that the actual measurement of HD became scientifically sounder. Biswas and Caliendo (2001) proposed the use of the principal component analysis in order to combine the components of HD. Their analysis yielded nearly an equal weight for the three components, i.e. 34% for LEI, 34% for EI and 32% for GDPI. Neumayer (2001) claimed that a country's HD would be potentially unsustainable if the net depreciation of country's manufactured and natural capital stock was bigger than its investment.

McGillivray (2002) questioned composition and usefulness of HDI. Noorbakhsh (2002) showed regional disparities with respect to HDI components in the provinces of Iran. Crafts (2002) concluded that HDI of today's less-developed countries exceeded that of Western Europe in 1870 and added that the gaps in HDI between Western Europe and each of Africa, China and India had become smaller in 1999 than in 1950. Panigrahi and Sivramkrishna (2002) proposed an adjusted HDI and showed that HDI-based country rankings were not robust. They suggested standardization of components before averaging them. Cahill (2002) tested whether GDP per capita had diminishing returns to development as assumed in HDI. Alkire (2002) concluded that planning, monitoring and evaluation frameworks should be designed in order for HDI to become an operational objective for countries.

Raworth and Stewart (2003) concluded that adding extra dimensions to HDI would not help the HDI move closer to its fundamental goals, but data with reasonable and better quality would. Ahmed (2003) found that the HDI was inversely related to decent work deficit. Morse (2003a) recalculated the HDI of 114 countries and found deviations in their ranks. Morse (2003b) included environmental and resource-consumption dimensions in the HDI calculations. Lai (2003) employed the weighted principal component analysis to measure and analyze HDI in the provinces of China. Fukuda-Parr (2003) stated that the HD approach shifted towards the direction of political freedoms and institutions, political processes and advocating equal rights for women. Jahan (2003) measured living standard and poverty by means of the HDI. Mazumdar

(2003) proposed an alternative method for measuring the HDI. Chakravarty (2003) introduced an axiomatic method, namely the Generalized HDI. Osberg and Sharpe (2003) developed an economic well-being index incorporating current effective per capita consumption flows, net societal accumulation of stocks of productive resources, income distribution and economic security and suggested that this index yielded significantly different rankings than the HDI that measured total well-being.

Wherry (2004) elaborated on the institutionalization of the HDI. McGillivray and Noorbakhsh (2004) found that conflict and aid were negatively associated with HDI levels. Harkness (2004) criticizes the education component of the HDI. Muller and Trannoy (2004) suggested the use of a dominance approach to inequality across countries. Jordan (2004) examined the HDI for the 159 counties of Georgia, US that made use of the indicators of education, employment and housing variables. Peinado and Cespedes (2004) examined the HDI in Spain and elaborated on gender and regional inequality issues. Lanzi (2004) improved Chakravarty's (2003) axiomatic Generalized HDI. Lind (2004) concluded that literacy and education were given very high weights in the HDI while the weight of GDP per capita was correct. Hongyuan and Yongliang (2004) compared HDI's of rural and urban China.

Foster, Lopez-Calva and Szekely (2005) examined the HDI in Mexico. Ramos and Silber (2005) concluded that the overall level of HD was much more equally distributed than its components and added that HDI could be conceptually and empirically measured in many different ways. Günsoy (2005) recommended the health policies be revised in Turkey in order to be ranked higher in HDI. Chatterjee (2005) developed an alternative HDI. Arcelus, Sharma and Srinivasan (2005a) examined the differences in the resource utilization efficiency of countries reflected in the HDI by DEA. In another paper, Arcelus, Sharma and Srinivasan (2005b) compared the Technology Achievement Index with the HDI and concluded that both yielded similar country rankings and similar information validity. Costantini and Monni (2005) introduced a new measure for sustainable HD with environmental aspects. Despotis (2005a) developed a DEA model and estimated the relative efficiency of the countries.

Then, Despotis (2005) proposed a new DEA approach for HDI and applied it to Asia and Pacific countries incorporating optimal weights for the HDI components. Gatt (2005) examined the HDI behavior of small states and countries. Cahill (2005a) worked on a wide range of weights for HDI components and concluded that the HDI was either robust to a wide range of index weights or it was largely redundant. In another paper, Cahill (2005b) proposed two alternative sets of weights to be used in the calculation of the HDI which were statistically indistinguishable and very highly correlated with the HDI. Blanchflower and Oswald (2005) studied happiness and the HDI in Australia.

Vemuria and Costanza (2006) concluded that the HDI successfully explained life satisfaction at the country level. Leigh and Wolfers (2006) concluded that Australia was a happier country than the HDI predicted. Noorbakhsh (2006) examined the HDI in major states in India and concluded that they showed significant improvements in both inequality and polarization. Alzate (2006) listed the lessons learned from HDI components that were used for the US welfare policy related to health coverage, infant mortality rate, maternal mortality rate and the mismatch between education and standard of living. Chowdhury and Squire (2006) evaluated alternative sets of weights to HDI components, but favored the use of equal weights. Lee, Lin and Fang (2006) suggested the use of a fuzzy multiple objective DEA model to assess the relative HDI performance of the countries. Ranis, Stewart and Samman (2006) worked on the under-five mortality indicator and its potential use in the HDI. Ferrer (2006) elaborated on the selection of statistic information for HDI and added that UNDP should strengthen data collection by reports at the national levels and standardized definitions. Tokuyama and Pillarisetti (2006) examined the reliability of UNDP's databases that had shown significant measurement errors and inadequacies. Zgheib et al. (2006) investigated the effects of population growth in Middle East countries to the HDI. Stanton (2006) proposed an inequality-adjusted HDI and applied it to 46 countries.

Stapleton and Garrod (2007) favored the use of different weights for the HDI components. McNeill (2007) investigated the relationship between social capital and the HDI. Stanton (2007) stated that the strength of HDI was due to its being allowed to

improve over time. She favored the potential HDI refinements in the future that would evolve the HDI towards a better measure for HD. Mishra (2007) proposed a distribution augmented principal component HDI. Tridico (2007) examined the HDI in different regions of Poland and concluded that GDP growth was not a sufficient condition for improvements in HD. Conte, Torre and Vasta (2007) predicted a long run estimate of the HDI for Italy. Neri (2007) proposed a Perceived HDI that incorporated also the perceptions on work conditions and satisfaction.

Grimm et al. (2008) suggested a new method to compute the three HDI components and the overall HDI for quartiles of the income distribution and found large differences in African countries. Cifuentes et al. (2008) investigated the relationship between the HDI and major depressive episodes and found that moderately developed countries had the lowest prevalence of major depressive episodes. Wolff, Chong and Auffhammer (2008) found that up to 45% of developing countries were misclassified by UNDP's methodology. Cherchye, Ooghe and Puyenbroeck (2008) concluded that the HDI classification was robust but not the HDI ranking of countries. Monni (2008) investigated the relationship between environment with HD and economic growth. Konya and Guisan (2008) found that under developed countries succeeded to improve their HDI more than developed countries. Mishra and Nathan (2008) investigated the behavior of the non-uniformly and uniformly developed countries with their HDI trend. Engineer, King and Roy (2008) suggested the use of net income for calculating the HDI for OECD countries. Lozano and Gutierrez (2008) made use of the DEA and found that the efficiency scores were highly correlated with HDI. Ünal (2008) investigated the HDI of different regions in Turkey.

Khalifa and Connelly (2009) examined a modified HDI with sustainable development indicators in rural Egypt. Mukherjee and Chakraborty (2009) investigated the relationship between Environmental Quality Index, HDI and economic growth for 14 major states in India. Davies (2009) measured the impact of the size of government consumption expenditures on social welfare by means of the HDI and derived an optimal size. Smith (2009) measured the capacity of human agency by the HDI such as

the indicators of political democracy, slavery, national debt, corruption, internal conflict, political freedom and emancipative employment. Segura and Moya (2009) suggested the use of a non-compensatory assessment HDI that yielded different ranking for countries. Karabulut, Kaya and Gürsoy (2009) concluded that all of the OECD countries were determined to have high HD levels except for Turkey. Yang (2009) examined the effects of international migration on HDI. Ortega (2009) concluded that the peoples of the least developed countries benefited most from international migration. Harttgen and Klasen (2009) investigated the differences in the HD components of internal migrants and non-migrants and concluded that differences in income between migrants and non-migrants were found to be higher than differences in education and life-expectancy.

Shetty and Pakkala (2010) measured the HDI in different regions of India by utilizing income. Hidalgo (2010) made use of graphical statistical method to deal with the complex HDI data and compared relative level of HD of countries. Rinaldi and Nurwita (2010) examined the HDI in Indonesia. Alkire (2010) elaborated on the relationship of the HDI with the Millennium Development Goals, human rights, human security, inequality, environmental sustainability and happiness. Stewart (2010) examined the level of HDI in European countries including Turkey. Nguefack-Tsague, Klasen and Zucchini (2010) employed the principal component analysis and favored the use of the same weights for the HDI components. Engineer, Roy and Fink (2010) suggested the use of a morbidity indicator, namely the expected lost healthy years at birth in the HDI. Lind (2010) introduced a Calibrated HDI. Harttgen and Klasen (2010) suggested the use of the HDI at the household level. Vierstraete (2010) suggested the use of the DEA and concluded that countries were efficient both in reaching the optimal level of HDI and attaining their GDP objectives. Kovacevic and Aguna (2010) applied the sensitivity analysis to the HDI.

2.3. Competencies of the HDI

The HDI:

1. is a simple and manageable index.
2. has a unitless scalar value.
3. forms the basis for cross country comparisons.
4. uses a broader definition for HD than GDP per capita.
5. covers both social and economic choices.
6. reflects the most basic achievements in HD.
7. gives a scope for prediction.
8. is flexible to gradual refinements as analytical critiques merged and better became available.
9. allows statistical analysis and modeling.
10. reveals that a country can outperform predicted expectations at low income levels, while at the same time showing that countries with substantial income gains can still accomplish relatively little in HD.
11. clearly highlights that disparities in income are greater than disparities in other components of HD, i.e. health and education measures.
12. is both an outcome and a process of enlarging people's choices.
13. generates healthy competition and creates political will for change.
14. attracts public interest.
15. is policy relevant, although is not adequate for short-term impact of policy changes.

2.4. Deficiencies of the HDI

Since 1990, the HDI has been criticized in terms of its analytical framework, methodology and data. Most academicians have made constructive criticism of the HDI and suggested refinements to the HDI methodology, some of which was implemented by

the UNDP. In fact, they all argued that changes to how the HDI is calculated would result in a better mean of ranking the countries.

Staunton (2007) identified five main categories of the critiques as poor quality of data, incorrect choice of components, incorrect weighting schemes for components, incorrect specification of its income component and redundancy.

Poor quality of data involved the frequency of measurement errors, unavailability of data and the way data were collected. The authors state that, in order for the HDI to be a feasible component, its data need to be valid, policy relevant, of reasonable quality, available for a large proportion of the world's countries and internationally comparable (Raworth and Stewart, 2003). Even today, the current data of health and education components of the HDI are not available for some countries.

Wolff, Chong and Auffhammer (2008) identified three major sources of data error which are due to data updating, formula revisions and the use of inconsistent thresholds to assign a country as being of "low", "medium", or "high" HD. Based on these errors, they estimated country specific variances of the HDI scores and concluded that up to 45% of developing countries were misclassified by UNDP's methodology. They recommended that the UNDP should discontinue the practice of classifying countries every year with the same thresholds as this method of classification did not add any substantial informational value but rather had the potential to misguide politicians, policy-makers investors, and the public who made use of the HDI statistics.

Incorrect choice of indicators involved the missing of some important HD components from the HDI as well as the inclusion of the inappropriate ones in the HDI. Although the HDI is kept simple for wide comprehension, many authors suggested the use of other dimensions in the HDI including nutritional status and autonomy (Murray, 1991), culture (Khatib, 1994), uncertainty/unpredictability and mobility (Ryten, 2000), freedom from crime and violence (Rao, 1991; Ryten, 2000), self-respect and the opportunity to be creative and productive (Rao, 1991). Hopkins (1993) proposed the use

of a ten-dimensional HDI with the dimensions of environment, food security, job security, housing, personal security, political freedom, transport and communication, safe water and health, education and real income. Some authors complained that HDI does not take into account poverty or environmental factors that are vital measures in this century (See Table 2.3).

Incorrect weighting schemes have represented wrong specifications for components. The academicians questioned whether the three HDI components were equally important (See Table 2.3).

HDI gives little sense of income distribution. In addition, PPP values change very quickly and are likely to be inaccurate or misleading. The critiques related to HDI's income component were related to the measure of income per capita. The academicians questioned whether this component reflected the diminishing returns to transforming income into enlarging people's choices (See Table 2.3).

It is also considered that HDI has a problem of redundancy, i.e. its income component is correlated with its education and health components (McGillivray, 1991).

2.5. Refinements in HDI

Some aspects of the above critiques in the literature were taken into account by the UNDP and incorporated into the HDI as in Table 2.4. These included the change of the relative maximum and minimum values into fixed levels; reversion of the HDI from Atkinson's formula to logarithmic function of GDP per capita and the change in the dimensions of the EI.

Table 2.3. Categories of the Critiques on the HDI

Category of the Critique	Author(s) (Year of Publication)
Suggested the use of different indicators as HDI components	Hopkins (1991), Kelley (1991), Dasgupta and Weale (1992), Ram (1992), Paul (1996), Hicks (1997), Sager and Najam (1998), Morse (2003), Harkness (2004), Dar (2004), Ranis, Stewart and Samman (2006), Engineer, Roy and Fink (2010)
Suggested a modified HDI	Smith (1993), Acharya and Wall (1994), Akder (1994), Paul (1996), Hicks (1997), Panigrahi and Sivramkrishna (2002), Mazumdar (2003), Chakravarty (2003), Osberg and Sharpe (2003), Lanzi (2004), Chatterjee (2005), Costantini and Monni (2005), Stanton (2006), Mishra (2007), Khalifa and Connelly (2009), Segura and Moya (2009), Lind (2010)
Complained about data	Srinivasan (1994), Ogowang (1994), Aturupane, Glewwe and Isenman (1994), Sharma (1997), Raworth and Stewart (2002), Harkness (2004), Ferrer (2006), Tokuyama and Pillarisetti (2006)
Worked on weighting schemes of HDI components	Hopkins (1991), Kelley (1991), Slottje (1991), Rao (1991), Dasgupta and Weale (1992), Streeten (1994), Paul (1996), Ravallion (1997), Sager and Najam (1998), Noorbakhsh (1998b), Biswas and Caliendo (2001), Panigrahi and Sivramkrishna (2002), Cahill (2002), Lai (2003), Mazumdar (2003), Lind (2004), McGillivray and Noorbakhsh (2004), Cahill (2005), Chowdhury and Squire (2006), Stapleton and Garrod (2007), Mishra (2007), Nguefack-Tsague, Klasen and Zucchini (2010)
Worked on technical issues of HDI	McGillivray (1991), Trabold-Nubler (1991), Dasgupta and Weale (1992), MacGillivray and White (1993), Dossel and Gouner (1994), Nübler (1995), Gormely (1995), Luchters and Menskhoff (1996), Noorbakhsh (1998), Ivanoca, Arcelus, and Srinivasan (1999), Ramos and Silber (2005)
Worked on the income component of HDI	Kelley (1991), Rao (1991), Chowdhury (1991), Rati (1992), MacGillivray and White (1993), Srinivasan (1994), Acharya and Wall (1994), Luchters and Menskhoff (1995), Islam (1995), Paul (1996), Ravallion (1997), Pillarisetti (1997), Hicks (1997), Noorbakhsh (1998a), Sager and Najam (1998), Lai (2000), Luchters and Menkhoff (2000), Anand and Sen (2000), Bhatnagar (2001), Cahill (2002), Tridico (2007), Grimm et al. (2008)
Worked on the ranking problems of HDI	Noorbakhsh (1998b), Morse (2003), Wolff, Chong and Auffhammer (2008), Cherchye, Ooghe and Puyenbroeck (2008), Segura and Moya (2009) Taner et al. (2010)
Applied DEA to overcome weighting problems	Mahlberg and Obersteiner (2001), Despotis (2004), Despotis (2005), Arcelus, Sharma and Srinivasan (2005a), Lee, Lin and Fang (2006), Lozano and Gutierrez (2008), Vierstraete (2010), Taner et al. (2010)

Table 2.4. Refinements on the HDI (1990-2010)

Year	Human Development Index
1990	Use of relative observed minimum and maximum values for current year. Scaling of each component index by (maximum-actual)/(maximum-minimum). HDI = 1 – arithmetic unweighted mean of three scaled component indices. EI = ALR of adults (≥ 25 years). GDPI = log (PPP GDP per capita).
1991	Change of the dimensions of EI: to ALR (≥ 15 years) and mean years of school enrolment. Use of the Atkinson formula of adjusted PPP GDP per capita with a threshold value derived from an average poverty line.
1994	Change in the scaling formula of component index: to (actual value -minimum) / (maximum - minimum). Use of the Atkinson formula with a threshold value derived from the global average of PPP GDP per capita. Fixed minimum and maximum values to be used in the formula for each component, i.e. LE (25 years and 85 years), ALR (0% and 100%), GER (0% and 100%), GDP (\$200 and \$40,000).
1995	Change of the EI dimensions: to ALR (≥ 15 years) and GER. Change of the minimum value of GDPI to \$100.
1999	New logarithmic formula for GDPI: log (PPP GDP per capita).
2010	Geometric mean of three scaled component indices. Use of fixed minimum and observed maximum values. Change of the two dimensions of EI: to mean years of schooling and expected years of schooling. Change in the income component from log (PPP GDP per capita) to natural log (PPP GNI per capita).

3. METHODOLOGY

The current HDI has a limited capacity to reflect the human condition and country ranking in an accurate way. In addition, main critics on the HDI have claimed that it uses very few or the wrong indicators in measuring the HD of countries. This is mainly because health and education components used for calculating the HDI are not dynamic. It is true that the HDI value is developed to progress over time, however, these components cannot yield a significant overall annual increase to affect the HDI value. This lowers the sensitivity of the HDI towards annual changes.

Anand and Harris (1994), Srinivasan (1994), Streeten (1994) argue that GDP is the best proxy for development. In the short-term, there would not be much increase in health and education figures to highly affect the HDI. Therefore, a change in the HDI would only depend on a severe change in GDP per capita due to the impact of an economic crisis or very high annual economic growth.

The author believes that GDP per capita is the only dynamic and fluctuating dimension of HDI. Therefore, the addition of a second dynamic and fluctuating dimension would be useful to track the core of real human development. The author lists the rationales why unemployment rate (UEMP) is a suitable indicator to be used as a HDI component for this purpose.

UEMP reflects the real life condition of people just like health, education and access to resources. In addition, it shows considerable variation across countries.

Although it has not been currently included in the sub-indices of HDI, the UEMP is an indicator of social inclusion and human security. It impacts on well-being far more than loss of income (Clark and Oswald 1994). The effects of unemployment on personal well-being have been studied in the literature. Many of these studies showed that unemployment was a key factor in contributing to declines in personal well-being, like deterioration in self-esteem, health and suicide; an increased propensity to engage in illegal activities and social dislocation like crime

or child ill health (Darity Jr. and Goldsmith, 1996; Fagan and Freeman, 1997; Machin and Manning, 1998). An increase in the UEMP has a direct impact on individuals' level of happiness and expected personal future utility (Altındağ and Mocan, 2010).

