THE RELATION BETWEEN ECONOMIC GROWTH AND PUBLIC-PRIVATE PARTNERSHIP MARKET DEVELOPMENT IN THE COUNTRIES OF THE EUROPEAN UNION

Linas Jasiukevicius[1], Asta Vasiliauskaite[2]

[1,2]*Kaunas University of Technology, Lithuania*

cross**ref** http://dx.doi.org/10.5755/j01.em.18.2.4223

Abstract

Over the last two decades the public-private partnership (PPP) has expanded in both a number and value of projects inside the European Union (EU). Considering the financial features of PPPs it is possible to make an assumption that a requirement to initiate PPPs especially arises when public sector funds are lacking to implement projects in desirable quality and scale. However, during the economic recession, when this problem was the most relevant, PPP market has declined considerably and more reflected the changes of gross domestic product's (GDP) growth than related to the assumption mentioned above. The encouragement of PPP is going to play a significant role in the policy of the EU during the next financial perspective 2014–2020. Therefore, the researches of factors which influence the development of PPP market are very relevant. This paper is intended for the analysis of relation between GDP growth and PPP market development in the EU.

Research objective: to examine whether it is possible to envisage the positive relation between economic growth and PPP market development in the countries of the EU and evaluate how strong this relation is.

Research methods: scientific literature analysis; statistical data analysis; document analysis.

Research results: The development of PPP market has had a general tendency to reflect the changes of GDP growth over the last 20 years; however, a situation was very different in each of the countries. Only Belgium, Ireland, France and the United Kingdom (UK) have characterized as strong or medium correlations accordingly between GDP growth and PPP market development. The correlations of GDP growth with the number of PPP deals were statistically significantly stronger than with the capital costs of PPPs in group of the top-10 countries. There is no statistically significantly difference between the impacts of prognosticated and entire data of GDP growth on the PPP market development as well as in most of cases there is no statistically significantly difference in the correlations of GDP growth and PPP market development between the countries net contributors and countries net recipients, though the differences were observed. However, due to conditionally low correlations in most of the countries these differences have to be treated with a caution.

The type of the article: Research paper.

Keywords: Public-private partnership (PPP), PPP market, economic growth, European Union, correlation analysis.

JEL Classification: G32, G38, L32, L38.

1. Introduction

Over the last two decades private sector financing through PPPs has become increasingly popular as a way of procuring, renewing and maintaining public sector infrastructure in many sectors such as social infrastructure, transportation, public utilities, communications, government offices, accommodation and others in which public services are provided. Pioneered by the United Kingdom with its Private Finance Initiative (PFI) of the early 1990s, nowadays the PPP approach is

being adopted in countries of all wealth level and on all continents (Betigness & Ross, 2009). Especially, PPP market is developed in the modern western countries.

The reasons of increasing popularity of PPP are described by many authors such as Meunier & Quinet (2010), Viegas (2010), Liu & Wilkinson (2010), Moszoro (2010), Dūda (2010), Chung, Hensher & Rose (2010), Alonso-Conde, Brown & Rojo-Suarez (2007), Jefferies (2006), Valila (2005), Grimsey &Lewis (2005), Li, *et al.* (2005), Currie (2005) and Spackman (2002). According to them beside all benefits which PPPs provide, one of the key justification for pursuing PPP is the possibility to achieve better value for money or improved services for the same amount of money than the public sector would spend to deliver a similar project. Also equally important argument for PPPs is that, due to the peculiarities of public sector's accounting rules, depends on division of risks between the partners, in some cases PPP can be off balance sheet for government. Therefore, PPP is often referred as off-balance sheet borrowing by governments. Though, in a case of PFI, this has an eventual impact on the public sector budget in much the same way as borrowing, due to this particularity, PPP enables the public sector to make investments in infrastructure which otherwise would not be possible or would be delayed until later. This is especially relevance in the countries where the budget constraints are created by artificial rules such as the Maastrict Treaty and Fiscal Pact limitations on the budget deficits in the EU. Due to these constraints the choice between PPP and traditional public sector procurement, based on a principle of value for money, described by the authors such as Tang, *et al.* (2010), Hall (2008), Grimsey & Lewis (2005) and Chung, Hensher & Rose (2010), in reality is more similar to the choice between the PPP and no investment at all. Suffering from the budget shortfall PPP allows investing more quickly and/or in greater scale in public infrastructure and services, thus, despite some difficulties which arise due to complexity of procurement process (Jasiukevicius & Vasiliauskaite, 2012; Ke, *at al.,* 2011; Chen & Chiu, 2010; Bonnafous, 2010; Takashima, Yagi & Takamori, 2010; Fischer, *et al.,* 2010), makes it attractive in economical, financial and political point of view. These reasons determine the development of the PPP market.

