#### DECOMPOSITION OF GLOBAL AND EUROPEAN SOCIO-ECONOMIC INEQUALITIES WITH ATTENTION TO THEIR REGIONAL DIMENSIONS NOVOTNY, Josef<sup>\*</sup>

## Abstract

The paper concentrates on quantification of socio-economic inequalities within the World, world macro-regions, and within European regions. The alternative regional categories are used here instead more conventional but heterogeneous category of individual countries. The relative rates of inequalities are assessed in order to enable some across-scales comparisons of inequalities. The results document the fact that (relative) regional inequality of a system generally increases with geographical scale at which it is observed. Additionally, slightly negative relationship between the level of regional inequality and the level of economic development is found out regarding regional inequality within the world subsystems and European regions.

## JEL classification: D31, F0, 011, R11

Keywords: Global and European inequalities, regional economic development

# 1. Introduction

Global economic inequalities are today perhaps higher than they have ever been in history. Although there are many more imminent dimensions of inequalities in the world society (such as these in access to health care, education and other resources or inequalities in life-quality in general) they are very often essentially determined by

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disability to provide the poor with a fair portion of growing world economic assets.

This paper concentrates above all on regional dimensions of the world end European socio-economic inequalities. The overall world and European inequalities are unfolded and some weights that should be assigned to their particular components are estimated. Differently from other studies on this topic I do not deal with individual countries here but rather prefer the hierarchically ordered set of geographical macro-regions and regions. The structure of this paper is organized as follows. In this first section I generally introduce the topic. The second section briefly reviews some literature addressing the issues of the world economic inequality as well as the relationship between regional inequality and economic development (additional references are then made further in relevant sections). In the third chapter I point out some methodological notes concerning data, regionalization, and inequality measures. In the fourth and fifth sections I present some results of the attempts to quantify and decompose global and European inequalities, respectively. Finally there is a space for discussion, some generalizations, and concluding remarks in the final section.

# 2. Global socio-economic inequalities, regional inequality, and economic development

As Bairoch(1993) claims, it was before Industrial Revolution when almost all global differentiation fell on local (micro-regional) level. Moreover, Bourguignon and Morrisson(2002) decompose the global economic inequality into its among-countries and withincountries components in order to document that it was sometimes at the beginning of the twentieth century when the former overcame the latter. This could be regarded as "the first inequality transition" that was matter of unequal economic growth in different parts of the world both during the nineteenth as well as most of the twentieth century. Nowadays, on the contrary, it seems that the amongcountries inequality component is currently wiping off, above all as the economies of both the two most populous countries China and India rapidly grow. For the global inequality issue it could mean that "the second inequality transition" has started sometimes at the end of twentieth century, as Firebaugh(2003) suggests, for instance.

Nevertheless, the tendency of the overall level of socio-economic inequality to diminish at the aggregate level is not so clear; there are rather mixed results among studies on this topic: e.g. Chotikapanich et al.(1997), Schultz(1998), Milanovic(2000), Sala-i-Martin(2002), Bourguignon and Morrisson(2002), Firebaugh(2003), Dowrick and Akmal(2003). It could also be that some kind of a club convergence among countries has proceeded, but at the same time polarization has in fact increased within the world society. Moreover, while the economic levels of countries might really converge, inequality between regions within individual countries may increase (and, by the way, that is precisely the case of China and India during past decade; as for example Milanovic(2004) documents). First of all because we are still short of requisite data, it seems that only shorttime, marginal changes can be reliably revealed concerning the global inequality development at most. Thus the documentation sometimes need not be very helpful in identifying of a breakpoint in historical trends at the aggregate level. Therefore I focus here rather on some structural aspects of the global distribution of income, trying to re-structure it differently. This means nevertheless only the first step while the next one should be to link particular components' dynamics to the development of the overall inequality.