Very few of the developed countries offer benefits such as unemployment insurances and social assistance systems to their citizens. Therefore, the insecurity of losing job imposes a great risk for the social development of individuals. Therefore, governments should consider new policies that would enable to increase the number of jobs, if not the availability of these benefits.

The current HDI ignores the inequality in distribution of resources across populations. This oversight together with the inadequate use of human resources might fully concern the UNDP and the addition of a new component, such as the UEMP to HDI. The current HDI includes two non-income components of people's living conditions and one income component. The unemployment problem, however, needs to be considered in the long-term development perspective.

HDI is not always parallel with GDP per capita. This is partly due to the fact that existing wealth is unequally distributed and/or other aspects of HD have not been appropriately factored in HDI calculations. Countries with high GDP per capita with high Gini coefficients should be penalized in their HDI rankings if they were accompanied by high UEMPs. Therefore, in order to capture such deficiencies, it would be beneficial to include further indicators in the calculation of HDI. The UEMP emerges as a good indicator for this purpose.

In today's world, employment can be recognized as a fundamental human right. It brings personal economic freedom. Providing and implementing strategies for meaningful and productive work for youth is one of the main targets of the Millennium Development Goals. Thus, the capacity to develop and meet the job needs of its citizens must be the major goals of every nation in the next decades. Employment can be further considered as a physical need. It constitutes the essential basis for peace, food security and HD. In this context, securing full employment level can be considered as one of the primary objectives of every nation. Moreover,

rising employment levels is also beneficial in fostering economic growth and achieve sustainable development.

Furthermore, unemployment is of growing concern because populations have expanded in recent decades at a faster rate than job creation and because a larger percentage of the population, principally women, seek employment now more than at any time in the past. Economies with high levels of unemployment cannot achieve lasting and sustainable development. In other words, only the economies functioning with a high employment level, and thus, a high level of production can show radical improvements in terms of HD.

Human mobility is one of the major factors influencing employment changes in societies. Thus, migration, both within and beyond borders, has become an increasingly prominent theme in domestic and international debates, and was the topic of the HDR in 2009. While immigration pressures are increasing and have become the major concern in most of the OECD countries, an increase in the share of immigrants in the labor force is estimated to raise temporarily natives' unemployment, over a period of approximately five to ten years (Jean and Jimenez, 2007). Changes in the proportion of immigrants in the labor force may have a distributive impact on natives' wages, and a temporary impact on unemployment (Jean et al., 2007). These are the rationales for the inclusion of an unemployment measure as an additional dimension.

3.1. Scaling

In constructing the HDI-2, each dimension is normalized through a process of scaling. In this process, for each dimension, maximum and minimum values are selected and the difference between these defines the scale (Table 3.1). Such a transformation is needed for additive purposes while constructing a composite index.

With the data measured in years, percentages and US dollars, a formula needed to be devised to unify the four indicators. By comparing the indicators against separate maximums and minimums, each could be indexed between 0 and 1.

Table 3.1. Summary of Goalposts for calculating the HDI

Indicator	Maximum	Minimum
LE (years)	85	25
ALR (%)	100	0
GER (%)	100	0
GDP per capita (PPP US\$)	40,000	100
UEMP (%)	20	0

To illustrate the sub-index formulas, health is represented by Longevity Index (LEI); education by Educational Attainment Index (EI); standard of living by Gross Domestic Product Index (GDPI) and human security by Reversed Unemployment Index (RUI). The value for each these components is transformed into an index by means of a normalization formula (3.1) in which the actual value is compared to a stylized range of values across all countries for each year as follows:

$$\text{Scaled Index} = (\text{Actual} - \text{Minimum}) / (\text{Maximum} - \text{Minimum}) \quad (3.1)$$

3.2. Dimensions

Dimensions of the proposed HDI-2 include health, education, income and human security.

3.2.1. Health

The health dimension is represented by life expectancy at birth (LE), i.e. longevity index (LEI).

3.2.1.1. Life Expectancy

HDI uses life expectancy at birth (LE) as an indicator of the availability and quality of health services in a country. It is “the number of years a newborn infant could expect to live if prevailing patterns of age-specific mortality rates at the time of birth were to stay the same throughout the infant’s life” (HDR, 2009). Minimum LE and Maximum LE are set at 25 years and 85 years, respectively. This can be summarized in the following formula (3.2):

$$LEI = (LE - 25) / (85 - 25) \quad (3.2.)$$

where LEI is the longevity index. LE gaps are among the most fundamental of all inequalities in the world.

3.3.2. Education

The education component of the HDI-2 is comprised of ALR and the GER for primary, secondary and tertiary schooling, weighted to give ALR more significance in the statistic. Each of these sub-indicators is weighted (2/3 for ALR, 1/3 for GER). These values are summed in formula 3.3 to find the EI as follows:

$$EI = 2/3(ALR) + 1/3(GER) \quad (3.3.)$$

where EI is the Educational Attainment Index.

3.3.2.1. Adult Literacy Rate

Adult literacy rate (ALR) is “the percentage of people ages 15 and older who can, with understanding, both read and write a short simple statement on their everyday life” (HDR, 2009). It can be calculated from the following formula (3.4):

$$ALR = (ALR_y - 0\%) / (100\% - 0\%) \quad (3.4.)$$

3.3.2.2. Gross Enrolment Ratio

Gross enrolment ratio (GER) is “the total enrolment in a given level of education, regardless of age, expressed as a percentage of the official school-age population for the same level of education” (HDR, 2009). It can be calculated from the following formula (3.5):

$$GER = (GER_y - 0\%) / (100\% - 0\%) \quad (3.5.)$$

3.3.3. Income

The standard of living dimension of HDI-2 is represented by the Gross Domestic Product Index (GDPI) measured by GDP per capita in PPP\$.

3.3.3.1. GDP per Capita

Since the 1990s, GNP (i.e. the sum of all consumption, investment, and government spending by a country’s nationals) has been replaced by GDP (i.e. consumption, investment, and government spending within a country, plus exports minus imports) as the most common definition of national income.

GDP per capita is gross domestic product (GDP) in US\$ terms, divided by midyear population. It was scaled logarithmically in such a way that extra dollars earned above global average GDP contributed diminishing amounts to the GDP index (GDPI). This was done because “people do not need an infinite amount of income for a decent life” (ul Haq, 1995). GDPI can be calculated from the following formula (3.6):

$$GDPI = [\log(GDP_y) - \log(\$100)] / [\log(\$40,000) - \log(\$100)] \quad (3.6.)$$

where GDPI is the Gross Domestic Product Index. For the income component, the goalpost for minimum income is \$100 (PPP) and the maximum is \$40,000 (PPP). The HDI uses the logarithm of income, to reflect the diminishing importance of income with increasing GDP.

3.3.4. Human Security

The human security component is comprised of the Reversed Unemployment Index (RUI) calculated from actual Unemployment Rate (UEMP).

3.3.4.1. Unemployment Rate

UEMP can be defined as “the percentage of the labor force (the employed and unemployed population) ages 15 years and older who are not in paid employment nor self-employed but who are available for work and have taken specific steps to seek paid employment or self-employment” (HDR, 2009). It is a measure of the risk that a person will not have a job even if he/she wants to work. The following general formula (3.7) is constructed by scaling directly from the total unemployment rate as (%) of labor force:

$$RUI = 1 - [(20 - \text{Actual UEMP}) / (20 - \text{Minimum})] \quad (3.7.)$$

where RUI is the new included index, i.e. reversed unemployment index. It should be noted that this formula reduces to (maximum value - actual value)/maximum value when minimum value is set to 0.01 due to the concept of structural unemployment (Salop 1979; Richardson et al. 2000). The choice of goalposts is the same over the years. That is, maximum and minimum goalposts are taken as 20% and 0.01%, respectively. The maximum and minimum UEMP between 1998 and 2009 have been recorded in Portugal in 2004 and in Iceland in 2002 as 19.9% and 1.4%, respectively. Subsequently, RUI values are calculated for the OECD countries for years under study and given in Table 3.3.

3.4. The Proposed Index: Unemployment Adjusted HDI

Formerly, the HDI had been based on three sub-indices and four indicators: longevity index (LEI), as measured by life expectancy at birth; educational attainment index (EI), as measured by a combination of adult literacy (ALR) (two-thirds weight) and combined (i.e. primary, secondary and tertiary) enrolment (one-third weight) ratios (GER); and standard of living, as measured by real GDP index (GDPI) (PPP in US\$). To calibrate the dimensions, UNDP has assigned minimum and maximum values (goalposts) for each underlying sub-index. Performance in each sub-index is then calculated and expressed as a value between 0-1. In UNDP's approach, these sub-indices are assigned (equal) weights as suggested by Chowdhury and Squire (2006), Stapleton and Garrod (2007) and Nguetack-Tsague, Klasen and Zucchini (2010) and given in the formula (3.8) below:

$$\text{HDI} = (\text{LEI} + \text{EI} + \text{GDPI})/3 \quad (3.8.)$$

However, in our approach, the four indices in the HDI-2 represent a different set of indicators for assessing the aggregate level of HD with equal weights in the following way:

$$\text{HDI-2} = (3*\text{HDI} + \text{RUI})/4 \quad (3.9.)$$

The HDI-2 calculated likewise as a simple average of the sub-indices via basic algebra for each OECD country as shown in Table 3.3. These four sub-indices address conceptually different aspects of HD, which although correlated do not predetermine one another.

The equal weights allow easy comparison over time and across countries. From HDI-2 values, comparisons of achievements between countries at a given year or for a particular country for different periods can also be made.

Although all countries reported in the HDR are not included, the minimum and maximum unemployment values in this formula have been determined by considering the whole set of countries included in HDI. This index transformation is used in many indices of social and economic well-being. Increases in the value correspond to decreases in the unemployment value. The range of values is between 0 and 1, and unlikely to change much from year to year for any country regardless of any improvements. The lower values correspond to higher levels of unemployment and vice versa.

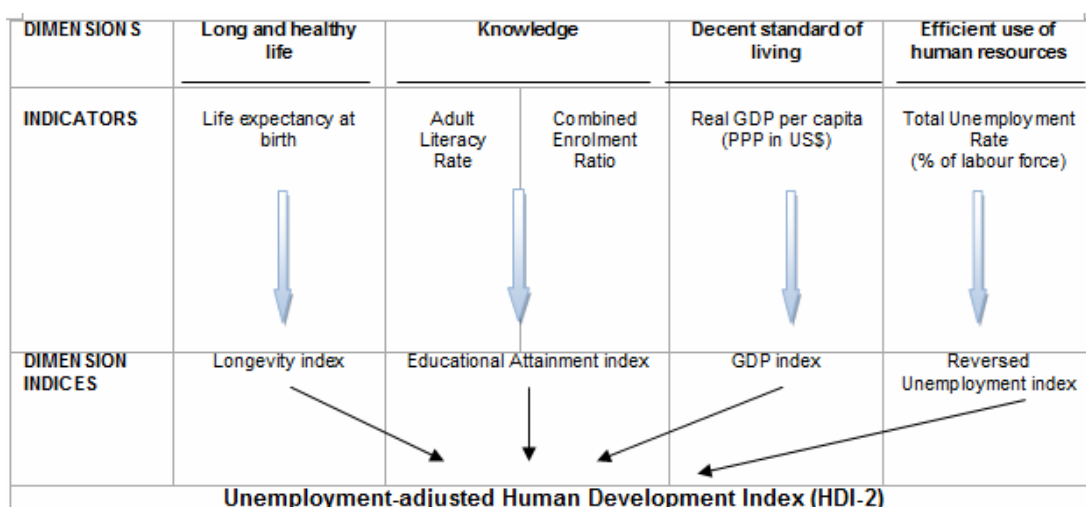


Figure 3.1. Construction of HDI-2

As shown in Figure 1, in addition to the three essential choices of leading a long and healthy life, acquiring knowledge, having access to resources needed for a decent standard of living; efficient use of human resources is included in the measure of HDI-2. That is meant to capture the ability of a nation to utilize efficient use of human resources.

In the final step for calculating HDI-2, the health, education, income and human security indices are averaged together in an overall index, with each one given an equal weight (Figure 3.2).

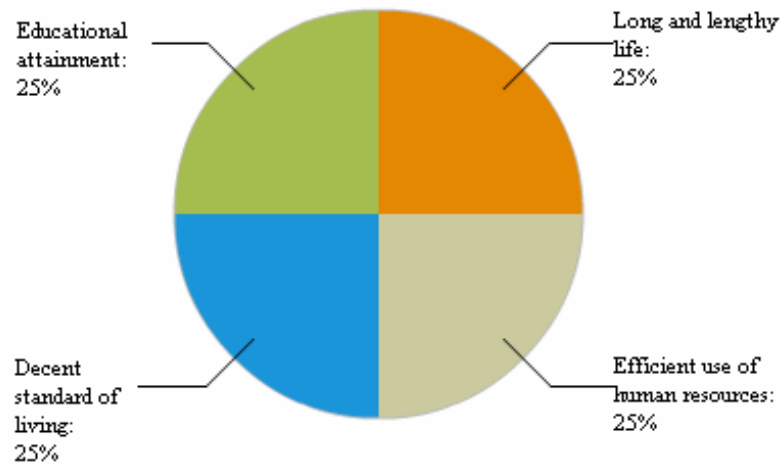


Figure 3.2. Weights of the HDI-2 components

They are given equal weights not because of simplicity, but because of the philosophical reasoning that all the dimensions included in the HDI are equally important and desirable in their own rights for building human capabilities. This is given in the formula (3.10) below:

$$HDI-2 = 1/4 (LEI_y) + 1/4 (EI_y) + 1/4 (GDPI_y) + 1/4 (RUI_y) \quad (3.10.)$$

Table 3.3 lists all the values for HDI-2 for 1998-2007. Combined and simplified to a single equation (3.11), the revised HDI-2 is:

$$HDI - 2 = \frac{1}{4} \left(\frac{5LE_y - 125 + 15UEMP_y + 2ALR_y + GER_y}{300} + \frac{\log(GDP_y) - 2}{\log(40000) - 2} \right) \quad (3.11.)$$

Table 3.2. Reversed Unemployment Index (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
Iceland	0.865	0.905	0.930	0.885	0.835	0.775	0.880	0.850	0.885
Norway	0.835	0.840	0.830	0.825	0.800	0.830	0.770	0.825	0.875
Australia	0.600	0.640	0.685	0.665	0.685	0.700	0.750	0.755	0.780
Canada	0.585	0.620	0.660	0.640	0.620	0.620	0.660	0.685	0.700
Ireland	0.610	0.720	0.785	0.805	0.780	0.770	0.790	0.780	0.770
Sweden	0.590	0.720	0.765	0.800	0.800	0.755	0.720	0.650	0.695
Switzerland	0.790	0.865	0.900	0.905	0.845	0.800	0.800	0.800	0.820
Japan	0.795	0.765	0.765	0.750	0.730	0.735	0.780	0.795	0.805
Netherlands	0.800	0.840	0.870	0.900	0.885	0.795	0.690	0.805	0.840
France	0.415	0.445	0.525	0.565	0.550	0.515	0.500	0.530	0.585
Finland	0.430	0.490	0.510	0.540	0.545	0.545	0.570	0.615	0.655
United States	0.775	0.790	0.800	0.760	0.710	0.700	0.750	0.770	0.770
Spain	0.060	0.205	0.295	0.475	0.430	0.435	0.550	0.575	0.585
Denmark	0.745	0.740	0.765	0.785	0.775	0.720	0.760	0.805	0.810
Austria	0.765	0.740	0.765	0.755	0.735	0.715	0.710	0.760	0.780
United Kingdom	0.685	0.700	0.725	0.745	0.740	0.750	0.760	0.735	0.735
Belgium	0.560	0.550	0.650	0.670	0.635	0.605	0.580	0.590	0.625
Luxembourg	0.860	0.855	0.870	0.870	0.850	0.810	0.770	0.760	0.790
New Zealand	0.625	0.660	0.700	0.735	0.740	0.770	0.820	0.810	0.815
Italy	0.390	0.425	0.465	0.520	0.545	0.560	0.620	0.660	0.690
Germany	0.530	0.585	0.625	0.635	0.595	0.545	0.540	0.580	0.580
Greece	0.520	0.400	0.430	0.480	0.500	0.525	0.470	0.555	0.585
Korean Republic	0.645	0.685	0.795	0.815	0.845	0.830	0.810	0.825	0.840
Portugal	0.755	0.775	0.800	0.795	0.745	0.685	0.630	0.615	0.595
Czech Republic	0.675	0.560	0.555	0.590	0.635	0.610	0.600	0.640	0.735
Hungary	0.600	0.645	0.675	0.710	0.705	0.705	0.650	0.625	0.630
Poland	0.470	0.305	0.195	0.090	0.005	0.020	0.110	0.310	0.520
Slovakia	0.220	n/a	0.060	0.035	0.070	0.125	0.180	0.330	0.445
Mexico	0.850	0.870	0.890	0.875	0.865	0.875	0.820	0.840	0.815
Turkey	0.670	0.635	0.680	0.575	0.485	0.485	0.500	0.505	0.560

Source: Author's own calculations using HDR (2000-2009) data

Table 3.3. HDI-2 values (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
Iceland	0,911	0,926	0,935	0,926	0,914	0,911	0,939	0,939	0,948
Norway	0,909	0,913	0,913	0,916	0,920	0,930	0,915	0,932	0,947
Australia	0,845	0,863	0,876	0,869	0,879	0,890	0,901	0,910	0,923
Canada	0,846	0,855	0,870	0,863	0,863	0,868	0,878	0,892	0,900
Ireland	0,833	0,868	0,889	0,896	0,895	0,903	0,914	0,914	0,917
Sweden	0,843	0,880	0,896	0,905	0,910	0,899	0,893	0,879	0,896
Switzerland	0,885	0,911	0,920	0,924	0,911	0,913	0,911	0,916	0,925
Japan	0,891	0,886	0,889	0,888	0,885	0,891	0,905	0,914	0,922
Netherlands	0,893	0,908	0,920	0,930	0,929	0,906	0,883	0,916	0,933
France	0,791	0,804	0,826	0,834	0,835	0,834	0,833	0,846	0,867
Finland	0,795	0,815	0,825	0,833	0,836	0,841	0,850	0,868	0,883
United States	0,889	0,898	0,905	0,890	0,883	0,883	0,899	0,906	0,910
Spain	0,690	0,734	0,759	0,809	0,798	0,804	0,839	0,856	0,862
Denmark	0,871	0,875	0,884	0,896	0,894	0,885	0,894	0,913	0,918
Austria	0,874	0,875	0,886	0,886	0,884	0,881	0,883	0,901	0,912
United Kingdom	0,859	0,865	0,876	0,884	0,885	0,893	0,895	0,894	0,894
Belgium	0,833	0,838	0,868	0,868	0,866	0,859	0,855	0,857	0,871
Luxembourg	0,895	0,906	0,910	0,913	0,913	0,913	0,900	0,898	0,918
New Zealand	0,834	0,850	0,863	0,871	0,880	0,890	0,905	0,910	0,916
Italy	0,775	0,789	0,801	0,815	0,824	0,843	0,859	0,871	0,886
Germany	0,815	0,836	0,849	0,849	0,844	0,836	0,834	0,846	0,856
Greece	0,785	0,763	0,773	0,790	0,803	0,816	0,808	0,833	0,853
Korean Republic	0,801	0,826	0,859	0,864	0,879	0,885	0,888	0,897	0,913
Portugal	0,836	0,849	0,860	0,871	0,859	0,849	0,834	0,827	0,831
Czech Republic	0,801	0,773	0,774	0,790	0,809	0,808	0,815	0,829	0,861
Hungary	0,763	0,784	0,794	0,803	0,814	0,824	0,814	0,812	0,817
Poland	0,728	0,696	0,674	0,653	0,639	0,648	0,675	0,730	0,790
Slovakia	0,673	n/a	0,640	0,634	0,650	0,669	0,688	0,730	0,771
Mexico	0,803	0,825	0,818	0,819	0,819	0,826	0,823	0,832	0,844
Turkey	0,715	0,709	0,728	0,694	0,684	0,684	0,693	0,708	0,745

Source: Authors' own calculations using HDR (2000-2009) data

4. DATA AND ANALYSIS

4.1. Data

Since 1990, the UNDP launches almost annually the HDR, together with a statistical annex where the HDI is found. This annex also includes the components of the HDI. Each HDR publishes the data of the preceding two years. The components and their respective years are tabulated in Table 4.1. The international statistical agencies that UNDP takes the data from, are given in Table 4.2. Longevity Index values are given in Appendix 3. GDP Index values are tabulated in Appendix 4. Educational Attainment Index values are displayed in Appendix 5. Values of Total Unemployment Rate are given in Appendix 6.

