

**REGIONAL AND ENVIRONMENTAL EFFECTS OF THE EU ENLARGEMENT
AND EURO ZONE**GIANNIAS, DIMITRIOS¹,
SFAKIANAKI, ELENI²**Abstract**

Awareness of regional economic disparities has been long established. It is clear that regional disparities still play an important role in quality of life. Particularly in Europe and in the European Union, extensive research has been boosted on regional disparities and how they are influenced by the economic integration and the Economic Monetary Union. This paper proposes a theoretical framework for regional classifications and rankings based on the development of environmental indices. This framework is being used to classify European Union countries according to the extent to which they are influenced by supply-side (producer) and demand-side (consumer) responses to their specific bundle of economic and environmental attributes. This classification provides information about the relative attractiveness to producers and consumers of the combination of economic and environmental attributes indigenous to each region. It can also assist on the regional and environmental policies of the European Union by proposing an appropriate mix of environmental and regional policies for each country under examination based on a number of characteristics (high productivity, low productivity, high amenity, low amenity).

Keywords: EU Enlargement, Euro Area, Regional Effects, Environmental Effects

1. Introduction

Regional disparities and inequalities have long been a subject of research (see for example Braunerhjelm et al. (2000); Puga (1999); Boldrin and Canova (2001) among others). As such a number of models have been developed that examine regional disparities. In Europe, the impact of the economic integration due to the Economic Monetary Union and the development of a Single market, on economic disparities is still an issue under investigation, not to mention the more fundamental question if regional disparities will remain or disappear (Bouvet, 2010). In the EU, research has generally demonstrated that the two variables that cause disparities are geographic and economic. The well known publication of Krugman (1991) refers to the concepts of core and periphery to describe regional disparities. Regions close to the core of activity in a country are developed much better than regions that are distant from the core. In the case of the EU, high concentration of economic development, modern infrastructure and advanced social indicators is evident in a core whereas the periphery contains many regions that would be traditionally designated as underdeveloped. Many of these regions have been outside the main processes of economic development experienced in the core regions.

¹ Dimitris Giannias is a Professor at the Department of Economics of the University of Thessaly (Greece), e-mail: giannias@uth.gr

² Dr Eleni Sfakianaki is an Assistant Professor at the Hellenic Open University, e-mail: esfakianaki@eap.gr

The regional disparities can influence to a large extent, quality of life which is one of the major reasons that this subject has attracted large interest by researchers, policymakers and the public. Quality of life across cities is so important these days that a number of publications has been developed that rank the quality of life across cities and states based on their observable characteristics (Winters, 2010). According to Rappaport (2009), differences in quality of life affect individual well-being and are among the important factors that influence metropolitan population growth. A number of researches rank quality of life based on compensating differentials in labor, housing and consumption markets (see for example Rosen, 1979 and Roback, 1982). More specifically, Rosen (1979) in his research he developed an index of urban quality of life which is based on the measurement of value of local amenities that differ from one urban area to another. These amenities are features of locations that are attractive, such as sunny, smog-free days, safety from violent crime, and well-staffed, effective schools. This index measures the monetary value of the set of amenities that households get by living and working in the area. According to Rosen a quality of life index should measure the value of local amenities and this opinion is shared by a number of urban economists. In this case, the difficulty is not the information about the money incomes in urban areas, which is usually available to researchers; the challenge is to gather the information about the value of amenities that households get to consume in different areas. Rosen's (1979) research has managed to bridge this gap by focusing in the value of the bundle of local amenities in various locations rather than evaluating overall well-being or total utility. In this respect, conclusions can be derived regarding the locational choices of consumers based on their evaluation of the amenities of an area, which eventually determine their overall well-being.

Berger et al. (2003) believe that compensating differentials can be used as a means to estimate the values people place on goods that are not typically sold in markets and to measure quality of life across geographic locations. They studied therefore the compensating differentials for location specific amenities and quality of life for a transition economy. More specifically, they developed a compensating differential framework to estimate wage and housing hedonic equations, amenity values, and a quality of life index and they applied this framework in Russia which is a country in transition. The research ranked 953 Russian cities by quality of life as measured by a group of eleven amenities amongst which are climate, environmental conditions, ethnic conflicts, crime rates, and health condition. The study also showed that these compensating differentials exist even after the regional pay differences which are used by the Russian government as a means to compensate workers for living in regions that are designated as less desirable. It is perhaps no surprise that the highest ranked cities are the relatively warm areas and those in the western, European part of the country.

Blomquist (2006) further supports that money income can be used as a metric to measure well-being based on the assumption that more money relaxes the budget constraint and allows a person to make more purchases and achieve a higher level of utility. In this way, the average income in different areas has great value because one can say that households with high incomes are better off because they can buy more. On the contrary, there are arguments that although incomes do matter to the well-being of individuals that live in a specific area, it is an imperfect measure of utility either because money does not measure

the value of the social and natural environment or because it cannot really measure the satisfaction that derives from traditional market goods and their uses (Blomquist, 2006).

Glaeser et al. (2001) identify four general types of urban amenities: variety in private goods and services, including diversity in restaurants and theatres; aesthetics, physical setting, and climate; availability and quality of public goods, including education, health care, and crime protection; and ease of movement for people and goods. According to Mulligan et al. (2004), amenities are site- or region-specific goods and services that make some locations particularly attractive for living and working; Smith (1977) states that amenities, which exist at various geographic scales, influence quality of life or social well-being. A bundle of amenities can influence decisions on the purchase of households, production of firms and other locational dilemmas.