Though the situation is very different in every member states, the EU, with the UK, France, Spain and some other countries in the front, can be characterized as the region in which the PPP market has highly expanded during the last decade or so. From 1995 over 16-years period a total number and value of PPP deals contracted in the countries, despite when they have become the member states, have increased more than 116 and 100 times respectively (Kappeler, 2012). However, the development was fairly uneven. The PPP market especially increased in the period of rapid economic growth and, reaching its peak in 2006 – 2007, has considerably declined in the period of economic crisis and, though it returned to positive growth later, the PPP market remained quite low in comparison with its best time. Considering the advantages of PPP mentioned above it can be assumed that requirement of PPP becomes especially relevant in the period of economic recession when increased budget deficit encourages governments to look for external financial resources to implement the projects of public infrastructure. However, as it will be shown later, it seems unlikely that PPP market has increased in the EU during the economic crisis; conversely, it more reflected the economic changes. Considering the policy of the EU to encourage PPP in the next multiannual financial perspective 2014–2020 (CEPS), it is very relevant to analyze the relation between these two variables: economic growth and PPP market development. However, the authors' forces of this paper have failed to find the researches in which PPP market development and its economic factors of development such as GDP growth would be analyzed. Therefore, low level of investigation of the relation between GDP growth and PPP market development is the relevant problem.

Research objective: to examine whether it is possible to envisage the relation between economic growth and PPP market development in the countries of the EU and evaluate how strong this relation is.

Research methods: scientific literature analysis; statistical data analysis; document analysis.

The paper is arranged as follow. First, evolution of PPPs market shortly is presented and assumption of relation between GDP growth and PPP market development is raised. Second, data collection and the methodology of the research are described. Third, the results of the research by various aspects of relation between GDP growth and PPP market development are discussed. Finally, the paper is summarized by the conclusions.

2. Evolution of PPP market and assumptions of its relation to economic growth

The total PPP market in the EU has grown steadily over the past two decades reaching its peak in 2006 – 2007 (Figure 1). Since the beginning of the period by then the market has increased more than hundred times in both a number and aggregate value of deals. However, since 2008 the market has declined considerably despite the temporary return to positive growth in terms of financial needs in 2010. Considering the period of PPP market's decrease, it can be assumed that the decline can be explained by economic and financial crisis whose impact was sensed until the end of analyzed period. In comparison with PPP market's changes, GDP has moved to a similar direction. The figure below shows that changes of PPP market and GDP have similarities. The periods of growth until the beginning of the crisis and the recession thereafter are graphically observable in both parts of the figure. This allows making the assumption about existence of the positive relation between development of PPP market development and economic changes.

According to the authors such as Moszoro (2010) and Li, *et al.* (2005) a demand of PPP determines the requirement to implement projects of public infrastructure faster and in a greater scale than public sector budget allows. Here two factors can be identified making the assumption about the impact of economic growth on the changes of PPP market. On one hand, under conditions of economic recession, the lack of budget to develop public infrastructure enforces the governments to look for external financial recourses and encourages launching more PPP projects (Hall, 2008). On the other hand the economic growth, accompanied by higher budget's income and positive expectations about the future, enables governments to take more obligations including greater possibilities to initiate more PPP projects. These factors encourage examining the relation between economic growth and development of PPP market.
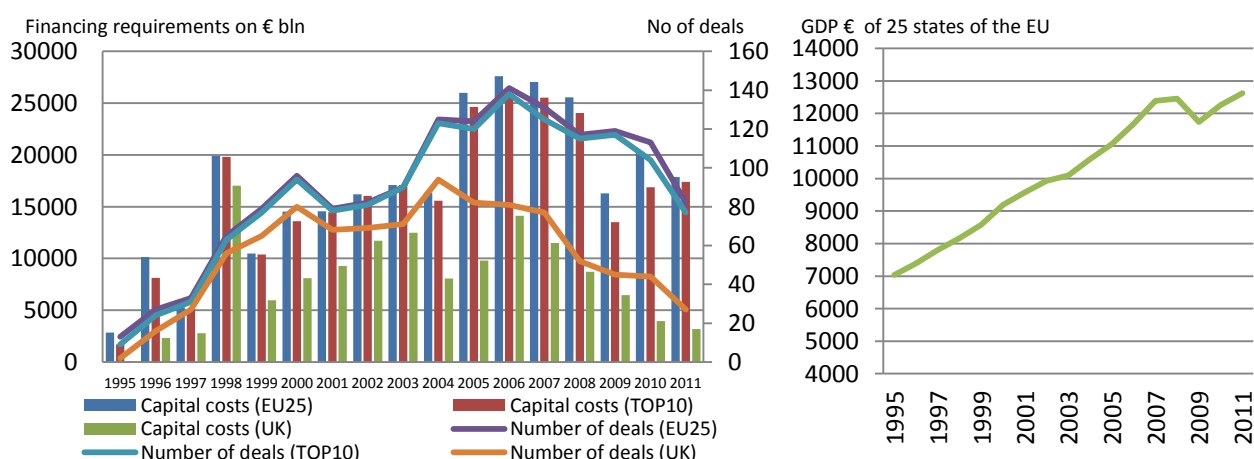

