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<u>Master Thesis</u>

‘Investigating the impact of well-being on economic performance: Evidence from European Union countries and regions.’

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Δήλωση

Βεβαιώνω ότι η παρούσα εργασία είναι δική μου, δεν έχει συγγραφεί από άλλο πρόσωπο με ή χωρίς αμοιβή, δεν έχει αντιγραφεί από δημοσιευμένη ή αδημοσίευτη εργασία άλλου και δεν έχει προηγουμένως υποβληθεί για βαθμολόγηση στο Πανεπιστήμιο Θεσσαλίας ή αλλού. Βεβαιώνω ότι είμαι εν γνώσει των κανόνων περί λογοκλοπής του ΤΜΧΠΠΑ και ότι στο πλαίσιο αυτού έχουν τηρηθεί όλοι οι κανόνες κατά την ακαδημαϊκή δεοντολογία, σχετικά με αναφορές, βιβλιογραφία, κ.λ.π., τόσο από έντυπες όσο και από ηλεκτρονικές πηγές. Σε περίπτωση λογοκλοπής αποδέχομαι όλες ανεξαιρέτως τις ποινές που προβλέπουν οι εκάστοτε Κανονισμοί του ΠΘ ή και του ΤΜΧΠΠΑ.

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Abstarct

Every society seeks to achieve an advanced level concerning the status of well-being both in social and economic level. Gross Domestic Product (GDP) indicates a primary measure of determining economic development between regions, within countries, across nations. Hence, it is considered a fundamental statistical measure the level of which might be crucial to make decisions and choose a direction concerning the course and level of development within a territory unit. In this perspective, the purpose of this study lies in investigating potential impacts that a wide range of well-being and world governance composite indicators exert on regional GDP per capita for the year 2016 (cross-sectional approach). Regressors found to positively impact regional GDP per capita implying that even non-material conditions might become crucial to achieve regional economic development. Significant practical implications have been derived based on research findings which in turn can be incorporated in relevant regional policies.

Keywords: well-being, regional economics, economic development

Περίληψη

Κάθε κοινωνία επιδιώκει να κατακτήσει μια ιδανική κατάσταση ευημερίας τόσο σε κοινωνικό όσο και σε οικονομικό επίπεδο. Το Ακαθάριστο Εγχώριο Προϊόν (ΑΕΠ) αποτελεί το κύριο μέτρο που καθορίζει την οικονομική ανάπτυξη μεταξύ περιφερειών και κρατών. Κατά συνέπεια, πρόκειται για ένα σημαντικό στατιστικό μέγεθος, το επίπεδο του οποίου καθορίζει σε κρίσιμο βαθμό τη λήψη αποφάσεων και την κατεύθυνση σχετικά με την πορεία και το επίπεδο της ανάπτυξης μιας περιοχής. Στο πλαίσιο αυτό, ο σκοπός της παρούσας εργασίας έγκειται στη διερεύνηση του πιθανού αντίκτυπου που επιφέρει μια ευρεία σειρά δεικτών ευημερίας και δεικτών παγκόσμιας διακυβέρνησης στο περιφερειακό κατά κεφαλήν ΑΕΠ για το έτος 2016. Οι διερευνητικές μεταβλητές των παλινδρομήσεων βρέθηκε ότι επηρεάζουν θετικά το περιφερειακό κατά κεφαλήν ΑΕΠ με σαφείς ενδείξεις ότι οι μη-υλικοί παράγοντες μπορούν να επηρεάσουν σε σημαντικό βαθμό το επίπεδο της περιφερειακής οικονομικής ανάπτυξης. Τα αποτελέσματα της έρευνας μπορούν να χρησιμοποιηθούν σε πρακτικό επίπεδο για τη διαμόρφωση αντίστοιχης περιφερειακής πολιτικής.

Λέξεις Κλειδιά: ευημερία, περιφερειακή οικονομία, οικονομική ανάπτυξη

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1. Introduction

Every society seeks to achieve an advanced level concerning the status (state) of well-being in human, social and economic terms. Wellbeing has been a philosophical and sociological concern since the beginning of time, and research has extended over time to disciplines such as psychology, health sciences and economics (Smith and Diekmann 2017). Well-being might be considered as an outcome situation that defines the human (individual) perception and society status concerning living and standard conditions of living. Dunn (1973) argues that well-being integrates mental health (mind) and physical health (body) resulting in more holistic approaches to disease prevention and health promotion. Furthermore, well-being is a valid population outcome measure beyond morbidity, mortality, and economic status that tells us how people perceive their life is going from their own perspective (Diener and Seligman 2004; Diener, 2009; Diener et al., 2009; Frey and Stutzer, 2002; Diener, 2009). Another interested point of view is presented by Carlisle et al. (2009). They consider wellbeing as a collateral causality of many social, cultural and economic changes associated with the period roughly recognized as high, late or liquid modernity connecting it to the moral value system of modern society.

In general terms, Gross Domestic Product (GDP) measures the value of a country's production of goods and services. GDP represents the total monetary value of all goods and services produced over a specific time period. In essence, GDP indicates a primary measure of economic development between regions, within countries, across nations. It is an economic measure the rate of which mirrors whether habitants within a specifically defined administrative tier experience growth or decline, convergence or divergence, in terms of monetary values. Furthermore, for many years GDP suggests a statistical measure to gain benefits through exploitation of financial instruments arising from European Union and relevant development funds. Hence, it is considered a fundamental statistical measure the level of which might be crucial to make decisions and choose a direction concerning to which sectors within an economy must focus on. Politicians and economists, GDP, reflects the level of performance within a specific socio-economic system and thus, based on this evidence they formulate policies adjusted to the consequences that each time have to confront.

But, to what extent does this measure adequately reflect the level of well-being interpreted in non-monetary values? Does this measure always define the status of living, high or low, for intangible, but, substantial, non-material conditions? Does this number mirror any aspect of quality of life beyond financial terms? Does the current socio-economic status allow for resting only in economic dimensions of well-being?

D'Acci (2010) argues that research is intensively put into practice so as to study measurements of well-being, including a more holistic vision of the development and welfare of a country. Human-centric approaches seem to be in the centre of the relevant debate for finding answers and provide relevant feedback when planning strategies. Scientists struggle for putting into practice policies and regional development plans that are highly connected with well-being status.

They investigate additional measures and dimensions that depict in a more comprehensive, complete and wide-ranging way the determination of well-being. This is supported by the fact that many relevant initiatives have its roots in identifying factors that make people feel satisfaction, pleasure and fulfilment when experiencing its everyday life. It would be wise to mention that such initiatives do not ignore the economic dimension of GDP.

In this perspective, the purpose of this study lies in investigating potential influences e.g. connection, relationship, strength, direction that a wide range of well-being and world governance composite indicators exert on regional GDP per capita for the year 2016 (cross-sectional approach). In essence, the aim of this paper is to look critically at the different concepts of wellbeing and investigate how they inform economic research across regions of EU and OECD. Only regions from countries that simultaneously belong to European Union (EU) and Organization for Economic Cooperation and Development (OECD) have been considered for the purpose of the analyses. Tracking and quantifying research evidence might shed light on the realization of potential and capacity (lessons learned, continuous improvement) to becoming better and achieving higher levels of human and society satisfaction.

The logic behind such intention is to investigate factors that meaningfully affect economic performance in a more manageable and interpretable level e.g. regional level. Such factors are directly connected with non-monetary aspects that feature largely in the life of every individual no matter its origin or place of living.

Arrigo and Sordelli (2004) state that it is crucial to not only study well-being as objective well-being e.g. tangible goods, but also examine thoroughly subjective well-being, or respectively material well-being e.g. material utility and psychological well-being e.g. psychological utility.

What it might be valued most, is the relationship and strength reported among such well-being factors (topics and/or indicators) and the most acknowledgeable measure for economic performance in terms of development and growth, namely regional Gross Domestic Product per capita.

2. Theoretical Background

Gross Domestic Product, has been called the ‘world’s most powerful number’ (Fioramonti, 2013). But now, more than ever, GDP, as a measure of well-being or a prosperity measure is being contested across the globe. D’Acci (2012) in his work ‘Measuring Well-Being and Progress’ provides an argument for setting limitations concerning the incorporation of GDP in determining well-being status. In the Conference Beyond GDP (European Parliament, 2007) in Brussels, José Manuel Durão Barroso, in the opening speech said:

> Let me give you an example. A decision is made to ban all trade in certain types of precious hardwood to preserve an ecologically important forest. The policy is a great success. The forest is preserved for future generations. The ecosystem, and all the life it supports, is protected. Tourism too is safeguarded. In other words, well-being goes up. But what will be the evaluation of this decision if only measured by GDP? It is difficult, and I'm sure that everyone will agree to make tough decisions that promote long-term well-being, even if the short-term consequence is a drop in GDP.

In the same direction, Kubiszewski et al. (2013) argue that global GDP has more than tripled since 1950, but the Genuine Progress Indicator (GPI), which reflects a wellbeing measure, has fallen since 1978. Furthermore, they concluded that, global ecological footprint has grown beyond sustainable levels.

Moreover, regional inequalities appear to have been consistently high – and in several cases increasing – during the last 20 years, following a mixed core–periphery, east–west and north–south pattern (Petrakos et al., 2008). Economists have debated between the use of GDP per capita and other measures that have as a central premise human and social aspects of living such as Human Development Index (United Nations) or Happiness Index (World Happiness Report). In this perspective, the General Assembly of the United Nations adopted a resolution entitled ‘Happiness: towards a holistic approach to development’ in which it states that *“the gross domestic product indicator by nature was not designed to and does not adequately reflect the happiness and well-being of people in a country”* (U.N., 2011). However, GDP per capita has long been used to estimate empirically models of the determinants of economic growth. Such debate has a common argument. That of achieving the more precise and complete measure for defining what really matters (affects, influences, impacts) economic development and living conditions (material and non-material). No one would doubt that more developed countries will grow at a slower rate than countries that are in the early stages of development. It is major theory within economists worldwide. Many economists argue that growth in advanced (developed) regions is a function of high technology, innovation, research and development, the human capital, and specialization in capital-intensive and knowledge-intensive sectors. Such dominating factors seem to be less visible or completely not reported in less advanced or lagging regions.

Given that regions in Europe become larger, more diversified with a different economic structure and background it is evident that the process of achieving intraregional and interregional integration will become harder and time consuming. In the same wavelength, Bonini (2008) claims that variation across countries concerning life satisfaction results from difference among regions rather than HDI or GDP per capita as reports and government policies might have reported so far. As a result, divergence is the most likely spatial outcome of market dynamics if counteractive policies do not come into place (Petrakos et al., 2008).

Some papers perceive evidence of regional convergence as an empirical validation of the neoclassical argument that, in the long term, markets generate an even distribution of income without the need for any type of (costly) policy intervention. They conclude that, above some threshold level of development, regional convergence trends vanish and regional divergence starts to emerge (Petrakos et al., 2008). This threshold might not be a standard value for regional GDP per capita as time runs. It may vary according to current socio-economic circumstances (conditions) that largely refer to standards of living that are not directly connected with pure monetary-values.

Thus, the leverage of regional GDP per capita might be questionable since it may not reflect in a catholic and complete mode the real situation related to quality of life and overall satisfaction level for individuals no matter what we call them e.g. citizens, human capital, social members, citizens, residents or habitants.

In light of such concerns, much should be done in identifying, decoding and interpreting potential dominating factors that affect regional GDP per capita within a non-monetary context. Many scientists interpret convergence (divergence) trends as a sign of the effectiveness (ineffectiveness) of the existing policy mix (Petrakos et al., 2005c). On the other hand, factors that explain happiness levels at large scale are still unclear and debated (Denes et al., 2017). It remains crucial to incorporate factors (indicators and topics) that not only have statistical power to interpret economic output but also control (regulate, governor) aspects of life which in turn impact productivity and/or level of income and consequently the level of wealth created. Such factors might be intangible or at least not directly quantifiable in monetary terms.

Interestingly, the essence is that they profoundly affect economic activity within a region which, consequently, contribute to calculate regional GDP per capita. Hence, they affect the relevant growth rates which, provide evidence to officials to judge which regional policy should focus on. It becomes evident then that well-being status is not merely a term that scientist use to deploy theories and develop vague arguments within the globe. It is a situation that all people need to closely approach (experience) and describes a set of conditions (state) that all efforts should be directed to.

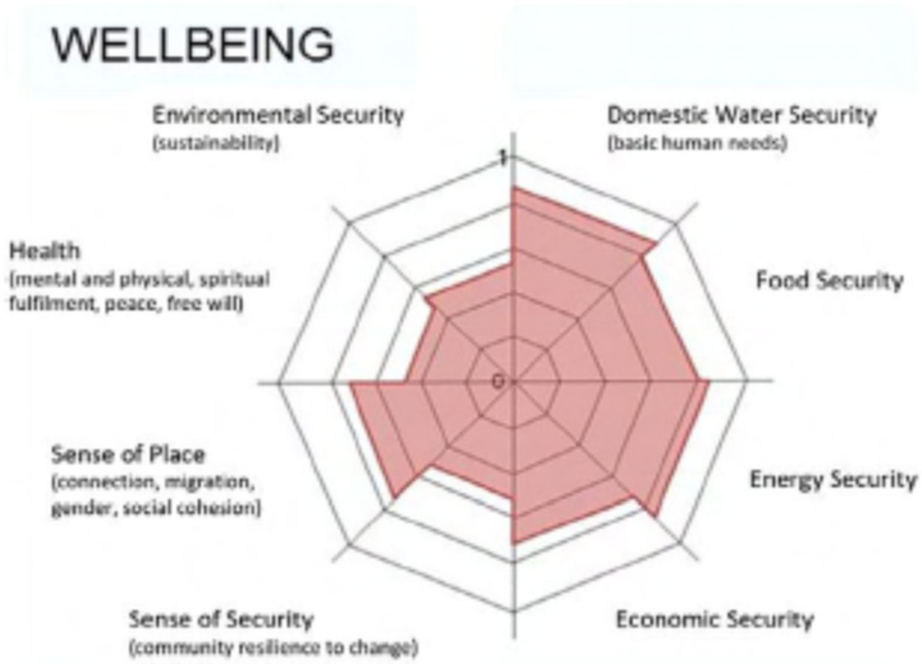
But, how this situation can be analyzed and evaluated? What are the factors that synthesize in a complete or, at least, precise and valid manner the situation that all people wish to experience? Do these factors interrelate with the regional GDP per capita and its range of values? Given a set of well-being topics, measured by relevant indicators, it remains vital to detect potential relationships with regional GDP per capita and make decisions about the strength of this identified correlation. For instance, quality of life is a complicated concept that highly interrelates a wide range of dimensions starting from income and employment and ending to environment and quality of natural resources. D'Acci (2010) mentions that the concept of quality of life tends to become more relevant in every economic study.

The Millennium Ecosystem Assessment work (MEA; Millennium Ecosystem Assessment, 2003) conceptualizes relations between ecosystem services and human wellbeing Four main wellbeing categories are articulated: security, basic material for a good life, health, and good social relations (Leviston 2018). Leviston (2018) in her work 'Linkages between ecosystem services and human wellbeing: A Nexus Webs approach' presents the Wellbeing Nexus Web, which specifies eight components of human livelihood having modified it from Overton et al. (2013) (Fig. 1).

The size and shape of the shaded area in the Wellbeing Web in Figure 1, indicate a level of social well-being, distribution of benefits to different stakeholders, and net trade-offs. Wellbeing takes different forms conflicted across different time, settings and societies demanding for all-inclusive environment for human settlement (Bakara et al. 2015).