Blomquist et al. (1988) carried out a study where a very wide range of amenities was addressed, since amenities are considered to be an important component of economic well-being. The authors developed a quality of life index for 253 urban counties within 183 metropolitan areas of the U.S. The research was based on the idea that different urban locations offer different sets of wages, rents and amenities. Households attempt to maximise well-being and firms attempt to minimise costs by their location decisions. The results of the index demonstrated that places with the highest overall quality of life, imputed in the aggregate from the individual amenity estimates, were affluent suburbs and medium-sized places located in the U.S. Sun Belt and Colorado. The bottom of the ranking is occupied by medium to large northern cities. The conclusion of the research, beyond the actual ranking of counties, is that quality of life is clearly one factor considered in location decisions along with other factors such as job availability.

Considering that regional disparities are still an important subject of interest, especially with the enlargement of the European Union and the Economic Monetary Union, the research presented in this paper applies the Giannias and Liargovas (1998) framework to study the regional disparities and the relevant classifications of the 27 EU member states, the Euro zone and the group of the 15 EU member states examined in Giannias and Liargovas (1998).

Giannias and Liargovas (1998) presented a neoclassical framework to analyze regional disparities across the 15 European Union member states and classify³ them into four groups based on the relative values of a country's per capita income and environmental quality. This is a useful classification because it offers information about the relative attractiveness to industry and people of the total bundle of environmental and other attributes indigenous to each country of the European Union. Moreover, it provides information and therefore assistance to European policy makers to formulate the best-

³ Countries are classified as high amenity (low consumer income, high environmental quality), low amenity (high consumer income, low environmental quality), high productivity (high consumer income, high environmental quality), and low productivity (low consumer income, low environmental quality).

suited regional and environmental policies that reflect the specific circumstances of each member state⁴. This methodology is applied in this article to identify the recent regional characterisation for the 27 EU member states, the Euro zone and the initial group of 15 EU member states. Furthermore, in subsequent sections the environmental and regional policies of the EU are examined and the theoretical framework used in the analysis is reviewed. Conclusions and policy suggestions follow at the end.

2. Environmental Policy in the EU

Environmental policy is a relatively recent policy in the EU. It was only in 1972 that the first series of European Environmental Action Plans (EAP) were launched. The principle that environmental protection should be considered in all new Community legislation was introduced in 1986 with the Single European Act. The Treaties of Maastricht (1992) and Amsterdam (1997) focused much more to EU environmental policy and made sustainable development a key objective which was further reinforced by the Lisbon Treaty (2007). In 2010, the EU renewed a number of environmental Directives to ensure they comply with the Lisbon Treaty and in alignment with this policy, the Europe 2020 Strategy, which underpins all EU policy regarding the single market, has as a key part sustainable development (Civitas, 2011). The EU has also been part in global environmental negotiations and the signing of the Kyoto Protocol. In 1997, in the UN Conference on Climate Change in Kyoto, in Japan, the EU committed that its members will reduce greenhouse gas emissions by 8% by 2012, compared to levels in 1990. It also set targets in the 2008 EU Climate Change package so as 20% of energy to come from renewable sources and committed to reduce greenhouse gas emissions to 20% by 2020.

Growth is frequently seen by environmentalists as a source of adverse ecological consequences whereas environmental protection measures can be viewed as constraints to economic development. In the long term, the economic potential of future production factors will increasingly depend on the state of environmental conditions. The integration of environmental and regional policy should therefore be an inherent process in the sustainable development route.

3. Regional Policy in the EU

Regional policies have been researched in the EU for more than half a century although the Treaty of Rome made no specific commitment to the creation of a Community regional

⁴ High amenity countries or regions, for example, require regional policy measures to increase their income. Similarly, low amenity countries or regions require environmental policy measures to increase their quality of life. Finally, in low productivity and low amenity areas both policies, regional and environmental, are important for increasing the per capita incomes and environmental quality.

policy. The regional policies implemented by the EU over time aimed to increase growth and to reduce disparities between regions. In this respect, it supported the use of economic and knowledge transfer from rich to poor regions. For a long time disparities were addressed at national level and there was no clear Community regional policy although a number of financial instruments were in force and they did have a regional aspect (Bache, 1998). In 1986, the Single European Act allowed for a regional policy designed to take into consideration any negative implications of the single market. In preparation for the single market, a number of changes took place that gave the Commission a much greater role in the delivery, implementation and regulation of the Policy. One major reform was that the Funds could no longer be used by the Member States based and their perception of where best to be allocated. It now required approval by the Commission as to how and where they were spent. The principles applied in these reforms are still at the heart of regional policy (European Union Committee, 2008).

A brief historic examination shows that in 1975 the main financial instrument of EC regional policy was developed, the European Regional Development (ERDF). It was the first explicit regional fund and was based on the then existing premise that regional policy should be still a national rather than Community concern. There are also other EC financial instruments that have regional aspects such as the European Social Fund (ESF) (established in 1958) and the Guidance section of the European Agricultural Guidance and Guarantee Fund (EAGGF) (established in 1962) collectively known as the structural funds. Later in 1993, the Financial Instrument of Fisheries Guidance (FIFG) was added to the structural funds. The term cohesion policy came into use after the Single European Act of 1986 to describe a range of Community measures, including the structural funds, aimed at reducing economic and social disparities in Europe. In 1999, the Maastricht Treaty laid the basis for establishing an Economic and Monetary Union (EMU). In an attempt to address the risk that EMU could worsen regional disparities, the treaty required that budget deficits to be limited to a maximum of 3% of Gross Domestic Product (GDP) to limit the possibilities of poorer states increasing investments to catch up with their richer partners.

Despite the efforts of the EU to reduce disparities between regions, the recent enlargements have deepened the disparities between the European member states and regions. For example, Luxembourg, the wealthiest member state, is now seven times richer than the poorest one, Romania. At a regional level, the richest region is Inner London with 290% of EU-27's average gross domestic product (GDP) per capita, while the poorest region is Nord-Est in Romania with 23% of the EU average (Regional Policy, 2008).