Figure1. Financing requirements and number of deals reaching financial close and economic growth of 25 countries of the EU

Source: European Investment Bank, Eurostat Database

However, to evaluate the relation and interpret the findings correctly the following factors in the data should be considered. The most of PPP market of the EU is concentrated in several countries. During the analyzed period the major part of PPP market was covered by 10 countries

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such as the UK and Spain in the front, which together occupied 82 percent, and France, Portugal, Greece, Germany, Italy, Poland, Belgium and the Netherlands which altogether with previous couple of the countries took nearly 98% of market by value of PPP projects. Other last 15 member states contracted less than 10 PPP projects each, therefore their aggregate value of PPP projects in comparison with leader group were conditionally insignificant. This determines that changes of the PPP market in one of the leading countries can significantly distort not only the general tendencies of aggregated results of the entire EU, but also can have a great impact on general results of relation between PPP market development and economic changes. As an example this revealed in 1998 when Spain contracted some voluminous PPP projects or in the domination of the UK in the European PPP market during the all 16-years period. Due to a great share of the UK in PPP market of the EU, the recession of PPP market in this country, determined by the reform of PPP started in 2010, had a great impact on the shrinkage of PPP market in the whole region. Therefore, considering distortions determined by these factors, it is relevant not only to evaluate the general relation between PPP market development and economic changes in the EU, but also in the separate countries or their groups.

In order to evaluate the relation between PPP market development and GDP growth comprehensively, two hypotheses were raised:

Hypothesis 1: The average of correlations between current PPP market development and the prognostic data of GDP growth is higher than between current data of PPP market development and GDP growth. Due to a complexity of PPP agreements the average PPP procurement time, from a initial tender of project to financial close, is around 2 years (HM Treasury). Considering this period of time, in the phase of project's initiation it is important to foresee the changes of factors such as interest rates, demand of public services and others which have a critical impact on the value for money of the PPP project. The positive prognosis helps to take decision for the project's initiation and encourages taking further action for project implementation. The growth of GDP is a very aggregate factor. However, its prognosis reflects the condition of country's economy and may have the impact on the decisions for PPP project's initiation. Therefore, it was aimed to ascertain whether the prognosis of GDP growth has a stronger relation with PPP market development than with the current data.

Hypothesis 2: The average of correlations between PPP market development and GDP growth in the EU countries net contributors is higher than in the countries net recipients. Highly different development of PPP market in the separate countries allows making the assumption that its development strongly depends on the governments' view and established traditions to cooperate with the private sector. Moreover, the major part of the EU countries contracted less than 10 PPP project are the countries net recipients. Therefore, these countries, getting more support from the infrastructure funds than paying to the EU budget, may be less interested in looking for other external financial resources such as private investments in comparison with the countries net contributors. However, considering Structural funds regulations, it is foreseen better possibilities to combine EU Funds with PPPs in the financial perspective 2014 – 2020 (Council of the European Union). Therefore, the factor of country status in regard to getting support from the EU funds is also relevant to evaluate by seeking to measure the relation between PPP market development and GDP changes in the different countries of the EU.

Considering the assumptions, factors mentioned above and hypothesis raised the analysis of relation between PPP market development and GDP growth is further analyzed.

3. Methodology and data collection

Methodology. First, in order to disclose the relation between economic growth and PPP market development, the evolution of PPP market and economic growth of 16-years period in the EU were shortly reviewed and the assumptions for the relation between these variables in the previous chapter were made.

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Second, the research of relation between GDP growth and PPP market development was done. The relation was analyzed by focusing on the strength of correlation between economic growth and the indicators of PPP market development such as a number and capital costs of contracted PPPs in the different countries of the EU. Correlations were analyzed by measuring the impact of nominal GDP growth on PPP market development by using different time lags of PPP market data. For the purpose to disclose the features of correlations during all the analyzed period, the correlations were measured in stages of different duration, in every stage shortening distance between the first and the last years by 3 years. In total 5 stages were measured. The majority of member states – 25 out of 27 (all countries of the EU except Estonia and Malta in which PPP projects were not implemented or implemented in very low capacity) were included in the research despite when they have become the member states of the EU. However, due to a great part of the analyzed countries in which the number and capital costs of contracted PPPs were conditionally low, in order to get more accurate results only the countries which contracted 10 and more PPP projects were included in the detail analysis. Based on this criteria in total 10 countries (top-10 countries) were selected. The results of remaining 15 countries were included in the general results of all 25 countries.