In this study, 30 OECD economies are taken as the research sample; re-ranked and re-classified among themselves for the years between 1998 and 2007 (HDR, 2000-2009). It should be noted that most of these economies are at the stage of very high HD.

Table 4.1. Corresponding years of HDR data

	HDR 2000	HDR 2001	HDR 2002	HDR 2003	HDR 2004	HDR 2005	HDR 2006	HDR 2007/8	HDR 2009
UNEMP	1998	1999	2000	2001	2002	2003	2005	2006	2007
GDP per capita	1998	1999	2000	2001	2002	2003	2004	2005	2007
LE	1998	1999	2000	2001	2002	2003	2004	2005	2007
ALR	1998	1999	2000	2001	2002	2003	2004	2005	2007
GER	1998	1999	1999	2001	2002	2003	2004	2005	2007
HDI	1998	1999	2000	2001	2002	2003	2004	2005	2007
HDI-2	1998	1999	2000	2001	2002	2003	2004	2005	2007

Table 4.2. Data Sources of the HDI components

Indicator	Unit	Source
LE	years	UN Population Division
ALR	%	UNESCO Institute of Statistics
GER	years	UNESCO Institute of Statistics
GDP per capita	US\$	World Bank
UEMP	%	OECD

4.2. Analysis

4.2.1. UNDP's HDI Categorization

UNDP's HDI values are given in Appendix 7. The main function of the HDI is to rank countries annually. Appendix 8 lists all the ranks for HDI for 1998-2007. Each year's rankings should reflect proper and definite results so that they can serve primarily as a policy instrument, particularly in developed countries.

The HDI values follow an increasing trend over the years. The year 2001 has been exceptionally bad as HDI has decreased for Japan, France, United States, Belgium, Luxembourg, Germany, Greece, Korean Republic, Portugal, Czech Republic, Hungary, Poland, Slovakia, Mexico and Turkey.

Before 2005, a country was classified into three rank categories as "low HD", "medium HD" and "high HD". Since 2005, a country is classified into one of the following four categories: "low HD", "medium HD", "high HD" or "very high HD". In Appendix 9-17, these categories are denoted as follows:

- Group 4: low HD
- Group 3: medium HD
- Group 2: high HD
- Group 1: very high HD

Upper and lower threshold values used for classifying the OECD countries in HDR 2009 are given on Table 4.3.

The four mutually exclusive HD categories in Table 4.3 are utilized widely in many areas. For instance, these categories are used to study health outcomes across countries (Guindon and Boisclair, 2003), development economics (Kelley, 1991;

Noorbakhsh, 1998; Balamoune, 2004), and macroeconomics (Mazumdar, 2002; Noorbakhsh, 2006).

Table 4.3. UNDP's Thresholds for 2007

	No. of countries	UNDP's lower threshold for HDI	UNDP's upper threshold for HDI
Very High HD $0.900 \leq \text{HDI} \leq 1.000$	38	0.902	0.971
High HD $0.800 \leq \text{HDI} < 0.900$	45	0.803	0.895
Medium HD $0.500 \leq \text{HDI} < 0.800$	75	0.511	0.798
Low HD $\text{HDI} < 0.500$	24	0.340	0.499

However, Wolff, Chong and Auffhammer (2008) states that these categories are arbitrary as UNDP's classification is based on simple leveling structure. They add that the UNDP has been using the same threshold values (0.5 and 0.8) since 1990 which could be misleading. UNDP's HDI rankings of 30 OECD countries are given in Appendix 8.

According to UNDP's rankings, Iceland, Norway, Australia, Canada and Sweden have always ranked in top 7 OECD countries since 1998. Japan, the Netherlands, Switzerland and the United States have always ranked in the top 13 since 1998. Greece, Korean Republic, Portugal, Czech Republic, Hungary, Poland, Slovakia, Mexico and Turkey have always ranked in the last 10 OECD countries since 1998.

All countries but Mexico and Turkey have been categorized as High HD countries in 1998, 1999 and 2000. In 2001, Mexico moved from being a Medium HD country to a High HD country, leaving Turkey as the only OECD country with Medium

HD between 2001 and 2006. In 2007, Turkey moved to the High HD category and was categorized in the same group with Poland, Slovakia, Hungary and Mexico, while all the other OECD countries were grouped in the new established “Very High HD” category.

4.2.2. HDI and Cluster Analysis

A better method for categorizing the OECD countries would be to apply the Cluster Analysis to HDI data every year so that the new adjusted thresholds can reflect the same value judgment of the HDI for the levels of components.

Cluster Analysis is the statistical method of partitioning a sample into homogeneous classes to produce an operational classification. It is an exploratory data analysis tool for organizing observed data into meaningful groups or clusters, which maximizes the similarity of cases within each cluster while maximizing the dissimilarity between groups that are initially unknown. It is a data reduction tool that creates subgroups that are more manageable than individual datum. It examines the full complement of inter-relationships between variables and creates new groupings without any preconceived notion of what clusters may arise. Each cluster thus describes, in terms of the data collected, the class to which its members belong. Items in each cluster are similar in some ways to each other and dissimilar to those in other clusters (Burns and Burns, 2008).

The algorithm used in this study is called k-means, where k is the number of clusters (i.e. three in this study), since a case is assigned to the cluster for which its distance to the cluster mean is the smallest. The action in the algorithm centers around finding the k-means. First, an initial set of means are computed and the cases based on their distances to the centers are classified. Second, the cluster means are recomputed, using the cases that are assigned to the cluster; then, all cases are reclassified based on the new set of means. Finally, the means of the clusters are recalculated and the cases to their permanent clusters are assigned (Norusis, 2011).

Cluster Analysis was applied to HDI values of 30 OECD countries by using the Statistical Package for Social Sciences (SPSS). The countries were reclassified into 3 groups for each year according to the following criteria:

- Group A = Very High HD,
- Group B = High HD,
- Group C = High-Medium HD.

SPSS finds the clusters that are well-separated and use these values as initial cluster centers. Table 4.4 shows the initial centers for UNDP's HDI for 9 different data sets, i.e. each year from 1998 to 2007.

Table 4.4. Initial Cluster Centers for the HDI (1998-2007)

	Group A	Group B	Group C
1998	0.94	0.78	0.73
1999	0.94	0.83	0.74
2000	0.94	0.88	0.74
2001	0.94	0.84	0.73
2002	0.96	0.89	0.75
2003	0.96	0.85	0.75
2004	0.97	0.89	0.76
2005/6	0.97	0.83	0.78
2007	0.97	0.85	0.81

Source: Author's own calculations using HDR (2000-2009) data

After the initial cluster centers have been selected, each case is assigned to the closest cluster, based on its distance from the cluster centers. After all of the cases have been assigned to clusters, the cluster centers are recomputed, based on all of the cases in the cluster. Case assignment is done again, using these updated cluster centers. Assigning cases is continued while the cluster centers are recomputed until no cluster center changes appreciably or the maximum number of iterations (10 by default) is reached. After iteration stops, all cases are assigned to clusters, based on the last set of cluster centers. After all of the cases are clustered, the cluster centers are computed one last time. Using the final cluster centers, the clusters are described (Norusis, 2011).

Table 4.5 shows the final centers for UNDP's HDI for 9 different data sets, i.e. each year from 1998 to 2007.

Table 4.5 Final Cluster Centers for the HDI (1998-2007)

	Group A	Group B	Group C
1998	0.91	0.82	0.73
1999	0.93	0.85	0.74
2000	0.93	0.89	0.77
2001	0.93	0.84	0.73
2002	0.94	0.88	0.78
2003	0.94	0.87	0.75
2004	0.95	0.89	0.79
2005/6	0.95	0.87	0.78
2007	0.96	0.88	0.81

Source: Author's own calculations using HDR (2000-2009) data

Tables 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, 4.12, 4.13 and 4.14 display the cluster groups of reclassified OECD countries for each year.

The results of the Cluster Analysis show that in 1998, Korean Republic, Czech Republic, Slovakia, Hungary, Poland and Mexico are clustered in Group B. Turkey is the only OECD country categorized in Group C. In 1999, Greece and Portugal dropped to Group B from Group A while the other countries remained in the same groups. In 2000, Group A and Group B remained the same except for Mexico as it joined Turkey in Group C. In 2001, Portugal and Greece moved from Group B to Group A, while Mexico moved from Group C to Group B.

In 2002, the number of countries in Group B peaked to 8 countries. Italy, Greece and Portugal joined this group, while Mexico left this group and rejoined Turkey in Group C. In 2003, Italy and Greece moved to Group A, while Mexico joined back to Group B. In 2004, Greece and Mexico moved down to Group B and Group C, respectively. In 2005/6, Greece and Korean Republic moved to Group A, while Mexico moved back to Group B. The countries in 2007 were categorized in the same groups as in 2005/6.

Throughout the years under study, Norway, Australia, Iceland, Canada, Ireland, the Netherlands, Sweden, France, Switzerland, Japan, Luxembourg, Finland, United States, Austria, Spain, Denmark, Belgium, New Zealand, United Kingdom, Germany have remained in Group A, while Czech Republic, Slovakia, Hungary and Poland remained in Group B, and Turkey remained in Group C. Italy, Greece, Korean Republic and Portugal have fluctuated between the Group A and Group B, while Mexico has moved between Group B and Group C.

These obtained cluster groups of OECD countries are not arbitrary and show great differences from the UNDP's classification. Cluster Analysis differentiated groups of Mexico, Spain, Greece and Portugal in 1998; Mexico in 1999 and 2000; Greece in 2001; Italy, Greece and Mexico in 2002; Portugal and Korean Republic in 2003; Greece, Korean Republic, Mexico and Portugal in 2004; Turkey, Portugal and Czech Republic in 2007. Cluster Analysis did not yield different results for 2005/6. It differentiated the group of Mexico the most.

Table 4.6. Cluster Groups for the HDI (1998)

Group A	Group B	Group C
Canada Norway United States Australia Iceland Sweden Belgium Netherlands Japan United Kingdom Finland France Switzerland Germany Denmark Austria Luxembourg Ireland Italy New Zealand Spain Greece Portugal	Korean Republic Czech Republic Slovakia Hungary Poland Mexico	Turkey

Source: Author's own calculations using HDR (2000) data

Table 4.7 Cluster Groups for the HDI (1999)

Group A	Group B	Group C
Norway	Greece	Turkey
Australia	Korean Republic	
Canada	Portugal	
Sweden	Czech Republic	
Belgium	Hungary	
United States	Poland	
Iceland	Mexico	
Netherlands		
Japan		
Finland		
Switzerland		
Luxembourg		
France		
United Kingdom		
Denmark		
Austria		
Germany		
Ireland		
New Zealand		
Italy		
Spain		

Source: Author's own calculations using HDR (2001) data

Table 4.8. Cluster Groups for the HDI (2000)

Group A	Group B	Group C
Norway	Greece	Mexico
Sweden	Korean Republic	Turkey
Canada	Portugal	
Belgium	Czech Republic	
Australia	Hungary	
United States	Slovakia	
Iceland	Poland	
Netherlands		
Japan		
Finland		
Switzerland		
France		
United Kingdom		
Denmark		
Austria		
Luxembourg		
Germany		
Ireland		
New Zealand		
Italy		
Spain		

Source: Author's own calculations using HDR (2002) data

Table 4.9. Cluster Groups for the HDI (2001)

Group A	Group B	Group C
Norway Iceland Sweden Australia Netherlands Belgium United States Canada Japan Switzerland Denmark Ireland United Kingdom Finland Luxembourg Austria France Germany Spain New Zealand Italy Portugal Greece	Korean Republic Czech Republic Poland Hungary Slovakia Mexico	Turkey

Source: Author's own calculations using HDR (2003) data

Table 4.10. Cluster Groups for the HDI (2002)

Group A	Group B	Group C
Norway Sweden Australia Canada Netherlands Belgium Iceland United States Japan Ireland Switzerland United Kingdom Finland Austria Luxembourg France Denmark New Zealand Germany Spain	Italy Greece Portugal Korean Republic Czech Republic Poland Hungary Slovakia	Mexico Turkey

Source: Author's own calculations using HDR (2004) data

Table 4.11. Cluster Groups for the HDI (2003)

Group A	Group B	Group C
Norway Iceland Australia Luxembourg Canada Sweden Switzerland Ireland Belgium United States Japan Netherlands Finland Denmark United Kingdom France Austria Italy New Zealand Germany Spain Greece	Portugal Korea Republic Czech Republic Hungary Poland Slovakia Mexico	Turkey

Source: Author's own calculations using HDR (2005) data

Table 4.12. Cluster Groups for the HDI (2004)

Group A	Group B	Group C
Norway Iceland Australia Ireland Sweden Canada Japan United States Switzerland Netherlands Finland Luxembourg Belgium Austria Denmark France Italy United Kingdom Spain New Zealand Germany	Greece Korean Republic Portugal Czech Republic Hungary Poland Slovakia	Mexico Turkey

Source: Author's own calculations using HDR (2006) data

Table 4.13. Cluster Groups for the HDI (2005/6)

Group A	Group B	Group C
Iceland Norway Australia Canada Ireland Sweden Switzerland Japan Netherlands France Finland United States Spain Denmark Austria United Kingdom Belgium Luxembourg New Zealand Italy Germany Greece Korean Republic	Portugal Czech Republic Hungary Poland Slovakia Mexico	Turkey

Source: Author's own calculations using HDR (2007/8) data

Table 4.14. Cluster Groups for the HDI (2007)

Group A	Group B	Group C
Norway Australia Iceland Canada Ireland Netherlands Sweden France Switzerland Japan Luxembourg Finland United States Austria Spain Denmark Belgium Italy New Zealand United Kingdom Germany Greece Korean Republic	Portugal Czech Republic Poland Slovakia Hungary Mexico	Turkey

Source: Author's own calculations using HDR (2009) data

4.2.3. HDI-2 and Rankings

For all years and countries, HDI-2 values are always lower than HDI values. The improvements in HDI values over the years (Appendix 7) seem to originate from the changes in GDPI since the values of LEI and EI remained almost the same. On the other hand, many OECD countries represent a significant improvement in HDI-2 over the years. This is partly attributable to the inclusion of an unemployment measure.

According to HDI-2 rankings, Iceland, Norway, Switzerland and Japan have always ranked in top 10 OECD countries throughout the years. Sweden, the Netherlands, United States and Denmark have always ranked in the top 15. Spain, Czech Republic, Hungary, Poland, Slovakia, Mexico, Finland, France and Turkey have always ranked in the last 11 OECD countries since 1998. These results are quite different than these of the UNDP's since the proposed method has located Spain, France and Finland, i.e. UNDP's permanently "high HD" countries below the 19th ranks among the 30 OECD countries for all years. The inclusion of RUI in HD calculations has yielded great differences also for the rankings of Luxembourg, Korean Republic, New Zealand, Denmark, Mexico and Switzerland. These countries have ranked much better in HDI-2 for all years. These OECD countries have made clear, distinct, evident and concrete amelioration in the context of HD. Turkey has ranked slightly better except for 2005/6 and 2007 while for those two years, it is equally ranked. The ranks of Spain and Greece have worsened for all years.

Table 4.15. HDI-2 Ranks of OECD countries (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
Iceland	1	1	1	2	3	4	1	1	1
Norway	2	2	4	4	2	1	2	2	2
Australia	12	13	12	15	14	10	7	8	5
Canada	11	14	14	18	17	16	16	15	14
Ireland	16	11	8	7	7	6	3	5	9
Sweden	13	8	7	6	6	7	12	16	15
Switzerland	7	3	2	3	5	2	4	3	4
Japan	5	7	8	10	9	9	5	6	6
Netherlands	4	4	2	1	1	5	14	4	3
France	23	22	20	20	21	22	23	21	20
Finland	22	21	21	21	20	20	19	18	18
United States	6	6	6	9	12	14	9	10	13
Spain	29	27	27	24	27	27	20	20	21
Denmark	9	9	11	7	8	12	11	7	7
Austria	8	9	10	11	11	15	14	11	12
United Kingdom	10	12	12	12	9	8	10	14	16
Belgium	16	17	15	16	16	17	18	19	19
Luxembourg	3	5	5	5	4	2	8	12	7
New Zealand	15	15	16	13	13	10	5	9	10
Italy	25	23	23	23	22	19	17	17	17
Germany	18	18	19	19	19	21	20	22	23
Greece	24	26	26	26	26	25	27	23	24
Korean Republic	20	19	18	17	14	12	13	13	11
Portugal	14	16	17	13	18	18	20	26	26
Czech Republic	20	25	25	26	25	26	25	25	22
Hungary	26	24	24	25	24	24	26	27	27
Poland	27	29	29	29	30	30	30	28	28
Slovakia	30	n/a	30	30	29	29	29	29	29
Mexico	19	20	22	22	23	23	24	24	25
Turkey	28	28	28	28	28	28	28	30	30

Source: Author's own calculations using HDR (2000-2007) data

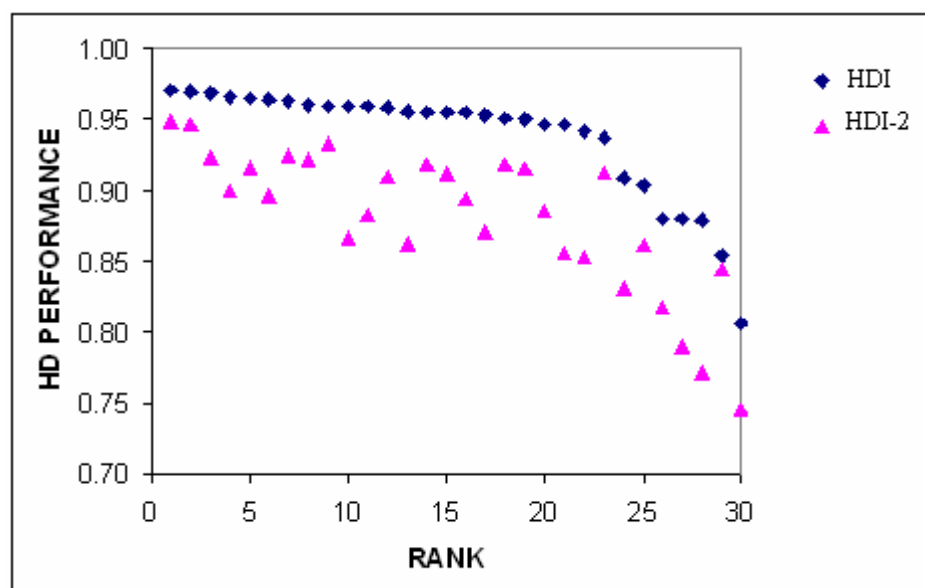


Figure 4.1. Distribution of Ranks with respect to HDI and HDI-2

According to HDI-2, Norway has always been ranked among the top four countries. Only Republic of Korea has experienced a continuous rise in HDI-2 ranking throughout the analysis period due to the structure of its economy. It is observed that the Netherlands have experienced a drastic fall in rank in 2004 after being ranked as the 1st in 2001 and 2002. This sharp decline is due to the variations in its unemployment rate. On the other hand, significant advances in the ranks of Australia, Ireland, Italy, New Zealand, and Spain are observed. The ranks of some countries such as Poland, Slovakia and Turkey remained almost the same. These countries often act like outliers. Likewise, no significant rank changes are observed for some countries such as Belgium, France and Greece.

