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Eva Lajtkepová[*]
Brno University of Technology, Czech Republic

Differences and Similarities in the Indebtedness of EU Member States after Last Financial Crisis

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Abstract: *Indebtedness is undoubtedly one of the most significant economic problems in the countries of the EU. Despite the fact that the EU-28 have adopted criteria and measures that should regulate indebtedness, the majority of member states are not keeping up to these previously agreed rules. For many countries indebtedness has become a barrier to further development.*

The article's aim is to provide an overview of the indebtedness of EU member states and to explore whether this indebtedness is linked to or even dependent on selected economic characteristics (GDP, unemployment rate and social benefits paid as a share of GDP). Data from the EU-28 countries, the Eurozone and the countries outside the Eurozone will be studied separately on the assumption that there will be differences between the countries in the Eurozone and those outside it.

In the investigation of the issue only secondary data from the official statistics can be used. All the data are taken from Eurostat and then processed using the standard methods of descriptive statistics and correlation analysis.

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[*] Contact: lajtkepova@fbm.vutbr.cz, Brno University of Technology, Faculty of Business and Management, Kolejní 2906/4, 612 00 Brno, Czech Republic

The analysis carried out showed that the average indebtedness of the EU-28 countries is higher than set by the EU criteria, and at the same time confirmed that there is a difference in debt levels between countries within and outside the Eurozone. The Eurozone countries show indebtedness that is overall higher than in countries outside the Eurozone, while at the same time they show a moderately strong linear dependence both between indebtedness and unemployment rates and between indebtedness and payments of social benefits. In the countries outside the Eurozone it was shown that while the relationship between indebtedness and the unemployment rate was weak that between indebtedness and the payment of social benefits was relatively strong.

Introduction

It is indisputable that indebtedness has become one of the most serious problems of the EU countries in recent years. Even though the EU has adopted a range of measures that should have regulated the indebtedness of individual member states, many countries have given up on their implementation and have for a long time not applied them (compare Begg, 2012), and there are even those who believe these rules have completely failed (Hallett *et al.*, 2012). For many states (e.g. Greece, Portugal and Italy) however indebtedness is a barrier to further development, while for the EU as a whole (and especially the Eurozone) it has then become the touchstone of their capacity to collectively resolve significant problems and enforce previously adopted rules. All these reasons make indebtedness a focus of attention not only for practical economists, but, of course, also for research in a variety of contexts.

At the same time, texts dealing with indebtedness in the EU states or in selected groups of these (as variously defined – e.g. the Eurozone/countries outside the Eurozone, "old" and "new" EU countries, southern EU members, etc.), are quite extensive, highly structured, and largely empirical. The frequency of articles, studies and other works remarkably increased with the financial and debt crisis, many dealing with the comparison between the development of indebtedness before and after the financial crisis exploded.

At the time it should be said that in itself public (or as it is often defined "state" or "government") debt is not in any way condemned by economic theory (Buchanan, 1998). Generally – in accordance with the golden rule of finance – the theory of public economics recommends to governments that they finance current expenditure from current revenues (primarily from taxes of course), and capital expenditure from income from capital, which can include loans and income from bonds issued. Thus indebtedness (whether in terms of loans received or bonds issued) is acceptable mainly in

connection with the acquisition of investments. Some authors even recommend debt financing: for example to provide intergenerational justice (Musgrave & Musgraveová, 1994) or to overcome a lack of liquidity (Gwosć & Van Der Beek, 2003). At the same time, however, they generally do not tackle its current level, development and sustainability. It is interesting that the term sustainability of public debt is defined extremely vaguely in texts – no precise definition exists (Botoc *et al.*, 2011). It can perhaps only be described generally as the capacity and willingness of governments to repay the debt.