Third, the comparison of both types of correlations of GDP growth with capital costs of PPPs and with numbers of PPP deals was done. A method of the comparison of two means was used and Paired-Sample t test was applied. In order to compare the means of countries' correlations and general correlation of countries the differences of these indicators were also provided.

Fourth, the both hypotheses were checked. For the verification of hypothesis the method of the comparison of two means was also used, however, in this case the Independent-Sample t test was applied.

Finally, the top-10 countries were classified into the groups based on their similarities of correlations in the different periods of time. To classify the countries the hierarchical cluster was used and the cluster method of between-groups linkage and the interval of squared Euclidean distance were applied.

Data collection. Data about PPP projects are collected from the official sources of European PPP Expertise Centre (EPEC). Data presented by this organization are collected from a variety of the official and other resources cross-checked where appropriate against European Investment Bank's own project files. Not all PPP projects of the list forming the dataset presented by EPEC have been validated by EPEC members. Therefore, the findings of this publication should be treated with caution.

Based on the EPEC's methodology of data collection, the data do not cover projects with financing requirements of less than EUR 5 mln. The project, to be counted as a PPP, must be based on a long term, risk sharing contract between private and private parties. The project must include the bundling of design, construction, operation and/or asset maintenance, together with a major component of private finance. The project values represent the amount of external financing requirements at the time of financial close (i.e. the date at which the main project and financing agreement are signed and debt drawdown can be made). The data of GDP growth are collected from the Eurostat Database. The list of countries net recipients and contributors are collected from the database of the European Commission. Data of a period of 1995 and 2011 are collected and analyzed. The data are collected in current prices.

4. The relation between PPP market changes and economic growth

The figure below shows the correlation between GDP growth and the capital costs of PPP projects. The lines and linear trends in the picture represent GDP and capital costs of contracted PPPs in the top-10 countries of the EU (Figure 2). The table alongside the figure represents the results of correlations not only in each of the top-10 countries but also the general results of the top-10 and all 25 countries. Also, it is delivered the results with the data of one and two years lags of PPP market development.

Country	1995-2011		1998-2011		2001-2011		2004-2011		2007-2011	
	GDP Cc	Sig.	GDP Cc	Sig.	GDP Cc	Sig.	GDP Cc	Sig.	GDP Cc	Sig.
Belgium	0,631	0,007	0,617	0,019	0,682	0,021	0,685	0,061	0,388	0,519
France	0,553	0,021	0,592	0,026	0,614	0,045	0,577	0,134	0,897	0,039
Germany	0,392	0,119	0,263	0,363	0,289	0,389	0,016	0,971	-0,371	0,538
Greece	0,146	0,577	0,298	0,302	0,462	0,153	0,400	0,326	0,192	0,757
Ireland	0,507	0,038	0,524	0,054	0,565	0,070	0,696	0,055	0,761	0,135
Italy	0,470	0,057	0,377	0,183	0,081	0,813	-0,361	0,379	0,238	0,700
Netherlands	0,202	0,438	0,201	0,491	-0,087	0,800	0,512	0,195	0,387	0,519
Portugal	0,324	0,205	0,155	0,598	0,320	0,337	0,402	0,324	0,487	0,406
Spain	0,501	0,041	0,396	0,161	0,116	0,733	-0,467	0,244	0,221	0,721
United Kingdom	0,537	0,026	-0,017	0,953	0,401	0,210	0,752	0,031	0,720	0,170
Total TOP10	0,776	0,000	0,530	0,051	0,500	0,117	0,234	0,578	0,735	0,157
Total EU25	0,795	0,000	0,610	0,020	0,568	0,068	0,185	0,661	0,457	0,439
Total TOP10 lag 1	0,791	0,000	0,537	0,058	0,532	0,113	0,227	0,625	-0,288	0,712
Total EU25 lag 1	0,826	0,826	0,655	0,015	0,666	0,036	0,293	0,523	-0,268	0,732
Total TOP10 lag 2	0,804	0,800	0,547	0,066	0,510	0,161	-0,046	0,932	-0,868	0,331
Total EU25 lag 2	0,824	0,000	0,642	0,024	0,626	0,072	0,059	0,912	-0,877	0,320
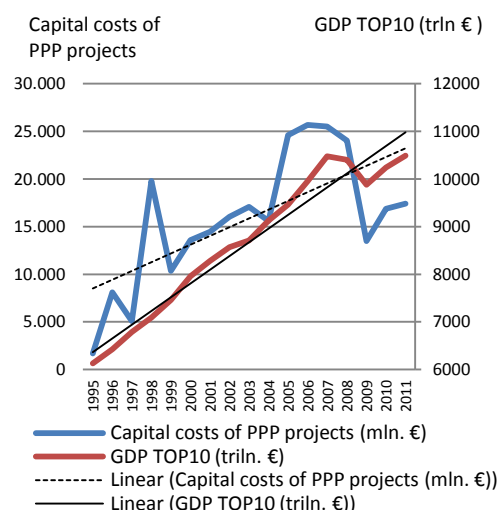
Correlation is significant at the 0,05 level (2-tailed)

