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“Economic effectiveness of Public-Private Partnership
(PPP) and PPP determinants in low and middle income
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INTRODUCTION

The theme of the present work is the economic effectiveness of public-private partnerships and the factors that influence the development of this form of sector cooperation in providing public services and satisfying public needs. Investment needs frequently exceed available funds to fulfill them (Brzozowska 2006). That is why policymakers should choose projects, which bring the greatest benefit to a society. One of the ways to provide public goods could be through public-private partnerships, which, thanks to their advantages, may be an attractive method of implementing public tasks. That is why public-private partnerships are becoming increasingly popular in many countries (Geddes and Wagner 2013; Ribeiro and Dantas 2006; Tang et al. 2010). One of the most important advantages of PPP is its potential economic effectiveness, which means that the benefits of PPP for society are higher in comparison with other methods of provision of public goods.

Since I wanted to write solely about public-private partnership and show that it can be a good and desirable cooperation between sectors and to investigate its determinants, the work is not going to be a comparative study. I have studied various articles and guidelines about PPP and its potential economic effectiveness and the aim of the theoretical part of the work was to summarize it and give an account of the present literature on the topic. Also an effort has been made here to find an area, which has not yet been deeply explored and thus, at the same time, is an intriguing field to study. There is little empirical research on the determinants of PPP, thus the author's interest in that matter. As PPP projects can be an effective way of provision of public good it is crucial to study its determinants to further promote this form of cooperation of public and private sector. Hence, there arise questions concerning the determinants of PPP projects. That is why the objective of this research is then twofold. Firstly to provide an up-to-date theoretical literature review concerning PPP projects, and

secondly, to find the factors that enhance the development of cooperation of public and private partners in providing public goods.

The structure of the research is as follows. Sections 1-5 contain a theoretical framework of PPP and the overview of the PPP statistics in the last two decades in low and middle income countries. There have also been discussed such issues as the economic effectiveness of PPP and the advantages of the partnership i.e. on time and within budget investment, effective division of tasks and risk allocation. Also empirical studies on the determinants of PPP are discussed in that part. Sections 6-9 contain an empirical study on determining factors influencing PPP projects. An econometric model is presented concerning the determinants of public-private partnerships in low and middle income countries, since the data are only available for such countries in the World Bank's Private Participation Database. Ordered Logistic Regression is used for this purpose. The empirical study shows that the determinants of the number of PPP projects are the size of GDP per capita, the size of population and inflation. The theoretical assumptions on the directions of the impact of these variables on the number of PPP projects have been confirmed in the study.

1. About PPP

1.1. A review of PPP - definition

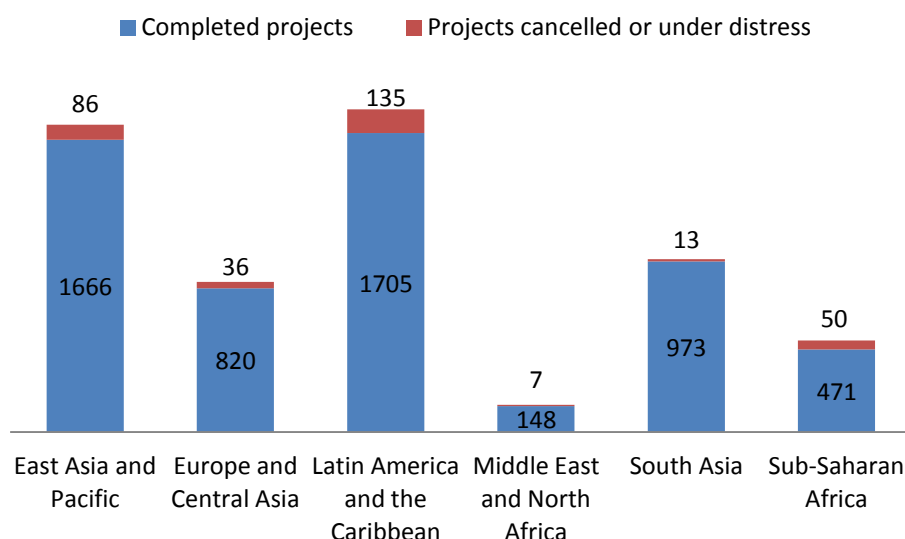
It is important to outline briefly what a Public-Private Partnership (PPP) is and why provision of public goods in this way is attractive. PPP is a form of cooperation between the public and private sector which aims at the provision of certain service (Brzozowska 2006). It defines a relation in which the recourses of public and private parties are blended to meet certain objectives, which are beneficial for both sectors (Witters et al. 2012). Such partnerships can also be called a “best-of-both-worlds” as PPP constitutes an alternative to traditional provision of public goods - by public sector and privatization (Engel et al. 2011). The service provided by a PPP must satisfy a public need since a public entity is involved. Through PPP, the public sector does not get rid of the control over a project but it transfers a range of tasks to a private entity in order to increase the efficiency of the service. The possibility of financing infrastructure projects with private funds is not only a way to save public resources thus reducing government spending, but also has other advantages (Yescombe 2008). In general PPP projects are carried out without delays and the costs do not exceed the planned budget due to the private partner’s presence, which has experience and knowledge in such tasks as well as capital, which enables the use of innovative solutions. The essence of the efficiency of the delivery of services through PPP is the division of tasks and risks between partners. Both the task and the risks present in the project should be controlled by the partner who is better prepared to manage it (Jin and Zhang 2011). Combining the strengths of both sectors leads to effective cooperation. The public partner has more knowledge when it comes to define a service that should be provided. The public sector determines the scope and the place of the service that will ensure the sustainable development of a region (Gajewska-Jedwabny 2007). On the other hand, a private partner is more experienced in managing difficult projects and ensures greater efficiency in the tasks. Effective co-operation brings