4. The Theoretical Framework for Regional Economic and Environmental Classifications

The theoretical framework of the research is based on the framework developed in the Giannias Liargovas (1998) research on regional disparities. This framework uses as a basis income differentials across the European Union to determine the relative importance of amenity and productivity differences. The basic hypothesis is that a bundle of environmental and other attributes can fully describe regions or countries. These attributes specify the environmental quality index of a country or region (EQ) which includes all aspects of natural and non-natural environment of a consumer's life. Naturally, EQ affects

the utility of consumers and the production⁵ cost of firms. The framework is illustrated in Figure 1 and it consists of two sets of curves.

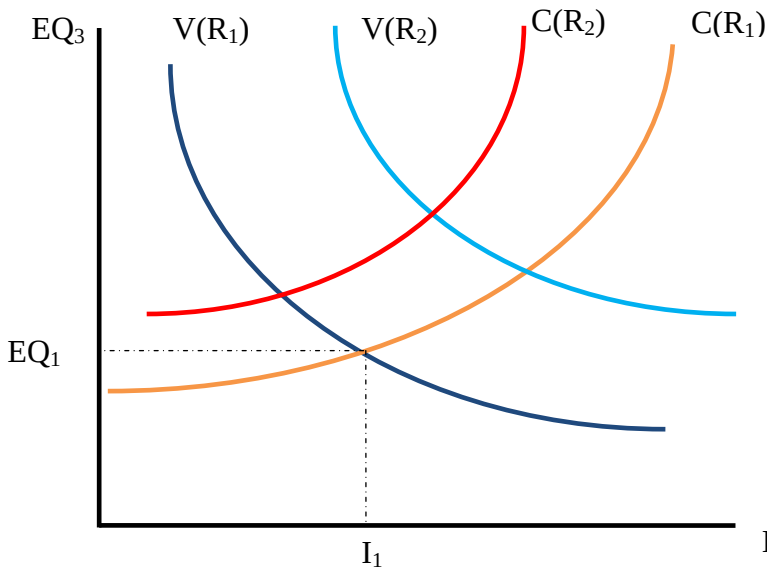


Figure 1: Iso-utility $V()$ and iso-cost $C()$ curves

The first set, the upward sloping curves (see Figure 1), named $C(R)$, show combinations of income (I) and environmental quality (EQ) which are associated with an equal level of cost for industry in equilibrium.⁶ This type of curve also implicitly takes into account the cost of real estate (R). In this case, the slope of these curves represents the trade-off that firms are willing to make between productivity and environmental quality for the given level of cost at any given implicit cost of renting industrial property. The value that a firm places on the environmental characteristics of a region is fixed along each curve and the curves shift up (down) as the environmental characteristics of a region increase (decrease) the productivity of firms and the implicit cost of housing.

The second set, the downward sloping curves (see Figure 1), named $V(R)$, show combinations of income⁷ (I) and environmental quality (EQ) for consumers that are associated with an equal level of utility in equilibrium. This type of curve also implicitly takes into account the cost of real estate (R).⁸ One of the answers that are provided by the slope of these curves is the trade-off that households are willing to make between income

⁵ Where the production technologies are assumed to exhibit constant returns to scale.

⁶ Under the assumption that production technologies exhibit constant returns to scale.

⁷ The income of a consumer is assumed to be determined by a hedonic wage equation which depends among others (e.g., personal characteristics, education, experience, etc.) on environmental quality.

⁸ For example, $R = (R_1, R_2, R_3)$ is the vector of implicit prices for the vector of housing characteristics $h = (h_1, h_2, h_3)$, so that the rental price, P , of a house that is described by the vector of characteristics (h_1, h_2, h_3) is $P = R h'$, where h' is the transpose of h .

and environmental quality for the given level of utility at any given implicit cost of housing. Along each curve, the curves shift up (down) as the implicit costs of housing increase (decrease), assuming that implicit cost of housing is fixed.

In this respect, in the framework, different regions are characterized by an environmental quality index. Apart from this, the implicit measure of the price of real estate which is associated with a specific pair of iso-cost and iso-utility curves, is also used to describe regions. The importance of the iso-cost and iso-utility curves lies on the fact that where costs for industry and utility for consumers are equal, there are no incentives to relocate. It is also worth mentioning, that the intersection of any two curves for each region at the level of its environmental quality, determines the relative income and the implicit prices of the real estate market in equilibrium. For example, in Figure 1, in region 1, where environmental quality equals EQ_1 , the equilibrium income will be I_1 and the equilibrium implicit rental prices R_1 .

The use of the suggested framework allows the examination of the implications of differences in environmental quality and income by keeping constant every other variable for any region. After examining the patterns of environmental quality and incomes across regions, it can be determined whether environmental quality and income differences reflect inter-regional differences in amenities or productivity. In the case that environmental quality and income differences primarily reflect amenity differences across regions, the relationship between environmental quality and incomes would be negative whereas the relationship would be positive if they reflect productivity differences.

Further, the framework can be employed to classify individual regions on the basis of whether their incomes and environmental quality differ from the average. Thus, regions can be distinguished to those which are above average or below average levels of amenities and between regions with above or below average levels of productivity. These classifications are illustrated in Figure 2. Environmental quality is higher than the average in the high amenity (HA) and high productivity (HP) regions and lower than the average in the low amenity (LA) and low productivity (LP) ones. On the other hand, incomes are relatively higher in the high productivity and low amenity regions.