Additionally, RUI negatively affected the HDI values of Canada, France, Sweden, Finland, Greece, Australia, Belgium and Spain. The fall in the ranks of these countries were crucial. These countries are among those countries experiencing net inflows of migrants since their GDP per capita has had an increasing trend (HDR, 2009). Therefore, they should take precautions to prevent their natives' unemployment problem, control immigration, make adjustments and implement new policies about the immigrants' integration into the host country labor market. As these adjustments may

depend on country-specific factors, they must first concern themselves with the influence of immigrants on the wage setting mechanism and create economic opportunities for the natives.

4.2.4. HDI-2 and Cluster Analysis

Cluster analysis is re-employed to classify the OECD countries into 3 groups according to their HDI-2. For the years under study, the initial and final cluster centers are tabulated in Table 4.16 and Table 4.17. The countries in corresponding cluster groups are tabulated in Table 4.18, 4.19, 4.20, 4.21, 4.22, 4.23, 4.24, 4.25 and 4.26.

Table 4.16 Initial Cluster Centers for the HDI-2 (1998-2007)

	Group A	Group B	Group C
1998	0.91	0.80	0.67
1999	0.93	0.83	0.70
2000	0.94	0.82	0.64
2001	0.93	0.79	0.63
2002	0.93	0.80	0.64
2003	0.93	0.83	0.65
2004	0.94	0.81	0.68
2005/6	0.94	0.83	0.71
2007	0.95	0.84	0.77

Source: Author's own calculations using HDR (2000-2009) data

Table 4.17 Final Cluster Centers for the HDI-2 (1998-2007)

	Group A	Group B	Group C
1998	0.89	0.81	0.70
1999	0.89	0.82	0.74
2000	0.89	0.80	0.68
2001	0.89	0.82	0.66
2002	0.89	0.82	0.66
2003	0.90	0.83	0.67
2004	0.90	0.83	0.69
2005/6	0.91	0.84	0.72
2007	0.92	0.86	0.77

Source: Author's own calculations using HDR (2000-2009) data

The effects of the inclusion of RUI into HDI is clearly seen in the cluster groups of the HDI-2. Since 1998, Turkey with two Eastern European countries, namely Slovakia and Poland have been categorized in Group C. Spain has been located in this group in 1998 and 1999; but moved to Group B in 2000. Similarly, Greece has been located in this group in 1999, but moved to Group B in 1999.

The categories has been made of the same countries for the years 2001 and 2002. Similarly, the categories has consisted of the same countries in 2003, 2004, 2005/6 and 2007. Iceland, Norway, Switzerland, Japan, the Netherlands, United States, United Kingdom, Luxembourg, Austria and Denmark remained in Group A throughout the years. None of the Eastern European countries have been categorized in Group A in any year. Sweden, Ireland and Australia moved to Group A in 1999. Germany remained in Group B except for 2000. New Zealand moved and Canada to Group A in 2000. Czech Republic, Mexico, Hungary, Finland and France remained in Group B throughout the years. Belgium has been categorized in Group B except for 2000, 2001 and 2002. In 2003, Belgium dropped back to Group B from Group A. Portugal has been fluctuated between Group A and Group B. Although it has been remarkably ranked the 13th in 2001, it dropped down to the borderline rank of 26th between Group B and Group C in 2005 and 2007.

Table 4.18 Cluster Groups for the HDI-2 (1998)

Group A	Group B	Group C
Iceland	Ireland	Poland
Norway	Sweden	Turkey
Switzerland	Australia	Spain
Japan	Canada	Slovakia
Netherlands	France	
United States	Finland	
Denmark	Belgium	
Austria	New Zealand	
United Kingdom	Italy	
Luxembourg	Germany	
	Greece	
	Korean Republic	
	Portugal	
	Czech Republic	
	Hungary	
	Mexico	

Source: Author's own calculations using HDR (2000) data

Table 4.19 Cluster Groups for the HDI-2 (1999)

Group A	Group B	Group C
Iceland	Canada	Poland
Norway	France	Turkey
Australia	Finland	Spain
Ireland	Belgium	Greece
Sweden	New Zealand	Czech Republic
Switzerland	Italy	
Japan	Germany	
Netherlands	Korean Republic	
United States	Portugal	
Denmark	Hungary	
Austria	Mexico	
United Kingdom		
Luxembourg		

Source: Author's own calculations using HDR (2001) data

Table 4.20 Cluster Groups for the HDI-2 (2000)

Group A	Group B	Group C
Iceland	France	Turkey
Norway	Finland	Slovakia
Australia	Italy	Poland
Canada	Hungary	
Ireland	Mexico	
Sweden	Czech Republic	
Switzerland	Spain	
Japan	Greece	
Netherlands		
United States		
Denmark		
Austria		
United Kingdom		
Luxembourg		
New Zealand		
Korean Republic		
Portugal		
Belgium		
Germany		

Source: Author's own calculations using HDR (2002) data

Table 4.21 Cluster Groups for the HDI-2 (2001)

Group A	Group B	Group C
Iceland	Germany	Turkey
Norway	France	Poland
Australia	Finland	Slovakia
Canada	Italy	
Ireland	Hungary	
Sweden	Mexico	
Switzerland	Czech Republic	
Japan	Spain	
Netherlands	Greece	
United States		
Austria		
United Kingdom		
Portugal		
Korean Republic		
New Zealand		
Luxembourg		
Belgium		
Denmark		

Source: Author's own calculations using HDR (2003) data

Table 4.22 Cluster Groups for the HDI-2 (2002)

Group A	Group B	Group C
Iceland	Germany	Turkey
Norway	France	Slovakia
Australia	Finland	Poland
Canada	Italy	
Ireland	Hungary	
Sweden	Mexico	
Switzerland	Czech Republic	
Japan	Spain	
Netherlands	Greece	
United States		
Austria		
United Kingdom		
Portugal		
Korean Republic		
New Zealand		
Luxembourg		
Belgium		
Denmark		

Source: Author's own calculations using HDR (2004) data

Table 4.23 Cluster Groups for the HDI-2 (2003)

Group A	Group B	Group C
Iceland	Belgium	Turkey
Norway	Portugal	Poland
Australia	Germany	Slovakia
Canada	France	
Ireland	Finland	
Sweden	Italy	
Switzerland	Hungary	
Japan	Mexico	
Netherlands	Czech Republic	
United States	Spain	
Austria	Greece	
United Kingdom		
Korean Republic		
New Zealand		
Luxembourg		
Denmark		

Source: Author's own calculations using HDR (2005) data

Table 4.24 Cluster Groups for the HDI-2 (2004)

Group A	Group B	Group C
Iceland	Belgium	Turkey
Norway	Portugal	Slovakia
Australia	Germany	Poland
Canada	France	
Ireland	Finland	
Sweden	Italy	
Switzerland	Hungary	
Japan	Mexico	
Netherlands	Czech Republic	
United States	Spain	
Austria	Greece	
United Kingdom		
Korean Republic		
New Zealand		
Luxembourg		
Denmark		

Source: Author's own calculations using HDR (2006) data

Table 4.25 Cluster Groups for the HDI-2 (2005/6)

Group A	Group B	Group C
Iceland	Belgium	Turkey
Norway	Portugal	Slovakia
Australia	Germany	Poland
Canada	France	
Ireland	Finland	
Sweden	Italy	
Switzerland	Hungary	
Japan	Mexico	
Netherlands	Czech Republic	
United States	Spain	
Austria	Greece	
United Kingdom		
Korean Republic		
New Zealand		
Luxembourg		
Denmark		

Source: Author's own calculations using HDR (2007/8) data

Table 4.26 Cluster Groups for the HDI-2 (2007)

Group A	Group B	Group C
Iceland	Belgium	Poland
Norway	Portugal	Slovakia
Australia	Germany	Turkey
Canada	France	
Ireland	Finland	
Sweden	Italy	
Switzerland	Hungary	
Japan	Mexico	
Netherlands	Czech Republic	
United States	Spain	
Austria	Greece	
United Kingdom		
Korean Republic		
New Zealand		
Luxembourg		
Denmark		

Source: Author's own calculations using HDR (2009) data

4.2.5. Comparison of HDI and HDI-2

Comparing the HDI rank and HDI-2 rank of a country gives us a basis for assessing whether the added RUI information has mattered. Most OECD countries experienced an increase in their unemployment in 2001 and 2002 while their GDPs have been increasing. This has resulted in falls in their HDI-2 for these years. This trend can be further considered as a signal of "jobless growth" for the same OECD countries.

For 2007, the author provides a histogram of rank changes between the HDI and the proposed HDI-2 in Figure 4.2. There is no change in the ranks of 2 countries; 14 countries show a positive change in rank (implying improved rank under HDI-2) while 14 countries show a negative change in rank (implying worsening of rank under HDI-2). 8 countries show a rank change that is greater than 5 in absolute value. The mode of the absolute value of rank change is (2). The most dramatic gainers were Korean Republic (12), Denmark (9) and New Zealand (5) and Denmark (10). The maximum drop in ranks was by France (12).

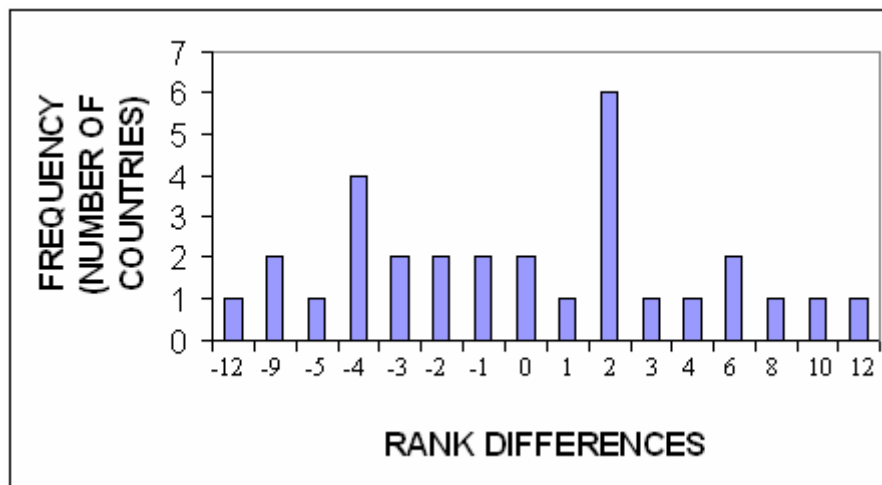


Figure 4.2. Histogram of rank difference (HDI-2 less HDI) for 2007

Table 4.27. Differences in Ranks (HDI-2 rank less HDI rank)

	1998	1999	2000	2001	2002	2003	2004/5	2005/6	2007
Iceland	-4	-6	-6	0	-4	2	-1	0	-2
Norway	0	1	3	3	1	0	1	1	1
Australia	8	11	8	11	11	7	4	5	3
Canada	10	11	11	12	13	12	10	11	10
Ireland	-2	-7	-8	-7	-3	-2	-1	0	4
Sweden	7	5	5	3	4	3	7	10	8
Switzerland	-6	-8	-9	-7	-5	-5	-5	-4	-5
Japan	-4	-2	-1	1	0	-2	-2	-2	-4
Netherlands	-4	-4	-6	-4	-4	-6	4	-5	-3
France	11	10	9	3	3	6	7	11	12
Finland	11	11	11	9	7	7	8	8	6
United States	3	0	2	1	4	4	1	-2	0
Spain	8	6	7	5	7	6	1	7	6
Denmark	-5	-6	-4	-4	-8	-1	-4	-6	-9
Austria	-8	-6	-4	-5	-3	-2	0	-4	-2
United Kingdom	0	-2	1	0	-1	-7	-7	-2	-4
Belgium	9	12	11	8	11	8	6	2	2
Luxembourg	-14	-7	-11	-9	-11	-3	-5	-6	-4
New Zealand	-5	-4	-3	-7	-5	-9	-15	-10	-9
Italy	6	3	3	2	1	1	0	-3	-1
Germany	3	3	3	1	0	1	-1	1	2
Greece	2	4	4	3	4	3	5	1	2
Korean Republic	-4	-4	-5	-7	-10	-12	-10	-10	-12
Portugal	-9	-8	-7	-9	-5	-5	-4	2	2
Czech Republic	-5	0	1	1	0	1	0	0	-3
Hungary	-1	-2	-2	-2	-3	-2	0	1	-1
Poland	-1	2	1	3	4	3	3	1	2
Slovakia	4	n/a	3	2	1	1	1	1	2
Mexico	-10	-8	-7	-7	-6	-6	-5	-5	-4
Turkey	-2	-1	-2	-2	-2	-2	-2	0	0

Source: Author's own calculations using HDR (2000-2009) data

Individual rank differences for each country, whether they are large or small, are better displayed in Tables 4.28, 4.29, 4.30, 4.31, 4.32, 4.33, 4.34, 4.35 and 4.36 for each year under study. “Zero” difference means no change in the ranking, while a negative difference show the number of ranks gained by the inclusion of RUI and vice versa.

Canada has been the country with the highest frequency of most lost ranks (i.e. six times). It has consistently been the most dramatic loser between 2000 and 2005. Luxembourg has been the country with the highest frequency of most gained ranks (i.e. four times). Mexico, Portugal and New Zealand have also gained significant number of ranks.

Table 4.28. Rank differences with corresponding countries (1998)

HDI-2 less HDI	Number of Countries	Countries
-14	1	Luxembourg
-10	1	Mexico
-9	1	Portugal
-8	1	Austria
-6	1	Switzerland
-5	3	Denmark, New Zealand, Czech Republic
-4	4	Netherlands, Japan, Korean Republic , Iceland
-2	2	Turkey, Ireland
-1	2	Hungary, Poland
0	2	United Kingdom, Norway
2	1	Greece
3	2	United States, Germany
4	1	Slovakia
6	1	Italy
7	1	Sweden
8	2	Australia, Spain
9	1	Belgium
10	1	Canada
11	2	Finland, France

Table 4.29. Rank differences with corresponding countries (1999)

HDI-2 less HDI	Number of Countries	Countries
-8	3	Switzerland, Portugal, Mexico
-7	2	Luxembourg, Ireland
-6	3	Iceland, Denmark, Austria
-4	3	New Zealand, Netherlands, Korean Republic
-2	3	Japan, United Kingdom, Hungary
-1	1	Turkey
0	2	Czech Republic, United States
1	1	Norway
2	1	Poland
3	2	Germany, Italy
4	1	Greece
5	1	Sweden
6	1	Spain
10	1	France
11	3	Canada, Australia, Finland
12	1	Belgium

Table 4.30. Rank differences with corresponding countries (2000)

HDI-2 less HDI	Number of Countries	Countries
-11	1	Luxembourg
-9	1	Switzerland
-8	1	Ireland
-7	2	Portugal, Mexico
-6	2	Iceland, Netherlands
-5	1	Korean Republic
-4	2	Denmark, Austria
-3	1	New Zealand
-2	2	Turkey, Hungary
-1	1	Japan
1	3	United Kingdom, Czech Republic, Poland
2	1	United States
3	1	Norway
4	1	Greece
5	1	Sweden
7	4	Spain, Germany, Italy, Slovakia
8	1	Australia
9	1	France
11	3	Canada, Belgium, Finland

Table 4.31. Rank differences with corresponding countries (2001)

HDI-2 less HDI	Number of Countries	Countries
-9	2	Luxembourg, Portugal
-7	5	Ireland, New Zealand, Korean Republic, Mexico, Switzerland
-5	1	Austria
-4	2	Netherlands, Denmark
-2	2	Turkey, Hungary
0	2	Iceland, United Kingdom
1	4	United States, Japan, Germany, Czech Republic
2	2	Slovakia, Italy
3	5	Norway, Sweden, Poland, Greece, France
5	1	Spain
8	1	Belgium
9	1	Finland
11	1	Australia
12	1	Canada

Table 4.32. Rank differences with corresponding countries (2002)

HDI-2 less HDI	Number of Countries	Countries
-11	1	Luxembourg
-10	1	Korean Republic
-8	1	Denmark
-6	1	Mexico
-5	3	Portugal, Switzerland, New Zealand
-4	2	Iceland, Netherlands
-3	3	Austria, Ireland, Hungary
-2	1	Turkey
-1	1	United Kingdom
0	3	Japan, Czech Republic, Germany
1	3	Slovakia, Italy, Norway
3	1	France
4	4	Sweden, Greece, Poland, United States
7	2	Finland, Spain
11	2	Australia, Belgium
13	1	Canada

Table 4.33. Rank differences with corresponding countries (2003)

HDI-2 less HDI	Number of Countries	Countries
-12	1	Korean Republic
-9	1	New Zealand
-7	1	United Kingdom
-6	2	Netherlands, Mexico
-5	2	Portugal, Switzerland
-3	1	Luxembourg
-2	5	Turkey, Japan, Austria, Hungary, Ireland
-1	1	Denmark
0	1	Norway
1	4	Italy, Slovakia, Czech Republic, Germany
2	1	Iceland
3	3	Poland, Sweden, Greece
4	1	United States
6	2	France, Spain
7	2	Australia, Finland
8	1	Belgium
12	1	Canada

Table 4.34. Rank differences with corresponding countries (2004)

HDI-2 less HDI	Number of Countries	Countries
-15	1	New Zealand
-10	1	Korean Republic
-7	1	United Kingdom
-5	3	Switzerland, Luxembourg, Mexico
-4	2	Denmark, Portugal
-2	2	Japan, Turkey
-1	2	Iceland, Germany
0	4	Austria, Italy, Czech Republic, Hungary
1	4	Norway, United States, Spain, Slovakia
3	1	Poland
4	2	Netherlands, Australia
5	1	Greece
6	1	Belgium
7	2	Sweden, France
8	1	Finland
10	1	Canada

Table 4.35. Rank differences with corresponding countries (2005/6)

HDI-2 less HDI	Number of Countries	Countries
-10	2	New Zealand, Korean Republic
-6	2	Denmark, Luxembourg
-5	2	Mexico, Netherlands
-4	2	Switzerland, Austria
-3	1	Italy
-2	3	United States, Japan, United Kingdom
0	4	Turkey, Czech Republic, Ireland, Iceland
1	6	Norway, Poland, Hungary, Slovakia, Germany, Greece
2	2	Portugal, Belgium
5	1	Australia
7	1	Spain
8	1	Finland
10	1	Sweden
11	2	Canada, France

Table 4.36. Rank differences with corresponding countries (2007)

HDI-2 less HDI	Number of Countries	Countries
-12	1	Korean Republic
-9	2	Denmark, New Zealand
-5	1	Switzerland
-4	4	Japan, United Kingdom, Luxembourg, Mexico
-3	2	Netherlands, Czech Republic
-2	2	Iceland, Austria
-1	2	Italy, Hungary
0	2	Turkey, United States
1	1	Norway
2	6	Belgium, Germany, Greece, Portugal, Slovakia, Poland
3	1	Australia
4	1	Ireland
6	2	Finland, Spain
8	1	Sweden
10	1	Canada
12	1	France

4.2.5.1. Paired t-test and Pearson Correlation

For each year under study, the HDI values are compared with the values of HDI-2 by means of paired t-test. The results indicate that the difference between the two indices are statistically significant (Table 4.37).

