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Analysis of European Union Economy in Terms of GDP Components

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The impact of the crises on national economies represented a subject of analysis and interest for a wide variety of research studies. Thus, starting from the GDP composition, the present research exhibits an analysis of the impact of European economies, at an EU level, of the events that followed the crisis of 2007 – 2008. Firstly, the research highlighted the existence of two groups of countries in 2012 in European Union, namely segments that were compiled in relation to the structure of the GDP's components. In the second stage of the research, a factor analysis was performed on the resulted segments, that showed that the economies of cluster A are based more on personal consumption compared to the economies of cluster B, and in terms of government consumption, the situation is reversed. Thus, between the two groups of countries, a different approach regarding the role of fiscal policy in the economy can be noted, with a greater emphasis on savings in cluster B. Moreover, besides the two groups of countries resulted, Ireland and Luxembourg stood out because these two countries did not fit in either of the resulted segments and their economies are based, to a large extent, on the positive balance of the external balance.

***Keywords**: GDP, consumption expenditure, consumption expenditure of general government, Gross capital formation, External balance of goods and services*

***JEL Classification**: E21, E22*

1. Introduction

Keynes placed the consumption function at the center of his theory regarding the economic fluctuations that plays a major role in the subsequent development of macroeconomic analysis. Mankiw analyzed the consumption function starting with Keynes's main ideas from his timeframe, and then he examined it from the perspective of the obtained results when Keynes's ideas were confronted with empirical data (Mankiw, 2010, p. 496).

The relationship between society income and that which is expected that will be spent for consumption depends on the psychological characteristics of society, characteristics that are named 'propensity to consume'. Thus, consumption depends on aggregated income and consequently on employment level, with the exception of the case when there are changes in relation to propensity to consume (Keynes, 1936, p.88). Also, Keynes (1936, p.62) stated that the expenditure on consumption during any period must mean the value of goods sold to consumers during that period, which throws us back to the question of what is meant by a consumer-purchaser. Expenditure on consumption can be defined as $-A_1$ where A is the total sales made during the period and A_1 is the total sales made by one entrepreneur to another.

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Starting from the definition of income, we can define current investment as "the current addition to the value of the capital equipment which has resulted from the productive activity of the period… this addition is equal to what we have just defined as saving, for it is that part of the income of the period which has not passed into consumption (Keynes, 1936, p.63).

Macroeconomic equilibrium occurs when aggregate demand of goods and services is equal to aggregate supply of goods and services, which leads to the equation of macroeconomic equilibrium:

$$Y = C + G + I + En$$

where Y represents national income, C - Household and NPISH final consumption expenditure; G - Final consumption expenditure of general government; I - Gross capital formation; En - External balance of goods and services.

This equation is valid for the situation of an open economy which has economic relations with the rest of the world. Moreover, a simplified form of the equation is used for the analysis of macroeconomic equilibrium in a closed economy. In this case, the following expression arises:

$$Y = C + G + I$$

Macroeconomic equilibrium can be rewritten starting from the equality that has to exist between outputs and inputs of money:

$$C + S + T = C + I + G + En$$

Where T represents taxes.

The above relationship becomes:

$$(S - I) + (T - G) = En$$

Where (S – I) represents the net saving from the private sector, (T – G) represents government budget surplus, En represents trade balance surplus.

2. Research Methodology

In this section, the current situation in the EU is analyzed based on empirical data, in terms of GDP components: C - Household and NPISH final consumption expenditure; G - Final consumption expenditure of general government; I - Gross capital formation; En - External balance of goods and services.

In this analysis, we will consider as exogenous variables the following four components that characterize the economic situation in the European Union household and NPISH final consumption expenditure (C), final consumption expenditure of general government (G), gross capital formation (I) and external balance of goods and services (En). All four variables are expressed as a percentage of GDP and the data were provided by Eurostat.

The current analysis of this study includes the following two steps:

1. Segmentation of EU countries in groups of countries, according to C, G, I and En.
2. Factor analysis of the segment results.

3. Analysis and Results

3.1. Segmentation of the European Union

In this first stage of the analysis, several segments were attained, which include groups of countries characterized by similar results of the four variables taken into account (C, G, I and En). To achieve this research objective, we use the Two-Step Cluster method and we obtained the following results regarding the relevancy of the clusters formed:

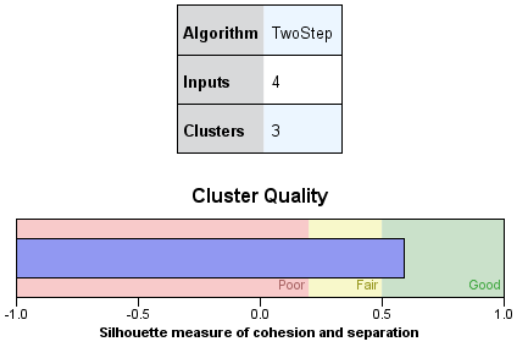
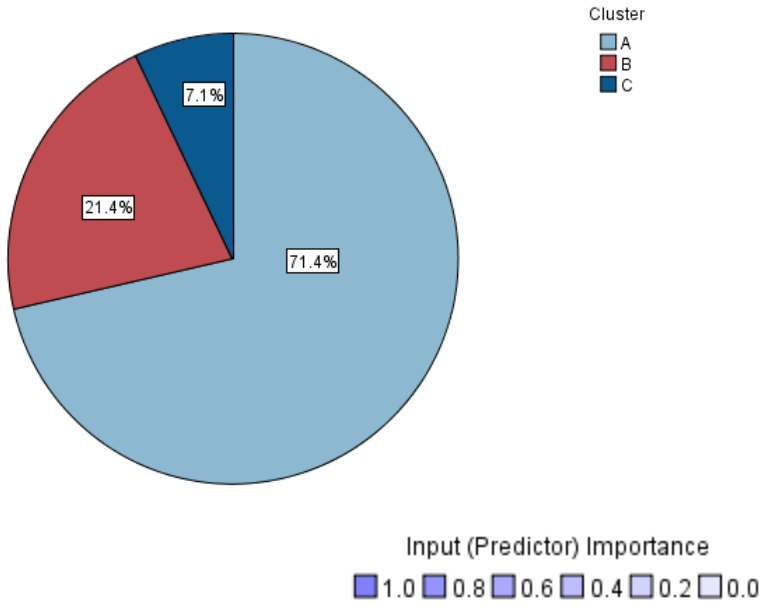


Figure 1. *Segmentation Model Summary*

From the figure above (Figure 1), it can be observed that the three clusters resulted, with their forming variables, and the segmentation has a high relevance in terms of the quality of clusters obtained.

Further, the relative and absolute proportions of clusters and the countries that form each segment are presented.



Cluster	1	2	3
Label	A	B	C
Description	Austria; Bulgaria; Cyprus; Czech Republic; Estonia; Germany; Greece; Hungary; Italy; Latvia; Lithuania; Malta; Poland; Portugal; Romania; Slovakia; Slovenia; Spain, UK	Belgium; Denmark; Finland; France; Netherlands; Sweden	Ireland; Luxembourg
Size	71.4% (20)	21.4% (6)	7.1% (2)
Inputs	g 18.88	g 26.45	g 17.75
	en 0.95	en 2.88	en 26.70
	c 60.55	c 51.68	c 39.95
	i 19.45	i 19.07	i 16.10

Figure 2. *Clusters of EU Countries*

Thus, the analysis displays three segments with following composition:

Table 1. *Clusters of EU Countries*

Cluster	Features	Countries
A	**60.55%** Household and NPISH final consumption expenditure **18.88%** Final consumption expenditure of general government **19.45%** Gross capital formation **0.95%** External balance of goods and services	Austria, Bulgaria Cyprus, Czech Republic Estonia, Germany Greece, Hungary Italy, Latvia Lithuania, Malta Poland, Portugal Romania, Slovakia Slovenia, Spain United Kingdom
B	**51.68%** Household and NPISH final consumption expenditure **26.45%** Final consumption expenditure of general government **19.07%** Gross capital formation **2.88%** External balance of goods and services	Belgium Denmark Finland France Netherlands Sweden
C	**39.95%** Household and NPISH final consumption expenditure **17.75%** Final consumption expenditure of general government **16.10%** Gross capital formation **26.70%** External balance of goods and services	Ireland Luxembourg

Next, Table 2 presents a descriptive analysis of the 3 clusters, as an intermediate stage of transition to the second stage of analysis.

Table 2. *Descriptive Statistics*

Descriptive statistics		N	Minimum	Maximum	Mean	Std. Deviation
A	C	20	50.6	73.7	60.550	5.5687
	G	20	15.5	21.8	18.885	1.8196
	I	20	12.8	28.2	19.450	4.4687
	En	20	-5.2	7.4	.950	3.9501
	Valid N	20				
B	C	6	45.6	57.7	51.683	4.7831
	G	6	24.7	28.5	26.450	1.7661
	I	6	17.4	21.0	19.067	1.4194
	En	6	-2.3	8.4	2.883	4.1825
	Valid N	6				
C	C	2	32.1	47.8	39.950	11.1016
	G	2	17.5	18.0	17.750	.3536
	I	2	10.9	21.3	16.100	7.3539
	En	2	24.2	29.2	26.700	3.5355
	Valid N	2				

3.2. Factor Analysis of the Resulted Segments

Further, the study aims to achieve factorial analysis using the Principal Component Analysis as the extraction method and Varimax with Kaizer normalization as the rotation method, for the 2 of the 3 resulted segments. Thus, cluster C is excluded from the analysis because it includes only two countries characterized by contextual circumstances in respect of the indicators of the analysis, and cannot be integrated into a broader analysis of the situation in the EU.