OECD (2016) asserts that the mix between different well-being dimensions is unique to each community where people live, study, work and connect. In essence, improving people's lives requires making where they live a better place.

Figure 1. The Wellbeing Nexus Web (Modified from Overton et al., 2013.)



To this effort, OECD (2016) has prepared a conceptual framework (Fig. 2) titled as '*How's life in your region?'* at a regional level for its member countries. Three main concepts characterize such effort. The first concern, was to define and measure well-being in regions and cites. Secondly, such framework aims at delivering a common set of internationally comparable indicators of well-being. In addition, such attempt offers a critical assessment of the statistical agenda that scientist will meet ahead. Last but far from least, such framework provides guidance to policy-makers at all levels on the use of well-being metrics for improving policy results.

The success or failure of each relevant attempt might have its roots in succeeding or failing to identify, code and meaningfully interpret what people value most as far as their status of living (conditions) is concerned. It is essential to read between the lines and perceive how these findings affect e.g. relationship and direction, degree and power, level and strength, regional economic performance and relevant growth rates. OECD (2016) managed to develop a conceptual framework with seven distinctive features:

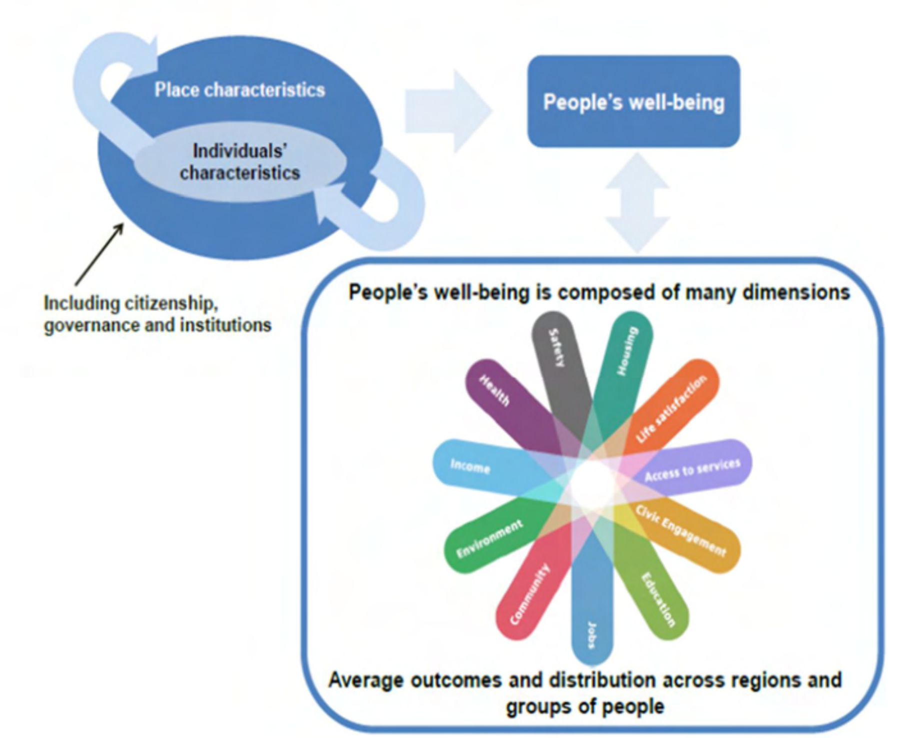
- It measures well-being where people experience it. Two dimensions are included. First, it conceptualizes individuals' characteristics. Second, encompasses place-based characteristics. Both of them are deemed crucial since its interaction shapes people's overall well-being.
- It focuses on well-being outcomes as a direct source of information concerning people's lives rather than on inputs or outputs.
- It is a multi-dimensional concept. It clearly includes both material and non-material dimensions.
- It assesses well-being outcomes based on averages. It takes into consideration how they are distributed across regions and groups of people.
- It is influenced by citizenship, governance and institutions.
- It considers complementarities and trade-offs among the different well-being dimensions.
- It looks at:
    - the dynamics of well-being,
    - its sustainability, and
    - the resilience, concerning different regions.

The usefulness of such instrument, not only under a theoretical background but also in terms of practical implications, is widely acknowledged by the scientific community. Practically, such instrument can be widely used to benchmark a relative position of a specific region and draw conclusions concerning targeted actions that should be implemented. As a direct consequence, such corrective actions will identify gaps, prioritize resources and align public policies towards development and growth.

The issue is to measure and perceive how much society gains from each input in the economic activity and how it benefits from any change in the capital or the labour. Public policies are the cornerstone for the successful transition from a current unwanted but existing situation (lagging regions) to a desirable state (developed regions). In a broader context, this process might be characterized as convergence whereas the situation is reported as divergence. At this point, World Governance Indicators (WGI) as defined and developed by (Kaufmann et al., 2010) position its significance and importance. Such factors were used to measure and value the governance performance in terms of effectiveness and efficiency through a wide range of aspects. The WGI project constructs aggregate indicators of six broad dimensions of governance They report the perceptions of governance of a large number of survey respondents and expert assessments worldwide. World Bank in 1992 defines the term governance as *"the manner in which power is exercised in the management of a country's economic and social resources for development"*.

As mentioned above, economists use regional GDP per capita to make comparisons concerning the living of standards across regions and countries. Such approach is still controversial within scientific community. Understandingly, public policies, especially economic and development policies, should be result-driven and armed with tools in light of gauge changes (e.g. improvement) in living conditions. Living conditions encompass material and non-material aspects of living in a well-being status. Policymakers might not merely rely on regional GDP per capita as the only factor in measuring economic prosperity, social progress and subjective well-being. It should be mentioned that subjective well-being is psychologically experienced (Easterlin, 2001).

Figure 2. Conceptual Framework for regional well-being (Source: OECD 2016)



Data analysis is not only about testing of statistical hypothesis but also about thinking to update, deciding to upgrade, changing to recover and improving to proceed.

Therefore, it is about to address problems and questions in response to sudden or gradual regions' changing socio-economic characteristics and patterns of diversity. Although the variables chosen for this research were derived from data from worldwide acknowledged organizations, a new set could be selected using relevant resources and background information from various reports.

3. Methodology

This study aims at investigating the potential impact of well-being indicators derived from OECD on regional GDP per capita among European Union (EU) member states. Such member states are simultaneously members of OECD. In addition, WGI obtained from World Bank datasets as defined by Kauffman et al. (2010) were used to investigate potential effects on material condition indicator as defined and calculated by OECD. The conceptual framework to measure regional well-being builds on over ten years of OECD work focusing on measures of people's well-being and societal progress which led to the creation of the *Better Life Initiative.* The nature of the indented analyses as well as the purpose of this study required the construction of three econometric models so as to process the data with the help of multiple linear regression. Multiple regression is widely used to estimate the size and significance of the effects of a number of independent variables on a dependent variable (Neale et al., 1994).

3.1 Data Sets

Two datasets were used to perform the analyses. The first concerns data derived from OECD (2016). Such data are directly related with three well-being indicators used as composite variables (predictors) in multiple linear regression. The definition and the components of such predictors are presented in Table 1. Thirteen indicators compose eleven well-being topics which in turn give three 'broader' composite indicators: Material Conditions (mat), Quality of Life (qual), Subjective Well-being (sub). More specifically, Material Conditions predictor is composed by income, jobs, and housing well-big topics. Quality of Life encompasses health, education, environment, safety, civic engagement and accessibility of services whereas Subjective well-being consists of two well-being topics, namely community and life satisfaction.

Well-being indicators were initially obtained in different units. In view of becoming consistent with statistical theory and compare indicators appropriately OECD (2008) used the min-max method so as to compute such variables and obtain reliable results. Data were normalized with a statistical formula that range values from 0 to 10.

First, minimum and maximum scores for each indicator were identified. Second, values of each indicator were normalized by using formula (1) and (2). Third, OECD, aggregate scores when a topic contained more than one indicator. Regions were sorted from lower to higher values. OECD (2016) applied a threshold so as to eliminate values that were below the 4^{th} percentile and above the 96^{th} percentile. By imposing a threshold on extreme values only well-being scores obtained that were more evenly distributed. At the same time, cases that where for almost all regions between 9 and 10 were avoided. The min-max formula was applied. All extreme values identified in the first step were assigned to the scores of 0 and 10. Other regions were assigned to a score $\hat{x_i}$. Unemployment rate, mortality rate, air pollution and homicide rate were inversely coded ($\breve{x_i}$) since they correspond to lower well-being values. Furthermore, the arithmetic mean was used to construct well-being topics composed of two indicators. For instance, job well-being topic was constructed by calculating the arithmetic mean of employment and unemployment. All composite variables used have a common scale measurement the range of which is between 0 and 1, [0,1]. Zero means a lower value whereas one means a high value relative to the indicator under consideration.

$$\hat{x_i} = (\frac{x_i - \min(x)}{\max(x) - \min(x)}) * 10 \quad (1)$$

$$\breve{x_i} = \left(\frac{\max(x) - x_i}{\max(x) - \min(x)}\right) * 10 \quad (2)$$

For analytical purposes a region was defined in terms of its administrative boundaries. OECD classifies regions as the first administrative tier of sub-national government. According to OECD classification regions are called Territorial Unit 2 or TL2. The international comparability was ensured by using the equivalent classification name that Eurostat uses, viz. NUTSII (Nomenclature of Territorial Units for Statistics). No regions were defined in Luxemburg. A set of indicators to measure different topics of well-being was developed by OECD. In total, 193 regions of EU and OECD member states were included in the analyses.

More specifically, the countries, the regions of which were included in the analyses, were[1]: Austria (9), Belgium (3), Czech Republic (8), Denmark (5), Estonia (1), Finland (4), France (22), Germany (16), Greece (13), Hungary (7), Ireland (2), Italy

[1] The number in brackets correspond to the regions of each country included in the analysis.

(21), Luxemburg (1), Netherlands (12), Poland (16), Portugal (7), Slovakia (4), Slovenia (2), Spain (19), Sweden (8), United Kingdom (12).

Table 1. Well-Being topics and relevant indicators (Source: OECD Regional Well-Being Database 2016).

	Topics	**Indicators**
Material Conditions	**Income**	• Household disposable income per capita (in real USD PPP)
	Jobs	• Employment rate (%) • Unemployment rate (%)
	Housing	• Number of rooms per person (ratio)
Quality of Life	**Health**	• Life expectancy at birth (years) • Age adjusted mortality rate (per 1 000 people)
	Education	• Share of labour force with at least secondary education (%)
	Environment	• Estimated average exposure to air pollution in PM2.5 (μg/m³), based on satellite imagery data
	Safety	• Homicide rate (per 100 000 people)
	Civic engagement	• Voter turnout (%)
	Accessibility of services	• Share of households with broadband access (%)
Subjective Well-being	**Community***	• Percentage of people who have friends or relatives to rely on in case of need

	Life Satisfaction*	• Average self-evaluation of life satisfaction on a scale from 0 to 10
*Indicators added in 2016		

The most recent values of all indicators were released in 2016. Two new dimensions have been added compared to previous relevant datasets (e.g. 2014): Community and Life satisfaction. Both compose the Subjective Well-being which was used in multiple linear regression as a predictor variable. Region of Åland in Finland (FI20) was excluded from the analysis due to lack of data on Perceived social network support (Community well-being topic) and Self-assessment of life satisfaction indicators (Life satisfaction). As a result, 192 regions for further analyses were finally used. Eurostat database was the source to obtain regional Gross Domestic Product per capita (PPS) by NUTSII regions for the year 2016. PPS stands for Purchasing Power Standards and is a common currency that eliminates the differences in price levels between countries allowing meaningful volume comparisons of GDP between countries. For analytical purposes, we assume that exchange rate between USD dollars ($) and EURO (€) is 1:1.

World Governance Indicators (WGI) were used to perform multiple linear regression as well. Kaufmann et al. (2010) state the definition and methodology used so as to arrive at safe calculations. Definitions of WGI are given in Table 2.

Table 2. World Governance Indicators (Source: World Bank 2016; Kaufmann et al. 2010).

World Governance Indicators	Description
Voice and Accountability	Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
Political Stability and Absence of Violence	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability

	and/or politically-motivated violence, including terrorism.
Government Effectiveness	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
Regulatory Quality	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
Rule of Law	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
Control of Corruption	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Kaufmann et al. (2010) argue that for each of the six components of WGI, we assume that we can write the observed score of country on indicator k y_{jk}, as a linear function of unobserved governance in country j, g_j, and a disturbance term, ε_{jk}, as follows (equation (3)):

$$y_{jk} = a_k + \beta_\kappa(g_i + \varepsilon_{jk}) \tag{3}$$

where:

a_κ	β_κ	parameters which map unobserved governance in country j, g_j into the observed data from source k , y_{jk}
		(different sources use different units to measure governance)
g_j		assumed that is normally distributed random variable with mean zero and variance one (as an innocuous choice of unit)

Based on the above, Kaufmann et al. (2010) indicate that the units of our aggregate governance indicators will also be those of a standard normal random variable, i.e. with zero mean, unit standard deviation, and ranging approximately from [-2.5 to 2.5].

The methodology used assumes that error term, though normally distributed, differs among indicators. Furthermore, it is assumed that errors are independent across sources. Equations (4) and (5) reflect the above assumptions.

$$V\left[\varepsilon_{jk}\right] = \sigma_k^2 \tag{4}$$

$$E[\varepsilon_{jk}\varepsilon_{jm}] = 0 \tag{5}$$

where, m and k are different resources.

Two sources might be correlated with each other because both may measure the same underlying unobserved governance dimension. The error term ε_{jk} refers to two sources of uncertainty concerning the relationship between true governance and the observed indicators. Such sources of uncertainty are reflected in the indicator-specific variance of the error term σ_k^2. Estimates of unobserved governance g_j can be constructed since observed data for each country y_{jk} are given. The unobserved components model allows for summarizing the knowledge concerning unobserved governance in country j using the distribution $g_j$of conditional on the observed data y_{ik}

Such distribution is normal and its mean is calculated by the equation (6).

$$E[g_j \mathrm{I}\, y_{j1,\dots,}y_{jK}]=\sum_{k=1}^{K} W_k \frac{y_{ik-a_k}}{\beta_\kappa} \quad (6)$$

This conditional mean as governance estimate.

$$SD\left[g_j \mathrm{I}\, y_{j1,\dots,}y_{jK}\right] = (1+\sum_{k=1}^{K} \sigma_k^{-2})\wedge{-1}/_2 \quad (7)$$

Equation (7) is related to unavoidable uncertainty around this estimate of governance. The standard deviation of the distribution of governance conditional on the observed data is used for handling such uncertainty. Through a maximum likelihood procedure, estimates of all of the unknown survey-specific parameters, a_κ, β_k and σ_k^2 are obtained.

3.2 Data Analysis

Multiple linear regression as presented in formula (8) was used as the most appropriate and suitable statistical method to meet the goals of the present research: process the data, model potential relationships, interpret results, draw reliable conclusions. Multiple linear regression is about detecting effects (model the relationship, strength and direction) of two or more exploratory variables (predictors, regressors) on a dependent variable (response, outcome, criterion) by fitting a linear equation to observed (actual) data. Dependent variable must be continuous whether ratio or interval.

$$y = \beta_0 + \beta_1 * x_1 + \beta_2 * x_2 + \cdots + \beta_\kappa * x_k + \varepsilon \quad (8)$$

where*:*

y	*dependent variable (response, outcome, criterion variable)*
β_0	intercept or constant term
$\beta_1, \dots\ \beta_\kappa$	regression coefficients
$x_1 \dots x_k$	predictor variables (exploratory variables, regressors)
ε	random error

A set of assumptions must be met so as to conclude the robustness of the implemented model in a reliable manner and secure the credibility of the analyses. More precisely, such assumptions incorporate at a large degree statistical terms that reflect if the model performed can be used to make valid and accurate projections concerning the dependent variable.

