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Exploring Social Exclusion in The European Union, a Quantitative Approach

Abstract

Social exclusion is a widely debated issue. Its definitions and perceptions vary. Within the paper we identify the underlying factors of social exclusion within the EUfor years 2005-2009 through the use of factor analysis. These factors are as such immeasurable by common indicators. Through factor scores we compare the severity of these factors in each EU 27 and suggest five categories of types of social exclusion.

1. Introduction

Social exclusion as a concept is perceived differently, however when it comes to analysing and aiming for results based on objective criteria, it always comes down to the measurability of its dimensions. Social exclusion isa multidimensional concept and focuses on deprivation in different areas: economic, social, and on the processes and mechanisms that exclude people (Haan 1998).

When analysing social exclusion across Europe, we will use the dataset from European Sustainable Development Strategy (Eurostat 2006), also overlapping with Europe 2020 indicators and targets (Eurostat 2010).

Not all of the dimensions of social exclusion can be captured or measured objectively by indicators. However if these underlying – hidden factors do have

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a significant impact on social exclusion, they should be reflected in the measurable indicators in some way. We aim to extract these underlying factors. First we will identify the major factors behind social exclusion in Europe using factor analysis. We will then calculate and transform their factor scores into a measurable form that is suitable for comparison. Using the transformed factor score values for the year 2009 we will use cluster analysis in order to categorize the countries of European Union based on the underlying factors.

1.1. Indicators of social exclusion and poverty in Europe

We will focus on measurements of poverty and social exclusion included in the Sustainable Development Strategy (SDS) of the European Union (EU) created in 2006. The hierarchy of indicators spans three levels. The headline indicators at the top, representing the monitored area, theme-related indicators on the second level that serve as operational objectives and targets supported by a third level of actions/explanatory variables divided into sections related to the theme-related indicators on the second level. Each of the themes can have contextual indicators that transcend the second and third level (Eurostat 2006) (Figure 1).

Figure 1. Hierarchy of social inclusion indicators within the SDS

Headline indicator	**Operational objectives and targets Actions/explanatory variables**	**Operational objectives and targets Actions/explanatory variables**
Population at risk of poverty or exclusion	***Monetary poverty and living conditions***	
	Persons at risk of poverty after social transfers	Persistent at risk of poverty rate
		Persons at-risk-of-poverty after social transfers, by gender
		At risk of poverty rate, by age group
		At risk of poverty rate, by household type
	Severely materially deprived persons	Relative median at risk of poverty gap
		Inequality of income distribution
	Access to labour market	
	Persons living in households with very low work intensity	In work at risk of poverty rate
		Total long-term unemployment rate
		Gender pay gap in unadjusted form

	Education	
	Early leavers from education and training	At risk of poverty rate, by highest level of education attained
		Persons with low educational attainment, by age group
		Life long learning
		Low reading literacy performance of pupils
		Individuals' level of computer skills
		Individuals' level of internet skills
Contextual indicator	Public expenditure on education (for sub-theme Education)	

Source: http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/indicators.

The indicator *Population at risk of poverty or exclusion* is constructed as the union of the three second level indicators *Persons at risk of poverty after social transfers, Persons living in households with very low work intensity, Early leavers from education and training* not featuring intersections.

The threshold of poverty according to Eurostat is defined as 60 % of the national median of the equivalised disposable incomes in an economy. The indicator *Persons at risk of poverty after social transfers* is calculated as the ratio of persons with equivalised disposable incomes below the poverty threshold.

Severe material deprivation is a share of population with an enforced lack of at least four out of nine material deprivation items. The nine items are defined in the EU SILC methodology (Eurostat 2009).

Households in low work intensity translate to the share of population aged 0-59 living in households where the working age members worked less than 20% of their total work potential during the past year.

The Early leavers from education and training indicator is defined as the percentage of the population aged 18-24 with at most lower secondary education and not in further education or training.

The Europe 2020 strategy aims for reduction of poverty by aiming to lift at least 20 million people out of the risk of poverty or exclusion across EU. Our aim is to extract additional dimensions of social exclusion that could serve as a basis for comparative policy analysis that could help achieve this goal. We extract the factors of social exclusion from the third level of the system of indicators – the explanatory variables. All of the indicators included in the area are obtained either through the EU SILC survey or the Labour Force Survey.