Factor Analysis of Cluster A

Regarding the results obtained from factor analysis for cluster A, they are represented in the following tables (Tables 3 and 4):

Table 3. *Total Variance Explained for Cluster A*

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.123	53.078	53.078	2.123	53.078	53.078	2.080	52.010	52.010
2	1.552	38.793	91.871	1.552	38.793	91.871	1.594	39.860	91.871
3	.319	7.983	99.854						
4	.006	.146	100.000						

Table 4. *Rotated Component Matrix for Cluster A*

	Component	
	1	2
C	-0.902	0.427
G	0.654	0.637
I	0.073	-0.981
En	0.914	0.209

It is observed that cluster A is influenced by two main factors: consumption and investment. Thus, consumption (expressed in C, G and En) explains 52.01% of the cases, and investments explain 32.86% of the cases.

Factor Analysis of Cluster B

Regarding the results obtained from factor analysis for cluster B, they are represented in the following tables (Tables 5 and 6):

Table 5. *Total Variance Explained for Cluster B*

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.624	90.602	90.602	3.624	90.602	90.602	2.183	54.579	54.579
2	.359	8.971	99.573	.359	8.971	99.573	1.800	44.994	99.573
3	.016	.405	99.978						
4	.001	.022	100.000						

Table 6. *Rotated Component Matrix for Cluster B*

	Component	
	1	2
C	-0.914	0.406
G	0.645	-0.757
I	-0.384	0.922
En	0.886	-0.460

It is observed that cluster B is influenced by two main factors: consumption and investment. Thus, final consumption expenditure (C) and external balance (En) explain 54.579% of the analysis' situations, and investment (I) and government consumption (G) explain 44.994% of the situations.

4. Conclusion

In this conducted study, we main analysis methods were used: Two-Step Cluster in the first stage (for an EU segmentation) and Principal Component Analysis as the extraction method and Varimax with Kaizer normalization as the rotation method, in the second stage of the analysis (for a factor analysis of the segments resulted in the first stage). Thus, through the process of segmentation via Two-Step Cluster, the following the situation at EU level was identified:

Table 1. *Clusters of EU Countries*

Cluster	Countries	C	G	I	En
A	Austria	55.1	19.0	22.7	3.2
	Bulgaria	64.3	15.5	23.8	-3.7
	Croatia	60.2	19.8	19.4	0.7
	Cyprus	67.6	19.2	13.1	-2.6
	Czech Republic	50.6	20.5	23.3	5.6
	Estonia	51.2	19.2	28.2	0.3
	Germany	57.5	19.3	17.3	5.9
	Greece	73.7	17.8	13.6	-5.0
	Hungary	54.8	20.4	17.5	7.4
	Italy	60.9	20.1	17.9	1.1
	Latvia	62.4	16.0	25.5	-3.9
	Lithuania	63.3	17.6	18.3	0.8
	Malta	60.0	21.2	12.8	6.1
	Poland	61.5	17.8	20.4	0.3
	Portugal	65.7	18.2	16.7	-0.6
	Romania	62.4	15.7	27.0	-5.2
	Slovakia	57.7	17.6	19.4	5.2
	Slovenia	56.9	20.8	17.5	4.8
	Spain	59.3	20.2	19.8	0.8
	United Kingdom	65.9	21.8	14.8	-2.2
	Mean	**60.55**	**18.88**	**19.45**	**0.95**
B	Belgium	52.9	25.0	21.0	1.1
	Denmark	49.1	28.5	17.4	5.1
	Finland	56.4	25.1	19.8	-0.8
	France	57.7	24.7	19.8	-2.3
	Netherlands	45.6	28.5	17.5	8.4
	Sweden	48.4	26.9	18.9	5.8
	Mean	**51.68**	**26.45**	**19.07**	**2.88**
C	Ireland	47.8	18.0	10.9	24.2
	Luxembourg	32.1	17.5	21.3	29.2
	Mean	**39.95**	**17.75**	**16.10**	**26.70**

From the results of the analysis, it is observed that the economies of cluster A are based more on personal consumption (60.55% of GDP) compared to the economies of cluster B (51.68% of GDP), and in terms of government consumption, the situation is reversed (26.45% of GDP for cluster B compared to 18.88% for cluster A). Thus, between the two groups of countries, a different approach regarding the role of fiscal policy in the economy can be noted, with a greater emphasis on savings in cluster B. Regarding Ireland and Luxembourg, it is apparent that the savings of these countries are based, to a very large extent, on the positive balance of the external balance.

5. References

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