3.2.1 Normality

Dependent variable must be normally distributed. It is assumed that mean and median values of dependent variable must be equal or close enough in a way that the distribution under consideration is symmetric or bell-curved. Positively skewed distributions indicate the existence of outliers on the right side of the graphical representation. Negatively skewed distributions suggest outliers on the left side of the relevant diagram.

The degree and the direction are given by the skewness coefficient. A comparison between the sample distribution and normal distribution is put into practice. A value of zero means no skewness at all. Usually, values within the range [-1, 1] indicate low levels of skewness. In essence, the larger the value of skewness coefficient, the larger the distance from the normal distribution. Kurtosis statistic, gives the thickness of the distribution.

Additionally, by implementing tests for normality such as Kolmogorov-Smirnov (K-S) and Shapiro-Wilks tests we can confirm if the data are normally distributed. The null hypothesis is that the data follow a specific distribution. The alternative hypothesis is that the data do not follow the specific distribution After applying the test if sig. value is lower than 0.05 then the null hypothesis is rejected.

Thus, the data do not follow the normal distribution. Consequently, we wish to receive values greater than 0.05, so that we cannot reject the null hypothesis. If the distribution is skewed, whether positively or negatively skewed, a mathematical transformation of the dependent variable must be put into process. The most often are the logarithmic transformations (log or ln) with the prerequisite that all values of dependent variable are positive. The most common transformations are presented in Table 3.

Table 3. Common transformations for achieving normality of dependent variables.

Type	**Mathematical Transformation for dependent variable x**	**Case**

Log (ln: natural logarithm)	$\log_{10} x \quad lnx$	suitable for right skewed data
Square root	$\sqrt{x}$	suitable for right skewed data
Square	x^2	suitable for left skewed data
Cube root	$x^{1/3}$	suitable for right skewed data (negative values)
Reciprocal	$1/x$	NOT suitable when zero values exist in dataset

3.2.2 Multicollinearity

Multicollinearity, is a key statistic to conclude whether the exploratory variables are correlated to each other and, if they are, to what extent (degree, level). Side effects of collinearity are high standard errors, spuriously low or high t-statistics, and parameter estimates with illogical signs or overly sensitive to small changes in data values (Liao and Valliant, 2012). Concerning nonexperimental sciences, Belsley (1991) claims that "collinearity is a natural law in the data set resulting from the uncontrollable operations of the data-generating mechanism and is simply a painful and unavoidable fact of life." The following criteria are usually used to conclude whether there is multicollinearity in the model.

Correlation matrix among variables should be examined. Pearson correlation coefficient r must be checked for identifying the degree (strength) of the relationship between exploratory variables. The sign in front of the correlation coefficient gives the direction of the relationship: positive $(+)$ or negative (-). Correlation coefficient r is calculated from the formula (9).

It should be mentioned that values of r greater than 0.8 indicate that the examined variables are highly to very highly correlated. In essence, when two variables are highly correlated they both convey the same information (Paul 2014). The values of correlation coefficient are always between [-1 +1]. Table 4 presents the values and the relevant interpretation of r correlation coefficient.

$$r = \int_{i=1}^{n} (x_i - \overline{x})(y_i - \overline{y}) \Big/ \sqrt{\sum (x_i - \overline{x})^2 * (y_i - \overline{y})^2} \tag{9}$$

where:

n	sample size
x, y	variables for which Pearson correlation coefficient $(r)$is computed
x_i , y_i	individual sample (data) points indexed with (i)
$\overline{x}$, $\overline{y}$	Sample means for $x_1 \dots x_n$, $y_i \dots y_n$ where $\overline{x}=\frac{1}{n}\sum_{i-1}^{n} x_i$ (the same for y_i)

Table 4. Values of Pearson correlation coefficient r.

Value r	**Interpretation**
-1.00	Perfectly negative relationship
-0.70	Strong negative relationship
-0.50	Moderate negative relationship
-0.30	Weak negative relationship
0.00	Perfectly independent variables
+0.30	Weak positive relationship
+0.50	Moderate positive relationship
+0.70	Strong positive relationship
+1.00	Perfectly positive relationship

The positive direction indicates that as the value of one variable increases, so does the value of the other variable. On the contrapy, negative values of r indicate that variables change in the opposite direction. That is, if the value of one variable increases (decreases), the value of the other variable decreases (increases). The stronger the relationship between the variables the closer the values in either -1 or +1.

Two additional statistics must be examined. Tolerance (TOL) and Variance Inflation Factor (VIF). Tolerance statistic, the calculation of which is given in the formula (10), shows if one exploratory variable can be predicted by the other variables in the model. Values of TOL close to zero indicate that the variables are highly dependent. Consequently, phenomena of multicollinearity exist and no reliable results are obtained.

$$TOL_i = 1 - R_i^2 \tag{10}$$

where:

TOL_i Tolerance for variable I

R_i^2 coefficient of determination concerning prediction variable I by the other predictor variables

Variance Inflation Factor (VIF) is the reciprocal of tolerance and is calculated based on the formula (11).

$$VIF = {}^{1}/_{1 - R_i^2} \tag{11}$$

VIF represents the proportion of variance in the *i*th independent variable that is not related to the other independent variables in the model (O'Brien, 2007). R_i^2 represents the value of the squared multiple correlation coefficient when an explanatory variable is regressed on the remaining variables (Johnston 1984). Menard (1995) states "A tolerance of less than 0.20 is cause for concern; a tolerance of less than 0.10 almost certainly indicates a serious collinearity problem." Since VIF is the inverse of tolerance a tolerance of 0.20 corresponds to the rule of 5 and a tolerance of 0.10 to the rule of 10. Neter et al. (1989) state "A maximum VIF value in excess of 10 is often taken as an indication that multi-collinearity may be unduly influencing the least square estimates". For high values of VIF we expect low values of TOL.

Furthermore, Condition Index (CI) is another statistic that should be examined in multiple regression output. It belongs to the collinearity diagnostics. It is calculated as the square root of the ratio of each eigenvalue to the smallest eigenvalue of variables as presented in formula (12). CI is a measure of collinearity between combinations of variables in the data. It represents the relative size of the eigenvalues of the matrix.

According to Belsley et al. (1980) and Douglass et al. (2003), CI is a measure of severity of multicollinearity associated with *j* th eigenvalues; the CIs of a correlation matrix are the square-roots of the ratios of the largest eigenvalue divided by the one in focus; all CI values equal or larger than 30 are critical whereas values between 10 and 30 indicate weak multicollinearity (Belsley, 1991). High CI values indicate dependence among the variables because if λ_i is close to zero, and since the determinant of the correlation matrix is the product of the eigenvalues, the determinant of this matrix will also be near zero indicating multicollinearity (Dias et al. 2011).

$$CI = ({}^{\lambda_{max}}/_{\lambda_i})\,{}^\wedge{}^{1}/_{2} \quad (12)$$

where:

λ_{max} is the largest eigenvalue

λ_i Is the i^{th} eigenvalue of the correlation matrix

The interpretation of CI is accompanied by the variance proposition concerning regression coefficients. Variance proportion gives more specific information on the eigenvectors' contribution to collinearity (Belsley et al.1980; Brauner and Shacham 1998). High variance proportion of two or more regression coefficients associated with a high condition index indicates which variables are potentially involved in the multicollinearity (Vatcheva, 2016). A problem of multicollinearity is reported when a condition index exceeds the threshold value and simultaneously accounts for a substantial proportion of variance, usually greater than 0.90, for two or more coefficients.

Paul (2014) in his article 'Multicollinearity: Causes, Effects and Remedies' refers to a list of consequences that multicollinearity can bring:

- With given that predictors are perfectly correlated with a pure linear relationship, the condition of exact multicollinearity, exists and the least-squares estimator is not defined. Estimation of coefficients and standard errors is not possible.
- For variables that are highly related to one another (but not perfectly related), the Ordinary Least Squares estimators have large variances and covariances. Thus, the precise estimation of them is problematic.
- Confidence intervals tend to be inaccurate (e.g. much higher) leading to the acceptance of the null hypothesis more readily, due to the relatively large standard error. The standard error is based, in part, on the correlation between the variables in the model.

- Although the t ratio of one or more of the coefficients is more likely to be insignificant with multicollinearity. The value of R^2 can be relatively high.
- The OLS estimators and their standard errors can be sensitive to small changes in the data., resulting in no robust results.

3.2.3 Homoscedasticity

Homoscedasticity indicates that the variance of regression residuals is constant. In other words, homogeneity of variance exists and the interpretation of the model will be accurate. In essence, homogeneity of variance refers to the assumption that, within the population, the variance of the dependent variable for each value of the exploratory variable is constant. Homoscedasticity suggests that the variance concerning the regression line is the same (constant, equal) for all values with regard to predictor variables. The most common, test to detect phenomena of heteroscedasticity is White's test. Berenson (2013) as well as Wasserstein and Lazar (2016) argue that in White test a second regression is implemented with the squared residuals from the initial linear regression analysis used as the dependent variable. In such second regression, the independent variables consist of the initial predictor variables along with their squares and their cross-products. Berenson (2013) argues that such test is implemented in four steps.

Step 1

An initial regression analysis takes place. The same equation is used to receive the residuals e_i.

$$\widehat{Y_i} = b_o + b_1 * x_{1i} \tag{13}$$

$e_i = Y_i - \widehat{Y_i}$, residuals for each of the n observations (14)

Step 2

Implementation of the secondary linear regression with the squared residuals e^2i as the dependent variable and the initial predictor variable and its square as the two independent variables.

$$\widehat{e_i^2} = b'_o + b'_1 * X_i + b'_2 * X_i^2 \tag{15}$$

where $\widehat{e_i^2}$ are squared residuals

Step 3

The White test statistic nr^2 is obtained from the second regression analysis, thus the "unadjusted" coefficient of multiple determination. Within the context of White test, the null hypothesis assumes that nr^2 follows a χ^2 distribution with 2 degrees of freedom reflecting the number of the independent variables in the secondary regression equation.

Step 4

Given a level of significance a, if the White test statistic nr^2 is less than or equal to the χ^2 critical value with two degrees of freedom then there is no evidence of a violation in the equal variance assumption. If the White test statistic nr^2 is greater than the $\chi 2$ critical value with 2 degrees of freedom then the null hypothesis is rejected and the key equality of variance assumption in the regression analysis is deemed violated (misspecified model).

To sum up, when heteroscedasticity is found the ordinary least squares estimators of the slope are not efficient. Consequently, estimates of the variances and standard errors are biased (misleading, misspecified) questioning the validity level of the regression analysis and the accuracy of its predictive power.

4. Results

Two econometric models as a function of multiple linear regression were constructed so as to serve the purpose of this study. When such models are performed the basic logic behind them lies in the following question:

Given a change in an exploratory variable x, how much do we expect the dependent variable y to change by? (ceteris paribus: by keeping all other exploratory variables constant).

For all variables included in both the econometric models descriptive statistics are presented in Table 5.

Table 5. Descriptives statistics for regression variables.

	N	Minimum	Maximum	Mean	Std. Deviation
GDP per capita 2016 (€)	192	12,500	71,500	27,619.27	10,225.21
mat	192	1.60	7.70	4.70	1.6191
qual	192	4.20	8.80	6.67	1.1643
sub	192	1.20	9.8	6.40	2.0431
voice	192	0.37	1.77	1.13	0.2963
regulat	192	0.15	1.98	1.17	0.5148

The mean value for regional GDP per capita within the regions under consideration was 27,619€. Luxemburg has the highest value of regional GDP per capita for the year 2016 (71,500€) whereas Northern Great Plain in Hungary has the lowest value (12,500€).

For mat well-being composite variable, the highest value was reported in Bavaria region in Germany (7.7) while the lowest value was found in both West Macedonia (1.6) and West Greece (1.6) regions in Greece.

For qual well-being composite variable, the highest value was reported in Sweden, and specifically in Upper Norrland region (8.8) whereas its lowest value was found in Lubuskie region in Poland (4.2).

For sub well-being composite variable, the highest value was found in both Northern Jutland (9.8) and Capital (DK, Hovedstaden) (9.8) regions in Denmark while the lowest value was reported in region of Central Greece (Sterea Ellada) (1.2).

For voice Worldwide Governance Indicator, the highest value was reported in Portugal in North region (Norte) (1.77) whereas the lowest value was found in region of Central Hungary (Közép-Magyarország) (0.37).

For regulat WGI, the highest value was reported in Grinigen in Netherlands (1.98) whereas the lowest value was found in region of East Macedonia in Greece (0.15).

The first econometric model was constructed so as to investigate potential effects of wellbeing indicators on regional Gross Domestic Product (GDP) per capita for the year 2016 (dependent variable) among countries that are simultaneously members of EU and OECD.

Initially, 193 regions (NUTS II level) were included in the analysis. Due to lack of statistical data concerning the subjective well-being topic the region Aland (Finland) was excluded from the analysis.

Therefore, 192 regions at a NUTSII level were finally considered for performing the analyses. Three composite variables as defined and calculated by OECD were used in the regression model as predictor variables.

More specifically, material condition (mat), quality of life (qual) and subjective well-being (sub) were included in the analysis so as to modelling potential effects and examine the relationship between the dependent and exploratory variables. Its detailed explanation is presented in the Methodology section of this study.

In the tables and graph below, it is obvious that the data concerning regional Gross Domestic Product per capita for the year 2016 does not follow the normal distribution.

More precisely, skewness coefficient has a value of 1.407 (much greater than 1), while histogram shows the existence of outliers on the right side of the graph. Also, boxplot visualization confirms such conclusion.

The sig. values for both Kolmogorov - Smirnov (K-S) and Shapiro – Wilk tests for normality are less than 0.05 meaning that we reject the null hypothesis that our data follow a specific distribution. Consequently, the data are not normally distributed. Table 6 and Figure 3 and 4 support this finding.

Table 6. Descriptive statistics and relevant tests to check for normality for regional GDP per capita (2016).

			Statistic	Std. Error
GPD per capita 2016	Mean		27619.27	737.941
	95.0% Confidence Interval foe Mean	Lower Bound	26163.71	
		Upper Bound	29084.83	
	5% Trimmed Mean		26769.68	
	Median		25750.00	
	Variance		1.046E8	
	Std. Deviation		10225.212	
	Minimum		12500	
	Maximum		75100	
	Range		62600	
	Interquartile Range		10775	
	Skewness		**1.407**	0.175
	Kurtosis		3.041	0.349

Test of Normality

	Kolmogorov - Smirnov			Shapiro – Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.

GPD per capita 2016	0.103	192	**0.000**	0.906	192	**0.000**

Figure 3. Histogram of values for GDP per capita (2016).