One important issue is additionally discussed in this paper. The calculations are also used to aim at relationship between the level of economic development and regional inequality. The question of the nature of regional disparities alongside the path of economic development is a constitutive topic of regional science. A huge discussion exists both whether regions converge or diverge in time and what factors determine their development. However, the discussion is carried out mostly at the theoretical level or, empirically, at the level of individual countries or particular regions. Differently from the case of "vertical" income inequalities there has been surprisingly almost no effort to focus on the cross-sectional comprehensive documentation of the relationship between the level

of economic progress and regional inequality, except the descriptive paper carried out by Williamson(1965) four decades ago.

## **3. Methodological notes**

3.1. Regional units: As was mentioned above the conventional regional category of individual countries is not used in this paper. Instead, system approach is applied in order to define units for the analysis. The world system is divided into 12 macro-regions-called subsystems here. Additionally, each of the subsystems is divided into 11 or 12 regions(1). In the case of Europe I elaborate regional inequalities even further and divide the European regions (1) into their inner units-signed regions(2) in this paper. Since there is hardly any agreement in the usage of the term "region" I use it here both in its general meaning and specifically-for the geographical units under the analysis-then however I index it as above. There are some basic principles followed in the way of regionalization. On the one hand I try to respect common principles that selected units should be as homogenous as possible by virtue of their cultural-historic and political-economic integrity as well as integrity between their settlement cores and surrounding peripheries. On the other hand there are two other requirements that limit the former. First, each of units at one particular scale should be of a comparable area size (in the extent from 0.5 to 1.5 of an average region, if possible). Second, each of regionalized units should be divided into the same or similar number of its inner parts (from 10 to 12). It is obvious that the mentioned principles can be contradictory in some cases. Moreover, any way of regionalization will be always to some extent subjective. I believe however that the hierarchically organized sets of subsystems, regions(1), and regions(2) are more suitable for proposed analysis than an extraordinarily heterogeneous set of countries. Furthermore, there is one important point to be stressed in relation to the principle of division of a unit into the similar number of inner parts. In fact, the relative inequalities are assessed in this paper: an inequality of a unit at N scale is observed among the same number (10-12) of units at N-1 scale. It guarantees the comparability of inequality measures both among regions at the same scale but across geographical scales as well. Unfortunately it is no space to

discuss the regionalization here in detail though it is undoubtedly debatable but also some variants of the delimitation briefly indicated in Appendix are mentioned in further calculations.

3.2. Data: A couple of problems arise in connection with data availability. It is not the case of population numbers for particular countries that are handily available when I draw here from the base of the U.S. Census Bureau. Nevertheless, regarding economic indicators only economic product data are accessible in sufficient regional elaboration. The adjusted data on purchasing power parity (PPP) are preferred here because they seem to suit better for comparisons of international living standards. In this respect, GNI-s per capita (year 2000) from World Bank is used as the base. The level of GNI per capita (as well as population size) in a region within a country is calculated according to the region's share on total income and population of the country. The data on regional distribution of population and economic product within individual countries originate from various sources: mostly from national statistics of particular countries (Argentina, Australia, Austria, Brazil, Bulgaria, Canada, China, Finland, Germany, Hungary, Iceland, India, Indonesia, Mexico, Norway, Philippines, Poland, Romania, Serbia and Montenegro, Sweden, Turkey, UK, USA), and Eurostat (Czech Republic, France, Greece, Ireland, Italy, Portugal, Spain), but also from Russian Federation Human Development Report 1991 (Russia). Additionally, regarding the "vertical" income distribution, some estimates of distribution among income deciles within regions(1) are applied. The estimates proceeds from the base collected by Bourguignon and Morrisson(2002) whereas in some cases they are combined with the data from World Income Inequality Database. The income distribution of a region(1) is derived according to the character of income distribution in the core country in cases where there are more countries in a region(1).