What is definitely an attractive theme for many authors (Mencinger *et al.*, 2014; Baum *et al.*, 2013; Reinhart & Rogoff, 2010; Greiner, 2012; Sulikova *et al.*, 2015) is the impact of indebtedness on the rate of economic growth. Even though there is some variance in the results, this research arrives at the same conclusions. A mild (low) level of debt has a positive impact on economic growth, but once it passes a certain level of indebtedness (the tipping point) a negative effect dominates. According to individual conclusions, this tipping point does not lie at the same level of indebtedness for each country, for example Mencinger *et al.* (2014) only indicate that in the "old" countries of the EU this border is higher than in the "new" countries. This research also agrees that the relationship between indebtedness and economic growth is not linear (compare Woo & Kumar, 2015; Eberhard & Presbitero, 2014). But Égert (2015) remarks that the nonlinear relationship is extremely dependent on modelling choices and data coverage.

The reaction of individual countries to the growth in debt is also studied in connection with the financial crisis. For the most part, the authors describe a certain rigidity or inflexibility on the part of EU fiscal policy (Alfonso *et al.*, 2010; Baldi & Staehr, 2016), although once again with minor differences between individual states (Paloviita, 2012). Cafiso (2012) at the same time warned before the explosion of the crisis that Greece and Portugal had unsustainable fiscal policies. The emergence, speed and spread of the debt crisis in the EU is ascribed by Lane (2012) to not understanding the fragility of the currency union in the original Euro project. He also sees inadequate crisis management as a destabilising element. Otherwise Apergis & Cooray (2014) also point out that neither for the EU nor the Eurozone itself is there one single recommendation for crisis measures and that each country has to proceed in accordance with its specific conditions (see also Nevile & Kriesler, 2014). Fahrholz and Wójcik (2013) argue that the key issue for solving the Eurozone´s problems lies in readjusting the relationship between the centre and the periphery.

The subject of this text is indebtedness in the member states of the European Union (measured as the share of GDP accounted for by gross government debt) in connection with selected economic indicators. Since several authors have pointed to the differences between countries in the Eurozone and those outside of it, (e.g. Câmpeanu, 2016), special attention will be paid to differences in levels of indebtedness within and outside the Eurozone.

This article has two basic aims: a) to describe the indebtedness of EU member states, b) to study whether this indebtedness shows some form of dependence on selected economic characteristics.

Research Methodology

On the basis of a study of related sources (see above), the following macroeconomic indicators were chosen: GDP per capita in PPS, annual GDP growth rate, the unemployment rate and the share of social benefits paid in GDP. In accordance with many authors (Mencinger *et al.*, 2014; Baum *et al.*, 2013; Reinhart & Rogoff, 2010; Greiner, 2012; Sulikova *et al.*, 2015) we will assume that debt is linked to economic level (here given by the indicator GDP per capita in PPS) and the growth rate of the economy. Since unemployment and the generosity of social benefits have a significant influence on the primary deficit of the state budget, which certainly affects the debt (Cafiso, 2012), these indicators were also added.

The basic assumptions behind the analysis are as follows:

- The level of indebtedness will significantly vary in the Eurozone states and those outside it,
- Indebtedness will be positively correlated with the rate of unemployment and the share of social benefits in GDP,
- Indebtedness will be negatively correlated with the annual GDP growth rate and with economic level (measured as GDP per capita in PPS).

Given the nature off the studied subject only secondary data from official statistics can be used: all the source data is taken from Eurostat. This analysis targeted the years 2011–2015, i.e. the period of the fully developed financial and mainly debt crisis (in 2011 for the first time the EU's overall indebtedness exceeded 80% of its output, and never fell below it in subsequent years). Even if the given period for the analysis is relatively short, these years for the EU countries were to a certain extent crucial also for other reasons: on the one side there were the efforts of the Communities to regulate debt while on the other there was the inability of many countries to effectively enforce these (jointly) adopted measures.

These secondary data were then processed using the methods of descriptive statistics and correlation analysis. There is no doubt that these methods can give an interesting, but only basic, perspective on the issue concerned. However given the priority interest in the (as yet) relatively short period of the financial and debt crisis that developed the use of more sophisticated methods (e.g. an econometric model) would still be equally questionable. For this reason, the given methods were chosen despite the awareness of certain limitations in the results.