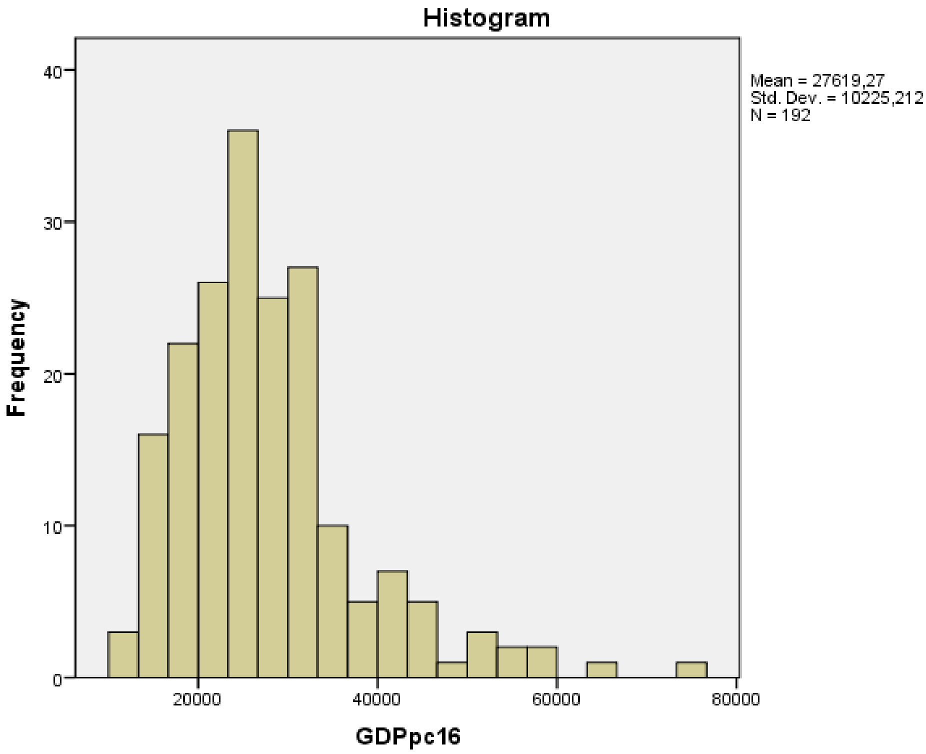
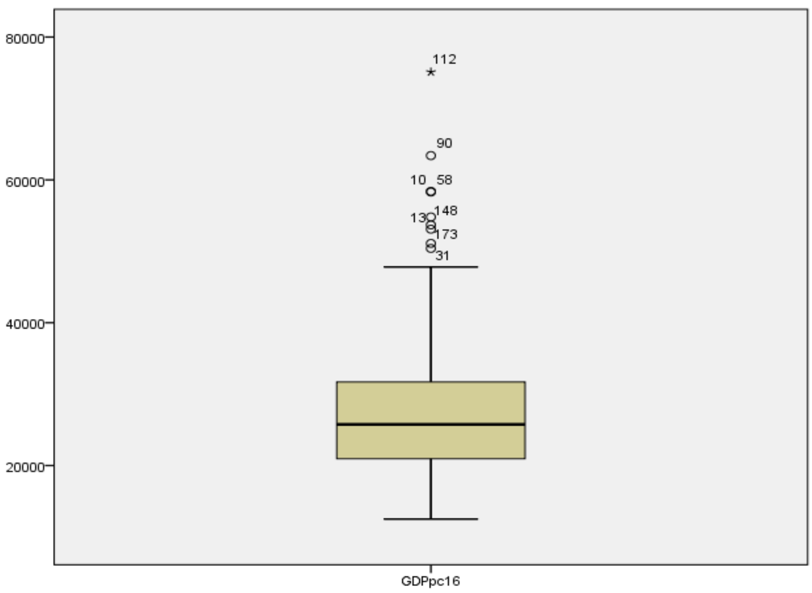


Figure 4. Boxplot concerning values of GDP per capita 2016.



In view of meeting the assumption of normality concerning the dependent variable, a mathematical transformation was applied and the dependent variable took the form of its natural logarithm.

After the transformation the dependent variable ln_GDPpc found to be normally distributed. Furthermore, by examining the relevant boxplot no extreme outliers seem to exist. The results show that the values of the dependent variable ln_pcGDP16 are normally distributed with a skewness coefficient of 0.237. Also, Kolmogorov – Smirnov test for normality gave a sig. value of 0.200 whereas Shapiro – Wilk test gave a sig. value of 0.190. For both tests for normality we do not reject the null hypothesis that the data follow a specific distribution. Thus, the data under consideration are normally distributed as we can conclude from Table 7 and Figure 5.

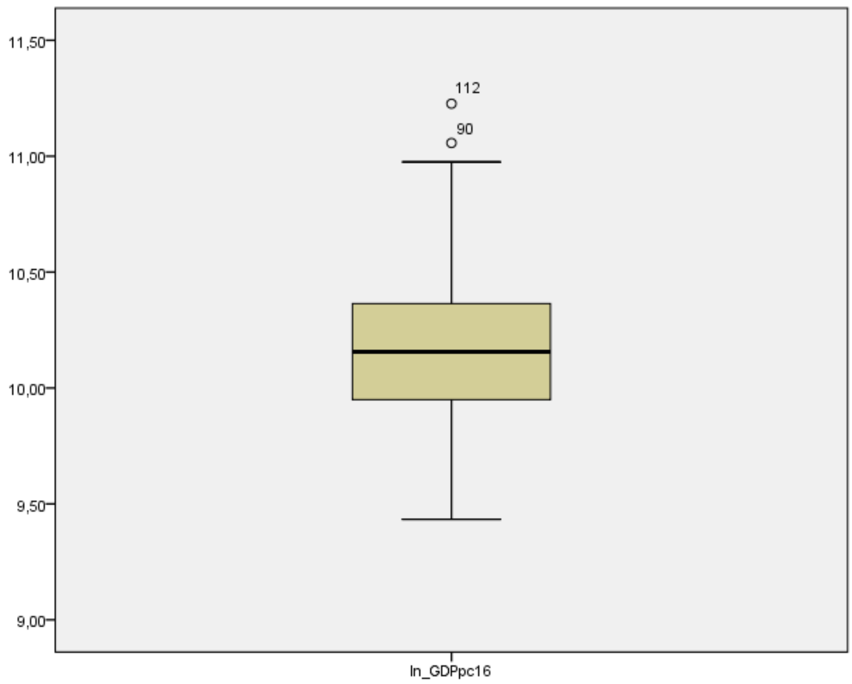
Table 7. Descriptives and relevant tests to check for normality for ln_GDP per capita values (2016).

			Statistic	**Std. Error**
ln_GDP per capita 2016	**Mean**		10.1656	0.02486
	95.0% Confidence Interval foe Mean	**Lower Bound**	10.1166	
		Upper Bound	10.2147	
	5% Trimmed Mean		10.1587	
	Median		10.1562	
	Variance		0.119	
	Std. Deviation		0.34488	
	Minimum		9.43	
	Maximum		11.23	
	Range		1.79	

	Interquartile Range		0.42	
	Skewness		**0.237**	0.175
	Kurtosis		0.091	0.349

Test of Normality						
	Kolmogorov - Smirnov			**Shapiro – Wilk**		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
ln_GDP per capita 2016	0.045	192	**0.200**	0.990	192	**0.190**

Figure 5. Boxplot for ln_GDP per capita (2016) values.



As far as the correlation matrix is concerned (Table 8), the larger the absolute value of Pearson correlation coefficient r, the stronger the relationship between the variables. The sign of the coefficient indicates the direction of the relationship. More substantially, the correlation matrix allows for determining which pairs of regressors require further investigation for potential phenomena of collinearity. Pearson correlation coefficient r indicates how well the data fit the regression model line (best fit).

Correlation coefficients whose magnitude is between 0.5 and 0.7 indicate variables which can be considered moderately correlated whereas lager values (greater than 0.7) indicate variables that are strongly correlated. The statistical significance of the correlation is indicated by a probability value less than 0.05 meaning that the probability to obtain the correlation coefficient by chance is less than 5%. In essence, the results with the given significance level indicate the presence of a relationship that is statistically significant (confidence interval 95%).

Judging from the correlation matrix the predictors are moderate to strongly (marginally) related to each other suggesting an adequate level of independence among them. Specifically, the results indicate that there is a positive moderate relationship between the predictors. All r values are below 0.8 suggesting that no disruptive or 'troublemaking' multicollinearity occurs and the model can be furtherly interpreted.

Moreover, the correlation between the variables under consideration is significant since p values are lower than 0.05 meaning that the correlation coefficients are significantly different from zero. The sign of each coefficient denotes the direction of the correlation. All correlations are positive. Thus, they change in the same direction. To be more specific, mat and qual are correlated at a marginally high level (0.737) whereas mat and sub are moderately correlated (0.682). Also, qual and sub are marginally highly correlated (0.708). All correlations are statistically significant at a 95% confidence interval ($p<0.05$).

Table 8. Correlation matrix for the first econometric model.

Correlations					
		ln_GDPpc	**mat**	**qual**	**sub**
Pearson Correlation	**ln_GDPpc**	1.000	0.751	0.649	0.604
	mat	0.751	1.000	0.737	0.682
	qual	0.649	0.737	1.000	0.708
	sub	0.604	0.682	0.708	1.000
Sig. (1-tailed)	**ln_GDPpc**	.	0.000	0.000	0.000
	mat	0.000	.	0.000	0.000

	qual	0.000	0.000	.	0.000
	sub	0.000	0.000	0.000	.
N	**ln_GDPpc**	192	192	192	192
	mat	192	192	192	192
	qual	192	192	192	192
	sub	192	192	192	192

An equation with F (3,188) = 90.071, $p < 0.05$, and an R^2 of 0.59 was found, meaning that 59% of the variance of the dependent variable (ln_GDPpc) is explained by the regressor variables (predictors) included in the model. The value of such strength of relationship among the natural logarithm (ln) of GDPpc and the three predictors is acceptable, meaning that the model fits the data well at a considerable and significant level (goodness-of-fit). Analysis of Variance table (ANOVA) shows that at least one of the regression coefficients is significantly different from zero. The value of R^2 is considered high. Such evidence is presented in Table 9.

Table 9. Model summary and ANOVA results for the first econometric model.

Model Summary					
R	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**		
0.768	0.590	0.583	0.22240		
Change Statistics					
R Square Change	**F Change**	**df1**	**df2**	**Sig. F Change**	**Durbin - Watson**
0.59	90.071	3	188	0.000	1.592
ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**

Regression	13.366	3	4.455	90.071	0.000
Residual	9.299	188	0.049		
Total	22.665	191			

The p value for each predictor tests the null hypothesis that the regression coefficient equals zero (Table 10). When p values are lower than 0.05 the null hypothesis is rejected. Thus, regression coefficients are different from zero and consequently statistically significant. In the regression model we keep for further interpretation all predictors that have p values lower than 0.05 (for confidence interval 95%). If a predictor has a p value greater that 0.05 this might be considered significant for a 90% confidence interval. Based on the results above, mat and qual, are statistically significant ($p<0.05$) whereas sub predictor is not even at a 90% confidence interval. Signs for all predictors are in the expected direction (positive). Tolerance (TOL) and Variance Inflation Factor (VIF) are indicators of multicollinearity (Table 10). Higher levels of TOL indicate absence or low levels of multicollinearity. Such levels of multicollinearity do not affect the accuracy or the significance of the constructed econometric model. A value of 0.10 is recommended as the minimum level of tolerance (Tabachnick and Fidell, 2001) whereas Menard (1995) suggests 0.2 as the minimum value. In addition, Huber and Stephens (1993) suggest 0.25 as the minimum acceptable value for TOL. VIF is also an indicator of multicollinearity. It is defined as the reciprocal of TOL (1/VIF). A value of 10 has been recommended as the maximum level of VIF (Hair et al 1995; Kennedy 1992). Notwithstanding, Rogerson (2001) suggests a maximum value of 0.5 whereas Pan and Jackson (2008) recommend a maximum value of 4.

Table 10. Regression coefficients for the first econometric model.

Coefficients					
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
Constant	9.172	0.099		92.482	0.000

mat	0.119	0.016	0.558	7.609	0.000
qual	0.047	0.022	0.159	2.099	0.037
sub	0.019	0.012	0.111	1.581	**0.116**

95.0 % Coefficient Interval for B		**Collinearity Statistics**	
Lower Bound	**Upper Bound**	**Tolerance**	**VIF**
8.977	9.368		
0.088	0.149	0.406	2.464
0.003	0.092	0.378	2.646
-0.005	0.042	0.443	2.259

Furthermore, Condition Index (CI) was calculated since high CI values indicate dependence among the variables (Table 11). Values of CI lower than 15 indicate weak multicollinearity whereas values greater than 15 and lower than 30 (15<VIF<30) indicate a moderate level of multicollinearity.

Values of CI greater than 30 indicate strong multicollinearity which in turn might lead to misleading conclusions. Also, a collinearity problem is indicated when a high value of CI accounts for a substantial proportion of variance (greater than 90%) for two or more coefficients.

Consequently, Collinearity Diagnostics confirm that the level of multicollinearity is within an acceptable range of values. Judging from all of the above we can find no support for the existence of serious multicollinearity in the regression results just as indicated by the TOL, VIF, CI and Variance Proportion values.

Table 11. Collinearity diagnostics for the first econometric model.

Collinearity Diagnostics						
Dimension	**Eigenvalue**	**Condition Index**	**Variance Proportions**			
			(Constant)	**mat**	**qual**	**sub**
1	3.900	1.000	0.00	0.00	0.00	0.00

2	0.061	8.026	0.22	0.22	0.01	0.09
3	0.031	11.200	0.01	0.55	0.00	0.77
4	0.008	22.251	0.77	0.23	0.99	0.13

One of the basic assumptions that should be tested in multiple linear regression is the presence of homoscedasticity which means that regression residuals must have a constant variance (same variance, equal variability). In essence, if homoscedasticity is present, the error term is the same across all values of the predictor variables. When this assumption is violated (heteroscedasticity) then the calculation of the standard errors is unreliable which in turn leads to unreliable conclusions concerning the significance of the regression coefficients. From the Figures below (Figs. 6,7), it is visually judged that the values of regression standardized residuals are not normally distributed due to the existence of outliers on the right side. Such evidence shows lack of homoscedasticity which in turns does not allow for achieving dependable results and damages the robustness of the constructed model.

Figure 6. Histogram of regression standardized residuals for the first econometric model and ln_GDP per capita (2016) dependent variable.