*3.3. Inequality Measures:* It can be stated that there is no one ideal measure of inequality due to its multidimensionality. As a clearly perceptible measure, I apply here so called rate of heterogeneity (H). It corresponds to a point on the Lorenz curve and shows the percentage share of population that falls on regions (income shares)

with the "dispersed" (bottom) half of the overall economic product (income); i.e. on poorer regions (or income shares) in the distribution–see e.g. Hampl(2000). Additionally, perhaps the two most often used inequality indicators: Theil ( $GE_{(1)}$ ) and Gini (G) indexes are also applied. There are more ways how to calculate Gini however I use the weighted form corresponding to:

$$G = \frac{1}{\overline{x}} \sum_{i=1}^{n} \sum_{j=1}^{n} (x_j - x_i) p_i p_j$$

Where  $x_i$  is income per capita  $(x_j > x_i)$  of *i*-th region, while  $p_i$  is its share on total population. Theil index (the most frequently used one from the family of generalized entropy measures) is then chosen above all because of possibility of its decomposition. Theil index may be generally expressed as:

$$GE(1) = \frac{1}{n} \sum_{j=1}^{n} \ln\left(\frac{x_j}{\overline{x}}\right)^{\overline{x}} = M + V$$

Theil index of the "overall" inequality can be decomposed into the inequality among *i* regions (inter-regional component–M) and the sum of inequalities within *i* regions (intra-regional component–V):

$$M = \frac{n_i}{n} \sum_{i=1}^k \ln\left(\frac{\overline{x}_i}{\overline{x}}\right)^{\overline{x}_i} \qquad \qquad V = \sum_{i=1}^k \frac{n_i}{n} \frac{\overline{x}_i}{\overline{x}} \frac{1}{n_i} \sum_{j=1}^{n_i} \ln\left(\frac{x_{ij}}{\overline{x}_i}\right)^{\overline{x}_i}$$

At least one more important reminder should be stated upon H and Theil index at least. It is that one has to keep in mind the sensitivity of the measures to the both ends of a distribution (and to the upper end in particular). For the more exact discussion of the measures of inequality I only refer here to Atkinson(1970) or Litchfield(1999) among many others.

#### 4. The level of Global socio-economic inequality

The basic macro-geographical pattern of the global socioeconomic differentiation is well-known: first of all there is a considerable difference between the level of economic progress of the West and the rest of the world mainly due to the uneven (macro)regional economic development during two past centuries or so; among others see Maddison(1995b) or Bourguignon and Morrisson(2002). Some authors claim that there have been substantial differences in living standards of the European core countries and the rest of the world already long time ago–say from the end of the eighteenth century; e.g. Kuznets(1966), Maddison (1995a). Others however advocate rather similar estimates of the (generally low) standards that were not far from subsistence rates within all of the macro-regions; e.g. Bairoch(1993) or Lucas(2000). Putting the discussion aside, there is anyway an undoubted fact that the differences were quite limited at the time if we compare them with current ones–shown in Table 1, for instance.

*	Percentage share in the world's:		
Subsystem	Area	Population	Economic
			product
American	8.4	6.3	23.7
Canadian	8.1	0.5	1.9
European	4.3	9.8	24.6
Oceanic	6.3	0.5	1.2
Brazil	6.3	2.8	2.8
East-Asian	9.6	24.6	22.2
Russian	15.3	4.1	3.5
Latino-American	7.4	4.0	3.5
Islamic	10.6	6.2	3.7
South-Asian	6.5	30.2	10.7
South-African	8.4	4.8	1.4
Central-African	8.8	6.2	0.8
	Area: 135600 km <sup>2</sup> Population: 6076 millions GNI per capita: 7290 current USD		
World in 2000:			

Table 1. Shares of subsystems in the world's total area, population, and economic product

Note: Units in all of the tables in this paper are sorted according to their GNI per capita