The Results of the Descriptive Statistics

If we take a look at the Eurostat statistics[1], we have to say the levels of indebtedness in individual EU members are significantly different. On one side stands Estonia, where the share of gross government debt in GDP over the examined years has been below 10% (with the minor exception of 2014), while on the other side lies Greece, where the same indicator has reached a critical level (in 2014 even above 180%). The countries that have kept fiscal discipline (the agreed Stability and Growth Pact – SGP), are many fewer than those who have given up on the rules. It is interesting that more discipline is shown by the "new" EU members (for example the Baltic states and the countries of central and eastern Europe), than by the "old" EU states. Out of these in the last few years some have even exceeded a 100 % share of gross government debt in GDP: Belgium, Cyprus, Greece, Ireland, Italy and Portugal: meaning that their indebtedness is greater than the annual performance of the economy.

Table 1. Results of Descriptive Statistics – indebtedness of EU countries

	2011	**2012**	**2013**	**2014**	**2015**
Average	65.07037	68.64815	72.23214	73.69643	72.48929
Median	61.70	66.40	69.80	71.45	68.15
MIN	5.9	9.5	9.9	10.4	9.7
MAX	172.0	159.6	177.7	180.1	176.9
Standard deviation	36.32236	36.13186	38.13273	37.99821	37.82317
Coeff. of variation	55.82012	52.633400	52.79192	51.56049	52.17760

Source: own calculation based on Eurostat data (2011 and 2012 without Croatia).

[1] http://ec.europa.eu/eurostat/web/government-finance-statistics/data/main-tables.

The first observations on the indebtedness of the EU countries given above are supplemented by the results of the descriptive statistics (see Tab. 1). In all the followed years both average and median indebtedness were always above 60 % of GDP (the criterion given by the Maastricht Treaty). We should only add that the data on the minimum are always for Estonia and the maximum for Greece. The values for the coefficient of variation are interesting: it testifies to a marked heterogeneity of the EU states from the perspective of indebtedness. Otherwise, the values of the standard deviation indicate the same: the absolute variability between the European Union countries in terms of indebtedness is quite high. From this perspective, we can question the explanatory power of the calculated arithmetic average or median: in this case, the figures for indebtedness in the EU countries were too greatly influenced by extreme values.

Table 2. Results of descriptive statistics – indebtedness of the Eurozone countries

	2011	**2012**	**2013**	**2014**	**2015**
Average	75.71765	80.78824	85.80588	84.57222	80.91579
Median	69.80000	79.60000	80.80000	82.65000	83.20000
MIN	5.9	9.5	9.9	10.4	9.7
MAX	172.0	159.6	177.7	180.1	176.9
Standard deviation	39.72979	38.32519	40.75613	41.22216	40.96474
Coeff. of variation	52.47098	47.43907	47.49806	48.74197	50.62639

Source: own calculations based on Eurostat data.

We can also draw rather similar conclusions from studying the results for the Eurozone countries: in all the studied years both average and median indebtedness were always well above 60% of GDP. In both cases the results are even worse than in the case of the complete set of the EU countries. Data on the minimum are again for Estonia, and the maximum for Greece. Despite the values of the coefficient of variation being lower than in the case of the calculation for all the EU countries, they still testify to the heterogeneity of the Eurozone countries in terms of indebtedness. It is a similar case with the values of the standard deviation – once more we can only note the high absolute variability in the indebtedness of the Eurozone countries.

Table 3. Results of descriptive statistics – indebtedness of countries outside the Eurozone

	2011	**2012**	**2013**	**2014**	**2015**
Average	46.97000	48.01000	51.25455	54.12000	54.70000
Median	41.35000	43.05000	44.70000	44.80000	43.40000
MIN	15.3	16.8	17.1	27.0	26.7
MAX	81.8	85.3	86.2	88.2	89.2
Standard deviation	20.66511	20.21372	21.70485	21.43553	22.97488
Coeff. of variation	43.99640	42.10314	42.34718	39.60740	42.00160

Source: own calculations based on Eurostat data.