satisfaction to both partners. The public partner fulfills its obligations concerning the provision of good quality services, while the private operator is paid for its delivery. Implementation of tasks in the form of a PPP leads to value for money (VFM), which brings the highest benefit to a society. This happens when the maximum benefits are achieved with the PPP project, i.e. cost savings and high quality service, higher than if it had been delivered in some other way (Brzozowska 2006). That is why a project characterized by value for money is not the lowest cost option but takes into account the whole life benefits and appropriate risk allocation between public and private partners (Ismail et al. 2011).

1.2. Statistics and overview of PPP in low and middle income countries in 1990-2012

It would be useful to mention some statistics on PPP which can be obtained from the Private Partnership in Infrastructure Database which belongs to the World Bank Group, which collects information on PPP projects in low and middle income countries. The database provides various information on conducted PPP projects, which can be aggregated to the project, country level or to provide regional statistics. To my mind, regional statistics will serve the best overview of PPP throughout the world. The database gathers information on the number of PPP projects and the amount of investment into it. First of all let us have a look at the number of PPP projects over the period 1990-2012 in the regions: East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa and afterwards we will focus on the investment into PPP projects in these regions.

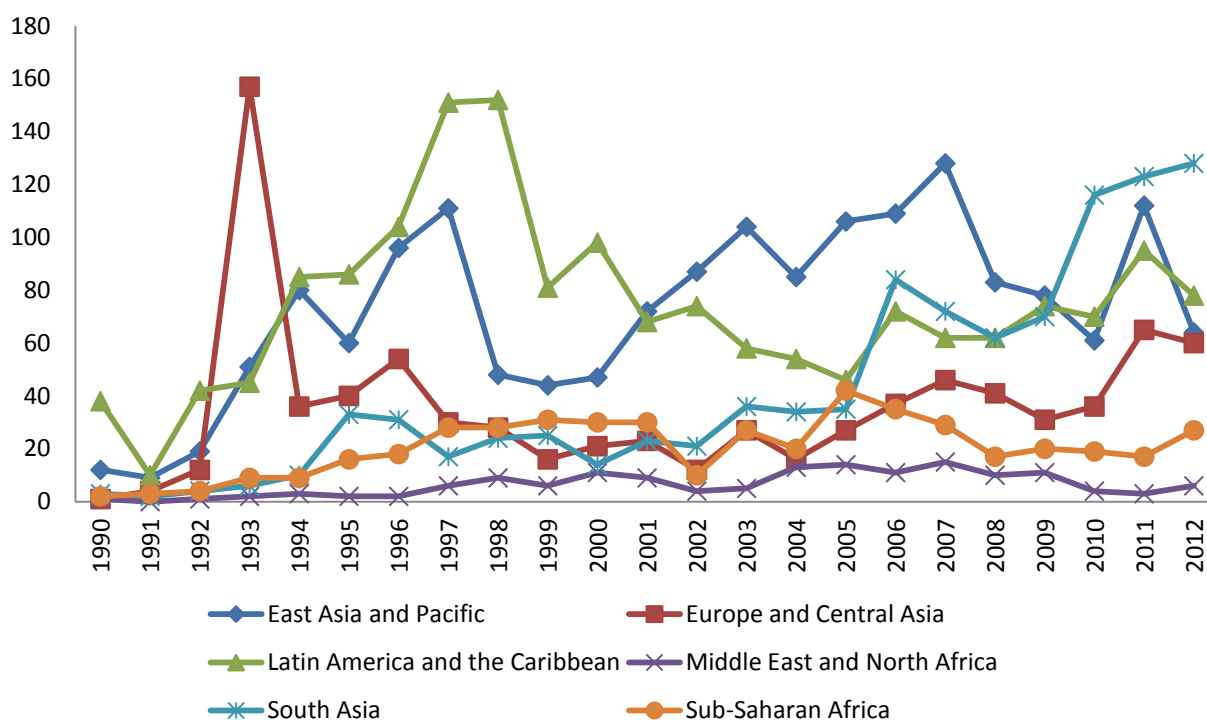
Figure 1.
Number of PPP projects in 1990-2012 in regions