Table 4.37 Paired t-test

[illegible]

For each year, to analyze the impact of the modification between HDI and HDI-2, Pearson Correlation is employed. The results show that there is high rank correlation between HDI rankings and HDI-2 rankings as tabulated in Table 4.38. Adjusting for unemployment has resulted in major changes in the rankings of countries. The results for all years show that the difference between HDI rankings and HDI-2 rankings are statistically significant.

Table 4.38 Pearson Correlation

[illegible]

5. DATA ENVELOPMENT ANALYSIS

5.1. Data Envelopment Analysis

Data Envelopment Analysis (DEA) is a data-oriented method effective in evaluating relative efficiency of productive units, i.e. decision-making units (DMUs). It is a nonparametric method, first introduced into the literature by Charnes, Cooper and Rhodes in 1978.

DEA uses a linear programming technique to evaluate the relative efficiency of a set of homogenous productive DMUs. To achieve this, it makes use of the amounts of inputs and outputs consumed and produced by each DMU. It is constructed based on examples of best practice, i.e., the efficient production frontier, based on which the efficiency of each DMU is evaluated.

To measure the HD, the DEA model has been firstly used by Mahlberg and Obersteiner in 2001. Lozano and Gutierrez (2002) proposed a new DEA model that computes a range-adjusted measure of efficiency for HDI. Thereafter, the HDs of the Asian and Pacific countries were calculated by Despotis (2005). Arcelus, Sharma and Srinivasan (2005a) and Vierstraete (2010) investigated the relation between resource utilization and the HDI. Lee, Lin and Fang (2006) made use of a fuzzy multiple objective DEA for the HDI. These authors and Lozano and Gutierrez (2008) computed the appropriate weight for each three components of the HDI. Taner et al. used the DEA model to re-rank 182 countries employing the HDR 2009. The current study differs from the previous DEA studies on HD assessment in that it incorporates four components and categorizes the countries by cluster analysis.

In this study, the author uses DMUs to represent countries and the DEA model in this study assumes an input-oriented radial CRS technology. Each DMU is assumed to

have a constant (dummy) input and represented by four outputs, namely LEI, EI, GDPI and RUI.

The main advantage of employing DEA to HD is that the author does not need prior information about weights of inputs and outputs as the DEA software (i.e. EMS) automatically assigns relative weights for each component. Thus, the yield of the DEA, i.e. efficiency score (ES) of each country is compared to that of an ideal operating country, rather than to the average performance. Each ES measures the ability of a country to transform the input into the corresponding outputs.

The objective of the DEA model is to maximize a type of index of total productivity of factors for each unit as units of output produced by each unit of input used. The numerator of the index is the sum of all the outputs, whereas, the denominator is the sum of all the inputs. The ES in the presence of input(s) and output(s) is calculated from the equation (5.1) below:

$$\text{Efficiency} = \text{Weighted sum of output(s)} / \text{Weighted sum of input(s)} \quad (5.1.)$$

Assuming that there are N numbers of DMUs, each of with I inputs and J outputs, the relative ES of a test DMU m is obtained by solving the following model (5.2 and 5.3) proposed by (Charnes et. al., 1978):

$$\text{Max} \frac{\sum_{j=1}^J v_{mj} y_{mj}}{\sum_{i=1}^I u_{mi} x_{mi}} \quad (5.2.)$$

$$0 \leq \frac{\sum_{j=1}^J v_{mj} y_{nj}}{\sum_{i=1}^I u_{mi} x_{ni}} \leq 1; n = 1, 2, \dots, N \quad (5.3.)$$

$$v_{mj}, u_{mi} \geq 0; i = 1, 2, \dots, I; j = 1, 2, \dots, J$$

y_{mj} = amount of output j produced by DMU m .

x_{mi} = amount of input i utilised by DMU m .

v_{mj} = weight given to output j

u_{mi} = weight given to input i

The above model is run n times in identifying the relative ES of all DMUs. The EMS selects input and output weights for each DMU that maximize its ES. In general, a DMU is considered to be efficient if it obtains an ES of 100% and inefficient if a score of less than 100% is obtained.

Unlike the HDI, the DEA scores are relative measures. Each country is compared with the best practice (i.e. efficient) countries when it assesses its composite performance on the HD indicators. Any country compared to others has an ES of 100% or less.

5.2. Application of the DEA

The author applied the DEA of set of the new dimensions to 30 OECD countries. Each country is the basic unit of analysis and weighed the components differently. Efficiency and superefficiency are denoted as follows:

ES-1: Efficiency Score of countries incorporating the HDI components

ES-2: Efficiency Score of countries incorporating the HDI-2 components

SES-1: Superefficiency Score of countries incorporating the HDI components

SES-2: Superefficiency Score of countries incorporating the HDI-2 components

Tables 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7 and 5.8 display ES-1, ES-2, SES-1, SES-2 of the countries each year.

The results show that the inclusion of RUI has resulted in increased efficiencies for Iceland, Czech Republic, Portugal, Mexico and Turkey in 1998; Switzerland, Czech Republic, Mexico and Turkey in 1999; Switzerland, Austria, Denmark, Mexico and Turkey in 2000; Switzerland, Ireland and Mexico in 2001; Iceland, Switzerland and Mexico in 2002; Switzerland, Korean Republic and Mexico in 2003; Mexico in 2004; the Netherlands, Korean Republic and Mexico in 2005/6; Korean Republic and Mexico in 2007.

Inclusion of RUI has affected the efficiencies mostly of Switzerland, Mexico and Turkey. The greatest efficiency increases are observed for Mexico. By this inclusion, Iceland has become an efficient country in 1998 and 2002; Switzerland in 2001; Mexico in 2003.

For 2007, the DEA approach identified only 11 optimally performing countries that are defined as efficient and assigns them an ES of 100%. These efficient countries are then used to create an “efficiency frontier” or “data envelope” against which all other countries are compared.

Efficient countries (1998-2002) and Efficient countries (2003-2007) are tabulated in Table 5.10 and Table 5.11. The number of times each country is found efficient is tabulated in Table 5.12. Norway, Iceland, Japan, Australia, Finland and Luxembourg have been found efficient in all years under study.

Table 5.1. Efficiency and Superefficiency scores (1998)

1998	ES-1	ES-2	SES-1	SES-2
Canada	100.00%	100.00%	100.43%	100.43%
Norway	100.00%	100.00%	100.42%	100.97%
United States	100.00%	100.00%	101.14%	101.14%
Australia	100.00%	100.00%	100.00%	100.00%
Iceland	99.77%	100.00%	99.77%	102.43%
Sweden	100.00%	100.00%	100.00%	100.02%
Belgium	100.00%	100.00%	100.00%	100.00%
Netherlands	100.00%	100.00%	100.00%	100.74%
Japan	100.00%	100.00%	102.22%	102.22%
United Kingdom	100.00%	100.00%	100.00%	100.00%
Finland	100.00%	100.00%	100.00%	100.00%
France	98.61%	98.61%	98.61%	98.61%
Switzerland	99.52%	99.52%	99.52%	99.52%
Germany	97.58%	97.58%	97.58%	97.58%
Denmark	98.96%	98.96%	98.96%	98.96%
Austria	97.74%	97.74%	97.74%	97.74%
Luxembourg	100.00%	100.00%	102.11%	104.00%
Ireland	97.58%	97.58%	97.58%	97.58%
Italy	97.52%	97.52%	97.52%	97.52%
New Zealand	98.99%	98.99%	98.99%	98.99%
Spain	98.30%	98.30%	98.30%	98.30%
Greece	96.76%	96.76%	96.76%	96.76%
Portugal	93.21%	94.03%	93.21%	94.03%
Korean Republic	95.96%	95.96%	95.96%	95.96%
Czech Republic	91.92%	92.15%	91.92%	92.15%
Slovakia	91.92%	91.92%	91.92%	91.92%
Hungary	91.92%	91.92%	91.92%	91.92%
Poland	92.93%	92.93%	92.93%	92.93%
Mexico	86.88%	98.27%	86.88%	98.27%
Turkey	80.56%	81.20%	80.56%	81.20%

Source: Author's own calculations using HDR (2000) data

Table 5.2. Efficiency and Superefficiency scores (1999)

1999	ES-1	ES-2	SES-1	SES-2
Norway	100.00%	100.00%	100.21%	100.43%
Australia	100.00%	100.00%	100.26%	100.26%
Canada	99.65%	99.65%	99.65%	99.65%
Sweden	100.00%	100.00%	100.72%	101.00%
Belgium	100.00%	100.00%	100.00%	100.00%
United States	100.00%	100.00%	101.19%	101.19%
Iceland	100.00%	100.00%	100.06%	104.50%
Netherlands	100.00%	100.00%	100.00%	100.95%
Japan	100.00%	100.00%	102.20%	102.36%
Finland	100.00%	100.00%	100.00%	100.00%
Switzerland	99.62%	99.68%	99.62%	99.68%
Luxembourg	100.00%	100.00%	104.17%	104.68%
France	98.68%	98.68%	98.68%	98.68%
United Kingdom	100.00%	100.00%	100.00%	100.00%
Denmark	99.39%	99.39%	99.39%	99.39%
Austria	98.32%	98.32%	98.32%	98.32%
Germany	98.24%	98.24%	98.24%	98.24%
Ireland	98.02%	98.02%	98.02%	98.02%
New Zealand	100.00%	100.00%	100.00%	100.00%
Italy	97.60%	97.60%	97.60%	97.60%
Spain	97.98%	97.98%	97.98%	97.98%
Greece	96.51%	96.51%	96.51%	96.51%
Korean Republic	95.96%	95.96%	95.96%	95.96%
Portugal	93.94%	94.37%	93.94%	94.37%
Czech Republic	90.86%	90.86%	90.86%	90.86%
Hungary	93.94%	93.94%	93.94%	93.94%
Poland	94.95%	94.95%	94.95%	94.95%
Mexico	86.81%	96.13%	86.81%	96.13%
Turkey	80.38%	80.70%	80.38%	80.70%

Source: Author's own calculations using HDR (2001) data

Table 5.3. Efficiency and Superefficiency scores (2000)

2000	ES-1	ES-2	SES-1	SES-2
Norway	100.00%	100.00%	100.00%	100.12%
Sweden	100.00%	100.00%	100.72%	100.95%
Canada	100.00%	100.00%	100.08%	100.08%
Belgium	100.00%	100.00%	100.20%	100.20%
Australia	100.00%	100.00%	100.00%	100.00%
United States	100.00%	100.00%	101.28%	101.28%
Iceland	100.00%	100.00%	100.09%	103.33%
Netherlands	100.00%	100.00%	100.00%	101.57%
Japan	100.00%	100.00%	102.20%	102.20%
Finland	100.00%	100.00%	100.00%	100.00%
Switzerland	99.23%	99.49%	99.23%	99.49%
France	98.58%	98.58%	98.58%	98.58%
United Kingdom	100.00%	100.00%	100.00%	100.00%
Denmark	99.23%	99.32%	99.23%	99.32%
Austria	98.72%	98.73%	98.72%	98.73%
Luxembourg	100.00%	100.00%	103.09%	103.73%
Germany	98.23%	98.23%	98.23%	98.23%
Ireland	98.28%	98.28%	98.28%	98.28%
New Zealand	100.00%	100.00%	100.00%	100.00%
Italy	97.54%	97.54%	97.54%	97.54%
Spain	97.98%	97.98%	97.98%	97.98%
Greece	96.51%	96.51%	96.51%	96.51%
Korean Republic	95.96%	95.96%	95.96%	95.96%
Portugal	94.95%	94.95%	94.95%	94.95%
Czech Republic	90.86%	90.86%	90.86%	90.86%
Hungary	93.94%	93.94%	93.94%	93.94%
Slovakia	91.92%	91.92%	91.92%	91.92%
Poland	94.95%	94.95%	94.95%	94.95%
Mexico	86.29%	95.70%	86.29%	95.70%
Turkey	81.18%	81.72%	81.18%	81.72%

Source: Author's own calculations using HDR (2002) data

Table 5.4. Efficiency and Superefficiency scores (2001)

2001	ES-1	ES-2	SES-1	SES-2
Norway	100.00%	100.00%	100.73%	100.73%
Iceland	100.00%	100.00%	100.10%	100.81%
Sweden	100.00%	100.00%	100.59%	100.59%
Australia	100.00%	100.00%	100.00%	100.00%
Netherlands	100.00%	100.00%	100.00%	102.67%
Belgium	100.00%	100.00%	100.00%	100.00%
United States	100.00%	100.00%	100.59%	100.59%
Canada	99.27%	99.27%	99.27%	99.27%
Japan	100.00%	100.00%	103.30%	103.30%
Switzerland	98.93%	100.00%	98.93%	100.80%
Denmark	100.00%	100.00%	100.00%	100.00%
Ireland	99.10%	99.35%	99.10%	99.35%
United Kingdom	100.00%	100.00%	100.00%	100.00%
Finland	100.00%	100.00%	100.00%	100.00%
Luxembourg	100.00%	100.00%	103.09%	104.36%
Austria	98.42%	98.42%	98.42%	98.42%
France	98.27%	98.27%	98.27%	98.27%
Germany	97.35%	97.35%	97.35%	97.35%
Spain	98.54%	98.54%	98.54%	98.54%
New Zealand	100.00%	100.00%	100.00%	100.00%
Italy	97.30%	97.30%	97.30%	97.30%
Portugal	97.98%	97.98%	97.98%	97.98%
Greece	96.28%	96.28%	96.28%	96.28%
Korean Republic	96.97%	96.97%	96.97%	96.97%
Czech Republic	91.92%	91.92%	91.92%	91.92%
Poland	95.96%	95.96%	95.96%	95.96%
Hungary	93.94%	93.94%	93.94%	93.94%
Slovakia	90.91%	90.91%	90.91%	90.91%
Mexico	87.50%	96.69%	87.50%	96.69%
Turkey	80.59%	80.59%	80.59%	80.59%

Source: Author's own calculations using HDR (2003) data

Table 5.5. Efficiency and Superefficiency scores (2002)

2002	ES-1	ES-2	SES-1	SES-2
Norway	100.00%	100.00%	102.02%	102.06%
Sweden	100.00%	100.00%	101.18%	101.23%
Australia	100.00%	100.00%	100.00%	100.00%
Canada	98.99%	98.99%	98.99%	98.99%
Netherlands	100.00%	100.00%	100.00%	104.49%
Belgium	100.00%	100.00%	100.00%	100.00%
Iceland	99.06%	100.00%	99.06%	100.36%
United States	98.88%	98.88%	98.88%	98.88%
Japan	100.00%	100.00%	102.17%	102.17%
Ireland	98.77%	98.77%	98.77%	98.77%
Switzerland	98.29%	99.60%	98.29%	99.60%
United Kingdom	100.00%	100.00%	100.00%	100.00%
Finland	100.00%	100.00%	100.00%	100.00%
Austria	97.83%	97.83%	97.83%	97.83%
Luxembourg	100.00%	100.00%	101.01%	102.45%
France	98.03%	98.03%	98.03%	98.03%
Denmark	98.99%	98.99%	98.99%	98.99%
New Zealand	100.00%	100.00%	100.00%	100.00%
Germany	97.38%	97.38%	97.38%	97.38%
Spain	97.98%	97.98%	97.98%	97.98%
Italy	96.79%	96.79%	96.79%	96.79%
Greece	96.50%	96.50%	96.50%	96.50%
Portugal	97.98%	97.98%	97.98%	97.98%
Korean Republic	97.98%	97.98%	97.98%	97.98%
Czech Republic	92.93%	92.93%	92.93%	92.93%
Poland	96.97%	96.97%	96.97%	96.97%
Hungary	95.96%	95.96%	95.96%	95.96%
Slovakia	91.92%	91.92%	91.92%	91.92%
Mexico	87.39%	97.74%	87.39%	97.74%
Turkey	82.07%	82.07%	82.07%	82.07%

Source: Author's own calculations using HDR (2004) data

Table 5.6. Efficiency and Superefficiency scores (2003)

2003	ES-1	ES-2	SES-1	SES-2
Norway	100.00%	100.00%	101.42%	102.61%
Iceland	100.00%	100.00%	100.41%	100.50%
Australia	100.00%	100.00%	100.13%	100.13%
Luxembourg	100.00%	100.00%	101.01%	101.01%
Canada	99.29%	99.29%	99.29%	99.29%
Sweden	100.00%	100.00%	100.00%	100.17%
Switzerland	99.76%	100.00%	99.76%	100.59%
Ireland	99.60%	99.60%	99.60%	99.60%
Belgium	100.00%	100.00%	100.00%	100.00%
United States	99.60%	99.60%	99.60%	99.60%
Japan	100.00%	100.00%	102.15%	102.15%
Netherlands	100.00%	100.00%	100.00%	100.00%
Finland	100.00%	100.00%	100.00%	100.00%
Denmark	100.00%	100.00%	100.00%	100.00%
United Kingdom	100.00%	100.00%	100.00%	100.00%
France	98.43%	98.43%	98.43%	98.43%
Austria	97.65%	97.65%	97.65%	97.65%
Italy	98.35%	98.35%	98.35%	98.35%
New Zealand	100.00%	100.00%	100.00%	100.00%
Germany	97.49%	97.49%	97.49%	97.49%
Spain	98.43%	98.43%	98.43%	98.43%
Greece	97.98%	97.98%	97.98%	97.98%
Portugal	97.98%	97.98%	97.98%	97.98%
Korean Republic	97.98%	99.44%	97.98%	99.44%
Czech Republic	93.94%	93.94%	93.94%	93.94%
Hungary	96.97%	96.97%	96.97%	96.97%
Poland	96.97%	96.97%	96.97%	96.97%
Slovakia	91.92%	91.92%	91.92%	91.92%
Mexico	88.38%	100.00%	88.38%	105.42%
Turkey	82.83%	82.83%	82.83%	82.83%

Source: Author's own calculations using HDR (2005) data

Table 5.7. Efficiency and Superefficiency scores (2004)

2004	ES-1	ES-2	SES-1	SES-2
Norway	100.00%	100.00%	100.65%	100.65%
Iceland	100.00%	100.00%	100.53%	107.00%
Australia	100.00%	100.00%	100.53%	100.53%
Ireland	100.00%	100.00%	100.67%	100.87%
Sweden	99.62%	99.62%	99.62%	99.62%
Canada	99.28%	99.28%	99.28%	99.28%
Japan	100.00%	100.00%	102.15%	102.15%
United States	100.00%	100.00%	100.00%	100.00%
Switzerland	99.58%	99.58%	99.58%	99.58%
Netherlands	100.00%	100.00%	100.00%	100.00%
Finland	100.00%	100.00%	100.00%	100.00%
Luxembourg	100.00%	100.00%	100.26%	100.26%
Belgium	98.99%	98.99%	98.99%	98.99%
Austria	97.84%	97.84%	97.84%	97.84%
Denmark	100.00%	100.00%	100.00%	100.00%
France	98.64%	98.64%	98.64%	98.64%
Italy	98.82%	98.82%	98.82%	98.82%
United Kingdom	97.98%	97.98%	97.98%	97.98%
Spain	98.99%	98.99%	98.99%	98.99%
New Zealand	100.00%	100.00%	100.00%	100.67%
Germany	97.59%	97.59%	97.59%	97.59%
Greece	97.98%	97.98%	97.98%	97.98%
Korean Republic	98.99%	98.99%	98.99%	98.99%
Portugal	96.97%	96.97%	96.97%	96.97%
Czech Republic	93.94%	93.94%	93.94%	93.94%
Hungary	95.96%	95.96%	95.96%	95.96%
Poland	95.96%	95.96%	95.96%	95.96%
Slovakia	92.93%	92.93%	92.93%	92.93%
Mexico	89.56%	93.71%	89.56%	93.71%
Turkey	81.82%	81.82%	81.82%	81.82%