None the less, the disparities among the averages of individual subsystems form (at the aggregate) only the first component of the overall world inequality whereas inequalities within subsystems should be also considered here. Regarding that, both Tables 2 and 3 that regional homogeneity differs significantly show among particular subsystems. It is clear that regional inequality within a subsystem is to certain extent determined by the regionalization. Both the inclusion of the region(1) of Japan (including South Korea and Taiwan) into East-Asian and that of South Africa into South-African subsystem sharply surge regional(1) inequalities within the two units. The levels of H listed in Table 2 would be substantially lower (i.e. 62.93 for China and 71.10 for South African subsystem) were China regarded alone and South-African subsystem without South Africa. Additionally, also American subsystem would be regionally(1) less unequal (H = 53.85) supposing the United States alone (Mexico is added to the U.S. here instead to Latino-American subsystem because of its strong economic linkages to the former).

rubie 2. Regional(1) mequantes wham the work subsystems				
Subsystem	Н	Subsystem	Н	
American	62.35	Russian	61.35	
Canadian	55.89	Latino-American	67.59	
European	63.42	Islamic	67.23	
Oceanic	63.13	South-Asian	65.04	
Brazil	66.11	South-African	87.10	
East-Asian	83.21	Central-African	63.73	

Table 2. Regional(1) inequalities within the world subsystems

Note: H is the rate of regional heterogeneity. See section 3.3 for definition.

The calculations of Theil indexes in Table 3 points additionally to the contributions of individual subsystems to the aggregate regional(1) differentiation. It is obvious that both the contributions of rich units on the one hand and populous ones on the other hand (i.e. subsystems at the both sides of the distribution) are crucial regarding the Theil index decomposition. Almost one half of the world regional-economic differentiation therefore falls on East-Asian subsystem and likewise the contributions of the two core Western units are worth to mention, respectively.

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	Regional(1) inequality	Contribution to
Subsystem		aggregate regional(1) inequality
	Theil index	Theil index
American	10.49	2.48
Canadian	0.94	0.02
European	9.19	2.26
Oceanic	12.60	0.18
Brazil	10.28	0.29
East-Asian	34.99*	7.75
Russian	4.17	0.15
Latino-American	10.53	0.36
Islamic	11.71	0.43
South-Asian	8.26	0.88
South-African	62.62*	0.90
Central-African	4.43	0.04
World aggregate reg	ional(1) inequality	15.74

Table 3. Decomposition of the world regional(1) inequality

Note: \*1.88 for China alone and 19.71 for South-African subsystem without South Africa.

The last step undertaken here alongside the decomposition of global inequality addresses income inequalities within regions(1). Nevertheless, due to numerous data imperfections it might be misguiding effort to quantify and compare income distributions within individual units. Though indeed approximately, it seems more possible to bring together existing data in order to estimate the aggregate level of global inequality among income deciles. The overall global income inequality in this paper corresponds thereby in fact to the aggregate inequalities among 1350 income groups: 10 income deciles within each of 135 world regions(1).

Some underestimation of the "real" global inequality among people therefore exists here. I guess however that this systematic bias is perhaps not as significant as may be various problems connected with data imperfections, for instance. All in all, the overall global inequality corresponds to 66 Gini points (Table 4). This means slightly higher value than was provided by the others concerned with the topic. For example Gini indexes calculated by Sala-i-Martin(2002) for 1998 and by Dowrick and Akmal(2003) for 1993 are approximately five points lower while these provided by Chotikapanich et al.(1997) for 1990 as well as Milanovic(2000) for 1998 are for about one point lower than my result. The difference could also reflect different territorial approach to measurement of the world inequality. Since the authors usually combine inequalities between and within countries lightly higher rate of the overall inequality revealed here may result from the fact that also regional disparities within a number of bigger countries are reflected.

Table 4. Global socio-economic inequalities measured at different geographical scales

Inequality among:	Gini index	Theil index	Η
12 subsystems	45.85	37.75	83.59
135 regions(1)	54.37	53.34	86.85
1350 income groups	65.94	84.79	90.91

All the same, the calculations again emphasize relatively wellknown fact of extreme economic inequalities have cut global society. More innovative however may be the comparison of inequalities measured at different scales of (geographical) detail described both in Table 4 and Table 5 where is the overall inequality in addition unfolded according to the Theil decomposition.