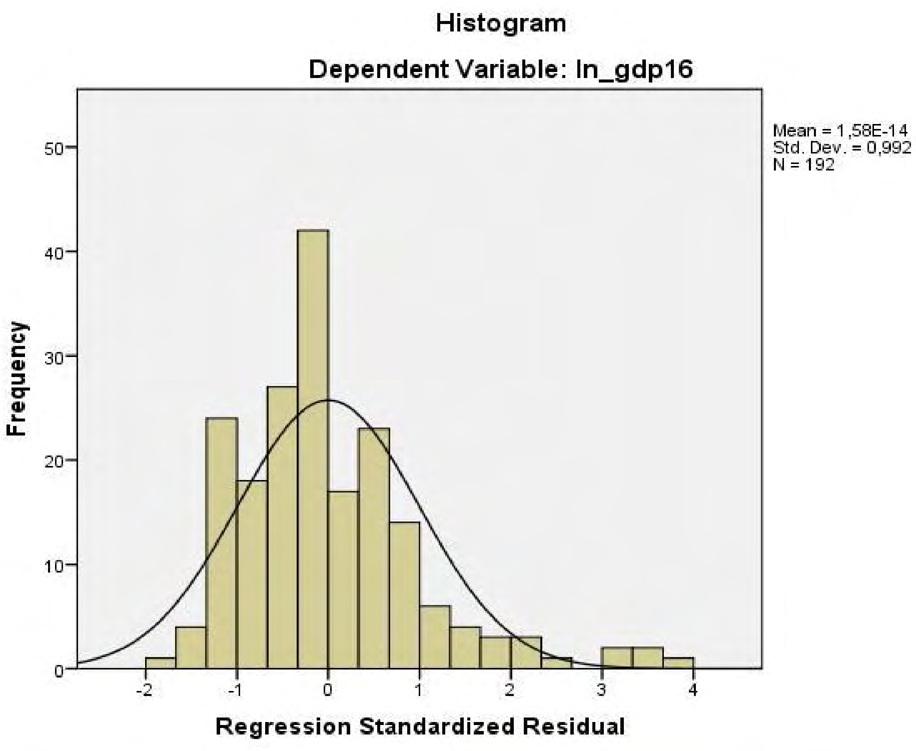
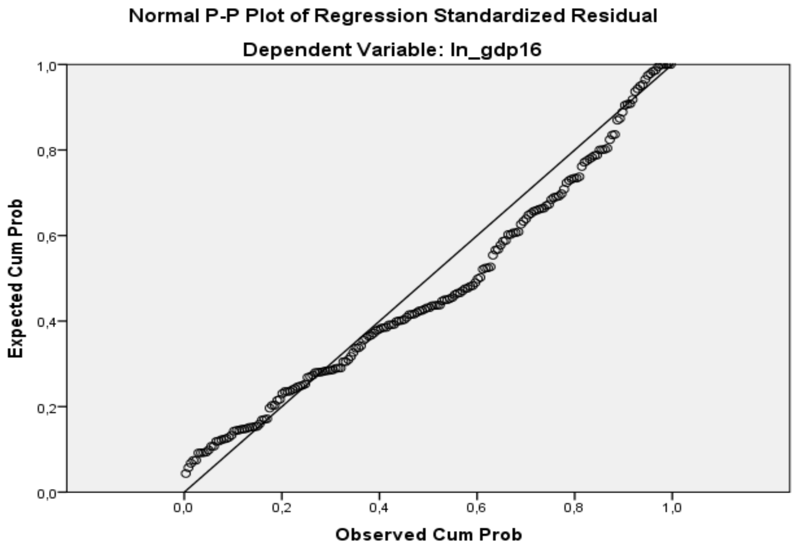
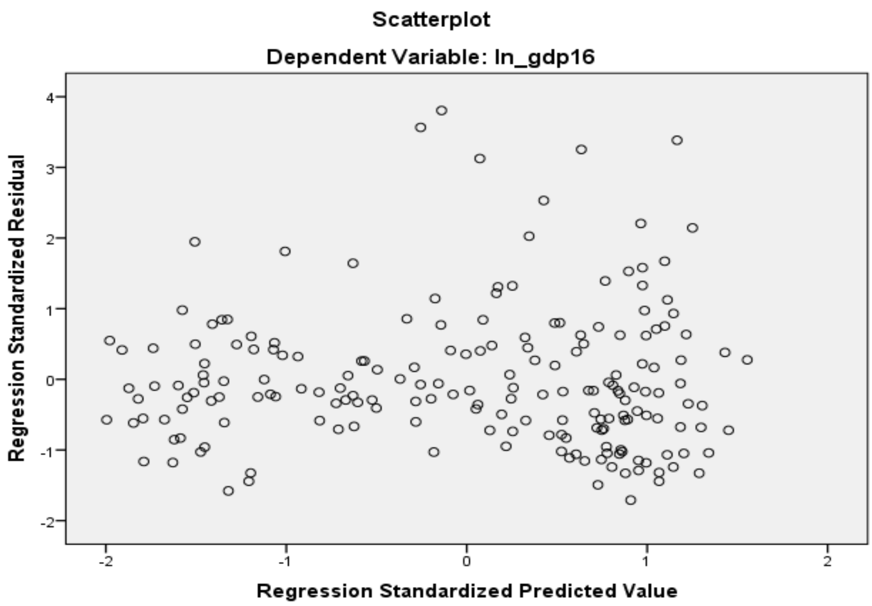


Figure 7. Normal probability plot for ln_GDP per capita (2016) dependent variable.



Furthermore, the scatterplot concerning regression standardized residual does not show in a clear and dependable manner that the assumption of homoscedasticity is met (homogeneity of variance). (Fig. 8)

Figure 8. Scatterplot for regression standardized predicted value for ln_GDP per capita (2016) dependent variable.



As a result, the assumption of homoscedasticity is violated and corrective action should be taken. Otherwise, the model will not perform well and misleading conclusions will be drawn. After applying the White test for detecting and correcting the model (removing heteroscedasticity) we received the following results. All regression coefficients remain the same (Table 12).

Table 12. Regression results having applied White test for removing heteroscedasticity.

	B	**SE**	**WHITE_SE**	**WT_VAL**	**SIG_WT**
Constant	9.172	0.099	0.095	96.466	0.000*
mat	0.119	0.016	0.013	9.001	0.000*
qual	0.047	0.022	0.023	2.093	0.038*
sub	0.019	0.012	0.010	1.783	**0.076****
* Significant at a 95% Confidence Interval **Significant at a 90% Confidence Interval					

Accordingly, the regression equation takes the following from:

$$ln\_pcGDP16 = 9.172 + 0.119 * mat + 0.047 * qual + 0.019 * sub \quad (16)$$

In the new regression equation, predictor variable sub becomes statistically significant at a 90% confidence interval, and can now be included in the interpretation analysis. After removing heteroscedasticity, the sig. value for such predictor has an acceptable value. Furthermore, the values of student statistics t can now be considered as true and standard errors have been corrected by applying the White algorithm in the data analysis. Since we have transformed the dependent variable, as a function of its natural logarithm, a backwards transformation for interpretation reasons should take place. Technically, the interpretation of the regression coefficient estimate results of the log-level model is based on the following equation (17):

$$\%\Delta y = 100 * (e^{\beta 1} - 1) \quad (17)$$

where:

- y, is the dependent variable (not in its transformed form),
- β_1, is the regression coefficient for the first variable of the regression model under consideration.

In general terms, the interpretation of the equation (17) indicates that if we change predictor x by one unit, we would expect (predict) our dependent variable y to change by 100*β1 percent (%), ceteris paribus. In the present research, and accordingly to the general mathematical form presented above, the interpretation of the regression coefficient estimate results is as follows:

- For predictor mat:

  $$\%\Delta pcGDP16 = 100 * (e^{0.119} - 1). \quad (18)$$

  Thus, if we increase mat by one unit we expect (predict) regional GDPpc to increase by 12.63% by keeping all other predictors constant.
- For predictor qual:

  $$\%\Delta pcGDP16 = 100 * (e^{0.049} - 1). \quad (19)$$

  Accordingly, if we increase qual by one unit we expect regional GDPpc to increase by 4.9% by keeping all other predictors constant.
- For predictor sub:

  $$\%\Delta pcGDP16 = 100 * (e^{0.019} - 1). \quad (20)$$

  Within the same mathematical logic, if we increase sub by one unit we expect regional GDPpc to increase by 1.9% by keeping all other predictors constant.

Based on its scale measurement all three predictors can take values between [0,10]. All regression coefficients are statistically significant (p value<0.05) and have the expected signs (positive). We can conclude that our model is robust.

The second econometric model was constructed so as to investigate potential effects of two Worldwide Governance Indicators (WGI) on regional Gross Domestic Product (GDP) per capita for the year 2016 (dependent variable) among countries that are simultaneously members of EU and OECD. More specifically, two indicators were used as predictor variables:

- Voice and Accountability (voice): reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
- Regulatory Quality (regulat): reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

  The Voice and Accountability predictor is correlated with the Government Effectiveness as strong as the Pearson coefficient r indicates, viz 0.778. It would be wise to mention that further consideration is required so as to safely draw conclusions concerning phenomena of multicollinearity. All correlations are statistically significant at a 95% confidence interval ($p<0.05$) (Table 13).

Table 13. Correlation matrix for the second econometric model.

Correlations				
		ln_GDPpc	**ln_voice**	**ln_regulat**
Pearson Correlation	**ln_GDPpc**	1.000	0.567	0.544
	ln_voice	0.567	1.000	0.698
	ln_regulat	0.544	0.698	1.000
Sig. (1-tailed)	**ln_GDPpc**	-	0.000	0.000
	ln_voice	0.000	-	0.000
	ln_regulat	0.000	0.000	-
N	**ln_GDPpc**	192	192	192
	ln_voice	192	192	192
	ln_regulat	192	192	192

An equation with $F (3,188) = 54.071$, $p <0.05$, and an R^2 of 0.36 was found, meaning that 36% of the variance of the dependent variable (ln_GPDpc16) is explained by the predictors included in the model. Analysis of Variance table (ANOVA) shows that at least one of the regression coefficients is significantly different from zero. Table 14 confirms such findings.

Table 14. Model Summary for the second econometric model.

Model Summary			
R	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
0.603	0.364	0.357	0.27618

Change Statistics					
R Square Change	**F Change**	**df1**	**df2**	**Sig. F Change**	**Durbin - Watson**
0.364	54.071	2	189	0.000	1.320

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Regression	8.249	2	4.124	54.071	0.000
Residual	14.416	189	0.076		
Total	22.665	191			

No multicollinearity exists since values of TOL (0.513) and VIF (1.948) are within the acceptable range of values. The same assumption can be made concerning CI and Variance Proportion Values. Both CI values are less than 15 whereas none of each CI is associated with more than two coefficients the variance of which is greater than 0.90 (Table 15).

Table 15. Regression results for the second econometric model.

Coefficients					
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
Constant	10.131	0.021		482.606	0.000
ln_voice	0.402	0.089	0.365	4.507	0.000
ln_regulat	0.159	0.044	0.289	3.571	0.000

95.0 % Coefficient Interval for B		Collinearity Statistics	
Lower Bound	**Upper Bound**	**Tolerance**	**VIF**

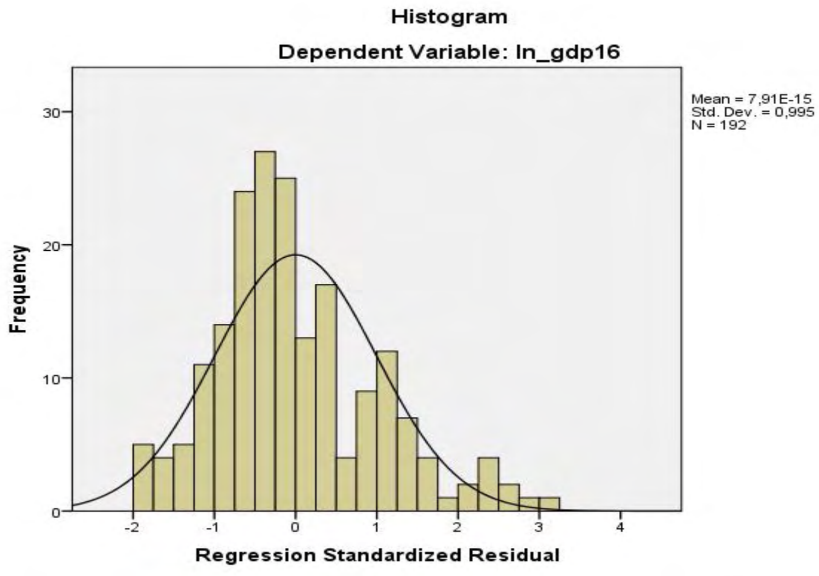
10.090	10.172		
0.226	0.578	0.513	1.948
0.071	0.246	0.513	1.948

Collinearity Diagnostics

			Variance Proportion		
	Eigenvalue	**Condition Index**	**Constant**	**ln_voice**	**ln_regulat**
1	1.735	1.000	0.04	0.14	0.13
2	0.983	1.329	0.81	0.00	0.06
3	0.283	2.478	0.15	0.86	0.81

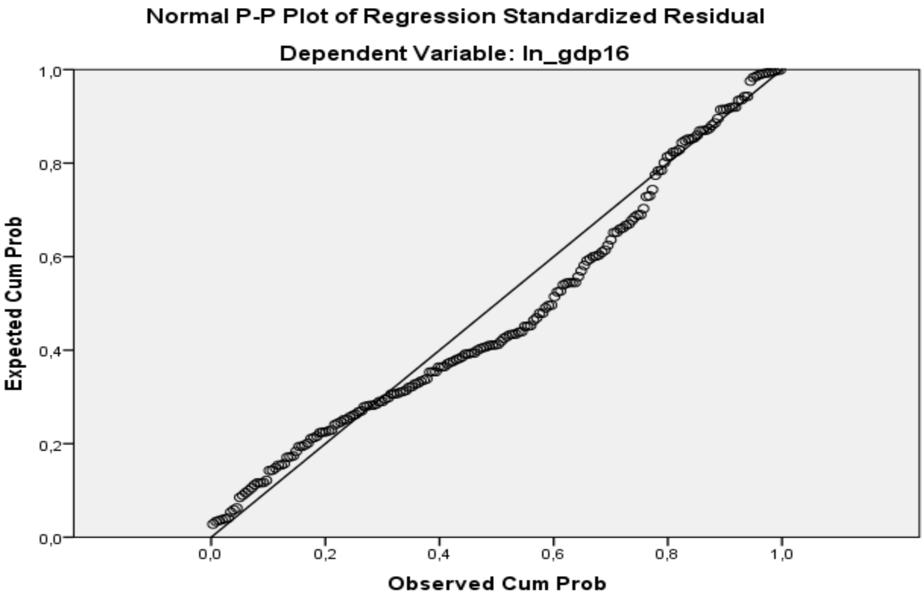
From the histogram below (Fig. 9), it is visually judged that the values of regression standardized residuals are not normally distributed due to the existence of outliers on the right side. Such evidence shows lack of homoscedasticity which in turns does not allow for achieving dependable results and damages the robustness of the constructed model.

Figure 9. Histogram for ln_GDPpc values (second econometric model).



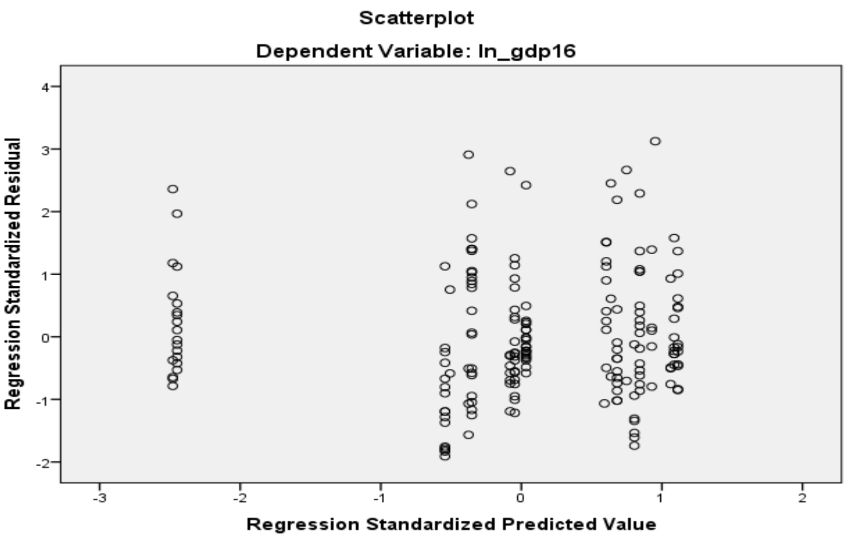
Normal probability plot (Fig. 10) shows in a graphical manner if the values of a variable, in our case regression standardized residuals, fit a normal distribution. By examining the relevant plot, we conclude that regression standardized residuals are not normally distributed.