Source: Author's own calculations using HDR (2006) data

Table 5.8. Efficiency and Superefficiency scores (2005/6)

2005/6	ES-1	ES-2	SES-1	SES-2
Iceland	100.00%	100.00%	100.78%	103.05%
Norway	100.00%	100.00%	100.79%	101.01%
Australia	100.00%	100.00%	100.53%	100.56%
Canada	99.83%	99.83%	99.83%	99.83%
Ireland	100.00%	100.00%	100.15%	100.15%
Sweden	99.05%	99.05%	99.05%	99.05%
Switzerland	99.65%	99.65%	99.65%	99.65%
Japan	100.00%	100.00%	101.38%	101.38%
Netherlands	99.50%	99.58%	99.50%	99.58%
France	98.90%	98.90%	98.90%	98.90%
Finland	100.00%	100.00%	100.00%	100.00%
United States	100.00%	100.00%	100.00%	100.00%
Spain	99.40%	99.40%	99.40%	99.40%
Denmark	100.00%	100.00%	100.00%	100.07%
Austria	97.98%	97.98%	97.98%	97.98%
United Kingdom	97.91%	97.91%	97.91%	97.91%
Belgium	98.40%	98.40%	98.40%	98.40%
Luxembourg	100.00%	100.00%	100.00%	100.00%
New Zealand	100.00%	100.00%	100.00%	100.13%
Italy	97.97%	97.97%	97.97%	97.97%
Germany	96.74%	96.74%	96.74%	96.74%
Greece	97.68%	97.68%	97.68%	97.68%
Korean Republic	98.69%	99.23%	98.69%	99.23%
Portugal	93.89%	93.89%	93.89%	93.89%
Czech Republic	94.26%	94.26%	94.26%	94.26%
Hungary	96.48%	96.48%	96.48%	96.48%
Poland	95.77%	95.77%	95.77%	95.77%
Slovakia	92.75%	92.75%	92.75%	92.75%
Mexico	89.19%	98.82%	89.19%	98.82%
Turkey	82.51%	82.51%	82.51%	82.51%

Source: Author's own calculations using HDR (2007-8) data

Table 5.9. Efficiency and Superefficiency scores (2007)

2007	ES-1	ES-2	SES-1	SES-2
Norway	100.00%	100.00%	100.52%	101.30%
Australia	100.00%	100.00%	100.62%	100.63%
Iceland	100.00%	100.00%	100.20%	101.90%
Canada	99.89%	99.89%	99.89%	99.89%
Ireland	100.00%	100.00%	100.00%	100.00%
Netherlands	99.56%	99.56%	99.56%	99.56%
Sweden	99.39%	99.39%	99.39%	99.39%
France	99.07%	99.07%	99.07%	99.07%
Switzerland	100.00%	100.00%	100.92%	100.92%
Japan	100.00%	100.00%	101.59%	101.59%
Luxembourg	100.00%	100.00%	100.00%	100.00%
Finland	100.00%	100.00%	100.00%	100.00%
United States	100.00%	100.00%	100.00%	100.00%
Austria	98.90%	98.90%	98.90%	98.90%
Spain	98.61%	98.61%	98.61%	98.61%
Denmark	100.00%	100.00%	100.09%	100.12%
Belgium	98.36%	98.36%	98.36%	98.36%
Italy	98.70%	98.70%	98.70%	98.70%
New Zealand	100.00%	100.00%	100.00%	100.10%
United Kingdom	97.80%	97.80%	97.80%	97.80%
Germany	97.83%	97.83%	97.83%	97.83%
Greece	98.79%	98.79%	98.79%	98.79%
Korean Republic	99.50%	99.68%	99.50%	99.68%
Portugal	94.52%	94.52%	94.52%	94.52%
Czech Republic	94.46%	94.46%	94.46%	94.46%
Poland	95.87%	95.87%	95.87%	95.87%
Slovakia	93.45%	93.45%	93.45%	93.45%
Hungary	96.68%	96.68%	96.68%	96.68%
Mexico	90.02%	92.09%	90.02%	92.09%
Turkey	83.38%	83.38%	83.38%	83.38%

Source: Author's own calculations using HDR (2009) data

Table 5.10. Efficient countries (1998-2002)

1998	1999	2000	2001	2002
Canada	Norway	Norway	Norway	Norway
Norway	Australia	Sweden	Iceland	Sweden
United States	Sweden	Canada	Sweden	Australia
Australia	Belgium	Belgium	Australia	Netherlands
Iceland	United States	Australia	Netherlands	Belgium
Sweden	Iceland	United States	Belgium	Iceland
Belgium	Netherlands	Iceland	United States	Japan
Netherlands	Japan	Netherlands	Japan	United
Japan	Finland	Japan	Switzerland	Kingdom
United	Luxembourg	Finland	Denmark	Finland
Kingdom	France	United	United	Luxembourg
Finland	United	Kingdom	Kingdom	New Zealand
Luxembourg	Kingdom	Luxembourg	Finland	
	New Zealand	New Zealand	Luxembourg	
			New Zealand	

Source: Author's own calculations using DEA (1998-2002) and HDR (2000-2004) data

Table 5.11. Efficient countries (2003-2007)

2003	2004	2005/6	2007
Norway	Norway	Iceland	Norway
Iceland	Iceland	Norway	Australia
Australia	Australia	Australia	Iceland
Luxembourg	Ireland	Ireland	Ireland
Sweden	Japan	Japan	Switzerland
Switzerland	United States	Finland	Japan
Belgium	Netherlands	United States	Luxembourg
Japan	Finland	Denmark	Finland
Netherlands	Luxembourg	Luxembourg	United States
Finland	Denmark	New Zealand	Denmark
Denmark	New Zealand		New Zealand
United Kingdom			
New Zealand			
Mexico			

Source: Author's own calculations using DEA (2003-2007) and HDR (2005-2009) data

Table 5.12. Frequency of Efficiency with corresponding countries (1998-2007)

Number of Efficient Years (ES-2)	Country
9	Norway, Iceland, Japan, Australia, Finland, Luxembourg
8	New Zealand
7	United States, Netherlands
6	United Kingdom, Sweden
5	Denmark, Belgium
3	Ireland, Switzerland
2	Canada
1	Mexico, France

The results show that Hungary, Czech Republic, Poland, Slovakia, Greece, Spain, Italy, Turkey, Korean Republic, Austria, Portugal and Germany are inefficient in transforming the income, unemployment, health and education into HD for all years under study.

5.2.1. Superefficiency

DEA super-efficiency model was originally proposed by Andersen and Petersen (1993). It has also become the creation of an important extension of DEA. Efficient DMUs become super-efficient and have different super-efficiency scores above 100%. Scores for inefficient DMUs remain the same as in the standard DEA models.

Luxembourg is the most super-efficient country in 1998, 1999, 2000 and 2001; the Netherlands in 2002; Mexico in 2003 and Iceland in 2004, 2005/6 and 2007.

Inclusion of RUI has resulted in the increase in the super-efficiencies of Norway, Iceland, the Netherlands, Luxembourg in 1998; Norway, Sweden, Iceland, Japan and Luxembourg in 1999; Norway, Sweden, Iceland, the Netherlands and Luxembourg in 2000; Iceland, the Netherlands and Luxembourg in 2001; Norway, Sweden, the Netherlands and Luxembourg in 2002; Norway, Iceland and Sweden in 2003; Iceland, Ireland and New Zealand in 2004; Iceland, Norway, Australia, Denmark and New Zealand in 2005/6; Norway, Australia, Iceland, Denmark and New Zealand in 2007.

The SES's rankings of the countries, however, cannot be directly compared to the HDI ranking. This is because, the DEA scores, due to the nature of DEA, are obtained by using different weights for each country. The use of the superefficiency DEA variant, as a procedure to rank the DEA efficient countries, has been criticized in the literature due to its poor performance (Banker and Chang, 2006). Therefore, the superefficiency results can only be used for outlier identification but not for discriminating and ranking efficient countries. That is, DEA's ESs and SESs can only be used to determine which OECD countries are transforming the four HDI components into HD efficiently.

6. THE CASE OF TURKEY

6.1. Human Development and Turkey

According to HDR 2009, the HDI of Turkey for 2007 is 0.806. Turkey's HDI which is higher than the world average (0.753), Arab States (0.719), East Asia and the Pacific (0.77), South Asia (0.612) and Sub-Saharan Africa (0.514), is slightly lower than Latin America and the Caribbean (0.821) and Europe and Central Asia (0.821).

Turkey is among the countries with high HD, according to HDR 2009. Turkey has reached this category in 2005/6 (HDR, 2007/8).

Turkey ranks as the 79th among 182 countries. It is observed, however, that this rank does not improve although its HDI has been continuously improving, with the exception of 2001 and 2003. Turkey dropped rank in 2000 and 2004 despite the HDI improvements. Turkey showed an improved rank for 1999, 2002, 2004, 2005/6 and 2007. This shows that countries having had higher indices than Turkey have done at least as well as Turkey. In the future HDRs, Turkey's performance will depend on how countries at more or less the same HDI level have performed.

Liechtenstein has the highest GDP per capita (85382 US\$) in the world. Turkey has a lower GDP per capita (12955 US\$) compared to the EU average (29956 US\$) and the OECD average (32647 US\$).

Japan has the highest life expectancy at birth with 82.7 years. Life expectancy at birth in Turkey (71.7 years) is lower than the EU average (79.0 years) and the OECD average (79.0 years).

Australia has the highest combined gross enrolment ratio in education (114.2%) in the world. Turkey's combined gross enrolment ratio in education (71.1%) is lower than the EU average (91%) and the OECD average (89.1%).

Georgia has the highest ALR with 100%. ALR in Turkey (88.7%) is lower than the average rate in the countries with high HD (94.1%). For most EU and OECD countries, a value of 99% is applied for the purpose of calculating the HDI.

Table 6.1. Summary of HDI Indicators for Turkey (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
GDP/capita (\$)	6422	6380	6974	5890	6390	6772	7753	8407	12955
UEMP (%)	6.6	7.3	6.4	8.5	10.3	10.3	10.0	9.9	8.8
LE (years)	69.3	69.5	69.8	70.1	70.4	68.7	68.9	71.4	71.7
GER (%)	61	62	62	60	68	68	69	68.7	71.1
ALR (%)	84	84.6	85.1	85.5	86.5	88.3	87.4	87.4	88.7
Gini Coefficient	n/a	41.5	41.5	40	40	40	43.6	43.6	43.2

Source: Human Development Reports (2000-2009)

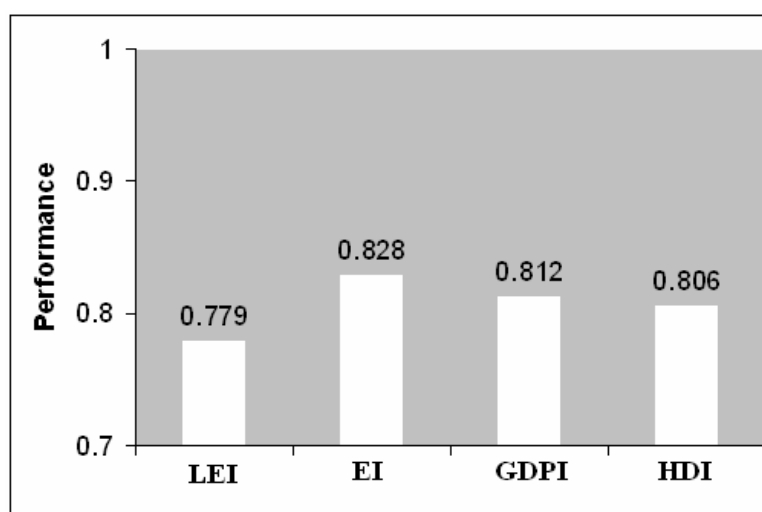


Figure 6.1. Turkey's performance in HDI components (2007)

Table 6.1 compares the relative levels of HDI and its indicators between 1998 and 2007. Since the HDI is the average of the three indicators, one can observe from the

histogram on Figure 6.1 that LEI is less than the HDI for Turkey. Although EI is the higher than the HDI, it is the indicator which shows great potential to reach the standard of developed countries.

There are 40 countries between Turkey and the “very high HD” threshold. Within the same category, there are 19 countries with a lower GDPI than Turkey. There are only 4 countries (Libya, Oman, Saudi Arabia and Dominica) which have a lower ALR than Turkey and only 5 countries (Oman, Trinidad and Tobago, Albania, Macedonia and Bosnia Herzegovina) which have a lower GER. There are only 3 countries (Russia, Belarus, Trinidad and Tobago) which show a lower LE at birth than Turkey. These indicate that education and health are the stronger, and income is the weakest component among the three indices indicating the HD level of Turkey.

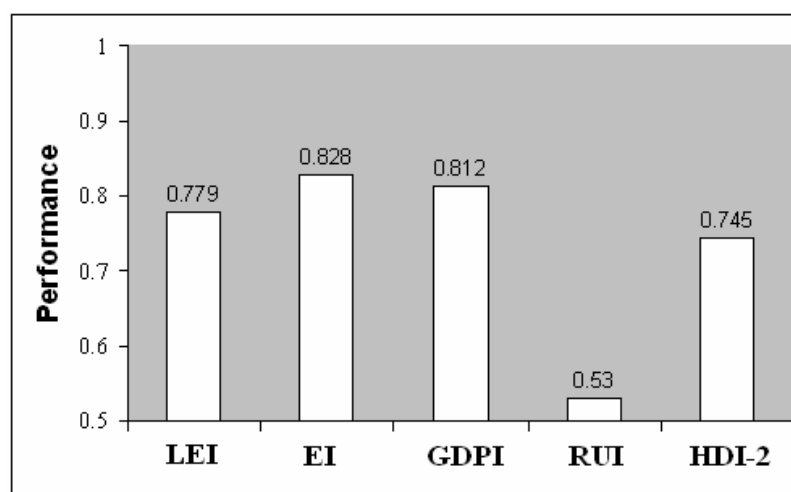


Figure 6.2 Turkey's Performance in HDI-2 components (2007)

The histogram in Figure 6.2 shows that RUI is much less than the HDI-2. Table 6.2 compares the values and ranks of the HDI, HDI-2, ES-1 and ES-2 of Turkey. Changes in the HDI and HDI-2 values for each year indicate the improvement that Turkey has undergone towards the maximum value of 1. ES-1 and ES-2, however, indicate Turkey's relative efficiency in transforming the components into HD among the other OECD countries.

Table 6.2 Summary of HDI, HDI-2, ES-1 and ES-2 for Turkey (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
HDI	0.732	0.735	0.742	0.734	0.751	0.750	0.757	0.775	0.806
HDI Rank (World)	85	82	85	96	88	94	92	84	79
HDI Rank (OECD)	last	last	last	last	last	last	last	last	last
HDI-2	0.715	0.709	0.728	0.694	0.684	0.684	0.693	0.708	0.745
HDI-2 rank (OECD)	28	28	28	28	28	28	28	last	last
ES-1 (%)	80.56	80.38	81.18	80.59	82.07	82.32	81.82	82.51	83.38
ES-2 (%)	81.20	80.70	81.72	80.59	82.07	82.32	81.82	82.51	83.38

Source: Human Development Reports (2000-2009) and author's own calculations

Although UNDP ranked Turkey as the country with the lowest HDI among the 30 OECD countries, it was found that HDI-2 ranked Turkey as the 28th among the same countries until 2005.

Turkey's efficiency of transforming the HDI's four components into enlarging Turkish people's capabilities as social development was 83.38% for 2007. This shows Turkey to be still inefficient and needs to improve some of its national indicators.

All indices, namely HDI, HDI-2, ES-1 and ES-2 peaked in 2007 for Turkey. This was the most efficient year for Turkey. Cluster analysis for HDI-2 placed Turkey in Group 3 for all years except for 2000. This was the year Turkey had the second highest HDI-2 value.

As observed from the HDI rankings, Turkey lags behind the developed and industrialized countries in terms of HD. This is because it faces many problems to overcome for better HD.

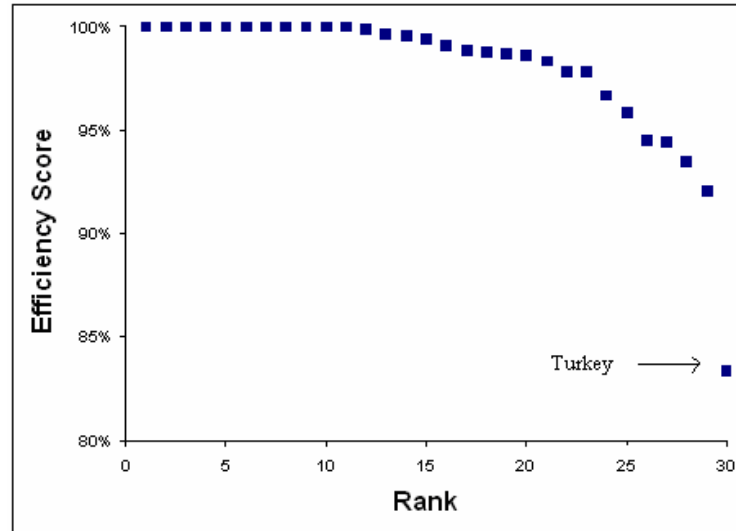


Figure 6.3 Gap between other OECD countries and Turkey in ES-2 (2007)

Gini coefficients (See Table 6.1) indicate that the income is not distributed equally across the population in Turkey. In addition, NHDR 2004 disaggregated the HDI by province and indicated that none of the HDI components were equally distributed. These values can be added up to calculate the HDI for different regions in Turkey. NHDR (2004) shows that in Turkey, there are 9 provinces (Kocaeli, Yalova, Istanbul, Bursa, İzmir, Muğla, Sakarya, Bolu and Tekirdağ) in the high and 72 provinces in the medium HD category. The 17 lowest ranks of the medium HD category consisted of the provinces in the East and South-east regions (Erzurum, Ardahan, Erzincan, Adıyaman, Kars, Batman, Mardin, Siirt, Iğdır, Şanlıurfa, Van, Hakkari, Bingöl, Bitlis, Muş, Ağrı and Şırnak) (NHDR, 2004). Thus, it is evident that regional differences in Turkey still persist in all categories, and especially the provinces in the East and South-east regions falling considerably behind the provinces in other regions (Ünal, 2008). It should be noted that these regions have more traditional lifestyles with a more conservative outlook, low educational quality, low access to social services and low employment opportunities showing the need for the implementation of a strong regional development reform plan.

One of the major problems in Turkey is the slow transformation of life style and adaptation to urban culture in Turkey. The number of people in the population with

traditional values is quite high and they resist change. These people need to adapt themselves to rapid urbanization and leave their traditional way of lives at least while educating and employing themselves.