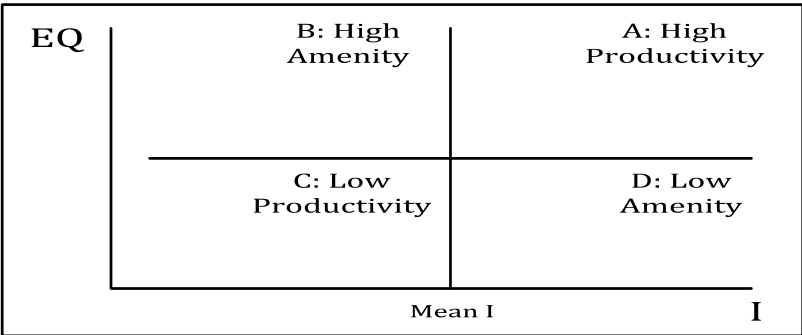


Figure 2: Classification based on regional income and environmental quality index values.

Each region within this analysis is characterized by an environmental quality index (EQ) whose effect on household utility and production costs differs from region to region. The problem of classifying regions by the relative magnitude of these two effects is in essence shifted to identifying the environmental quality and income differences that are experienced

in equilibrium when each curve shifts. This can be done by identifying the combinations of EQ and I in equilibrium that are associated with equal shifts of both curves and determining how incomes and environmental quality change relative to these shifts. For any region with above average incomes and environmental quality, the shift of the $C(R)$ (productivity) curve must be less than the shift of the $V(R)$ (amenity) curve. The less the direct effect of environmental quality on utility, the greater the increase in consumer income needed to offset the increase in rents and, consequently, the greater the shift of the $V(R)$ curve needed to keep the maximum utility level unchanged in equilibrium.

Any region with environmental quality and income combinations in quadrant A in Figure 2 is classified as a "high productivity" region. This is because the primary reason that this region's incomes, environmental quality, and rents differ from those of the average region is the above-average productivity effects of environmental quality. This above-average productivity effect is reflected in the ability of producers in these regions to pay above average incomes and rents for having at their disposal a greater than average level of environmental quality. Similarly regions with below average incomes and environmental quality as in quadrant C in Figure 2 are classified as "low productivity" regions. This below-average productivity effect is reflected in the ability of producers in these regions to pay below average incomes and rents for having at their disposal a lower than average level of environmental quality. Finally, an above average amenity effect for a region is associated with increases in rents and decreases in incomes reflecting consumers' willingness to pay relatively more for a region's high environmental quality. Quadrant D then identifies regions where the environmental quality is greater than the average and that this high amenity effect has a dominant influence on incomes and rents. For regions in quadrant B, the dominant influence is their below-average amenity value.

5. Classifications of the 27 EU Member States, the Euro zone, and of the initial group of the 15 EU Member States

The theoretical framework introduced above is used to classify the 27 European Union member states (EU27), the 16 member states of the Euro zone (EUZ), and the initial group of the 15 countries of the European Union before its enlargement (EU15). The environmental quality (EQ) for each country was calculated based on 2008 World Resources Report and United Nations Human Development Index data for the natural and non-natural environmental indicators set out in Appendix 1. These indicators were used to develop an overall index of environmental quality for each member state. The methodology for this approach is also presented in Appendix 1.

Table 1 gives the deviations of environmental quality (EQ) from its mean, $m(EQ)$, and the deviation of per capita income (I^*) from its mean, $m(I^*)$ for the group of countries EU27, EUZ, and EU15. This data is used to classify countries according to the theoretical framework illustrated in Figure 2. Each country is positioned on the relevant quadrant and classified according to the pair of its values taken from Table 1.

Table 1: Deviations of Environmental Quality and Income per capita from their mean values**Table 1a: The EU15 group**

	EQ	I*
Austria	67.297	34.303
Belgium	51.726	30.732
Denmark	65.899	49.528
Finland	72.438	38.304
France	54.845	29.719
Germany	59.173	30.894
Greece	58.287	12.773
Ireland	71.877	45.461
Italy	46.010	19.699
Luxembourg	50.408	100.000
Netherlands	47.588	33.693
Portugal	51.770	0.000
Spain	47.013	11.235
Sweden	77.741	46.489
UK	59.338	38.239

Table 1b: The EUZ group

	EQ	I*
Austria	71.207	42.438
Belgium	56.115	39.309
Cyprus	53.999	19.589
Finland	77.208	45.945
France	59.037	38.423
Germany	62.996	39.452
Greece	62.130	23.575
Ireland	74.363	52.215
Italy	51.137	29.643
Luxembourg	55.417	100.000
Malta	57.173	10.606
Netherlands	53.655	41.904
Portugal	57.965	12.384
Slovakia	60.654	0.000
Slovenia	63.704	14.002
Spain	50.265	22.227

Table 1c: The EU27 group

	EQ	I*
Austria	68.339	45.622
Belgium	56.210	42.666
Bulgaria	54.515	0.000
Cyprus	55.024	24.037
Czech Rep	58.031	9.257
Denmark	69.195	58.224
Estonia	66.679	9.030
Finland	75.537	48.934
France	57.485	41.828
Germany	60.353	42.801
Greece	60.406	27.801
Hungary	54.960	7.437
Ireland	73.171	54.858
Italy	49.716	33.534
Latvia	71.419	6.609
Lithuania	63.007	5.831
Luxembourg	56.343	100.000
Malta	55.645	15.550
Netherlands	52.233	45.117
Poland	57.418	6.359
Portugal	58.986	17.229
Romania	49.317	0.364
Slovakia	60.178	5.531
Slovenia	64.000	18.758
Spain	48.111	26.529
Sweden	76.656	55.709
UK	62.772	48.880

Using both Table 1 and Figure 2 (theoretical framework), the EU member states are positioned on an (EQ,I) diagram as shown in Figure 3, 4, and 5. This diagram identifies the high and low amenity and high and low productivity within each one of the 3 groups, EU27, EUZ, and EU15. The results of Figures 3-5 based classifications are presented in Table 2 together with an EQ based ranking, R(EQ), of the 27 EU member states.