Figure 2. The correlation of GDP and capital costs of contracted PPP projects

Source: European Investment Bank, Eurostat Database

The correlations of GDP growth and capital costs of contracted PPPs are fairly different between the countries ranging from 0,202 to 0,631 during all 16-years period. This conditionally can be interpreted as weak and medium relations depending on its strength. Moreover, the shorter stage is the more correlations are tended to decrease in most of the countries. During the all period the indicators were changing unevenly. It was observed that the shorter phase of growth is the weaker correlations are tended to be. Though the situation in every country should be considered separately, low and different correlations in each of countries allow arguing that in general PPP market development cannot be more or less directly related with the changes of economic growth in any of analyzed countries. The most of p-values, being higher than $\alpha = 0,05$, also not allow stating that correlations are statistically significant. The particular exception is France in which the strength of correlation remained conditionally at stable medium level and became even stronger in the last stage. In the most of stages the relations are statistically significant in this country. However, the results of other separate countries, due to statistical insignificancy, do not allow drawing broader conclusions than this research. However, the analysis of general correlation of the top-10 countries' group shows that the relation between GDP and capital costs of PPP is conditionally strong (0,776). The general result of 25 countries is even higher (0,795). However, due to a low number of projects contracted in slightly less than half of countries, these results of correlations should be treated with a caution. As in separate countries, the correlations between GDP growth and capital costs of PPPs in the groups of top-10 and 25 countries were also weakening by shortening the stages of time. Only correlations of 16-years stage are statistically significant. That allows arguing that in general case it would be incorrect to say that the development of PPP market is strongly influenced by the changes of GDP growth. However, at the same time it can be stated that only during the stage of 16 years the development of PPP market reflected the similar tendencies of GDP growth.

The same methodology was applied in order to evaluate the relation between GDP growth and a number of contracted PPPs (Figure 3).

Country	1995-2011 GDP Nm	1995-2011 Sig.	1998-2011 GDP Nm	1998-2011 Sig.	2001-2011 GDP Nm	2001-2011 Sig.	2004-2011 GDP Nm	2004-2011 Sig.	2007-2011 GDP Nm	2007-2011 Sig.
Belgium	0,708	0,001	0,719	0,004	0,796	0,003	0,838	0,009	0,876	0,051
France	0,868	0,000	0,895	0,000	0,931	0,000	0,908	0,002	0,474	0,420
Germany	0,689	0,002	0,646	0,013	0,607	0,048	0,376	0,359	-0,219	0,723
Greece	0,308	0,229	0,394	0,163	0,556	0,076	0,489	0,218	0,348	0,566
Ireland	0,651	0,005	0,630	0,016	0,535	0,090	0,580	0,132	0,694	0,193
Italy	0,591	0,013	0,534	0,049	0,230	0,497	-0,172	0,684	0,122	0,845
Netherlands	0,282	0,273	0,414	0,141	0,267	0,427	0,633	0,092	0,517	0,372
Portugal	0,489	0,046	0,364	0,200	0,418	0,201	0,111	0,793	-0,169	0,786
Spain	0,697	0,002	0,619	0,018	0,480	0,135	-0,060	0,888	0,673	0,213
United Kingdom	0,745	0,001	0,288	0,318	0,408	0,213	0,560	0,149	0,759	0,137
Total TOP10	0,853	0,000	0,664	0,010	0,447	0,168	-0,434	0,282	-0,302	0,621
Total EU25	0,846	0,000	0,673	0,008	0,466	0,148	-0,467	0,243	-0,456	0,440
Total TOP10 lag 1	0,944	0,000	0,884	0,884	0,823	0,003	0,032	0,946	-0,158	0,842
Total EU25 lag 1	0,943	0,000	0,893	0,000	0,843	0,002	0,077	0,869	0,129	0,871
Total TOP10 lag 2	0,960	0,000	0,905	0,905	0,879	0,002	-0,043	0,935	-0,823	0,385
Total EU25 lag 2	0,953	0,000	0,898	0,000	0,869	0,002	-0,110	0,836	-0,853	0,350