This transformation is necessary within the Turkish society especially to empower Turkish women. Gender inequality is still an observable phenomenon in many areas in Turkey.

The Gender-related Development Index (GDI) is the HDI adjusted for gender inequality. It uses the same variables as the HDI, but in accordance with the disparity in achievement between women and men. In 2009, GDI of Turkey is 0.788 and Turkey ranks 70th among the 155 countries (HDR, 2009).

The Gender Empowerment Measure (GEM) measures gender inequality in economic and political opportunities. The values show that opportunities for women are much more constrained in Turkey which has always ranked among the worst 10 countries in the world (Table 6.4.).

Turkey is still suffering from gender inequalities that are reflected in its ALR, GER, UEMP and GDP per capita. Table 6.3 compares the three measures of HD over the years and highlights the gap between the status of men and women in Turkey. As shown in Table 6.3, there are great differences in these values between the male and female. If Turkey seriously wants to catch up with the developed countries in this decade, it should make special provisions such that women are empowered to narrow the gender gap. Since 1998, the overall increase in female ALR was higher than that of males. This gap, however, continued to grow. For the same period, the overall increase in female GER was almost the same as that of the males. No significant increase is observed in female's GDP per capita, while the GDP capita for males almost tripled. This shows either that there is much less job opportunities for women than men, or the traditional pattern of their families discourages women to work.

Table 6.3. Gender Inequalities in Turkey

	ALR (F) %	ALR (M) %	GDP/capita (F) US\$	GDP/capita (M) US\$	GER (F) %	GER (M) %	GDI
1998	75	92.9	4703	8104	54	67	0.726
1999	75.9	93.2	3937	8772	55	68	0.726
2000	76.5	93.5	4379	9516	55	68	0.734
2001	77.2	93.7	3717	8028	54	65	0.726
2002	78.5	94.4	4757	7873	62	74	0.746
2003	81.1	95.7	4276	9286	62	74	0.742
2004	79.6	95.3	4038	11408	63	75	0.745
2005/6	79.6	95.3	4385	12368	64	73	0.763
2007	81.3	96.2	5352	20441	66.3	75.7	0.788

Source: Human Development Reports (2000-2009)

Table 6.4. Gender Empowerment Measure of Turkey

	GEM	GEM rank	Number of countries
1998	0.321	64	70
1999	0.308	63	64
2000	0.312	63	66
2001	0.290	66	70
2002	0.290	73	78
2003	0.285	76	80
2004	0.289	72	75
2005/6	0.298	90	93
2007	0.379	101	109

Source: Human Development Reports (2000-2009)

Infant mortality rate in Turkey has fallen dramatically since 1990, down from about 51.5 deaths per 1,000 live births in 1990 to 17.5 deaths in 2006. It should be noted, however, that the rate of infant mortality in Turkey remains three times higher than the OECD average of 5.2 (TÜİK, 2006; HDR, 2008).

6.2. Recommendations

Turkey seems similar to some countries, especially in terms of its economy, and has a comparable GDP per capita, but has a divergent HDI. This suggests that Turkey has invested resources in education and health in an inefficient and wasteful manner and thus has failed to realize the targeted results, i.e. healthier and more educated citizens.

Indeed, Turkey's health and education figures are still low. Although the Turkish economy shows a steady growth and has become the 16th largest economy in the world in terms of GDP at PPP in 2009 (IMF, 2011), Turkey still fails to provide equal access to education, health and income distribution among its citizens. Therefore, it must be emphasized that general improvement in Turkey's education, health and unemployment indicators will result in higher values in the HDI. This potential may exist if Turkey invests in individuals. To fully achieve this, however, it must target women and youth.

Turkey's current developmental tools can be listed as the Long-term Strategy 2001-2023, the Eighth Five-Year Development Plan, Preliminary National Development Plan to attain Millennium Development Goals to struggle specifically against poverty and hunger, gender equality and child mortality.

With the exception of these few national publications, there have not been extensive studies in the literature investigating the human development in Turkey: (Akder, 1992; Tuna and Yumuşak, 2002; Yumuşak and Tuna, 2002; Dikmen, 2004; Günsoy, 2005; Demir, 2006; Karabulut, 2006; Ünal, 2008; Çiftçi, 2008; Gürses, 2009).

6.2.1. Education

GER and ALR are directly relevant to educational improvements in Turkey. As for the author, Turkey needs to implement and commit to an educational reform plan.

Compulsory education has been increased to nine years for 32 provinces in 2009. It is planned to be increased to thirteen years in 2012.

6.2.1.1. Education of Turkish youth

Education is vital for Turkey's development. It is important that all of the Turkish youth receives proper education and compete with or at least approach the standards of developed countries.

Over time, older generations which contain the bulk of the illiterates and carry a smaller weight in the population, will be replaced by better educated younger generations who carry a larger percentage of responsibility in the population. Consequently, HDI will also improve.

6.2.1.2. Education of Turkish Women

Turkey lags behind the developed countries educationally, especially in the education of women. The enrolment of females in schooling in Turkey is still quite low. The need for progress in this area is evident.

Şahabettinoğlu et al. (2002) investigated the reasons for non-enrolment to schools for both sexes in urban and rural regions in Turkey. They found the major three reasons in urban regions as “high cost of schooling”, “lack of interest in school” and “unavailability of proper school”, respectively. For rural regions, “lack of interest in school” was found to be the major reason for both males and females. The other reasons investigated were “household chores,” “lack of family permission to go to school”, “family obligations” and “family values”, “need to care for younger siblings”, “sickness/disability”, “need to help the family in economic activity”, “to learn a skill or trade”, “failure to get along with teachers at school” and “need to work for pay”. They concluded that economic factors had a negative impact on the enrolment of both girls and boys in both areas.

Kağıtçıbaşı (1989) listed the most salient reasons for females as economic inadequacies, cultural norms, religious beliefs and the structural aspects of national education.

Turkey should ensure women's attainment of their right to education. Attention needs to be given to improving GER and ALR for females. Improving these ratios for females, especially in rural regions needs to be addressed.

In 2003, the Ministry of National Education started a campaign called "Haydi Kızlar Okula" aiming to increase the enrolment of girls to primary school. Such initiatives should continue.

Awareness on the importance of girls' education should be raised at the family and community levels. Every effort should be made to ensure greater enrolment of girls in the Turkish education system.

As the number of educated women increases, higher women participation will take place in Turkish work force.

6.2.2. Unemployment

Turkey has been having considerably high UEMPs as a developing country, although it has been having high economic growth and has relatively high GDP per capita. This is partly due to the fact that new job opportunities are not created and wealth is unequally distributed in Turkey.

According to TÜİK, the total UEMP in Turkey in September 2008 is 10.3%. This figure has increased to 11.9% in January 2011. According to the statistics in September 2008, the UEMPs in urban and rural regions are 12.3% and 7.1%, respectively.

One of the major problem that Turkey is facing is that its labor market in contains a considerable informal sector. Many children are working in this sector without taking adequate education. The system forces them to continue as unskilled workers into their adult years. Therefore, the association between the education system and the labor market should be fully explored and established in Turkey.

6.2.2.1. Unemployment of Turkish youth

Unemployment of youth has broad consequences for the future wealth and development of countries. Therefore, job creation for youth is a critical component of a Turkey's long-term economic stability and growth.

Turkey has a young population of over 72 million people with an average age of 28.8 (NHDR, 2008). This can be considered as an asset for Turkey. However, the youth UEMP was at 23.1% in urban and 15.3% in rural regions (TÜİK, 2008). In January 2011, the total youth UEMP was still quite high at 22% (TÜİK, 2011).

Having Europe's youngest population, Turkey needs to create new jobs and achieve rural development based on increasing income of youth and women.

Turkey joined the Youth Employment Network (YEN) in 2006. In addition in 2007, Turkey started implementing ILO (International Labor Organization)'s "Decent Work Country Programme". One important component of this programme is youth employment.

Traditional patterns, values and institutions continue to resist change. Transformation is necessary within the existing gender inequalities within the society and in the tendency to deny participation of the younger generation in the decision making process.

6.2.2.2. Unemployment of Turkish Women

Although the Turkish Constitution and other laws guarantee formal equality between men and women, there is still low female empowerment in Turkey. The GDI and GEM values for Turkey are alarming. Turkey should raise the social, political and economic status of women and prepare the basis of human resources development, especially with greater participation of women. Women should start participating more in social and cultural life, non-agricultural work force, administration and politics. To achieve these goals, Turkey should work to overcome prejudices and conservatism. The equality should first be achieved within the family, then at work and all political and civil rights arenas by giving equal opportunities in decision-making to women.

6.2.3. Health

Major healthcare providers in Turkey are the Ministry of Health, the Social Security Institution, the Ministry of Defense, universities and private health professionals. The Ministry of Health is officially responsible for designing and implementing nation-wide health policies and providing health care services. According to the existing laws, men and women in Turkey are supposed to receive equal health care services for their general health.

The implementation of the Green Card Program in 1992 has been covering the health care expenses of the people who have no social security and whose income amounted to less than one third of the net minimum wage.

The government combined the Social Security Institution (SSK) health care fund, Civil Service Retirement Fund (Emekli Sandığı) and Free Enterprise Scheme (Bağkur) under one single entity, the Social Security Institution (SGK) in 2006 in order to make sure that all citizens are supported by health care services.

A recent step taken was the assignment of a “family physician” for every family. This step decreased overcrowding in the hospitals. The government also founded “baby-friendly hospitals” for the care of pregnant women and their babies.

The healthcare system is currently being developed under “the 2003-2013 Health Transformation Program”. The purpose of this program is to increase the quality as well as the efficiency of the system and enhance access to health care facilities with the launch of a number of reforms.

The statistics indicate that the health status of women is poorer than that of men and there is a need to study the underlying psycho-social causes of this situation (Ministry of Health, 1993).

Life expectancy at birth in Turkey has been improving and should continue to improve. The following steps should be taken by the government:

- 1- Encouragement for women to give birth in hospitals,
- 2- Increased monitoring during pregnancy,
- 3- Increased facilities in intensive care departments.

In Turkey, especially in rural areas, owing to social pressures, traditions, and economic dependence, women often cannot go to the health institutions alone. Women have to be accompanied to the health centers or hospitals by their husband or by an older relative. Every effort should be made to empower women in Turkey by raising their educational level and status to increase the utilization of the health care services.

In planning health care services, various considerations for both male and female must be addressed. Both male and female patients need to be surveyed in a manner that best assesses their need. Implementation of the health care reforms needs to be launched and as a result of these recommendations, better management of the existing services should be achieved.

7. CONCLUSIONS AND DISCUSSION

7.1. Summary and Discussion

This study can be considered as an initial attempt for inclusion of the unemployment factor into HDI. Unemployment rate is a potentially useful variable to be incorporated in a modified HDI. Its inclusion into the HDI provides balance to the index. Furthermore, it is a relatively more advanced quantitative instrument to evaluate the HD capacity of the countries.

Through adding a fourth sub-index to the current HDI, namely the RUI, HDI has become more comprehensive with respect to development. The new HDI favors the countries attempting to overcome the unemployment problem.

Inclusion of RUI as a dynamic measure, however, significantly varied the HD measure for some countries from year to year and this brought an additional explanatory power to the index. With improved explanatory power, the proposed version of HDI gives more information about the HD performance of a country.

The proposed approach shows that development and especially, HD, should not solely consist of income growth. In fact, increasing each component's weight from $\frac{1}{3}$ to $\frac{1}{4}$ diminished the effect of GDPI in HDI. Lowering the weight by including more humane and social factors fitted more to HDI's nature. Assuming that "growth is necessary but not sufficient condition for development", humanitarian aspects of development process are captured in its measurement and assessment attempts.

With the proposed index, the number of HDI components has slightly increased, but it still remains at a manageable and easily understood size. Furthermore, such ramification in the calculation process enables the user to define HD in more holistic way. It is understood that the process to attain high and very high HD levels is more struggling than the current HDI envisaged.

The HDI-2 values have shown that there is a need to attain better HD performance due to the problem of global increase in unemployment. Therefore, this problem is reflected in the HDI measurements and additional goals for HD are suggested. Without the unemployment concern, the current HDI measures might direct the policy makers to emphasize heavily on the overall income factors, such as GDP per capita, to increase HD. This is due to the non-income factors increasingly approached to its limits especially for the high HD countries. However, the distribution of income among people and the probability and chance of having a job should also be considered in evaluating nations' HD levels.

The effect of adding the unemployment dimension has resulted in more sensitive and realistic rankings between OECD countries. This thesis shows that the strong economies of Switzerland, Japan, South Korea, the Netherlands, New Zealand and Denmark have been underestimated by HDI. On the other hand, HDI has overestimated the economies of Australia, Ireland, Canada, Sweden, Belgium, Finland, France, Germany, Spain and Greece.

In short, including unemployment factor to HDI as a new component has not only made the index broader but also presents more suitable dimension for assessing the HD performance of the countries. The integrity of the new index is also assured. Its concept is more complete and interpretable.

HDI-2 is consistent with all of the UNDP's previous refinements in that any new HDI formula had always decreased the countries index values considerably. However, this should not mean that the HD in these countries was worsened.

It is true that the HDI has brought the global community closer and inspired a united effort in the common cause of improving the human condition. It is also true that HDI is a simple and universal index. However, this index has been very subjective and

not been scientifically successful in correctly classifying the HD of countries. To overcome this problem, cluster analysis has been used.

Formerly, UNDP focused on three dimensions of basic capabilities, i.e. a long and healthy life, knowledge and a decent standard of living. However, it never considered the fact that other aspects of human life, such as participation, political freedom, human security, are equally important.

In this thesis, the author argues that the HDI is not a perfect index since it does not fully capture the concept of HD. Moreover, it does not provide a comprehensive picture of HD in any situation, as it is just a summary measure. Nor can it be substituted for all the rich information that is contained in the HDRs in various tables on HD components. When the HDI is supplemented with this rich information, only then one can get a fuller assessment of HD in any society.

The author accepts that the HDI as a more meaningful measure of HD is well-established and its value, importance and relevance are also recognized. However, the author believes that it still has some imperfections.

Finally, the author believes that the HDI-2 presented in this thesis will be useful in the context of the HD at national and international levels as it reorients the assessment of HD levels away from income to more broadly based measures which can result in better differentiation between countries.

7.2. Limitations of the Study

The major limitation of the proposed HDI-2 has been the lack of data for all countries. Future work will hopefully fill this gap and permit the development of more comprehensive and reliable calculation of the HDI-2. Nevertheless, the author believes that the current study provides significant insights for better understanding the HD process and implementation of public policies.

Non-availability of data still restricts the HDI-2 calculations for some countries. International organizations, working closely with country statistical offices and interacting within themselves can build networks for initiating new surveys, data collecting mechanisms, putting a framework for reliable and standardized data and publishing them regularly.

7.3. Directions for Future Research

Monitoring HD is important for assessment, policy making and enhancing the lives of millions. The present state of art is evolving slowly but with confidence. Researches continue, both within the Human Development Report Office and in academic and research institutions. More refinements should be made over the forthcoming years both with regard to methodological issues as well as statistical sophistication. Future studies may offer new and more advanced approaches for the use of HDI-2 in the assessment of HD. Similarly, future research agenda may also concentrate on the computation of HDI-2 through adding new components relevant to HD.

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APPENDIX 1

HDR Themes 1990-2010

Year	HDR Themes
1990	Concept and Measurement of human development
1991	Financing Human Development
1992	Global Dimensions of Human Development
1993	People's Participation
1994	New dimensions of human security
1995	Gender and human development
1996	Economic growth and human development
1997	Human Development to Eradicate Poverty
1998	Consumption for Human Development
1999	Globalization with a Human Face
2000	Human rights and human development
2001	Making new technologies work for human development
2002	Deepening democracy in a fragmented world
2003	Millennium Development Goals: A compact among nations to end human poverty
2004	Cultural Liberty in Today's Diverse World
2005	International cooperation at a crossroads: Aid, trade and security in an unequal world
2006	Beyond scarcity: Power, poverty and the global water crisis
2007/8	Fighting climate change: Human solidarity in a divided world
2009	Overcoming barriers: Human mobility and development
2010	The Real Wealth of Nations: Pathways to Human Development

APPENDIX 2

NHDR Themes of Turkey 1990-2010

Year	NHDR Themes of Turkey
1995	Major Sustainable Human Development Challenges in Turkey
1996	Human Settlements and Eradication of Poverty
1997	Human Development and Social Integration
1998	Human Development and Moving Towards a Right-based Approach to Development
1999	National Policy Building and Advocacy for Sustainable Human Development
2001	Measuring Turkey's Human Development Performance
2004	Human Development Report Turkey: Information and Communication Technology
2008	Youth in Turkey

APPENDIX 3

Longevity Index (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
Iceland	0.900	0.900	0.900	0.910	0.910	0.930	0.930	0.941	0.946
Norway	0.890	0.890	0.890	0.900	0.900	0.910	0.910	0.913	0.925
Australia	0.890	0.900	0.900	0.900	0.900	0.920	0.920	0.931	0.940
Canada	0.900	0.890	0.900	0.900	0.900	0.920	0.920	0.921	0.927
Ireland	0.860	0.860	0.860	0.860	0.860	0.880	0.880	0.890	0.911
Sweden	0.900	0.910	0.910	0.910	0.920	0.920	0.920	0.924	0.930
Switzerland	0.900	0.900	0.900	0.900	0.900	0.930	0.930	0.938	0.945
Japan	0.920	0.930	0.930	0.940	0.940	0.950	0.950	0.954	0.961
Netherlands	0.880	0.880	0.890	0.890	0.890	0.890	0.890	0.904	0.914
France	0.890	0.890	0.890	0.900	0.900	0.910	0.910	0.919	0.933
Finland	0.870	0.870	0.880	0.880	0.880	0.890	0.890	0.898	0.908
United States	0.860	0.860	0.870	0.860	0.870	0.870	0.880	0.881	0.902
Spain	0.890	0.890	0.890	0.900	0.890	0.910	0.910	0.925	0.929
Denmark	0.850	0.850	0.850	0.860	0.860	0.870	0.870	0.881	0.887
Austria	0.870	0.880	0.890	0.890	0.890	0.900	0.900	0.907	0.915
United Kingdom	0.870	0.870	0.880	0.880	0.880	0.890	0.890	0.900	0.906
Belgium	0.870	0.890	0.890	0.890	0.900	0.900	0.900	0.897	0.908
Luxembourg	0.860	0.870	0.870	0.880	0.890	0.890	0.890	0.891	0.906
New Zealand	0.870	0.870	0.880	0.880	0.890	0.900	0.900	0.913	0.919
Italy	0.890	0.890	0.890	0.890	0.890	0.920	0.920	0.922	0.935
Germany	0.870	0.880	0.880	0.880	0.890	0.900	0.900	0.902	0.913
Greece	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.898	0.902
Korean Republic	0.790	0.830	0.830	0.840	0.840	0.850	0.870	0.882	0.904
Portugal	0.840	0.840	0.840	0.850	0.850	0.870	0.870	0.879	0.893
Czech Republic	0.820	0.830	0.830	0.830	0.840	0.840	0.850	0.849	0.856
Hungary	0.770	0.770	0.770	0.770	0.780	0.800	0.800	0.799	0.805
Poland	0.800	0.800	0.810	0.810	0.810	0.820	0.830	0.836	0.842
Slovakia	0.800	n/a	0.800	0.800	0.810	0.820	0.820	0.821	0.827
Mexico	0.790	0.790	0.790	0.800	0.810	0.830	0.840	0.843	0.850
Turkey	0.740	0.740	0.750	0.750	0.760	0.730	0.730	0.773	0.779