1.2. Methodology

Factor analysis can be used to analyze interrelations among a large number of variables and to explain these variables in terms of their common underlying dimensions. (Hair et. al 2009).Exploratory factor analysis is one of the commonly used evaluation tools. As for the usage of factor analysis in the field of poverty and social inclusion, one of the current examples is (Vojtková M. 2009), where factor analysis was used to extract the factors in order to map and evaluate social cohesion within the EU.

Cluster analysis is a tool commonly used for classification of objects and for developing meaningful subgroups of individuals and objects (Hair et. al 2009).

2. Factor analysis results

Factor analysis can result in in a number of different results based on the selected method and rotation, in our casethe same pattern kept recurring across all possible approaches. The results interpreted in this chapter come from the varimax rotation of the classical factoring method.

The data used have been obtained from the Eurostat database. From the 16 available indicators on the third level two have been discarded for data unavailability - *Persistent-at-risk-of-poverty rate* and *Low reading literacy performance of pupils*. We used country specific panel data from years 2005 – 2009, for this period, all the values for all EU 27 countries are available (Eurostat, 2006). All of the values of the indicators in the analysis were standardized. Some indicators offer different variants; we chose the variants that represent the most vulnerable and/or influenced population groups. These choices come from our previous analyses. Variants are listed in Table 1.

Table 1. Variants of chosen indicators

Indicator	Variant
Persons at-risk-of-poverty after social transfers, by gender	Female population
At-risk-of-poverty rate, by age group	Aged 65 and above
At-risk-of-poverty rate, by household type	Single female
At-risk-of-poverty rate, by highest level of education attained	at most ISCED 2
Persons with low educational attainment, by age group	25 – 64 years
Individuals' level of computer skills	Lowest level
Individuals' level of internet skills	Lowest level

Source: Author’s research.

Based on the rule of thumb for significance of factor score coefficients (Hair J. F. et. Al 2009) we set the minimum significance threshold of a factor score coefficient at 0.5 In order to interpret the factors. Table 3 represents the simplified rotated matrix of factor score coefficients.

The factor score coefficients of the first two factors *Unfavourable living conditions* (U) and *Deprivation of education* (D)feature only positive scores on variables where an increase of the indicator means a negative development and negative scores on indicators where a decrease translates to a negative development. This is not the case with the third factor - *Gender inequality persisting above low educational attainment*(G), where the decrease of the decrease of the *Persons with low educational attainment, by age group* indicator is a positive development on its own. We will have to take this into account when using the factor scores for cluster analysis (Hair J. F. et. al 2009).

Table 2. Simplified rotated matrix of factor loadings (factor score coefficients)

↓Indicator / Factor →	**U**	**D**	**G**
At risk of poverty rate, by household type	0.89		
Relative median at risk of poverty gap		0.68	
Inequality of income distribution	0.67		
In work at risk of poverty rate		0.63	
Total long-term unemployment rate		0.66	
Persons at-risk-of-poverty after social transfers, by gender	0.86		
At risk of poverty rate, by age group	0.88		
Gender pay gap in unadjusted form			0.61
At risk of poverty rate, by highest level of education attained	0.91		
Persons with low educational attainment, by age group			-0.82
Life long learning		-0.72	
Individuals' level of computer skills			0.74
Individuals' level of internet skills			0.51
Public expenditure on education		-0.74	

Source: Author's research.

The living conditions of individuals influence their options and motivations for the future. The first factor - *Unfavourable living conditions* represents an antagonistic process. *U* increases the risk of poverty for all population groups in the analysis excluding working poverty as well as includes the reflection of poverty of these groups on the total inequality in a society. While one of the reason for affecting more of the poverty groups are the overlaps between these groups (a single female over 65 years of age for

example), the influence of the poverty of people aged 65 and above also hints to the existence of an intergenerational transfer of poverty.

The *Deprivation of education* factor describes the impact of reducing public expenditure on education, which results in the decrease of accessibility of life long learning, the effects of this process on the society decreases the competitiveness of a part of the population resulting in the affected population to either in low wages (increase of the *In work at risk of poverty rate* indicator) or in the increase of the long term unemployment. This further influences the inequality in society by increasing the *Relative median at risk of poverty gap*.

Based on the UN statistics of the ratio of estimated female to male earned income, EU countries still show a significant income gap between genders (UN,2009).*Gender inequality persisting above low educational attainment* factor represents a more advanced form of gender inequality. It is noticeable in countries where higher educational attainment is a standard. While there is a decrease in *Persons with low educational attainment, by age group* and an increase in basic level of computer and internet literacy, there is an increase in *Gender pay gap in unadjusted form* which points out to the fact, that even with a higher educational attainment, the gender pay gap still persists, possibly even in creases. This affects the overall inequality in a society, reflected in the *Inequality of income distribution* measures.