It is obvious from Table 5 that the most important part of the world inequality results from the differences in GNI-s per capita between individual subsystems. This component accounts for almost one half of the overall Theil index while the aggregate of regional(1) disparities within subsystems accounts only for one-fifth of the overall inequality, approximately. Finally, differences among income groups within the world regions(1) have, at the aggregate level, the second highest contribution, though one has to keep in mind the repeatedly mentioned roughness of the income distribution estimates.

	Theil	Share (%)	in the	overall
	index	inequality a	mong:	
Inequality among:		135	1350	income
		regions(1)	groups	
12 subsystems	37.75	70.6		44.5
Regions(1) within subsystems	15.74	29.4		18.5
135 regions	53.49	100.0	63.0	
within regions(1)	31.45		37.0	37.0
1350 income groups	84.94		100.0	100.0

Table 5. Contributions of particular scales of detail to the world socio-economic differentiation

## 5. European regional inequality

In addition to the world socio-economic inequalities I examine in this paper also the case of European regional differentiation. There are two reasons for it at least. First, practical one is that differently from the other subsystems there exist relatively comprehensive information on regional economic disparities within the most of European countries (and therefore also within the regions(1)). Second, the case of Europe can provide us with some lessons; i.e. what we might expect at the global level was the world get well as a whole. It is a matter of fact that regional structures of both systems (i.e. European and global) reflects their deeply embedded coreperiphery relations with some type of a club convergence though this type of integration is far more developed in Europe than at the world level.

The position of European subsystem among the other macroregions is shown in Tables 1, 2, and 3. It is obvious that Europe as a subsystem has the middle-lower level of regional(1) inequality. Nevertheless, as we know, there have been only several periods of regional economic convergence in European history. The authors who document some amelioration of regional inequalities refer usually to the limited territory of the European Union or to selected historical periods, respectively; e.g. Suarez-Villa and Cuadrado-Roura(1993), Armstrong(1995), Sala-i-Martin(1996), and others. There have been perhaps two main periods of regional convergence during the two past centuries. First, the Scandinavian countries reached the western core what has happened, as Madisson(1995b) suggests, approximately at the end of the nineteenth century. Second, some convergence also proceeded in the 50s and 60s of the twentieth century both within the capitalist core and perhaps also within the communist part of Europe. Overall however, the continent as a whole has been ever considerably diverse from the regional-economic point of view: the traditional core-periphery division in Europe dates back deep to the medieval centuries; see Berend(2003). The recent state of differences among the European regions(2) shows Table 6.

Region(1)	Percentage share in European:		
	Area	Population	Economic product
Norwegian	6.8	0.8	1.2
German	9.6	21.2	29.1
Swedish	8.5	2.4	3.2
French	9.3	10.0	14.0
British islands	5.4	10.7	13.9
Italian	5.2	9.8	12.4
Pyrenean	10.3	8.5	8.5
Baltic	8.8	2.2	1.7
Central-Eastern	9.2	11.0	6.1
Turkish	13.9	12.0	5.5
Balkan	7.1	6.1	2.7
Romanian-Bulgarian	6.0	5.2	1.7
	Area: 5825 km <sup>2</sup>		
Europe in 2000:	Population: 586 millions		
	GNI per capita: 18533 current USD		

Table 6. Shares of European regions(2) in the subsystem's total area, population, and economic product

Now I move further into detail and focus on regional disparities within the European regions(1); i.e. between their inner parts–indexed regions(2) in this paper. They mostly correspond to administrative units of individual countries clustered in order to fulfill scheduled methodological requirements. The values of H

within the European regions(1) are shown in Table 7; Theil index for the same phenomena is then listed in Table 8.

			0
Region(1)	Н	Region(1)	Н
Norwegian	55.86	Pyrenean	58.12
German	52.37	Baltic	72.41
Swedish	53.90	Central-Eastern	60.65
French	58.12	Turkish	76.24
British islands	57.55	Balkan	68.47
Italian	59.94	Romanian-Bulgarian	58.48

Table 7. Relative regional(2) inequalities within European regions(1)

Note: H is the rate of regional heterogeneity. See section 3.3 for definition.