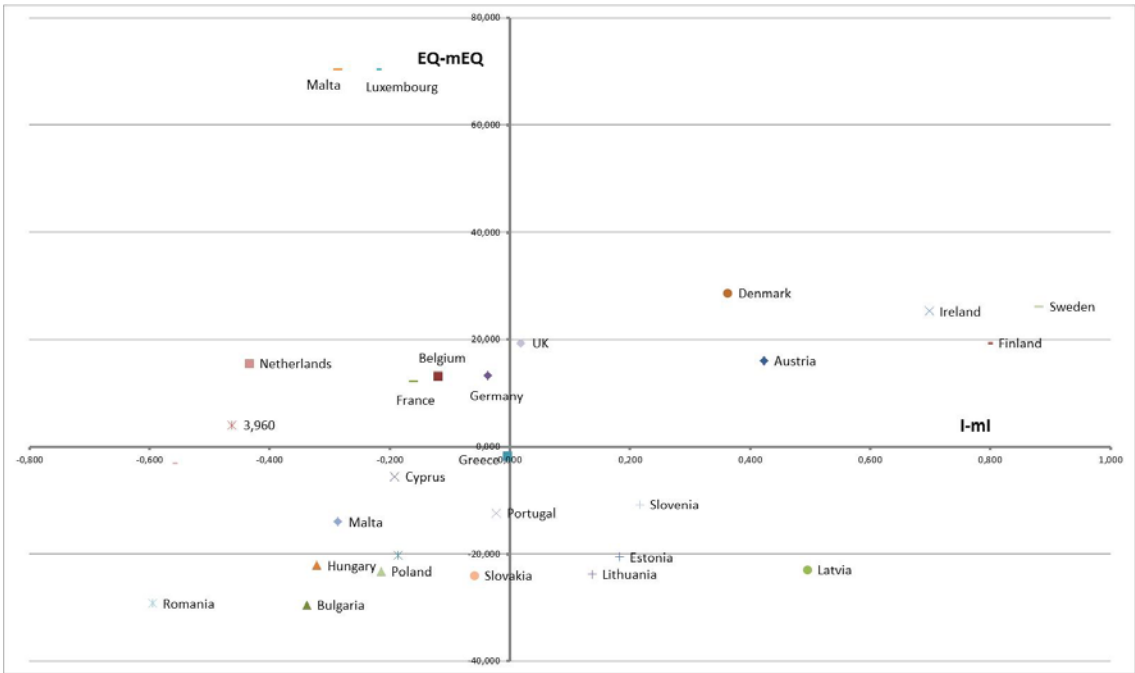


Figure 3: Positioning of the group EU27

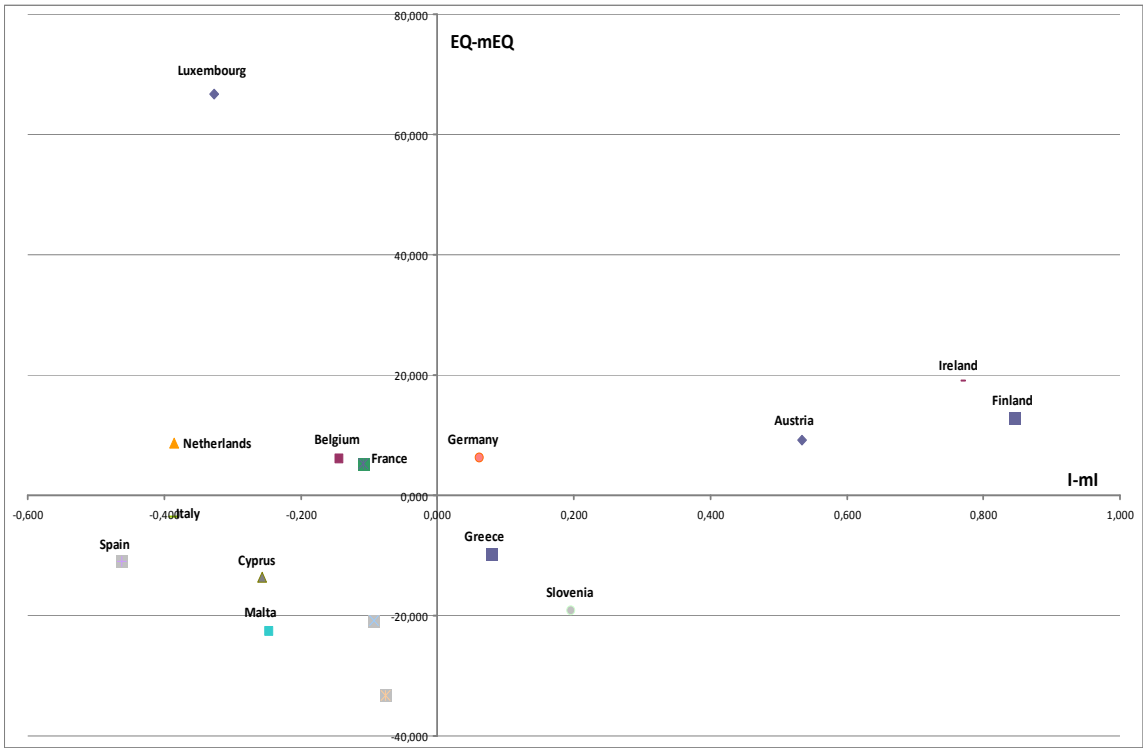


Figure 4: Positioning of the group EUZ

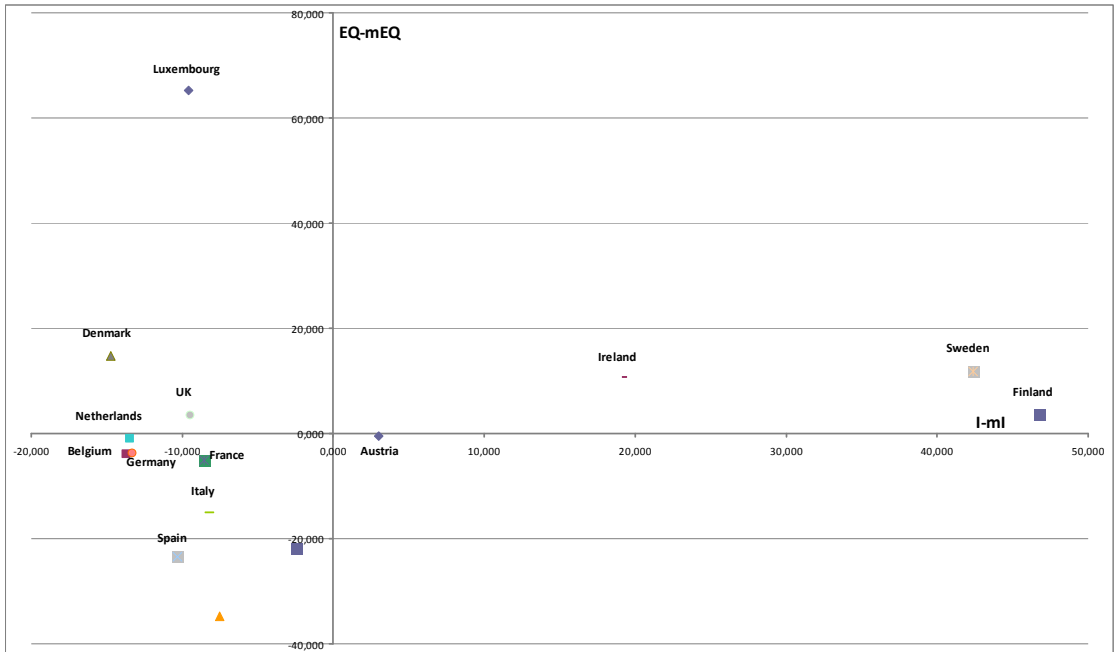


Figure 5: Positioning of the group EU15

The analysis identifies four groups of countries within the EU27 group: the high-productivity countries (Sweden, Ireland, Austria, Denmark and UK), the low-productivity countries (Greece, Slovakia, Czech Republic, Poland, Portugal, Malta, Hungary, Bulgaria, Cyprus, Spain and Romania), the low-amenity countries (Germany, France, Belgium, Finland, Netherlands and Italy) and the high amenity countries (Latvia, Estonia, Lithuania and Slovenia).

Considering the EUZ and EU 15 groups of countries we observe that the characterization of some countries is different from above⁹. To be more specific:

Within the EUZ group¹⁰:

- Greece is LP (while being LA in the EU27 group)
- Germany is HA (while being HP in the EU27 group)
- Italy is HA (while being LP in the EU27 group)

Within the EU15 group¹¹:

- Denmark, and UK are HP (while being HA in the EU27 group)
- Austria is HP (while being LA in the EU27 group)
- Germany, France, Belgium, Netherlands, and Italy are HA (while being LP in the EU27 group)

⁹ This is possible because the characterization (HP, LP, HA or LA) is relative and depends on what are the regions or countries are included in the group being classified.

¹⁰ See columns V and VI of Table 2.