Figure 10. Normal probability plot for regression standardised residuals for ln_GDPpc values (second econometric model).



Furthermore, the scatterplot concerning regression standardized residual is not always adequate to assume homoscedasticity (homogeneity of variance) (Fig. 11).

Figure 11. Scatterplot concerning regression standardized residual for second econometric model.



After applying the White test for detecting and correcting the model (removing heteroscedasticity) we received the following results. All regression coefficients remain the same (Table 16).

Table 16. Regression results after applying White test for the second econometric model.

	B	SE	WHITE_SE	WT_VAL	SIG_WT
Constant	10.131	0.21	0.021	476.765	0.000
ln_voice	0.402	0.089	0.100	4.025	0.000
ln_regulat	0.159	0.044	0.041	3.883	0.000

Technically, the interpretation of the regression coefficient estimate results of the log-log model is based on the following equation:

$$\%\Delta y = \beta_1 \%\Delta x \quad (21)$$

According to the equation if we change predictor variable x by one percent, we would expect dependent variable y to change by $\beta 1$ percent. Consequently, the interpretation of the regression coefficient estimate results is as follows:

- For predictor ln_voice:

  $$\%\Delta pcdGDP = \beta_1 \%\Delta voice \quad (22)$$

  If voice is increased by one percent, we expect pc GDP to increase by 0,4%, ceteris paribus.
- For predictor ln_regulat:

  $$\%\Delta pcdGDP = \beta_2 \%\Delta regulat \quad (23)$$

  If regulat is increased by one percent, we expect pc GDP to increase by 0.16%, ceteris paribus.

Voice and regulat predictors take values within [-2.5, 2.5]. All regression coefficients are statistically significant (p value<0.05) and have the expected signs (positive). We can conclude that the model is robust.

The third econometric model was constructed so as to investigate potential effects of two WGI on mat well-being composite variable for the year 2016 among regions of countries that are simultaneously members of EU and OECD.

In the analysis, the qual well-being variable was also included (OECD, 2016) as an exploratory variable given its context and significance in achieving more interpretable and manageable results. For the third econometric model the dependent variable mat is not severely skewed meaning that its distribution strongly tends to follow the normal distribution. The given distribution of mat dependent variable is not that much different from normal distribution while the size of the sample (192 items) does not allow serious margins for biasing the assumption of normality when performing multiple linear regression.

The skewness coefficient (symmetry of distribution) for the mat dependent variable is -0.386 suggesting that the assumption for normality is met at a considerable degree. Judging from the relevant boxplot no outliers are detected. The negative sign of skewness coefficient indicates that the left tail of the distribution under consideration is longer than the right tail. Table 17 and Figure 19 confirm such evidence.

At this point, it would be vital to mention that if the assumption of normality concerning the dependent variable is not met it does not automatically mean that the regression analysis performed cannot give reliable results.

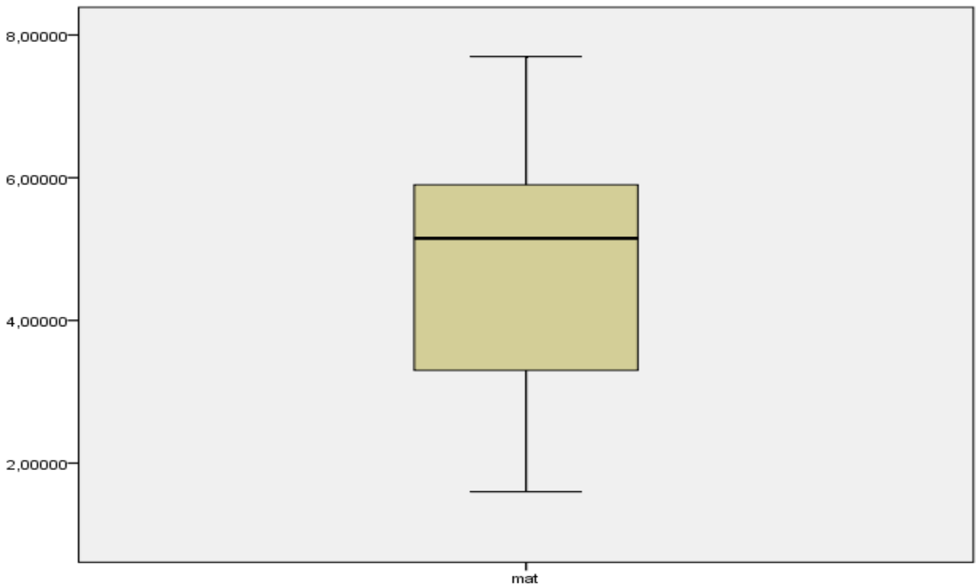
In multiple linear regression analysis, the focus is on the normality nature of the regression residuals and the homogeneity of variance (homoscedasticity) rather than the normal distributed data of the dependent variable.

Table 17. Descriptive for mat composite variable for the third econometric model.

			Statistic	**Std. Error**
mat	**Mean**		4.7098958	0.11684936
	95.0% Confidence Interval foe Mean	**Lower Bound**	4.4794149	
		Upper Bound	4.9403768	
	5% Trimmed Mean		4.735009	
	Median		5.150000	
	Variance		2.622	

	Std. Deviation		1.61911229	
	Minimum		1.60000	
	Maximum		7.70000	
	Range		6.10000	
	Interquartile Range		2.60000	
	Skewness		**-0.386**	0.175
	Kurtosis		-1.012	0.349

Figure 12. Boxplot of mat values for the third econometric model.



It should me mentioned that the transformation of mat dependent variable into its natural logarithm (ln_mat) did not give a corrected skewness coefficient. On the contrary, Table below shows that the transformation gave a skewness coefficient -of 0.880 which is much larger than the value of -0.386. Thus, the following variables were used so as to perform the multiple linear regression analysis:

- Dependent variable:
    - *mat*, indicating a well-being topic by OECD reflecting the material conditions

- Exploratory variables (predictors):
  - *qual* indicating a well-being topic by OECD reflecting the quality of life
  - *voice* reflecting perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
  - *regulat* reflecting perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development

After performing the regression analysis, the interpretation of the correlation matrix shows that ppredictor variable qual is moderately corelated with both voice (0.522) and regulat (0.592). Voice and regulat are corelated as high as the value of 0.734 indicates. All correlations are statistically significant at a 95% confidence interval ($p<0.05$). All variables are positively correlated to each other. It would be wise to mention that further consideration is required so as to safely draw conclusions concerning potential phenomena of multicollinearity (Table 18).

Table 18. Correlation matrix concerning mat, qual, voice, regulat, variables of the third econometric model.

Correlations					
		mat	**qual**	**voice**	**regulat**
Pearson Correlation	**mat**	1.000	0.737	0.695	0.766
	qual	0.737	1.000	0.522	0.592
	voice	0.695	0.522	1.000	0.734
	regulat	0.766	0.592	0.734	1000
Sig. (1-tailed)	**mat**	-	0.000	0.000	0.000
	qual	0.000	-	0.000	0.000
	voice	0.000	0.000	-	0.000
	regulat	0.000	0.000	0.000	-
N	**mat**	192	192	192	192
	qual	192	192	192	192

	voice	192	192	192	192
	regulat	192	192	192	192

An equation with F (3,188) = 169.340, $p < 0.05$, and an R^2 of 0.73 was found, meaning that 73% of the variance of the mat dependent variable is explained by the predictor variables included in the model. The value of such strength of relationship among the dependent variable and the three predictors is acceptable, meaning that the model fits the data well at a considerable and significant level (goodness-of-fit). Analysis of Variance table (ANOVA) shows that at least one of the regression coefficients is significantly different from zero. The value of R^2 is considered high which means that the regression model gives reliable predictions (Table 19).

Table 19. Model summary concerning the third econometric model.

Mosel Summary			
R	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
0.854	0.730	0.726	0.84817036

Model Summary					
Change Statistics					
R Square Change	**F Change**	**df1**	**df2**	**Sig. F Change**	**Durbin - Watson**
0,73	169.340	3	188	0.000	0.657

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Regression	365.465	3	121.822	169.340	0.000
Residual	135.246	188	0.719		
Total	500.711	191			

Based on the results all predictors are statistically significant at a 95% Confidence Interval ($p<0.05$). Signs for all predictors are in the expected direction (positive). Collinearity diagnostics show that predictor variables are independent. The values of TOL are above or close to 0.5, evidence that highlights the absence of multicollinearity. Such fact is largely supported by the values of VIF which are all lower than 2.5.

Condition Index values for the three first dimensions are lower than 15 whereas the fourth dimension has a CI value lower than 20. None of the variance proposition values relevant to the fourth dimension is greater than 0.90.
Judging from all of the above we can find no support for the existence of serious multicollinearity in the regression results just as indicated by the TOL, VIF, CI and Variance Proportion values (Tables 20, 21).

Table 20. Regression coefficient results for the third econometric model.

Coefficients					
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
Constant	-1.732	0.393		-4.407	0.000
qual	0.567	0.066	0.408	8.553	0.000
voice	1.148	0.309	0.210	3.714	0.000
regulat	1.164	0.188	0.370	6.185	0.000

95.0 % Coefficient Interval for B		**Collinearity Statistics**	
Lower Bound	**Upper Bound**	**Tolerance**	**VIF**
-2.507	-0.957		
0.436	0.698	0.632	1.581
0.538	1.757	0.449	2.226
0.793	1.536	0.401	2.494

In view of detecting potential phenomena of heteroscedasticity both Breusch Pagan Godfrey and Koenker tests were performed. The null hypothesis here is that heteroscedasticity is not present (homoscedasticity).

If sig. value is less than 0.05 then the null hypothesis is rejected. In this case, the tests showed a sig value of 0.683 for Breusch Pagan Godfrey test whereas sig. value for Koenker test equals 0.537.

Table 21. Collinearity diagnostics for the third econometric model.

Collinearity Diagnostics						
			Variance Proportions			
Dimension	**Eigenvalue**	**Condition Index**	**(Constant)**	**qual**	**voice**	**regulat**
1	3.875	1.000	0.00	0.00	0.00	0.00
2	0.092	6.487	0.08	0.02	0.00	0.42
3	0.022	13.312	0.03	0.13	0.95	0.30
4	0.011	18.494	0.89	0.86	0.04	0.27

In addition, heteroscedasticity White test was performed receiving a value of sig equals to 0.145. Judging from the above results we do not reject the null hypothesis. Since all p values are greater than 0.005, the assumption of homoscedasticity is not violated and corrective action should not be taken. Such conclusion can be visually confirmed by the following graphs.

Regression standard residuals are normally distributed (Fig. 13) whereas the relevant Normal P-P plot (Fig. 14) discloses that the values of residuals are constantly close enough to the fitted line (regression line) at a considerable level indicating homogeneity of variance (homoscedasticity). The same assumption can be judged by examining the corresponding scatterplot (Fig. 15).

Figure 13. Histogram for regression standardized residuals for the third econometric model.

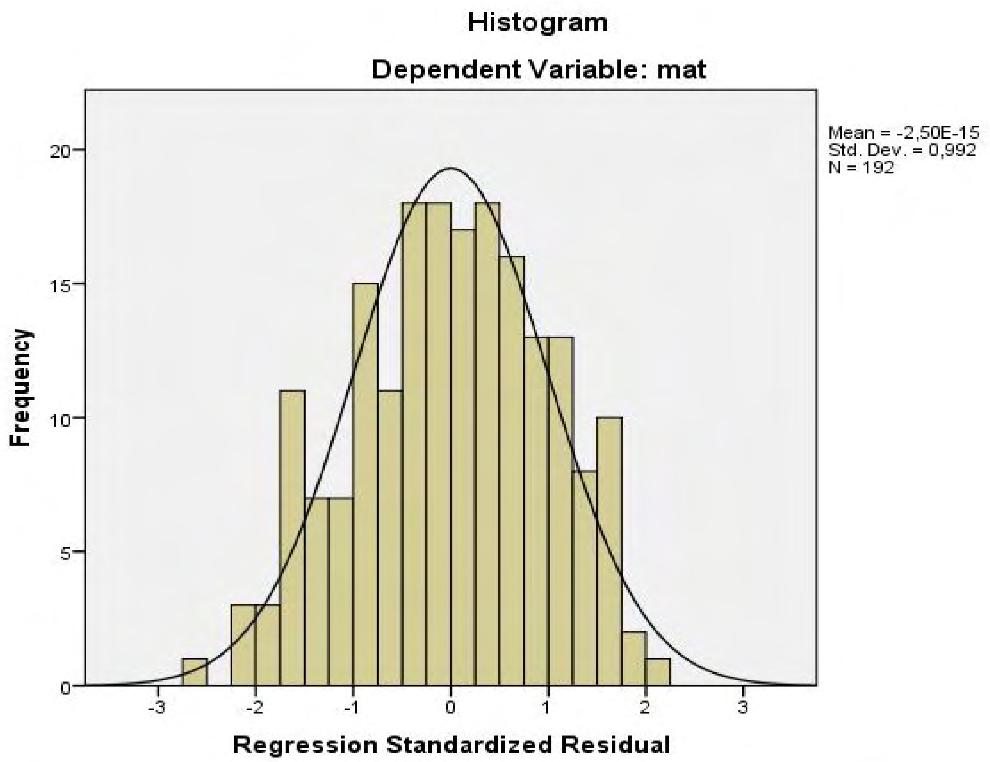


Figure 14. Normal probability plot for the third econometric model.