3. Cluster analysis results

By applying cluster analysis, we aim to classify the EU 27 countries based on the three factors we discovered. We believe such a classification is necessary as countries often look for inspiration in the area of social policies in countries with a similar setting. The socio-economical background of today calls for effective policies for combating social exclusion. Applying what has been successful in another country can only work in a similar setting. We came up with five groups of types of social exclusion that should serve as a basis for such comparison.

In order to improve the readability of the factors we aim for the factors to achieve only values above zero where higher values means a higher influence in a country. Usually factor scores are negative for countries (observations) with a below average influence of a factor and positive values for countries (observations) with an above average influence of a factor. First two factors could be transformed by one, very simple step – adding the value of the minimal factor score of a factor to each factor score of the same factor. This will retain

the informational value of comparing the values of the factor to their mean. Adding a constant to every factor score results in the mean increasing by the same constant which can be expressed as follows:

$$\mu + c = \frac{\sum_{1}^{n} c + F_i}{n} \quad (1)$$

where: i – country specific observation, n – number of observationsc – constant, $c = F_{min}\mu$ – mean, F – factor score, F_{min}– minimum of the factor scores

Both of these factors now have factor scores of zero and above and the higher their values are, the higher the influence of the respective factor which means a negative development.

Transforming the third factor score - *G*is different. Originally this factor included three factor score coefficients of indicators that meant a positive development and one with a negative. We aim for the factor scores to reflect negative development just as the two previous factors for easier comparability. Before calculating the factor score coefficient of this factor, we transform the single indicator with the negative development (*Gender pay gap in unadjusted form*) to an opposite, negative value.At this point all of the developments of the indicator of the factor are positive; in order to transform them into negative we will multiply all factor scores calculated after the transformation of the factor score coefficient by the value of -1.

$$\mu + c = \frac{\sum_{1}^{n} c \cdot F_i}{n} \quad (2)$$

This leaves us with*Gender inequality persisting above low educational attainment*values that are negative for countries (observations) with a below average influence of a factor and positive values for countries (observations) with an above average influence of a factor. The final transformation is similar to the one applied to the previous two factors – adding the value of the minimal factor score of a factor to each factor score.

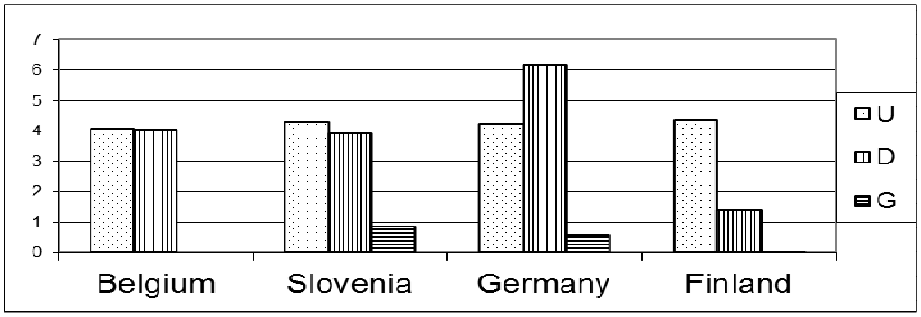
Results of the cluster analysis

Cluster analysis conducted through Ward's method with Euclidean distance measure, resulted in five country groups. All of the comparisons are not

made against an absolute benchmark;yet, the resulting groups seem to reflect the current situation in European Union quite well.

The first group of countries attains low values of all of the factors and especially at*Gender inequality persisting above low educational attainment* being close to zero. We can conclude there are high levels of gender equality in these countries as well as lower levels of social exclusion compared to the EU 27 average (Figure 3).

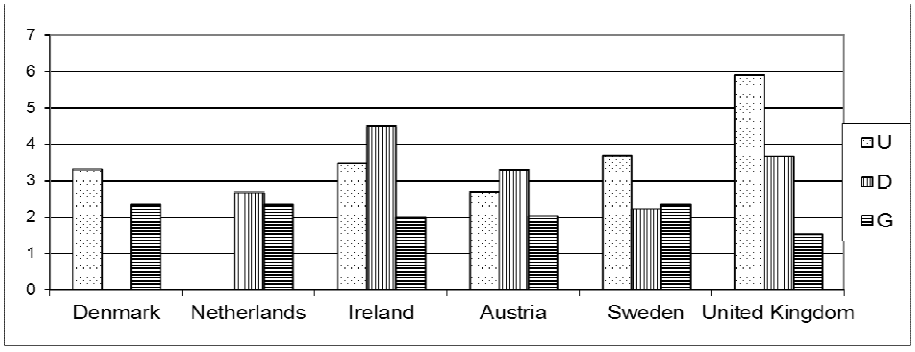
Figure 3. Factor score values: Belgium, Slovenia, Germany and Finland



Source: Author's calculations.