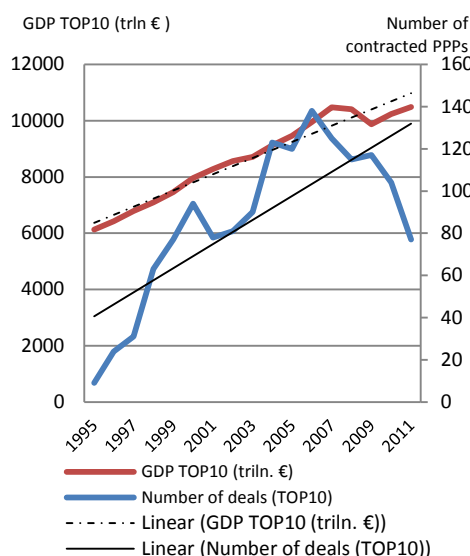Correlation is significant at the 0,05 level (2-tailed)

Figure 3. The correlation of GDP and number of contracted PPP projects

Source: European Investment Bank, Eurostat Database

The first look to the figure above discloses that the correlations are tended to be stronger in the separate countries and the groups of top-10 and 25 countries in comparison with the previous correlations of GDP growth and capital costs of PPPs e.g. the correlation of the top-10 countries are stronger by 77 points (0,853 – 0,776) in the 16 years period. The correlations between GDP growth and number of contracted PPPs are also less tended to decrease in the shorter periods of time, though this statement is very conditional because the results, as in previous correlations, are very diverse between the countries.

In order to compare the strength of both types of the correlations estimated above, the comparison of two means method was applied (Table 1).

Table 1. The comparison of correlations' means

Paired Samples Statistics			Paired Samples Test								Means Test	
Lag	Pairs		Mean	Mean	Std. Dev.	Std. Error Mean	95% Conf. Interval of the Diff. Lower	95% Conf. Interval of the Diff. Upper	t	df	Sig. (2-tailed)	General mean	Difference (gen. mean - mean)
0	Pair	Cor_GDP_Cc_10	0,426	-0,177	0,081	0,026	-0,234	-0,119	-6,924	9	0,000	0,776	0,350
		Cor_GDP_Nm_10	0,603									0,853	0,250
1	Pair	Cor_GDP_Cc_10	0,445	-0,178	0,106	0,033	-0,254	-0,102	-5,317	9	0,000	0,791	0,346
		Cor_GDP_Nm_10	0,623									0,944	0,321
2	Pair	Cor_GDP_Cc_10	0,414	-0,168	0,080	0,025	-0,225	-0,110	-6,592	9	0,000	0,804	0,390
		Cor_GDP_Nm_10	0,582									0,960	0,378
0	Pair	Cor_GDP_Cc_25	0,264	-0,052	0,207	0,041	-0,137	0,034	-1,249	24	0,224	0,795	0,531
		Cor_GDP_Nm_25	0,316									0,846	0,530
1	Pair	Cor_GDP_Cc_25	0,290	-0,047	0,232	0,047	-0,145	0,051	-0,993	23	0,331	0,826	0,536
		Cor_GDP_Nm_25	0,337									0,943	0,606
2	Pair	Cor_GDP_Cc_25	0,235	-0,027	0,198	0,041	-0,113	0,058	-0,660	22	0,516	0,804	0,569
		Cor_GDP_Nm_25	0,262									0,953	0,691

Correlation is significant at the 0,05 level (2-tailed).
Source: European Investment Bank, Eurostat Database

The table above allows arguing that with confidence level of the 95% the mean of correlations between GDP growth and number of PPPs are higher than the mean of correlations between GDP growth and capital costs of PPPs. Also the differences are statistically significant in all three cases of lags in the group of the top-10 countries ($p = 0 < \alpha = 0,05$). However, due to the impact of the countries with less than 10 contracted PPPs, the significances cannot be statistically confirmed in the results of 25 countries' group. The lower means of correlations than the general correlations of top-10 and 25 countries' groups allow supporting the statement mentioned above that the general

development of PPP market of the EU better reflected GDP growth than this appearance asserted in the separate countries.

In order to test the first hypothesis and find out whether and how the prognosis of GDP growth has the impact on PPP market development also the test of the comparison of two means method for the top-10 countries was applied (Table 2). The table below with confidence level of the 95% allows stating that the differences between the means of top-10 countries' correlations with different lags of the capital costs and numbers of contracted PPPs are not statistically significant (p-value > α = 0,05). Therefore, it would be incorrect to argue that the correlations between the current PPP market development and GDP growth's prognosis of one or two years are stronger than between the solely current indicators. In other words the prognosis of GDP growth does not have significantly more impact on PPP market development than the data of the current year. As a result, the first hypothesis was rejected. This means that it would be incorrect to make prognosis of PPP market development from the prognosis of GDP growth.