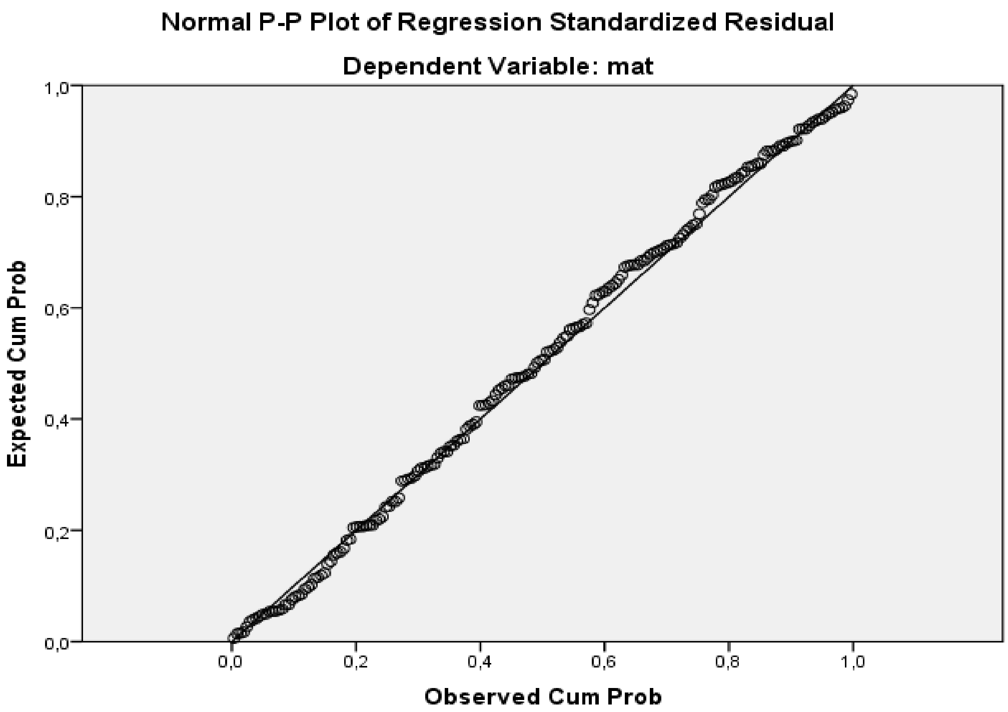
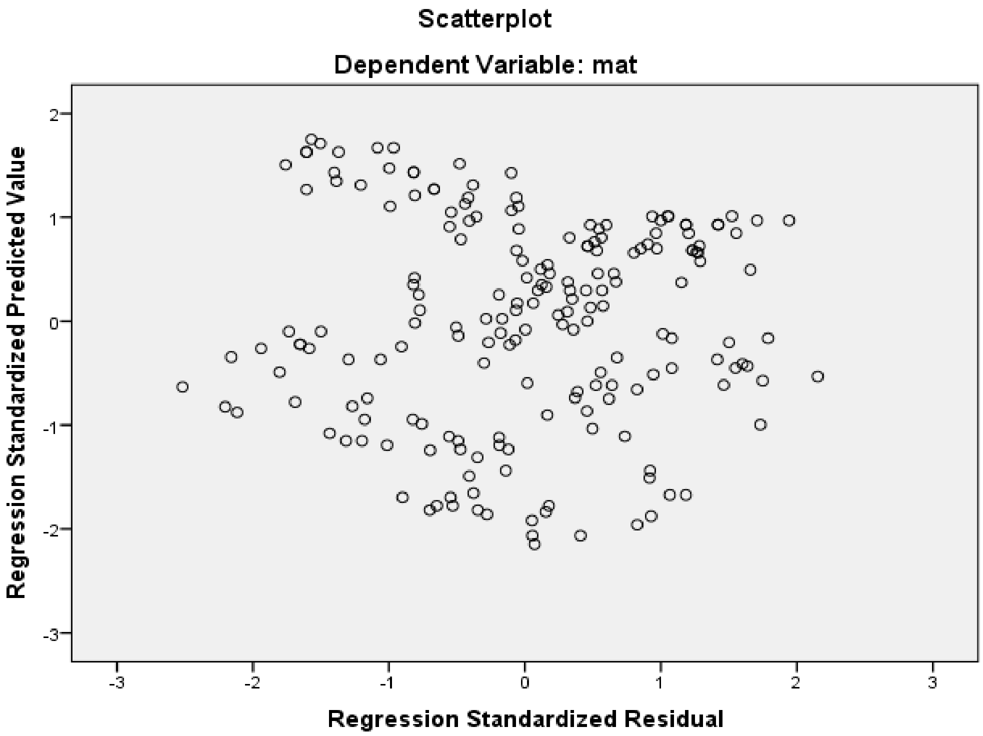


Figure 15. Scatterplot for regression standardized residuals for the third econometric model.



In general terms, the interpretation of the equation indicates that if we change predictor x by one unit, we would expect (predict) our dependent variable y to change by $100\beta_1$ percent (%).

$$\Delta y = \beta_1 * \Delta x \quad (24)$$

where:

- y, is the dependent variable, and
- β_1, is the regression coefficient of the first predictor x in the constructed econometric model.

Technically, the general form of the above equation can be interpreted as follows: If the exploratory variable x change by one (unit), then we would expect (predict) that dependent variable y to change by β_1 units, ceteris paribus. Consequently, the interpretation of the regression coefficient estimate results of the received level-level model is based on the following equation:

$$mat = 0.567 * qual + 1.148 * voice + 1.164 * regulat \quad (25)$$

According to the general mathematical form presented above, the interpretation of the regression coefficient estimate results is as follows:

- For predictor qual:

  $$\Delta mat = 0.567 * qual \tag{26}$$

  If we increase qual by one unit we expect (predict) mat to increase by 0.567 units by keeping all other predictors constant.

- For predictor variable voice:

  $$\Delta mat = 1.148 * voice \tag{27}$$

  Accordingly, if we increase voice by one unit we expect mat to increase by 1.148 units, by keeping all other predictors constant.

- For predictor regulat:

  $$\Delta mat = 1.164 * regulat \tag{28}$$

  Within the same logic, if we increase regulat by one unit we expect mat to increase by 1.164 units by keeping all other predictors constant.

Based on its scale of measurement, voice and stabil predictors can take values between [-2.5,2.5]. Qual predictor variable can take values between [0,1]. All regression coefficients are statistically significant (p value<0.05) and have the expected signs (positive). We can conclude that our model is robust.

5. Discussion

Well-being is a concept which is increasingly involved in research studies with economic oriented goals (development and growth) across regions. It is widely used to describe a situation, state or conditions of wellness which are characterized by multiple, diverse and interrelated dimensions often related to the context of regional economic performance and, more often, investigated in terms of regional GDP per capita. Understandingly, regional GDP per capita is a powerful indicator of economic development within a region which mirrors the economic 'health' (progress or decline, convergence or divergence) of this specific territory (administrative unit).

The present cross-sectional study across 192 regions at a NUTSII level within 192 countries for the year 2016 attempts to shed light on the effect and the relationship between the regional GDP per capita as calculated by Eurostat and the three well-being composite indicators as addressed by the OECD. Such countries are simultaneously members of the EU and the OECD.

Central is the effect of mat predictor on GDP per capita. Results showed that the greater change (increase) in the regional GDP per capita is caused by the mat predictor. For one unit increase in the scale measurement of the composite variable mat which takes values within zero (minimum value) and ten (maximum value), [0-10], GDP per capita will increase by 12,63% (ceteris paribus). Not surprisingly, GDP per capita is one of the most widely used indicators of material living conditions. Hence, such percentage change on GDP per capita is highly affected by and directly connected with material standards of living. The mat (material condition) predictor is composed of three indicators, namely income (household disposable income per capita), jobs (in terms of employment and unemployment) and housing (number of rooms per person). All components of such indicator are associated with monetary values and income created. For instance, employment in terms of job stability, duration, creativity and productivity at work create household disposable income that in turn allows individuals to buy things, consume goods and take advantage of services so as to cover their consumptive habits and patterns and, consequently, fulfil their demands at a considerable level within its daily life.

Interestingly, such indicators give a material dimension to the concept of well-being which in turn seems to positively affect the GDP per capita at a high degree. Mat composite variable has its lowest value (1.6) in Greece in both Regions of West Greece and West Macedonia. More analytically, as far as Region of West Greece is concerned income topic has a value of 1.3, jobs topic has a value of 0.0 and housing topic has a value of 3.3. For Region of West Macedonia income topic has a value of 1.6, jobs topic has a value of 0.0 and housing topic has a value of 3.3.

Based on research finding if we increase mat composite variable thus, fix unemployment issues by establishing a friendly business environment for private sector and take advantage of all region's advantages concerning geographical position, inherent characteristics, GDP per capita will increase at a considerable level from the present value (17,200€). In an effort to delineate the situation in quantitative terms, it can be argued that GDP per capita for both Regions of West Macedonia and West Greece is 62.27% lower than the average value among regions of this study. Figures 16 and 17 depict graphically the presented situation.

Therefore, Regional Smart Specialization Strategy for Western Macedonia should be put in practise (RIS3). The same issues come evident concerning Region of West Greece. Low values of mat composite variable indicate that corrective action should be taken so as to revitalize, reboot, regional and local economy at once. Well-structured regional policies and well-organized development plans must be aligned with the potential and capacity of the Region. Smart and effective exploitation of financial instruments from EU seems to be a good solution to start with.

The GDP per capita (2016) for this Region is 14.300€. It is claimed that cross-sectional analysis at the individual level still confirms a positive relationship between GDP and wellbeing, even if other factors such as health and social support are controlled for in multivariate analysis (Helliwell, 2018). Quite reasonably, positive changes in well-being status reflect positive changes in regional GDP per capita which in turn sets the base to experience greater measures at the level of the economic output relative to the population of the region.

Quality of life concept (qual) seems to be complementary to this argument. More specifically, for one unit increase in the scale measurement of the composite variable qual, [0-10], GDP per capita will increase by 4.7% (ceteris paribus). In the present study, quality of life is composed by several dimensions, namely health, education, environment, safety, civic engagement and accessibility of services.

In essence, positive changes in GDP per capita are supported by the fact that well-educated individuals, for instance, might receive private returns with regard to employment rates, research and development initiatives, high levels of productivity and social benefits. Figure 18 shows how the situation was in 2016 for Region of Thessaly concerning jobs and income topics.

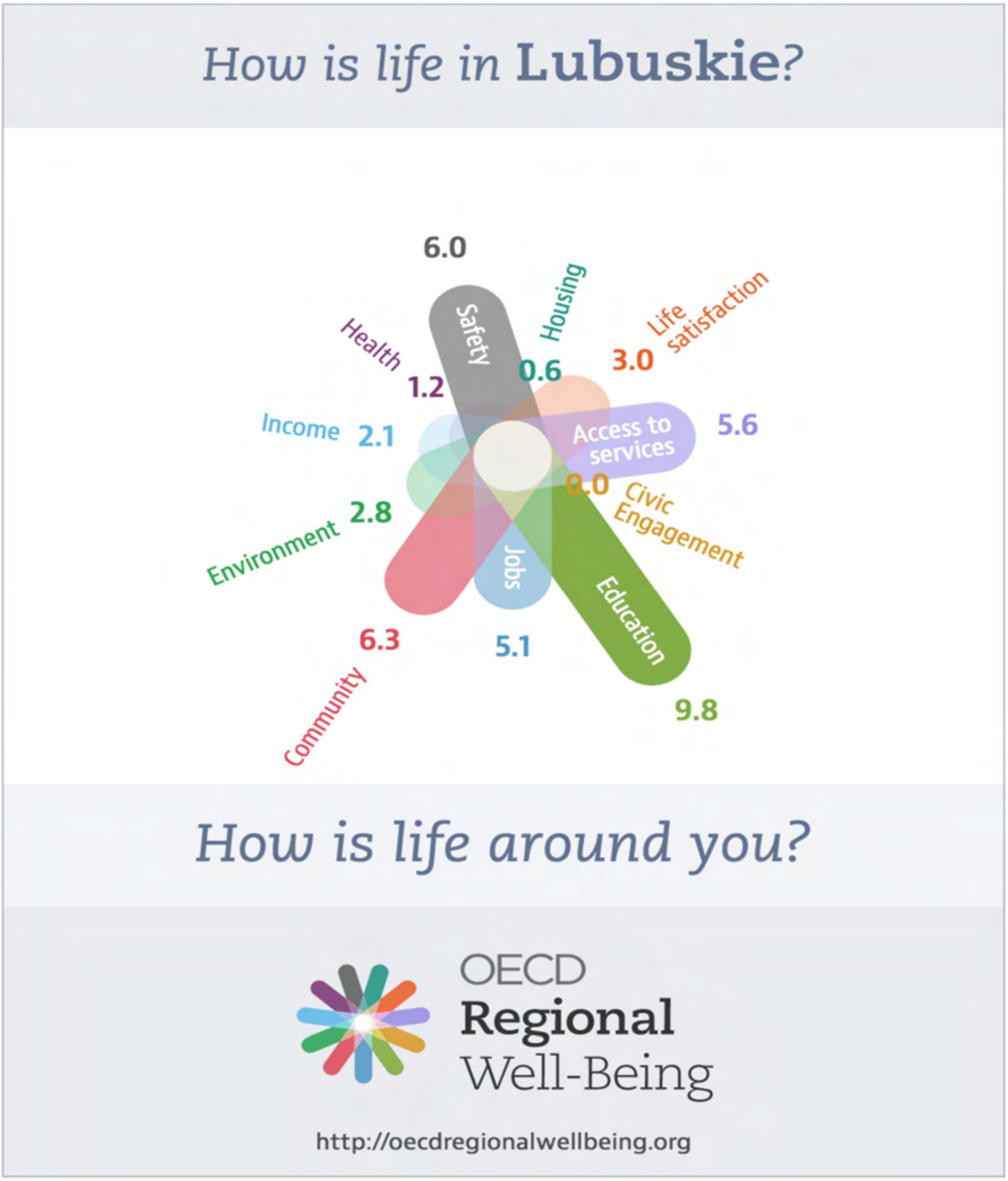
Figure 16. Well-being values for Region of West Greece (Source: OECD,2016).

Figure 17. Well-being values for Region of West Macedonia (Source: OECD,2016).

Figure 18. Jobs and income topics for Region of Thessaly (Source OECD, 2016).

For instance, Region of Lubuskie in Poland has the lower value in qual composite variable (4.2). A better look at the relationship leads to the assumption that basic components of qual variable are at the lower level that could be. Namely, health, and environment topics should be improved. Health has a value of 1.2 (life expectancy and age adjusted mortality rates) whereas environment (air pollution) has a low value too (2.8) (Fig. 19). Both can be considered fundamental dimension for experiencing a better life and produce in a safe and clean environment.

Figure 19. Well-being values for Region of Lubuskie in Poland (Source: OECD,2016).



That said, GDP per capita will evidently be increased given the importance of education in creating better and gaining more. Quality in life means developing in a sustainable and cost-effective manner its fundamental components e.g. environment Green and blue economy, cycling economy and relevant aspects of every economic activity encompass superior level of quality not only within its theoretical background but, also, within its practical implication with respect to the total economic outcome in a given region. Not to mention the significance of physical and mental health in producing and enjoying goods and services due to better health and labour participation. All aspects have to offer in a positive manner so as to produce better and consume smarter by, simultaneously, experiencing the added value to regional economic status.

Supportively, civic engagement in terms of governance, trust in institutions and political stability as well as consultation on rule-making are fundamental elements to achieve superior economic performance in terms of actively participating in determining the regulatory framework and the business environment where organizations and institutions deploy its management and marketing plans. Such participation of citizens in the political process seemed to affect in a positive manner the GDP per capita.

Since environmental quality in terms of biodiversity and geodiversity, contributes to the notion of quality of life, great attention should be paid since rising GDP per capita might have finally adverse effects on regions with a high degree of pollution. Intense industrialization and severe economic activity might damage ecosystem services and benefits received. Environmental changes might have long term devastating effects on citizens and affect in a negative manner the quality of life within a region. Furtherly, quality of life interrelates citizens (individuals that have preferences, make decisions and demonstrate environmental behaviour, are economically active), society (host communities which seek for social integrity and cohesion), ecosystems (supply goods and services, tangible and intangible) and economy (demand forecasts, revenues, return on investment).

Arguably, within a safe, clean, well-functioning and welcoming living environment the value of quality raise awareness of the economic and social impacts associated with development and growth. But, how this can be reflected in terms of subjective well-being? How this can be interpreted in light of interpreting individual well-being as a function of GDP per capita? One might expect that when average income is increased its satisfaction with life or happiness might increase as well. Yet, within this context, when people are being asked about their individual well-being they might find themselves less satisfied.

A wide array of thinking is being brought between GDP per capita and subjective well-being to describe how a region progress in economic terms and how social indicators affect, signal, such relationship. In this perspective, Davies (2014) argues that indicators of social aspects that have a dominant role in determining citizens' well-being are increasingly being used to supplement economic measures whereas subjective evaluations of well-being can also be used as a measure of progress.

Subjective well-being reflects the notion of measuring how people experience and evaluate their lives (OECD, 2016). In addition, it can be argued that subjective well-being is defined as ‘a person’s cognitive and affective evaluations of his or her life’ (Diener et al., 2003). In this perspective, subjective well-being represents a useful measurement for assessing progress and determining levels of satisfaction within the regional and topical socio-economic system.