The highest levels of regional(2) inequalities show Turkish and Baltic regions(1). Obviously, some impact of regionalization exists there again. Especially high inequalities within Turkish and Baltic regions(1) are determined by the facts that Israel (with Cyprus) is included into the former and Finland is joined with Estonia, Latvia, and Lithuania in the latter region(1). The level of regional inequality within Turkey would be notably lower (H = 64.17) supposing country alone. Analogously, was the same indicator calculated for Finland without the three post-soviet Baltic countries would be the (Finnish) regional heterogeneity considerably lower (H = 58.16).

As obvious from Table 8 Theil index additionally accentuates regional(2) economic heterogeneity of Balkan region(1). There are three Greek regions(2), Slovenia, and Croatia on the one hand and the rest of poorer units including Macedonia, Bosnia and Herzegovina, Albania, Voivodina, Central Serbia, Montenegro + Kosovo, on the other hand. Correspondingly, Theil decomposition indicates the most notable contribution of Balkan and Turkish regions(1) to the overall European regional(2) inequality.

Region(1)	Regional(2)	Contribution to
	inequality	aggregate European
		regional(2) inequality
	Theil index	Theil index
Norwegian	0.95	0.01
German	1.25	0.37
Swedish	0.58	0.02
French	1.41	0.19
British islands	1.28	0.18
Italian	3.58	0.45
Pyrenean	1.78	0.15
Baltic	15.62	0.26
Central-Eastern	2.92	0.18
Turkish	13.29	0.77
Balkan	28.57	0.81
Romanian-Bulgarian	2.23	0.04
European aggregate regional(2) inequality		3.43

Table 8. Decomposition of European regional(2) inequality

Finally, there are indicated the contributions of inequalities measured at two different geographical scales (i.e. between European regions(1) and within them) in Table 9. Therein the importance of between-regional(1) inequality clearly surpasses the impact of the aggregate within-regional(1) component. According the decomposition of Theil index, the former accounts approximately for two-thirds of the overall European regional(2) inequality.

Tuble 9: Decomposition of European regional(2) mequanty				
Inequality among:	Theil index	Share in regional(2)		
		inequality (%)		
12 European regions(1)	9.2	72.8		
Regions(2) within	3.4	27.2		
regions(1)				
European regions(2)	12.7	100.0		

Table 9. Decomposition of European regional(2) inequality

Note: Last column is the share in overall European regional inequality (%)

#### 6. Discussion and some concluding remarks

There are two types of remarks that can be highlighted. First, the assessment of inequalities provides some interesting factual information about the global and European socio-economic inequality. For that I would like to refer to previous sections. Second and perhaps more important, some generalization are expected to be found out in this final section. In this respect I concentrate on three types of questions.

First, regional inequality seems generally to increase with geographical scale at which it is measured. It is obvious from Table 10 that relative regional inequality is higher within the world (measured among its subsystems) than within an average subsystem (assessed among their regions(1)). The lowest levels of regional inequalities we can then (on an average) find within the European regions(1). One interpretation of the fact is that the level of regional inequality depends on the size of an area where is the differentiation observed. It may imply for instance that if we are to compare regional disparities within different countries (or regions) we should ever to keep in mind that our results will be systematically biased in that way!

	Un-weighted		Average weighted by
Mean value of:	average	Median	population
World	83.59	83.59	83.59
Subsystems	67.18	64.39	70.22
European subsystem	63.42	63.42	63.42
European regions(1)	61.01	58.48	59.60

Table 10. Average regional inequalities within systems

Second, although it is suggested that area size matters, it is naturally not only (and by no means the most important) factor determining regional heterogeneity of a geographical system. Another, practically perhaps more important remark thus concerns the cross-sectional relationship between regional inequality and the level of economic development. In this respect, as obvious from Figure 1, the results indicate a negative relationship (95% confidence) between two mentioned variables.