The results for the non-members of the Eurozone offer a somewhat different perspective: in none of the years followed did the average or the median reach the border for the Maastricht criteria, even if the average indebtedness from 2013 (when Croatia entered the EU) rose above 50%. The data for the minimum are for Bulgaria and for the maximum are always for the United Kingdom. While the values for the coefficient of variation are lower than in the case of the groups of the Eurozone countries and of all EU member states, nonetheless they are still quite high (the group of non-members of the Eurozone is also smaller than that for the Eurozone), bearing witness to the heterogeneity of the Eurozone from the perspective of indebtedness.

From the results given above, we can draw the conclusion that membership of the Eurozone tends to mean rather non-fulfilment of the Maastricht criteria, or in other words a common monetary policy frequently leads to the violation of these fiscal rules. To make it possible to more clearly address the idea of whether membership of the Eurozone was really linked to resigning on fiscal discipline, the coefficient of association r_{AB} was also calculated, measuring the dependence of two phenomena: in this case the dependence between membership (yes/no) of the Eurozone and fulfilment (yes/no) of the Maastricht fiscal criteria.

For 2015 the value of the coefficient of association $r_{AB} = –0.38586$, and for 2014 $r_{AB} = –0.40881$. Both of these values signal only a weak negative association between these two phenomena. So it can be said that there is only a weak connection between membership in the Eurozone and fulfilment of the fiscal criteria, and it certainly cannot be asserted that non-membership of the Eurozone indicates fiscal discipline, nor can it be said that non-fulfilment of the criteria is typical for Eurozone members.

The Results of Correlation Analysis

To determine the strength of the dependence between the ranking of indebtedness of EU countries and the ranking of selected characteristics we used Spearman's rank correlation coefficient r_s. We carried out the calculation for the years 2013–2015, when the number of members of the EU (28 countries) no longer changed, i.e. the sets were comparable. Since Eurostat did not yet have available the data for GDP per capita and GDP growth for all the member states, it was not possible in these cases to calculate the correlation coefficient for 2015. The results are as follows:

Table 4. Spearman's correlation coefficient (EU countries in 2013–2015)

	2013	**2014**	**2015**
Indebtedness / share of social benefits	0.587953	0.601013	0.547844
Indebtedness / unemployment rate	0.419165	0.455852	0.509514
Indebtedness / GDP per capita	0.215713	0.187791	*
Indebtedness / GDP growth	-0.606688	-0.470274	*

Note. *data not available for all countries, so it was not possible to calculate coefficient

Source: own calculation based on Eurostat data.

The above values of Spearman's coefficient indicate a moderate agreement between the ranking of indebtedness and share of social benefits in GDP, and between indebtedness and unemployment rate. This is understandable – if a country is affected by high unemployment, then one might expect higher public expenditure even at the cost of further indebtedness. It is also similar with the payment of social benefits. However, the values of Spearman's coefficient were lower than we expected. Especially surprising is the result with regard to the rate of unemployment, where there was an expectation of strong dependence.

Nonetheless, of a certain interest (not shown in the table, but nonetheless calculated in the course of the analyses) is the value of Spearman's coefficient between the rate of unemployment and the payment of social benefits: for 2013 it was 0.021495 and for 2014 it was then 0.1760044. This means that in the EU countries the unemployment rate does not have a decisive influence on the share of social benefits paid (which might be expected), but that it was mainly other factors (for example political populism might be expected).

From the results, we can also conclude that the ranking of countries by economic level (described by the simple indicator GDP per capita in PPS, where EU-28 =100) is only very weakly correlated with the ranking of countries by indebtedness. Thus our original assumption that these two variables would be dependent was not confirmed.

Conversely, there was confirmation of a moderately strong correlation between the ranking of countries by indebtedness and the economic growth rate (although even here the expected tightness of the dependence was expected to be stronger than the result actually turned out). Countries encountering an economic downturn become more indebted: this is, of course, relatively easier than revising public expenditure (and more acceptable to voters).

For the calculations above, we should add that they were carried out with a standard 5% significance level.

For the year 2014 Spearman's coefficient was also calculated separately for the Eurozone countries and those outside. The values are as follows:

Table 5. Spearman's correlation coefficient (2014)

	Eurozone	**Outside Eurozone**
Indebtedness / share of social benefits	0.562436	0.803354
Indebtedness / unemployment rate	0.581311	0.125524
Indebtedness / GDP per capita	-0.019608	0.275454
Indebtedness / GDP growth	-0.484004	0.033613

Source: own calculation based on Eurostat data.