Source: Human Development Reports (2000-2009)

APPENDIX 4

GDP Index (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
Iceland	0.920	0.940	0.950	0.950	0.950	0.960	0.980	0.985	0.981
Norway	0.930	0.940	0.950	0.950	0.990	0.990	0.990	1.000	1.000
Australia	0.900	0.920	0.930	0.920	0.940	0.950	0.950	0.962	0.977
Canada	0.910	0.930	0.940	0.940	0.950	0.960	0.960	0.970	0.982
Ireland	0.900	0.930	0.950	0.960	0.980	0.990	1.000	0.994	1.000
Sweden	0.890	0.900	0.920	0.920	0.930	0.930	0.950	0.965	0.986
Switzerland	0.920	0.940	0.940	0.940	0.950	0.960	0.970	0.981	1.000
Japan	0.910	0.920	0.930	0.920	0.930	0.940	0.950	0.959	0.971
Netherlands	0.900	0.920	0.930	0.940	0.950	0.950	0.960	0.966	0.994
France	0.890	0.910	0.920	0.910	0.930	0.940	0.950	0.954	0.971
Finland	0.890	0.910	0.920	0.920	0.930	0.940	0.950	0.964	0.975
United States	0.950	0.960	0.970	0.970	0.980	0.990	1.000	1.000	1.000
Spain	0.850	0.870	0.880	0.890	0.900	0.900	0.920	0.935	0.960
Denmark	0.920	0.930	0.940	0.950	0.960	0.960	0.960	0.973	0.983
Austria	0.910	0.920	0.930	0.930	0.950	0.950	0.960	0.971	0.989
United Kingdom	0.890	0.900	0.910	0.920	0.930	0.940	0.960	0.969	0.978
Belgium	0.910	0.920	0.940	0.920	0.940	0.940	0.960	0.963	0.977
Luxembourg	0.970	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
New Zealand	0.860	0.880	0.880	0.880	0.900	0.900	0.910	0.922	0.936
Italy	0.890	0.900	0.910	0.920	0.930	0.940	0.940	0.944	0.954
Germany	0.900	0.910	0.920	0.920	0.940	0.940	0.900	0.949	0.975
Greece	0.820	0.840	0.850	0.860	0.870	0.880	0.900	0.910	0.944
Korean Republic	0.820	0.840	0.860	0.840	0.860	0.870	0.890	0.900	0.920
Portugal	0.830	0.850	0.860	0.870	0.870	0.870	0.880	0.888	0.906
Czech Republic	0.800	0.810	0.820	0.830	0.840	0.850	0.880	0.889	0.916
Hungary	0.770	0.790	0.800	0.800	0.820	0.830	0.860	0.866	0.874
Poland	0.720	0.740	0.750	0.760	0.780	0.790	0.810	0.823	0.847
Slovakia	0.760	n/a	0.790	0.800	0.810	0.820	0.830	0.846	0.885
Mexico	0.730	0.800	0.750	0.740	0.750	0.750	0.770	0.781	0.826
Turkey	0.690	0.690	0.710	0.680	0.690	0.700	0.730	0.740	0.812

Source: Human Development Reports (2000-2009)

APPENDIX 5

Educational Attainment Index (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
Iceland	0.960	0.960	0.960	0.960	0.960	0.980	0.970	0.978	0.980
Norway	0.980	0.980	0.980	0.990	0.990	0.990	0.990	0.991	0.989
Australia	0.990	0.980	0.990	0.990	0.990	0.990	0.990	0.993	0.993
Canada	0.990	0.980	0.980	0.970	0.980	0.970	0.970	0.991	0.991
Ireland	0.960	0.960	0.960	0.960	0.960	0.970	0.990	0.993	0.985
Sweden	0.990	0.990	0.990	0.990	0.990	0.990	0.980	0.978	0.974
Switzerland	0.930	0.940	0.940	0.950	0.950	0.960	0.950	0.946	0.936
Japan	0.940	0.930	0.930	0.940	0.940	0.940	0.940	0.946	0.949
Netherlands	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.988	0.985
France	0.970	0.970	0.990	0.960	0.960	0.970	0.970	0.982	0.978
Finland	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.993	0.993
United States	0.970	0.980	0.980	0.970	0.970	0.970	0.970	0.971	0.968
Spain	0.960	0.970	0.970	0.970	0.970	0.970	0.980	0.987	0.975
Denmark	0.970	0.980	0.980	0.990	0.980	0.990	0.990	0.993	0.993
Austria	0.950	0.960	0.960	0.970	0.960	0.960	0.960	0.966	0.962
United Kingdom	0.990	0.980	0.990	0.990	0.990	0.990	0.970	0.970	0.957
Belgium	0.990	0.990	0.990	0.990	0.990	0.990	0.980	0.977	0.974
Luxembourg	0.890	0.900	0.900	0.900	0.910	0.950	0.940	0.942	0.975
New Zealand	0.980	0.990	0.990	0.990	0.990	0.990	0.990	0.993	0.993
Italy	0.930	0.940	0.940	0.930	0.930	0.950	0.960	0.958	0.965
Germany	0.960	0.970	0.970	0.960	0.950	0.960	0.960	0.953	0.954
Greece	0.910	0.920	0.920	0.930	0.950	0.970	0.970	0.970	0.981
Korean Republic	0.950	0.950	0.950	0.960	0.970	0.970	0.980	0.980	0.988
Portugal	0.920	0.930	0.940	0.970	0.970	0.970	0.960	0.925	0.929
Czech Republic	0.910	0.890	0.890	0.910	0.920	0.930	0.930	0.936	0.938
Hungary	0.910	0.930	0.930	0.930	0.950	0.960	0.950	0.958	0.960
Poland	0.920	0.940	0.940	0.950	0.960	0.960	0.950	0.951	0.952
Slovakia	0.910	n/a	0.910	0.900	0.910	0.910	0.920	0.921	0.928
Mexico	0.840	0.840	0.840	0.860	0.850	0.850	0.860	0.863	0.886
Turkey	0.760	0.770	0.770	0.770	0.800	0.820	0.810	0.812	0.828

Source: Human Development Reports (2000-2009)

APPENDIX 6

Total Unemployment Rate (% , 1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
Iceland	2.7	1.9	1.4	2.3	3.3	4.5	2.5	3.0	3.0
Norway	3.3	3.2	3.4	3.5	4.0	3.4	4.6	3.5	2.6
Australia	8.0	7.2	6.3	6.7	6.3	6.0	5.1	4.9	4.2
Canada	8.3	7.6	6.8	7.2	7.6	7.6	6.8	6.3	6.1
Ireland	7.8	5.6	4.3	3.9	4.4	4.6	4.3	4.4	6.0
Sweden	8.2	5.6	4.7	4.0	4.0	4.9	5.6	7.0	6.2
Switzerland	4.2	2.7	2.0	1.9	3.1	4.0	4.1	4.0	3.4
Japan	4.1	4.7	4.7	5.0	5.4	5.3	4.4	4.1	4.0
Netherlands	4.0	3.2	2.6	2.0	2.3	4.1	6.2	3.9	2.8
France	11.7	11.1	9.5	8.7	9.0	9.7	10.0	9.4	7.4
Finland	11.4	10.2	9.8	9.2	9.1	9.1	8.6	7.7	6.4
United States	4.5	4.2	4.0	4.8	5.8	6.0	5.1	4.6	5.8
Spain	18.8	15.9	14.1	10.5	11.4	11.3	9.1	8.5	11.3
Denmark	5.1	5.2	4.7	4.3	4.5	5.6	4.9	3.9	3.3
Austria	4.7	5.2	4.7	4.9	5.3	5.7	5.8	4.8	3.8
United Kingdom	6.3	6.0	5.5	5.1	5.2	5.0	4.8	5.3	5.6
Belgium	8.8	9.0	7.0	6.6	7.3	7.9	8.4	8.2	7.0
Luxembourg	2.8	2.9	2.6	2.6	3.0	3.8	4.6	4.8	5.1
New Zealand	7.5	6.8	6.0	5.3	5.2	4.6	3.6	3.8	4.1
Italy	12.2	11.5	10.7	9.6	9.1	8.8	7.7	6.8	6.7
Germany	9.4	8.3	7.5	7.3	8.1	9.1	9.3	8.4	7.5
Greece	9.6	12.0	11.4	10.4	10.0	9.5	10.6	8.9	7.7
Korean Republic	7.1	6.3	4.1	3.7	3.1	3.4	3.8	3.5	3.2
Portugal	4.9	4.5	4.0	4.1	5.1	6.3	7.5	7.7	7.6
Czech Republic	6.5	8.8	8.9	8.2	7.3	7.8	8.0	7.2	4.4
Hungary	8.0	7.1	6.5	5.8	5.9	5.9	7.1	7.5	7.8
Poland	10.6	13.9	16.1	18.2	19.9	19.6	17.8	13.8	7.1
Slovakia	15.6	n/a	18.8	19.3	18.6	17.5	16.4	13.4	9.5
Mexico	3.0	2.6	2.2	2.5	2.7	2.5	3.6	3.2	4.0
Turkey	6.6	7.3	6.4	8.5	10.3	10.3	10.0	9.9	9.4

Source: Human Development Reports (2000-2009)

APPENDIX 7

Human Development Index (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
Iceland	0.927	0.932	0.936	0.942	0.941	0.956	0.96	0.968	0.969
Norway	0.934	0.939	0.942	0.944	0.956	0.963	0.965	0.968	0.971
Australia	0.929	0.936	0.939	0.939	0.946	0.955	0.957	0.962	0.970
Canada	0.935	0.936	0.940	0.937	0.943	0.949	0.950	0.961	0.966
Ireland	0.907	0.916	0.925	0.930	0.936	0.946	0.956	0.959	0.965
Sweden	0.926	0.936	0.941	0.941	0.946	0.949	0.951	0.956	0.963
Switzerland	0.915	0.924	0.928	0.932	0.936	0.947	0.947	0.955	0.960
Japan	0.924	0.928	0.933	0.932	0.938	0.943	0.949	0.953	0.960
Netherlands	0.925	0.931	0.935	0.938	0.942	0.943	0.947	0.953	0.964
France	0.917	0.924	0.928	0.925	0.932	0.938	0.942	0.952	0.961
Finland	0.917	0.925	0.930	0.930	0.935	0.941	0.947	0.952	0.959
United States	0.929	0.934	0.939	0.937	0.939	0.944	0.948	0.951	0.956
Spain	0.899	0.908	0.913	0.918	0.922	0.928	0.938	0.949	0.955
Denmark	0.911	0.921	0.926	0.930	0.932	0.941	0.943	0.949	0.955
Austria	0.908	0.921	0.926	0.929	0.934	0.936	0.944	0.948	0.955
United Kingdom	0.918	0.923	0.928	0.930	0.936	0.939	0.940	0.946	0.947
Belgium	0.925	0.935	0.939	0.937	0.942	0.945	0.945	0.946	0.953
Luxembourg	0.908	0.924	0.925	0.930	0.933	0.949	0.945	0.944	0.960
New Zealand	0.903	0.913	0.917	0.917	0.926	0.933	0.936	0.943	0.950
Italy	0.903	0.909	0.913	0.916	0.920	0.934	0.940	0.941	0.951
Germany	0.911	0.921	0.925	0.921	0.925	0.930	0.932	0.935	0.947
Greece	0.875	0.881	0.896	0.892	0.902	0.912	0.921	0.926	0.942
Korean Republic	0.854	0.875	0.888	0.879	0.888	0.901	0.912	0.921	0.937
Portugal	0.864	0.874	0.885	0.896	0.897	0.904	0.904	0.897	0.909
Czech Republic	0.843	0.844	0.885	0.861	0.868	0.874	0.885	0.891	0.903
Hungary	0.817	0.829	0.883	0.837	0.848	0.862	0.869	0.874	0.879
Poland	0.814	0.828	0.880	0.841	0.850	0.858	0.862	0.870	0.880
Slovakia	0.825	n/a	0.882	0.836	0.842	0.849	0.856	0.863	0.880
Mexico	0.784	0.790	0.800	0.800	0.802	0.814	0.821	0.829	0.854
Turkey	0.732	0.735	0.742	0.734	0.751	0.750	0.757	0.775	0.806

Source: Human Development Reports (2000-2009)

APPENDIX 8

HDI Ranks of OECD countries (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005/6	2007
Iceland	5	7	7	2	7	2	2	1	3
Norway	2	1	1	1	1	1	1	1	1
Australia	4	2	4	4	3	3	3	3	2
Canada	1	3	3	6	4	4	6	4	4
Ireland	18	18	16	14	10	8	4	5	5
Sweden	6	3	2	3	2	4	5	6	7
Switzerland	13	11	11	10	10	7	9	7	9
Japan	9	9	9	9	9	11	7	8	10
Netherlands	8	8	8	5	5	11	10	9	6
France	12	12	11	17	18	16	16	10	8
Finland	11	10	10	12	13	13	11	10	12
United States	3	6	4	8	8	10	8	12	13
Spain	21	21	20	19	20	21	19	13	15
Denmark	14	15	15	11	16	13	15	13	16
Austria	16	15	14	16	14	17	14	15	14
United Kingdom	10	14	11	12	10	15	17	16	20
Belgium	7	5	4	8	5	9	12	17	17
Luxembourg	17	12	16	14	15	5	13	18	11
New Zealand	20	19	19	20	18	19	20	19	19
Italy	19	20	20	21	21	18	17	20	18
Germany	15	15	16	18	19	20	21	21	21
Greece	22	22	22	23	22	22	22	22	22
Korean Republic	24	23	23	24	24	24	23	23	23
Portugal	23	24	24	22	23	23	24	24	24
Czech Republic	25	25	24	25	25	25	25	25	25
Hungary	27	26	26	27	27	26	26	26	28
Poland	28	27	28	26	26	27	27	27	26
Slovakia	26	n/a	27	28	28	28	28	28	27
Mexico	29	28	29	29	29	29	29	29	29
Turkey	30	29	30	30	30	30	30	30	30

Source: Human Development Reports (2000 – 2009)

APPENDIX 9

UNDP's Classification of OECD countries (1998)

Group 1	Group 2	Group 3
Canada	Spain	Mexico
Norway	Greece	Turkey
United States	Portugal	
Australia	Korean Republic	
Iceland	Czech Republic	
Sweden	Slovakia	
Belgium	Hungary	
Netherlands	Poland	
Japan		
United Kingdom		
Finland		
France		
Switzerland		
Germany		
Denmark		
Austria		
Luxembourg		
Ireland		
Italy		
New Zealand		

Source: HDR (2000) data

APPENDIX 10

UNDP's Classification of OECD countries (1999)

Group 1	Group 2	Group 3
Norway	Greece	Mexico
Australia	Korean Republic	Turkey
Canada	Portugal	
Sweden	Czech Republic	
Belgium	Hungary	
United States	Poland	
Iceland		
Netherlands		
Japan		
Finland		
Switzerland		
Luxembourg		
France		
United Kingdom		
Denmark		
Austria		
Germany		
Ireland		
New Zealand		
Italy		
Spain		

Source: HDR (2001) data

APPENDIX 11

UNDP's Classification of OECD countries (2000)

Group 1	Group 2	Group 3
Norway	Greece	Turkey
Sweden	Korean Republic	
Canada	Portugal	
Belgium	Czech Republic	
Australia	Hungary	
United States	Slovakia	
Iceland	Poland	
Netherlands	Mexico	
Japan		
Finland		
Switzerland		
France		
United Kingdom		
Denmark		
Austria		
Luxembourg		
Germany		
Ireland		
New Zealand		
Italy		
Spain		

Source: HDR (2002) data

APPENDIX 12

UNDP's Classification of OECD countries (2001)

Group 1	Group 2	Group 3
Norway	Greece	Turkey
Iceland	Korean Republic	
Sweden	Czech Republic	
Australia	Poland	
Netherlands	Hungary	
Belgium	Slovakia	
United States	Mexico	
Canada		
Japan		
Switzerland		
Denmark		
Ireland		
United Kingdom		
Finland		
Luxembourg		
Austria		
France		
Germany		
Spain		
New Zealand		
Italy		
Portugal		

Source: HDR (2003) data

APPENDIX 13

UNDP's Classification of OECD countries (2002)

Group 1	Group 2	Group 3
Norway	Portugal	Turkey
Sweden	Korean Republic	
Australia	Czech Republic	
Canada	Poland	
Netherlands	Hungary	
Belgium	Slovakia	
Iceland	Mexico	
United States		
Japan		
Ireland		
Switzerland		
United Kingdom		
Finland		
Austria		
Luxembourg		
France		
Denmark		
New Zealand		
Germany		
Spain		
Italy		
Greece		

Source: HDR (2004) data

APPENDIX 14

UNDP's Classification of OECD countries (2003)

Group 1	Group 2	Group 3
Norway	Czech Republic	Turkey
Iceland	Hungary	
Australia	Poland	
Luxembourg	Slovakia	
Canada	Mexico	
Sweden		
Switzerland		
Ireland		
Belgium		
United States		
Japan		
Netherlands		
Finland		
Denmark		
United Kingdom		
France		
Austria		
Italy		
New Zealand		
Germany		
Spain		
Greece		
Portugal		
Korean Republic		

Source: HDR (2005) data

APPENDIX 15

UNDP's Classification of OECD countries (2004)

Group 1	Group 2	Group 3
Norway	Czech Republic	Turkey
Iceland	Hungary	
Australia	Poland	
Ireland	Slovakia	
Sweden	Mexico	
Canada		
Japan		
United States		
Switzerland		
Netherlands		
Finland		
Luxembourg		
Belgium		
Austria		
Denmark		
France		
Italy		
United Kingdom		
Spain		
New Zealand		
Germany		
Greece		
Korean Republic		
Portugal		

Source: HDR (2006) data

APPENDIX 16

UNDP's Classification of OECD countries (2005/6)

Group 1	Group 2	Group 3
Iceland Norway Australia Canada Ireland Sweden Switzerland Japan Netherlands France Finland United States Spain Denmark Austria United Kingdom Belgium Luxembourg New Zealand Italy Germany Greece Korean Republic	Portugal Czech Republic Hungary Poland Slovakia Mexico	Turkey

Source: HDR (2007/8) data

APPENDIX 17

UNDP's Classification of OECD countries (2007)

Group 1	Group 2	Group 3
Norway	Poland	-
Australia	Slovakia	
Iceland	Hungary	
Canada	Mexico	
Ireland	Turkey	
Netherlands		
Sweden		
France		
Switzerland		
Japan		
Luxembourg		
Finland		
United States		
Austria		
Spain		
Denmark		
Belgium		
Italy		
New Zealand		
United Kingdom		
Germany		
Greece		
Korean Republic		
Portugal		
Czech Republic		

Source: HDR (2009) data

MEHMET TOLGA TANER

I was born in Istanbul. Following my graduation from Kadıköy Anadolu Lisesi, I enrolled in Boğaziçi University where I received my Bachelor's Degree in Chemistry in January 1996. In 1999, I received my MBA degree in Yeditepe University and MSc degree in Biomedical Engineering in Boğaziçi University. I worked as a research student in Imperial College, Science, Technology and Medicine in 1994. I was a visiting scholar in Westminster University in 2001. Since 2006, I have been studying as a PhD student in the Faculty of Business Administration in Gebze Institute of Technology.