¹¹ See columns V and VII of Table 2.

Table 2: EQ based ranking, R(EQ), and classifications of EU27, EUZ, and EU15 groups

$R(EQ)^*$ **	R(EQ)							
EU15 (I)	EU15 (II)	EUZ (III)	EU27 (IV)		EU27 (V)	EUZ (VI)	EU15 (VII)	EU15* ** (VIII)
1	1		1	Sweden	HP		HP	HP
2	2	1	2	Finland	HP	HP	HP	HP
10	3	2	3	Ireland	HP	HP	HP	LP
			4	Latvia	LA			
4	4		5	Denmark	HP		HA	HP
5	5	3	6	Austria	HP	HP	LA	HP
			7	Estonia	LA			
		4	8	Slovenia	LA	LA		
			9	Lithuania	LA			
7	6		10	UK	HP		HA	HA
15	7	5	11	Greece	LP	LA	LP	LP
3	8	6	12	Germany	HA	HP	LP	HP
		7	13	Slovakia	LP	LP		
13	9	8	14	Portugal	LP	LP	LP	LP
			15	Czech Rep	LP			
8	10	9	16	France	HA	HA	LP	LA
			17	Poland	LP			
14	11	10	18	Luxembourg	HA	HA	HA	LA
9	12	11	19	Belgium	HA	HA	LP	LA
		12	20	Malta	LP	LP		
		13	21	Cyprus	LP	LP		
			22	Hungary	LP			
			23	Bulgaria	LP			
6	13	14	24	Netherlands	HA	HA	LP	HP
11	14	15	25	Italy	HA	LP	LP	LP
			26	Romania	LP			
12	15	16	27	Spain	LP	LP	LP	LP

*** Based on Giannias and Liargovas (1998) results

Using Giannias and Liargova (1998) empirical finding we may identify the changes of a country characterization from 1993 to 2008¹². These are the following:

Within the EU15 group in 1993¹³:

- Ireland is LP (while being HP within the EU27 group in 2008)
- Italy is LP (while being HA within the EU27 group in 2008)
- UK is HA (while being HP within the EU27 group in 2008)

¹² Giannias and Liargovas (1998) uses 1993 data, while this article is based on 2008 data.

¹³ See columns V and VIII of Table 2.