Table 2. The results of correlations' means with different lags of PPP market data

Correlation	Lag	Mean	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Diff.	
								Lower	Upper
Cor_GDP_Cc_10	0	0,426	-0,265	18	0,794	-0,019	0,071	-0,168	0,130
	1	0,445							
Cor_GDP_Nm_10	0	0,603	-0,234	18	0,818	-0,020	0,086	-0,202	0,161
	1	0,623							
Cor_GDP_Cc_10	0	0,426	0,154	18	0,879	0,012	0,078	-0,153	0,177
	2	0,414							
Cor_GDP_Nm_10	0	0,603	0,226	18	0,823	0,021	0,093	-0,174	0,217
	2	0,582							

Correlation is significant at the 0,05 level (2-tailed)
Source: European Investment Bank, Eurostat Database

In order to test the second hypothesis about higher general correlation between GDP growth and PPP market development in the group of the countries net contributors than in the group of the countries net recipients, the last test for equality of correlations' means was done (Table 3). The data represented in the table below allow arguing that the second hypothesis is correct. The means of correlations are higher in the group of the countries net contributors than in the group of the countries net recipients in both types of the correlations of GDP growth and PPP market indicators. However, only in one of cases, where the difference between the means of correlations of GDP growth and capital costs of PPPs in the group of 25 countries was measured, with confidence level of the 95% it is able to say, that the difference of means can be confirmed as statistically significant (p = 0,014 < α = 0,05). Therefore, the second hypothesis can be only partially verified.

Table 3. The results of equality of correlations' means of different types of countries' groups

Correlation	Type of the countries' group	N	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Diff.	
											Lower	Upper
Cor_GDP_Cc_10	Net contributors	7	0,469	0,139	0,053	1,384	8	0,204	0,144	0,104	-0,096	0,383
	Net recipients	3	0,325	0,180	0,104							
Cor_GDP_Nm_10	Net contributors	7	0,654	0,184	0,069	1,374	8	0,207	0,171	0,125	-0,116	0,459
	Net recipients	3	0,483	0,171	0,099							
Cor_GDP_Cc_25	Net contributors	13	0,384	0,176	0,049	2,675	23	0,014	0,250	0,093	0,057	0,443
	Net recipients	12	0,135	0,282	0,081							
Cor_GDP_Nm_25	Net contributors	13	0,410	0,362	0,100	1,513	23	0,144	0,195	0,129	-0,071	0,461
	Net recipients	12	0,215	0,270	0,078							

Correlation is significant at the 0,05 level (2-tailed)
Source: European Investment Bank, Eurostat Database

In conclusion the research of relation between PPP market development and GDP growth discloses that, considering estimated correlations, the great differences between countries do not allow stating that PPP market development and GDP growth are strongly related. It should be more factors to be analyzed in further researches in order to explain development of PPP market more accurate in the countries of the EU. However, the results of correlations of all 16 years period allow stating that the general tendency of PPP market development to reflect changes of GDP growth, at least in the group of top-10 countries, cannot be unambiguously denied.

5. The cluster analysis of the countries

Finally, in order to group countries based on their correlations between PPP market development and GDP growth, the cluster analysis was made. The table below shows the correlations of different stages estimated in the group of the top-10 countries. The dendrogram represents countries' classification based on their averages of both types of correlations.

Considering the results of the correlations, the countries were classified into 6 groups. The higher number of group, the lower average correlations were identified in the countries of the first group. The strongest correlations between GDP growth and development of PPP market were estimated in the group of France, Belgium, and Ireland. In this group the average of correlations of GDP growth and capital costs of PPPs, ranging from 0,601 to 0,647, and the correlations of GDP growth and number of PPP deals, ranging from 0,618 to 0,815 respectively, allow arguing about medium and strong relations between these variables. The strongest correlations were estimated in the results of France which, in comparison with all top-10 countries, took the first place in respect of both types of correlations. The second and third places were divided between the rest countries of the group. The high results of this group were determined by conditionally higher and more stable correlations in all periods in comparison with other countries. For example the suddenly decreased correlations in the second period determined that the UK was classified in the second group and took only the forth places in respect of both kinds of correlations. Lower positions of the rest countries were determined by lower and more variable correlations which asserted in the separate stages of the analyzed period.