Nevertheless, there are at least two points that limits the significance of the documented trade-off. First, I deal only with the limited number of units here. Second, it should be interpreted carefully also because, as I provide above, regional heterogeneity seems to depend on the area size of a unit observed. There will be therefore some bias if we include the world subsystem and European regions(1) into one sample.

I am thereby to clear the data of the influence of the "area size variable". One way is to shift all the square marks (H values for European regions(1)) in Figure 1 by 2.41 H points upwards, for instance. The shift corresponds to the difference between the value of European among-regional(1) inequality and the average of within-regional(1) inequalities. Adjusted the values in that way significance of the relationship would decrease ( $R^2 = 0.37$ ). In spite of this fact we can conclude that though we cannot speak about clear trade-off between the level of regional inequality and economic progress the

results indicate that high levels of economic development prevents extreme regional inequalities at least.

Third note concerns the decomposition of inequalities. It is documented above that the contributions of among-regional components-both to the world as well as to European overall regional inequalities-are substantially more important than the aggregate within-regional components. One can thus claim that the convergence of macro-regional averages would be the most important if one intended to wipe the overall world economic inequality substantially off. Analogously, the overall regional inequality in Europe depends much more on convergence between the core and peripheral parts of the continent (i.e. peripheral countries and their clusters) than on regional development within these areas.

In conclusion, on the one hand it is argued that regional integration, hand in hand with spatial socio-economic equality, goes on and reproduces itself "from below." It means also that there exists a good potential for various forms of (policy) coordination at local and regional (i.e. intra-national) levels. On the other hand however one can not expect that any regional policy will lead to substantial increases in regional inequalities if it doesn't follow stable macroeconomic policy connected with long-run macro-economic progress. Finally I can (again) argue that, regarding any notable reduction of global socioeconomic inequalities (as well as poverty), there is an inevitable need for some type of effective supranational macroeconomic (policy) coordination at global level.

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# Appendix

Since the regionalization used for purposes of the paper is quite extensive (25 units are delimited into their inner parts) it is not possible to list here all of the units carried out. Therefore I only briefly indicate the regionalization of the world and European subsystem while any details can be obtained from author upon a request.

#### A: Regionalization of the world into 12 subsystems:

1) American (USA including Alaska and Mexico), 2) Canadian (Canada including Greenland), 3) European (Europe without Russia, Belarus, Ukraine, Moldova but including Turkey, Cyprus, Israel), 4) Oceanic (Australia and Oceania, including Papua New Guinea), 5) Brazil (Brazil), 6) East-Asian (China, Taiwan, Mongolia, Korea-s, Japan), 7) Russian (Russia, Ukraine, Belarus, Moldova, Georgia, Azerbaijan, Armenia, Kazakhstan), 8) Latino-American (Latin and Central America - from Mexico to the south, without Brazil), 9) Islamic (North Africa (without Sudan), Near East without Israel, Iran, Afghanistan, Pakistan, Kyrgyzstan, Turkmenistan, Tajikistan), 10) South-Asian (South Asia from India to Indonesia), South-African (Gabon, Congo-s, Uganda, Kenya and southern countries), Central African (Sub-Saharan Africa to the north from South-African subsystem).

## B: European subsystem into 12 regions(2):

1) Norwegian (Norway, Island), 2) German (Germany, Switzerland, Austria, Be-Ne-Lux), 3) Swedish (Sweden, Denmark), 4) French (France), 5) British islands (GB, Ireland), 6) Italian (Italy), 7) Pyrenean (Spain, Portugal), 8) Baltic (Finland, Estonia, Latvia, Lithuania), 9) Central-Eastern (Poland, Czech Republic, Slovakia, Hungary), 10) Turkish (Turkey, Cyprus, Israel), 11) Balkan (Greece, Albania, former Yugoslavia), 12) Romanian-Bulgarian (Romania, Bulgaria).

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