The results given above also show some differences between members and non-members of the Eurozone. This is especially clear in the correlation between indebtedness and the share of social benefits paid: while among Eurozone members this relationship is only moderately strong, in non-members it is much stronger. Conversely, the very weak dependence in the non-members of the Eurozone between the ranking by indebtedness and that according to the unemployment rate or the GDP growth rate is surprising. From the results, it appears that in the non-members of the Eurozone indebtedness is not that dependent on the phase of the economic cycle, while in the members this dependence although only moderately strong, it is still higher.

We will try also calculating Kendall's correlation coefficient – it can provide us with a supplementary perspective on the relationship between indebtedness and characteristics we have chosen.

Table 6. Kendall's correlation coefficient (EU countries in 2013–2015)

	2013	**2014**	**2015**
Indebtedness / share of social benefits	0.432935	0.450928	0.411690
Indebtedness / unemployment rate	0.278885	0.310757	0.347944
Indebtedness / GDP per capita	0.132626	0.122016	*
Indebtedness / GDP growth	-0.461153	-0.328445	*

Note. *data not available for all countries, so it was not possible to calculate coefficient

Source: own calculation based on Eurostat data.

Nonetheless, the calculated values for Kendall's correlation coefficient really only confirm the conclusions above: the highest probability that the order according to indebtedness will be the same (or alternatively the reverse) as according to the second criterion, are for the share of social benefits paid, the unemployment rate (and that only for 2014 and 2015) and GDP growth. The other results are rather inconclusive.

Conclusions

Now, let us summarise the conclusions in relation to the original assumptions of the analysis:

Even though on the basis of the analysis it can be said that members and non-members of the Eurozone differ in indebtedness, this difference is smaller than we expected. Although among the members of the Eurozone the average and median indebtedness are above the agreed criterion (60% of GDP) and below it in non-members, nonetheless in both groups the heterogeneity of the indebtedness of countries is high. It is also not possible to clearly state on the basis of the calculated values of the association coefficient that the Eurozone countries are less disciplined than those outside it.

The second assumption was that indebtedness would be positively correlated with the unemployment rate and the share of social benefits in GDP. The results of the correlation analysis indicated that in the strength of the relationship between indebtedness and the share of social benefits paid

there is a clear difference between members and non-members of the Eurozone: this relationship is much stronger in non-members of the Eurozone.

At the same time, what is definitely an interesting result in the non-members is the very low value for the correlation coefficient (0.125524 for 2014) between indebtedness and the unemployment rate. This result (together with the result of the value of the correlation coefficient between indebtedness and economic growth for the given year: 0.033613) would appear to suggest that in non-members of the Eurozone the rate of indebtedness is less connected to the economic cycle, but for example is more reflective of political populism, increasing social expenditure.

Our third assumption was that indebtedness would also be negatively correlated with economic growth. Here again the results differ between members and non-members of Eurozone. While members of the Eurozone show a moderately strong negative correlation between indebtedness and the rate of economic growth, in the non-members these two variables are rather independent (the value of the correlation coefficient is very close to zero). However, from another angle these results confirm the conclusions of other research (Mancinger *et al.*, 2014; Sulikova *et al.*, 2015), which suggests the disparate impact of indebtedness on economic growth in individual EU members. However when we evaluate the result for the whole EU, this relationship is moderately strong, with reverse ranking (i.e. it would confirm our original assumption). On the other hand, the relationship between indebtedness and economic level is very weak: the results for the calculated correlation coefficients are close to zero.

These results encourage further analyses: these offer, with the aid of more robust statistical methods (e.g. ANOVA), a closer look at the dependence of the indebtedness of members and non-members of the Eurozone on the economic cycle, or focus on the analysis of indebtedness of otherwise defined groups of EU countries EU (for example "new" and "old" member countries). Of course another option is to return in several years to undertake a similar analysis for a longer examined period with the use of for example an econometric model.

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