While Finland and Germany are often considered one of the most socio-economically stable countries, it is interesting that Slovenia ranks among such countries. Germany ranks above average in the *Deprivation of education* factor score. The next group of countries, while still achieving below average scores of factor scores for social exclusion experiences higher values of the *Gender inequality persisting above low educational attainment* factor (Figure 4).

Figure 4. Factor score values: Denmark, Netherlands, Ireland, Austria, Sweden, and United Kingdom

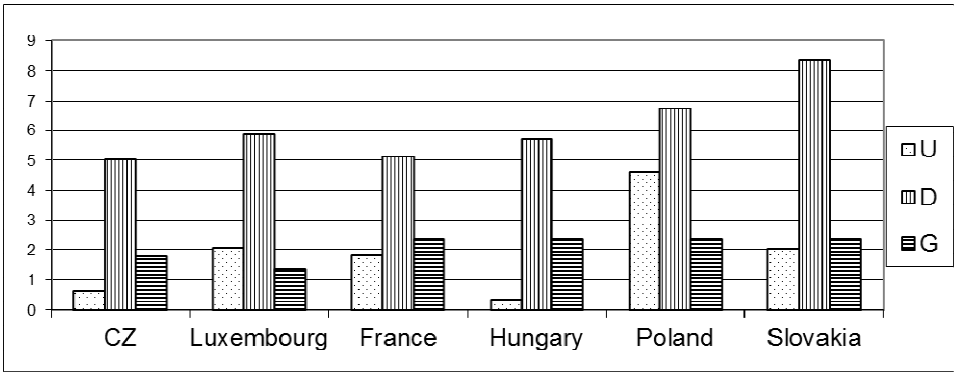


Source: Author's calculations.

Denmark has, compared to other EU 27 countries almost non-existing deprivation of education and Netherlands have a very good position on *Unfavourable living conditions*. Ireland, a country often mentioned with the connection with the current EU economical crisis is, compared to other affected countries much better off in the terms of social exclusion. The United Kingdom has however an above average value of the *Unfavourable living conditions* factor score which is disproportionate towards the two remaining factors.

The third group of countries contains France, Luxembourg and all Vysegrad countries. All of the countries have a below average value of *Unfavourable living conditions* and *Gender inequality persisting above low educational attainment* (Figure 5). For Vysegrad countries this could be caused by their communistic past where the equality of a society was higher (even though on the negative side). All of the countries experience disproportional values of the *Deprivation of education* factor scores which can lead to negative externalities connected with the deprivation of human capital.

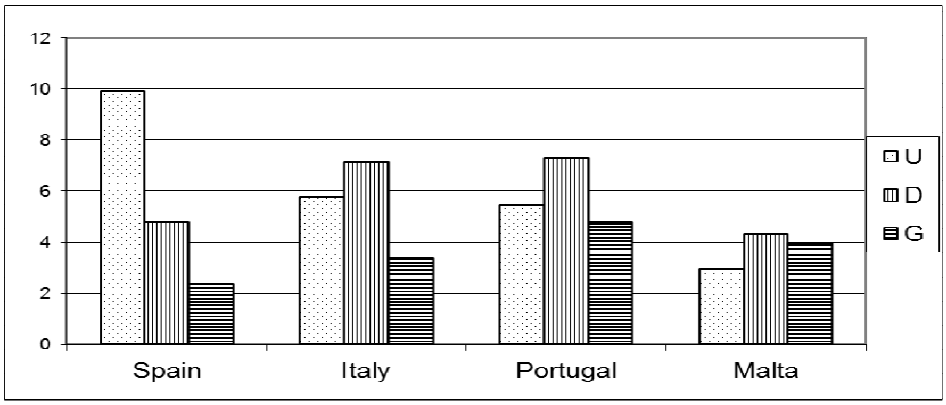
Figure 5. Factor score values: Czech Republic (CZ), Luxembourg, France, Hungary, Poland and Slovakia



Source: Author's calculations.