Table 4. The results of cluster analysis of the top-10 countries based on the correlations between PPP market development and GDP growth

No. of group	Country	Type of correlation	Correlations of different periods					Average of cor. of different period	Place	Dendrogram
			1995 - 2011	1998 - 2011	2001 - 2011	2004 - 2011	2007 - 2011			
1	Belgium	GDP_Cc	0,631	0,617	0,682	0,685	0,388	0,601	3	
		GDP_Nm	0,708	0,719	0,796	0,838	0,876	0,787	2	
	Ireland	GDP_Cc	0,507	0,524	0,565	0,696	0,761	0,611	2	
		GDP_Nm	0,651	0,630	0,535	0,580	0,694	0,618	3	
	France	GDP_Cc	0,553	0,592	0,614	0,577	0,897	0,647	1	
		GDP_Nm	0,868	0,895	0,931	0,908	0,474	0,815	1	
2	The UK	GDP_Cc	0,537	-0,017	0,401	0,752	0,720	0,479	4	
		GDP_Nm	0,745	0,288	0,408	0,560	0,759	0,552	4	
3	Italy	GDP_Cc	0,470	0,377	0,081	-0,361	0,238	0,161	8	
		GDP_Nm	0,591	0,534	0,230	-0,172	0,122	0,261	9	
	Spain	GDP_Cc	0,501	0,396	0,116	-0,467	0,221	0,153	9	
		GDP_Nm	0,697	0,619	0,480	-0,060	0,673	0,482	5	
4	The Netherlands	GDP_Cc	0,202	0,201	-0,087	0,512	0,387	0,243	7	
		GDP_Nm	0,282	0,414	0,267	0,633	0,517	0,423	6	
	Greece	GDP_Cc	0,146	0,298	0,462	0,400	0,192	0,300	6	
		GDP_Nm	0,308	0,394	0,556	0,489	0,348	0,419	8	
5	Portugal	GDP_Cc	0,324	0,155	0,320	0,402	0,487	0,338	5	
		GDP_Nm	0,489	0,364	0,418	0,111	-0,169	0,243	10	
6	Germany	GDP_Cc	0,607	0,376	-0,219	0,683	0,658	0,118	10	
		GDP_Nm	0,689	0,646	0,607	0,376	-0,219	0,420	7	

Source: European Investment Bank, Eurostat Database

Spain and Italy were classified in the third group, the Netherlands and Greece in the forth group respectively. As the last with approximately twice lower correlations it was classified Portugal and Germany which were separated into the fifth and sixth groups accordingly.

In conclusion the cluster analysis disclosed the broad spectrum of correlations of GDP growth and PPP market development between the countries. The great differences allow arguing that the development of PPP market cannot be explained solely by the changes of GDP growth and are strongly influenced by other factors whose impact on the PPP market have to be analyzed in further researches.

6. Conclusions

Over the past two decades the total PPP market significantly expanded in both a number and aggregate value of PPP project inside the EU. However, the general growth at the end of period was fairly variable and the development of PPP market was very different in every country. The top-10 countries with the UK in the front have taken the absolute majority of PPP market share by a number and value of PPP projects. Therefore, the decisions for PPPs initiation, though in one of these countries, can determine significant distortions in the results of entire region, thus the results of the EU make with a caution to be treated.

Conditionally low correlations and the great differences of countries in the relation between GDP growth and PPP market development allow arguing about other factors which have to be analyzed alongside in order to examine the development of PPP market in every country more accurate. However, the tendency of PPP market to reflect the changes of GDP growth during all the analyzed period was observed, though this relation as statistically significant was estimated only in the 16-years period. In data of the top-10 countries the correlations of GDP growth with a number of contracted PPPs were statistically significantly stronger than between GDP growth and value of PPP projects. However, in both cases the relations can be considered as conditionally no stronger than medium level. There is no statistically significant difference between the relations of PPP market development with the predictive and current data of GDP growth. Therefore, it cannot say that the prognosis of GDP growth has more impact on the decision to launch PPP project and arrange the amount of its capital costs than the data of a current situation; though, higher correlations with prognosticated data were estimated. Also, there is no statistically significant difference in the correlations of PPP market development and GDP growth between the countries net contributors and net recipients except in the case of correlation between GDP growth and PPP value in the group of 25 EU countries. However, the correlations are conditionally low, thus makes the relevance of these results to be treated with a caution.

The group of countries with Belgium, Ireland and France in the front has distinguished by the strongest relations in both types of correlations inside the entire EU. Their correlations were at medium and strong level. These results were determined by the low fluctuation of conditionally strong correlations during all the analyzed period that allows stating about conditionally strong relation between GDP growth and PPP market development in these countries. In this point of view it can be also mentioned the UK, however, its correlations in comparison with the leaders, were much lower. The results of other countries do not allow stating about significant relation between GDP growth and PPP market development in them.

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