- Germany and Netherlands is HP (while being HA in the EU27 group)
- France, Luxemburg, and Belgium are LA (while being HA in the EU27 group)

Within the EU15 group in 2008¹⁴:

- Ireland is HA (while being LP in 1993)
- Denmark is HA (while being HP in 1993)
- Austria is LA (while being HP in 1993)
- Germany and Netherlands are LP (while being HP in 1993)
- Belgium is LP (while being LA in 1993)
- France is LP (while being LA in 1993)
- France is LP (while being LA in 1993)
- Luxemburg is HA (while being LA in the EU27 group)

6. Conclusions and Policy Proposals

Awareness of regional economic disparities has been long established. The review of the literature has demonstrated that regional disparities still play an important role in quality of life. Particularly in Europe and in the European Union, extensive research has been boosted on regional disparities and how they are influenced by the economic integration and the Economic Monetary Union. Strengthening economic, social and territorial cohesion by reducing developmental disparities between its regions is a fundamental objective of the EU. According to a number of authors, regional disparities are strongly connected with quality of life which in turn is based on the measurement of value of amenities that differ from one urban area to another. In essence therefore the measurement of the inequalities between regions can be founded on the measurement of amenities.

The present research is based on the research developed by Giannias and Liargovas (1998) by extending the application of the framework originally developed. It classifies the regions under examination into four groups based on the relative values of a country's per capita income and environmental quality. More analytically, the environmental indices developed are being employed to European Union countries according to the extent they are influenced by supply-side (producer) and demand-side (consumer) responses to their net bundle of country-specific attributes. As Giannias and Liargovas (1998) demonstrated, this kind of classification is useful because it provides information about the relative attractiveness to producers and consumers of the combination of economic and environmental attributes indigenous to each region. It therefore has implications for the design and focus of the regional and environmental policies of the European Union.

The analysis shows that the characterization of Finland (HP), Portugal (LP), Spain (LP), Ireland (HP), and Luxemburg (HA) is robust, since it remains the same independently of the group of countries on which the classification is based on¹⁵; moreover, the characterization of Finland, Portugal and Spain was the same 15 years ago, which indicates some robustness

¹⁴ See columns VII and VIII of Table 2.

¹⁵ EU27, EUZ, or EU 15 (see columns V, VI, VII of Table 2)

through time¹⁶. From the countries that are not in the Euro group, Sweden is constantly characterized as HP¹⁷.

The majority of the countries (11) within the EU27 group are LP. In the high productivity countries of the European Union of 27 countries (Sweden, Ireland, Austria, Denmark and UK), measures of both environment and productivity are above average. Consequently, if the goal of policy is to reduce regional disparities, it may be appropriate to focus the attentions of both economic and environmental policies elsewhere. In the low productivity countries (Greece, Slovakia, Czech Republic, Poland, Portugal, Malta, Hungary, Bulgaria, Cyprus, Spain and Romania), environmental and productivity improvements appear to be mutually compatible policy objectives. This would appear to suggest that policies can be brought forward to enhance both economic and environmental conditions simultaneously. Finally, in the case of the high amenity countries (Latvia, Estonia, Lithuania and Slovenia), emphasis should be given to regional policy, since the country is characterized by relatively low income and high environmental quality. In the low amenity group (Germany, France, Belgium, Finland, Netherlands and Italy) emphasis should be given to environmental measures since this group is characterized by its high income and low environmental quality.

Considering that the EU has a strong goal to reduce regional disparities, the above observations can provide a useful database for consideration and decision-making. These observations also further reinforce the EU's aim to integrate environmental considerations into overall growth development plans. It is however clear that the classification of a country (its position on the relevant mapping) may change over time for various reasons (e.g. enlargement, technological change, physical disasters, etc). It is recommended therefore to update regularly the mapping to gain the ideal mix of policies. Furthermore, the relative differences in environmental quality suggested by the analysis should not be taken as a call for a convergence of environmental conditions towards the average. It is apparent in many instances that environmental policies need to promote the transfer of best practice to secure a general increase in the level of environmental quality.

References

- Bache, Ian. (1998) *The Politics of European Union Regional Policy: Multi-Level Governance or Flexible Gatekeeping?*, Contemporary European Studies Series, Sheffield: UACES/Sheffield Academic Press.
- Berger, Mark C., Blomquist, Glenn C., Peter, Klara Sabirianova (2003), Compensating Differentials in Emerging Labor and Housing Markets: Estimates of Quality of Life in Russian Cities, Discussion Paper No. 900 IZA, Institute for the Study of Labor.
- Blomquist, Glenn C., (2006) "Quality of Life" in Richard Arnott and Daniel McMillen (eds) *A Companion to Urban Economics*, Malden, MA: Blackwell Publishing.
- Blomquist, Glenn C., Berger, Mark C., Hoehn, J.P. (1988), New estimates of quality of life in urban areas, *American Economic Review*, Vol. 78, No. 1, pp. 89–107.
- Boldrin, M. and Canova F. (2001), Europe's regions: Income disparities and regional policies, *Economic Policy*, Vol. 32, pp. 207-253.

¹⁶ See columns V-VIII of Table 2.

¹⁷ See columns V, VII, VIII of Table 2.