The fourth group features mostly Southern Europe. All countrieshave above average *Gender inequality persisting above low educational attainment* factor scores. Spain ranks high in the *Unfavourable living conditions* factor score. Both Italy and Portugal achieve values above average. The values of *Deprivation of education* are above average also for Italy and Portugal. Malta has the best values of the factors of social exclusion from this group of countries (Figure 6).

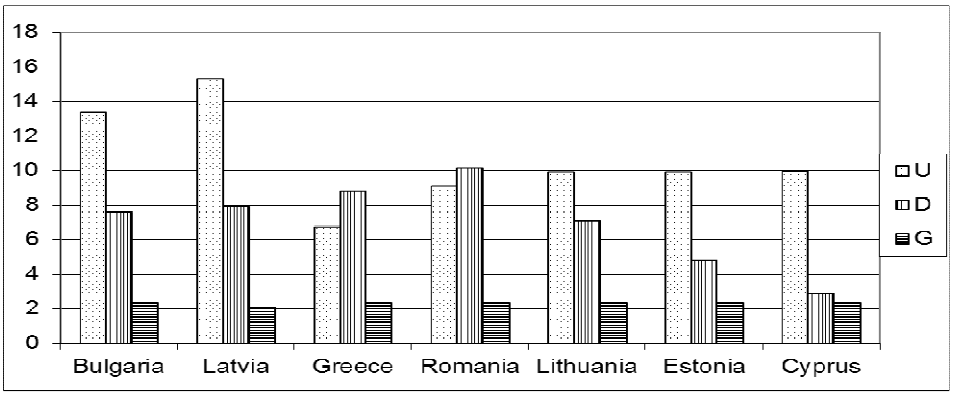
Figure 6. Factor score values: Spain, Italy, Portugal and Malta



Source: Author's calculations.

Last group of countries is the one ranking the worst on factor scores for social exclusion. Besides the last two admissions into the EU – Bulgaria and Romania it includes also countries from North-Eastern Europe, Cyprus and Greece. All of the factor score values of these countries are above average. For *Unfavourable living conditions* the highest values belong to Bulgaria and Latvia. The *Deprivation of education* is most prevalent in Romania and Greece. Factor scores of *Gender inequality persisting above low educational attainment* are very similar for all the countries (Figure 7).

Figure 7. Factor score values: Bulgaria, Latvia, Greece, Romania, Lithuania, Estonia and Cyprus



Source: Author's calculations.

4. Conclusion

With the use of exploratory factor analysis weidentified three major factors of social exclusion - *Unfavourable living conditions*, *Deprivation of education* and *Gender inequality persisting above low educational attainment*. These factors reflect crucial issues that need to be addressed across Europe. The transformed factor scores for the three factors behind social exclusion can serve further as indicators measuring the progress of the EU countries in combating social exclusion as well as variables when it comes to modeling social exclusion (such as regression or correlation analysis).

The extent of each factor varies in different countries; however there are similarities among the countries. We identified five groups of EU 27 countries that can be used as a basis for comparative approach when it comes to implementing policies aimed at combating social exclusion.

The groupings have a potential to serve as the basis for comparative policy analysis. When it comes to social exclusion, there is no dividing line between the founders of the European Union and the newcomers.

It is also interesting to note, that countries most associated with the ongoing budget crisis vary in the extent of the influence of the three factors behind social exclusion and thus we can't expect the same measures to have the same effect for them.

A basis for further research could be the influence of cultural or regional dimension on the rankings of the factor scores. When we look at the values of the factor scores, we see the following:

- No Nordic country ranks above average on any factor score
- Group 4 is formed exclusively by countries from the south of Europe and has an above average influence of the *Gender inequality persisting above low educational attainment* factor
- No country from south of Europe belongs to any of the first two groups except for Slovenia
- All Vysegrad countries belong to the third group; this may be caused by a very similar socio-economical past

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Streszczenie

ANALIZA WYKLUCZENIA SPOŁECZNEGO W UNII EUROPEJSKIEJ: PODEJŚCIE ILOŚCIOWE

W artykule określono podstawowe determinanty wykluczenia społecznego w Unii Europejskiej w latach 2005-2009, na podstawie analizy czynnikowej. Czynniki wykluczenia stanowią cechy niemierzalne, które w badaniu zostały zoperacjonalizowane za pomocą zmiennych mierzalnych. Porównanie wpływu poszczególnych czynników w krajach UE 27 pozwoliło na wyodrębnienie pięciu kategorii wykluczenia społecznego.