The results showed that subjective well-being is related in a positive manner with GDP per capita. Interestingly, for one unit increase in the scale measurement of the composite variable sub, [0-10], GDP per capita will increase by 1.9%, ceteris paribus. Subjective well-being is associated with social cohesion and social connectedness which in turn help people to trust organizations and institutions. As a direct consequence, social networks and interpersonal relations will be built resulting in achieving individual well-being and satisfaction within the overall socio-economic system. Consequently, there is emerging evidence of how such measures can lead to longer-term business and economic gains with a positive impact on GDP per capita. Not only subjective good interpersonal relations, social network supports and general trust in others and institutions act as supportive resources of well-being to material and cultural ones but they can also advance institutions’ performance and reduce transaction costs (OECD, 2016). For instance, Region of Central Greece has a value of 1.2 in subjective well-being composite variable. Such variable is composed of community topic with a value of 2.4 and life satisfaction topic which has the absolute minimum value of 0.0 (Fig. 20). In essence, greater rates of GDP per capita will be achieved if individuals feel that all efforts in their lives have a substantial outcome that can be interpreted in terms of satisfaction and fulfillment. Then, will be armed with more desire to produce and willingness to create more in a timely and effective manner.

As mentioned above the notion of well-being encompasses a wide range of social aspects such as good social relations and effective social networks. Such social aspects might widely involve trade-offs with and between others (people, institutions, organizations, communities) which influence well-being status. For instance, geographical mobility is real fact when individuals search for employment, which results in experiencing weak social ties if the worker is removed from a familiar social environment (Davies, 2014). It would be vital to mention that the lowest subjective well-being might be reported by unemployed individuals and thus, 'leakages' or reduced economic activity might be experienced in regions with low employment rates. In essence, higher values of subjective well-being will find GDP per capita to increase.

Given the rapidly expanding field of well-being it is crucial to stay consistent with this notion when developing public policy with a view of improving material conditions and status of living. This is where the second and third econometric models set its importance and contribution to meet the purpose of this study.

More specifically, such models were constructed so as to investigate potential effects of two WGI, coded as voice and regulat, on GDP per capita and mat well-being composite indicator for the year 2016 among regions of countries that are simultaneously members of EU and OECD. In the third econometric model, the qual well-being composite indicator was also included as an exploratory variable given its context and significance in achieving more interpretable and manageable results.

Voice predictor variable reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Regulat predictor variable reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Such indicators relate to material conditions positively and significantly since both increase the level of the dependent variable.

The results showed that for one unit increase in the scale measurement of the composite variable qual [0-10], mat dependent variable will increase by 0.57 units, ceteris paribus. This figure shows in a clear manner that quality of life is directly connected with material conditions at the same direction. For instance, advanced levels of health status, education level and environmental quality form a living environment that enable individuals to work better, produce larger and enjoy greater. The same assumption becomes true if we consider the second model. GDP per capita will increase by 0,40% given a one percent increase in voice predictor (ceteris paribus) whereas increase is expected for GDP per capita (0,16%) for each percent increase concerning regulatory quality (ceteris paribus).

Figure 20. Well-being values for Region of Central Greece (Source: OECD,2016).

Regions with high levels of efficiency and effectiveness concerning their business regulatory framework and their participation in electing those who have clear and specific vision for the future, seem to perform better both, pure economic terms and condition (standards) of living. For instance, Regions in Greece have low values in voice (0.65) and regulat predictors (0.15). If residents' willingness to participate in the formulation of public policies then each habitant might become financially better in terms of GDP.

The same argument is confirmed by research results. If decision makers foster a friendly and attractive environment with a view of catching the interest of entrepreneurs, attracting investments and supporting private initiative then the GDP per capita seems to be positively affected. Thus, inequalities within regions and disparities among regions will be reduced in favour of experiencing a well-being situation for the vast majority of people. Even those who will not manage to track this course will find themselves in a better condition than before but, most importantly, will have great chances to improve their status of living in a timely and effective manner.

It seems that every aspect of quality of life sets the bedrock to experience better conditions of living. Understandingly, material conditions should not only be viewed as a function of tangible things that can be expressed in monetary terms. On the contrary, evidence reported that quality of life influence at a considerable level disposable income for structuring consumptive patterns or housing.

In the same wavelength, such evidence concerning material conditions is supported by the other two predictors, namely voice and regulat. With regards to voice predictor, for one unit increase in the scale measurement of such composite variable, [-2.5, 2.5], mat dependent variable will increase by 1.15 units, ceteris paribus. In the same direction, for one unit increase in the scale measurement of the composite variable [-2.5, 2.5], mat dependent variable will increase by 1.16 units, ceteris paribus. Both results mirror to a large degree the need and necessity to actively participate, substantially contribute and firmly decide about the public policy that best serves common good and advances social cohesion. Such conclusion is highly associated with the ability to objectively judge public policies that have as a central premise regional growth in terms of sustainable development. When a situation as described above will become a reality then it is likely that material conditions will complement all other aspects of well-being in a profitable manner.

Within this framework, regulat predictor shows that when policies are designed to promote in a lawful and dependable manner private sector development then the relevant economic activity will create benefits for regional units. To experience such a situation, policy makers and spatial planners should take under serious consideration unique natural characteristics of each region, socio-economic factors, investment opportunities, current regional economic activity, potential margins for further improvement, education level and demographic factors of population to become effective and efficient, viz bring tangible results.

The above indicators were designed to measure governance performance and draw conclusions that will then be incorporated in structuring thorough and applicable public policies. Governance consists of the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them (World Bank, 2018). By its definition, governance indicators can be incorporated in formulating specific governance reforms in particular country contexts. For instance, regions that have poor governance performance in regulatory quality should shed light on the root cause that allows such situation to exist and even worse continue to develop. Poor governance performance creates negative impacts on material condition among individuals by widening the gap between the reach and the poor within and between regions (disparities and inequalities).

It goes without saying that public policies should facilitate investments and business extrovert character so as to experience growth year by year. If this is not the case, then opportunities of development will become less by simultaneously narrowing the margins for further exploitation of well-educated individuals (brain drain phenomena). Individuals will have less disposable amount of money to spent, unemployment will reach high levels and housing conditions will not become better. Consequently, they should take action against such phenomena by participating to public processes whereas officials should make appropriate reforms and set comprehensive regulatory framework characterized by flexibility and fairness to let entrepreneurs execute their business plans.

The issue behind this argument is that prosperity and good material conditions do not deal with individuals and its own way of thinking and acting. There is an imperative need to combine resources, allocate financial support instruments, and make changes that create big, but not questionable results. Nowadays, severe financial crisis does not leave margins for delays and conflicts. Even for rework. What is needed is a common agreement about developing policy plans that are robust and applicable so as to overcome such momentum and set a solid basis for a prosperous future where monetary aspects will have their price accompanied by its unique value. Then will find regional disparities to gradually be reduced and growth rates will become positive.

Well-being status will come closer for each individual and every region. Attention for further research should be paid since there is strong empirical and ethical arguments for degrowth (Buchs and Koch, 2018). The term is defined as a voluntary, democratically negotiated, equitable downscaling of societies' physical throughput until it reaches a sustainable steady-state (Alexander 2012; Schneider et al., 2010; Latouche, 2010).

6. Conclusions

The present study examined the effects of well-being indicators on economic performance across regions that belong to countries that are simultaneously members of EU and OECD. Also, this study examined the influence of two WGI on material condition indicator for the same regions. As a result, three econometric models were constructed. The first and second econometric model were performed between well-being and WGI (OECD, 2016) and regional GDP per capita (Eurostat). The third econometric model was constructed with two WGI and the quality of life indicator as defined by OECD (2016).

Results showed that all three well-being indicators influence in a positive manner the regional GDP per capita. Material condition composite predictor found to contribute at a considerable degree on the regional GDP per capita. For one unit increase in the scale measurement of the composite variable mat [0-10], GDP per capita will increase by 12,63%.

Significant opportunities to harness regions potential for experiencing better life conditions are emerging from research findings. The models put the well-being conditions at the centre of the agenda indicating that regional well-being in terms of monetary values is highly affected by public policies oriented to create better societies. Policies ought to aim at people's life conditions which in turn will establish a friendly and welcoming environment to deploy economic plans and experience economic activity.

Furthermore, as OECD (2016) points out, more fine-grained measures of well-being will help policy-makers to enhance the design and targeting of policies More specifically, no regions appear to enjoy simultaneously high or low levels of well-being in every dimension. Health outcomes are likely to be influenced by the demographic characteristics of rural and urban populations. Evidence shows that individuals assign great importance to the inequalities they experience in their local living context when assessing their own well-being and forming expectations about returns of education and skills, and fairness and efficiency of service delivery. All these findings, relate to regional GDP per capita since they influence productivity, income levels, employment rates and quality in life and at work. In turn, such influenced value of regional GDP per capita are then considered as a measure of economic performance and economic activity within and between regions, and in a broader context, across countries and nations.

They can also empower citizens to demand placed-based policy actions that respond to their specific expectations and, in turn, to restore people's trust and improve policy results. Such perspective will improve people's life resulting in better performance rates in all aspects of economic theories. Regional GDP per capita is an indicator of economic activity, and should be prepare to make projections on economic performance based on decisions concerning production, investment, and employment planning. Not surprisingly, increased rates on such elements will, in turn, increase the level of material conditions of life. Consequently, will find regional GDP per capita to be increased as well. The same argument is supported by the research findings concerning quality of life and subjective well-being. If we improve all dominating factors and driving forces that make life better (what people value most), regional GDP per capita will increase at the same direction (positive).

It is essential to furtherly search for factors and variables, whether these might be identifiable or less visible, that help to recover and/or improve the mix of well-being indicators form health and environment to household disposable income and high employment rates. Such an effort requires great attention since each region is unique and must act as a 'learning organization' that continually seek improvement and are taught by their mistakes so far. Nevertheless, the study results demonstrate the potential of the multiple linear regression for analysing data and make projections that profoundly enhance our understanding of the role these projections play in motivating and directing spatial planning, investments and public policies. As research findings were analyzed, author worked to make such information relevant at a national level with a view of supporting effective regional planning as well as becoming capable of ensuring that each region has its unique characteristics and starts from different trigger points.

Bearing in mind that today problems come from yesterday's "solutions" and that the harder you push, the harder the system pushes back (Senge, 1994), the present research tried to establish an argument that human-centric well-being aspects is what policy makers should value most. Such an attempt may find helpful the proposed methodology which is based on statistical data derived from valid organizations which have gain a global respect for their work and projections.

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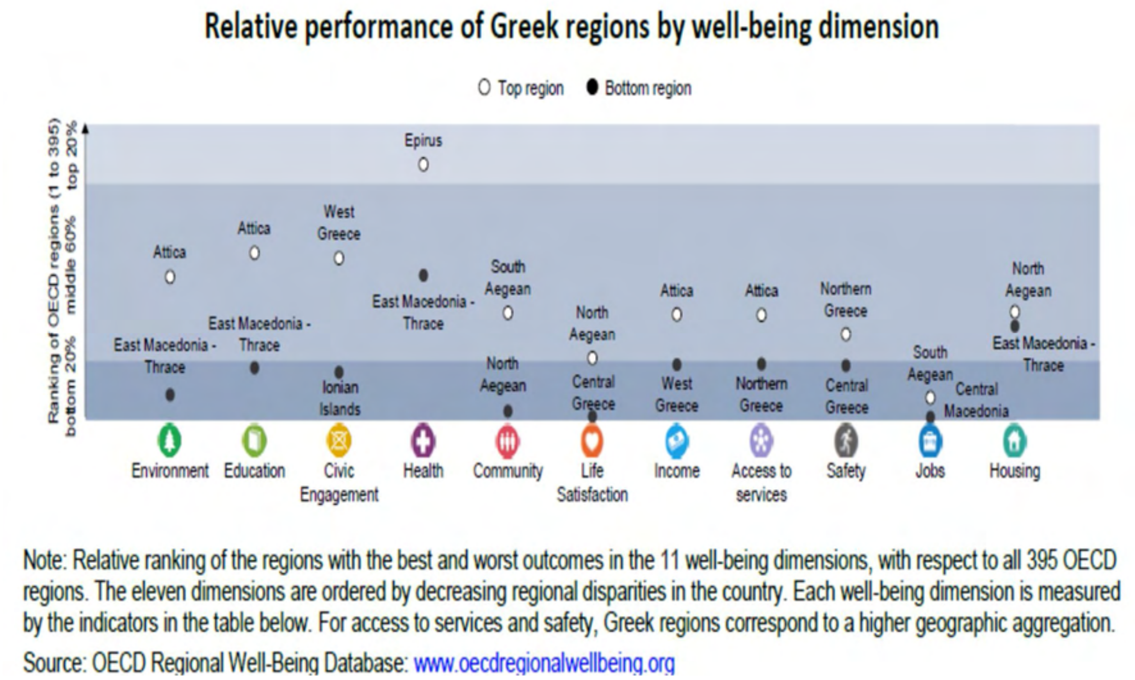
APPENDIX

REGIONAL WELL-BEING IN OECD COUNTRIES: GREECE

The largest regional disparities In Greece are found in environment, with Attica ranking in the middle of the OECD regions and East Macedonia - Thrace in the bottom 10%. Wide regional disparities also exist in education, the 5th largest among OECD countries. Epirus ranks among the top 20% of the OECD regions in health. All thirteen Greek regions are in the bottom 10% of the OECD regional ranking when it comes to jobs.



Note: Relative ranking of the regions with the best and worst outcomes in the 11 well-being dimensions, with respect to all 395 OECD regions. The eleven dimensions are ordered by decreasing regional disparities in the country. Each well-being dimension is measured by the indicators in the table below. For access to services and safety, Greek regions correspond to a higher geographic aggregation.

(Source: OECD Regional Well-Being Database: www.oecdregionalwellbeing.org)

The high performing Greek regions fare better than the OECD average for a majority of the well-being indicators, excluding income per capita, employment and unemployment rates, rooms per person, perceived social support network and self-evaluation of life satisfaction. In the low performing regions, the unemployment rate is more than three times the OECD average.

How do the top and bottom regions in Greece fare on the well-being indicators?

	Greek regions Top 20%	Greek regions Bottom 20%	Country average	OECD average
Environment				
Level of air pollution in PM 2.5 (µg/m³), 2013	10.3	16.2	13.6	10.4
Education				
Labour force with at least upper secondary education (%), 2014	83.5	61.3	72.7	74.3
Civic engagement				
Voters in last national election (%), 2015	68.3	60.0	65.1	68.1
Health				
Life Expectancy at birth (years), 2013	82.2	80.7	81.4	79.7
Age-adjusted mortality rate (per 1 000 people), 2013	6.9	7.8	7.5	8.4
Community				
Perceived social support network (%), average 2006-14	85.5	76.9	81.1	88.9
Life satisfaction				
Self-evaluation of life satisfaction (scale from 0 to 10), average 2006-14	5.9	5.0	5.6	6.7
Income				
Disposable income per capita (in USD PPP), 2013	14 073	8 193	10 755	17 916
Access to services				
Households with broadband access (%), 2014	70.0	59.0	65.0	69.8
Safety				
Homicide Rate (per 100 000 people), 2013	2.4	3.8	3.3	3.4
Jobs				
Employment rate (%), 2014	52.9	46.6	50.5	66.3
Unemployment rate (%), 2014	22.9	28.7	26.2	8.6
Housing				
Rooms per person, 2013	1.5	1.5	1.5	1.8

Note: Data in the first two columns refer to average values of top and bottom regions of national ranking and until the equivalent of 20% of the national population is reached.

Source: OECD Regional Well-Being Database: www.oecdregionalwellbeing.org