- Bouvet, Florence (2010), EMU and the dynamics of regional per capita income inequality in Europe, *Journal of Economic Inequality*, Volume 8, Number 3, pp. 323-344.
- Braunerhjelm, P., Faini, R., Norman, V. D., Ruane, F. and Seabright P., (2000) "Integration and the regions of Europe: How the right policies can prevent polarization", in Centre for Economic Policy Research (ed.), *Monitoring European integration*. Vol. 10.
- Civitas, (2011), Environmental Policy, Institute for the Study of Civil Society, <http://www.civitas.org.uk/eufacts/FSENV/ENV1.htm>, Accessed 7 January, 2011.
- EU Regional Policy 2007-13, (2008), Working for the regions, January.
- European Union Committee (2008), The Future of EU Regional Policy, 19th Report of Session 2007-08, HL Paper 141.
- Giannias, Dimitris and Liargovas, Panayiotis (1998), Focusing Regional and Environmental policies in the EU through the Development of Environmental Quality Indices, *European Environment*, Vol. 8, No. 3, pp. 86-93
- Glaeser, Edward L., Jed Kolko, and Albert Saiz (2001), Consumer City, *Journal of Economic Geography*, Vol.1, No.1, pp. 27-50.
- Mulligan, Gordon F., Carruthers John I., and Cahill Meagan, (2004), "Urban Quality of Life and Public Policy: A Review" in Roberta Capello and Peter Nijkamp (eds.) *Urban Dynamics and Growth*, Amsterdam: Elsevier, pp. 729-802.
- Puga, Diego (1999), The rise and fall of regional inequalities, *European Economic Review*, Vol.43, pp. 303-334 23.
- Rappaport, Jordan (2009), The increasing importance of quality of life, *Journal of Economic Geography*, Vol.9, No.6, pp. 779-804.
- Roback, Jennifer (1982), Wages, rents, and the quality of life, *Journal of Political Economy*, Vol. 90, No. 6, pp. 1257-1278.
- Rosen, Stuart, (1979) "Wage-based indexes of urban quality of life", in Mieskowski, P., Straszheim, M. (eds) *Current Issues in Urban Economics*, Baltimore: Johns Hopkins University Press, pp. 74-104.
- Smith, David M. (1977) *Human Geography: A Welfare Approach*. London: Edward Arnold.
- Winters, John V. (2010) Differences in Quality of Life Estimates Using Rents and Home Values, Munich Personal RePEc Archive, April

Appendix 1: Developing an Environmental Quality Index

Environmental quality, EQ, is taken to be the weighted mean of above variables. However, a mean cannot be computed directly because of differences in the units of measurement of the above variables. Therefore, these variables need to be scaled before a mean is computed. Consequently, the above variables are scaled from 0 to 100 for each country using the following transformations:

$$1) \quad y_{ij}^* = 100 (Y_{ij} - Y_{ijmin}) / (Y_{ijmax} - Y_{ijmin})$$

where, y_{ij}^* is the transformed variable, Y_{ijmin} is the minimum value of Y_{ij} , and Y_{ijmax} is the maximum value for all variables having a positive relationship with environmental quality, and

$$2) \quad y_{ij}^* = 100 - [100 (Y_{ij} - Y_{ijmin}) / (Y_{ijmax} - Y_{ijmin})]$$

where, y_{ij}^* is the transformed variable, Y_{ijmin} is the minimum value of Y_{ij} in the sample of countries and Y_{ijmax} is the maximum value for all variables having a negative relationship with environmental quality.

Finally, to compute the environmental quality for each country we (i) have used 2008 data from the World Resources and the Human Development Index, and (ii) have taken the mean of the scaled variables y_{ij}^* .

The per capita income, I , of each country is also scaled from 0 to 100 using the following transformation:

$$I_j^* = 100 (I_j - I_{\min}) / (I_{\max} - I_{\min})$$

where, I_j^* is the transformed index, $I_{\min}$ is the minimum index value in the sample of countries and $I_{\max}$ is the maximum value, and $j = 1, 2, 3, \dots, m$.

The weights used to obtain the weighted mean, EQ, were obtained from an experts opinion survey that was conducted in 2008; 40 Greek experts participated in the survey and each had a minimum 10 year research experience involved is social science research. The weight of each variable is goiven next.

The 2008 indicators used to develop the environmental quality index, EQ, are the following:

Y1, _j	Internal Renewable Water Resources (IRWR): Per capita / Units: Cubic meters (m ³) per person per year
Y2, _j	Protected Areas: IUCN categories I-VI and Other, percent of total land area / Unit: Percent
Y3, _j	Mammal species, number threatened / Units: Number of species threatened
Y4, _j	Bird species, number threatened / Units: Number of species threatened
Y5, _j	Reptile species, number threatened / Units: Number of species threatened
Y6, _j	Amphibian species, number threatened / Units: Number of species threatened
Y7, _j	Forest area (original) as a percent of total land area / Units: Percent
Y8, _j	Waste paper recycled as % of paper consumption / Units: Percent
Y9, _j	Fertilizer use intensity / Units: Kilograms per hectare (kg/Ha)
Y10, _j	Pesticide use intensity / Units: Kilograms per Hectare
Y11, _j	CO2 emissions per capita / Units: Metric tons of carbon dioxide per person
Y12, _j	Urban population as a percent of total population / Units: percent
Y13, _j	Population density / Units: People per square kilometer
Y14, _j	Life expectancy at birth / Units: Years
Y15, _j	Average length of schooling (primary to tertiary) / Units: Years
Y16, _j	Maternal mortality ratio / Units: Maternal deaths per 100,000 live births
Y17, _j	Television sets per 1000 people / Units: Per 1000 people
Y18, _j	Main telephone lines per 1000 people / Units: Per 1000 people
Y19, _j	Passenger cars per 1000 people / Units: Per 1000 people
Y20, _j	Deaths due to road accidents / Units: Number of deaths

WEIGHTS SUMMING UP TO

Y1, _j	0,0648	Y8, _j	0,0656	Y15, _j	0,0406
Y2, _j	0,0328	Y9, _j	0,0492	Y16, _j	0,0601
Y3, _j	0,0578	Y10, _j	0,0406	Y17, _j	0,0336
Y4, _j	0,0531	Y11, _j	0,0687	Y18, _j	0,0375
Y5, _j	0,0328	Y12, _j	0,0554	Y19, _j	0,0398
Y6, _j	0,0476	Y13, _j	0,0414	Y20, _j	0,0570
Y7, _j	0,0601	Y14, _j	0,0617	Total	1,0000