Source: own elaborations

In Figure 1. we observe that that Latin American and the Caribbean region have the most PPP projects followed by East Asia and the Pacific. PPPs are least popular in the Middle East and North Africa. Considering the number of cancelled projects, which according to the database, are those where the private partner has withdrawn from the partnership and transferred or sold its share back to the government, or the private sector has ceased operation, construction or service provision for at least 15% of the license or concession period, which led to the revocation of the licence or repudiation of the contract; and distressed projects i.e when the government or operator has asked for contract termination, the most unsuccessful projects in relation to the number of completed investments were in Sub-Saharan Africa (9.6%), then Latin America and the Caribbean (7.3%) and East Asia and Pacific (4.9%), whereas in South Asia only (1.3%) of projects were not completed.

Figure 2.
Number of PPP projects across 1990-2012

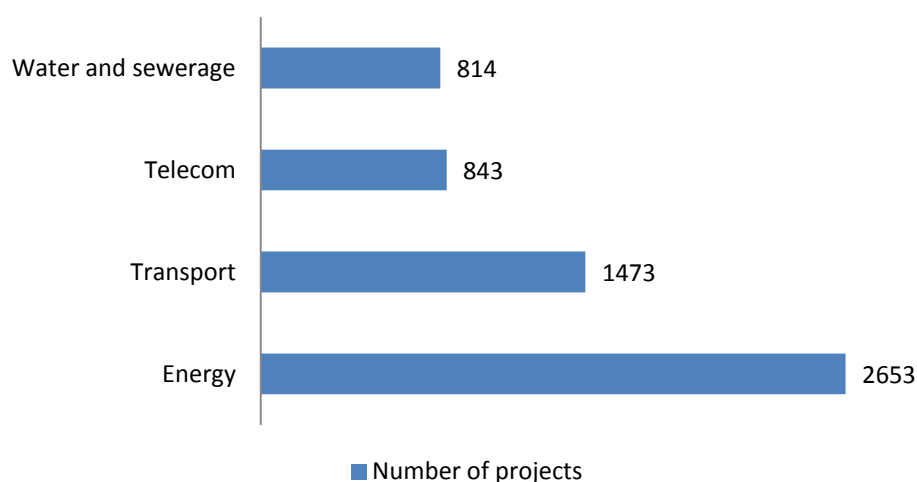


Source: own elaborations

As we can see in Figure 2, the number of PPP projects has been volatile across the last 2 decades in all of the regions. Only in the Middle East and North Africa has the number of PPP projects been rather stable with a slight rise till 2007 followed by a small drop in the number thereafter. Also in Sub-Saharan Africa the number of projects across the years is more balanced than in other regions. The highest number of projects was in 1993 in the region Europe and Central Asia. Other peaks were in 1998-1999 for Latin America and the Caribbean; in 2007 for East Asia and Pacific; and in 2012 for South Asia. We can also notice that, unsurprisingly, after the world financial crisis there was a decline in the number of PPP projects in all regions over the period 2009-2010 after which the trend started to recover. What is also worth pointing out is that all of the regions in 1990 had more or less the same number of PPP projects with the exception of Latin America and the Caribbean, where the number was bigger in comparison to the remaining regions at that time. However, when we

look at the most recent data for 2012 we can observe that the number for the regions is not at the same level, which means that in certain parts of the globe, the cooperation between the private and public sector is more popular than in other regions. In 2012 the most PPP projects were in South Asia, Latin America and the Caribbean, East Asia and the Pacific, and Europe and Central Asia the number is on a comparable level; whereas the least projects are in Sub-Saharan Africa and the Middle East and North Africa.

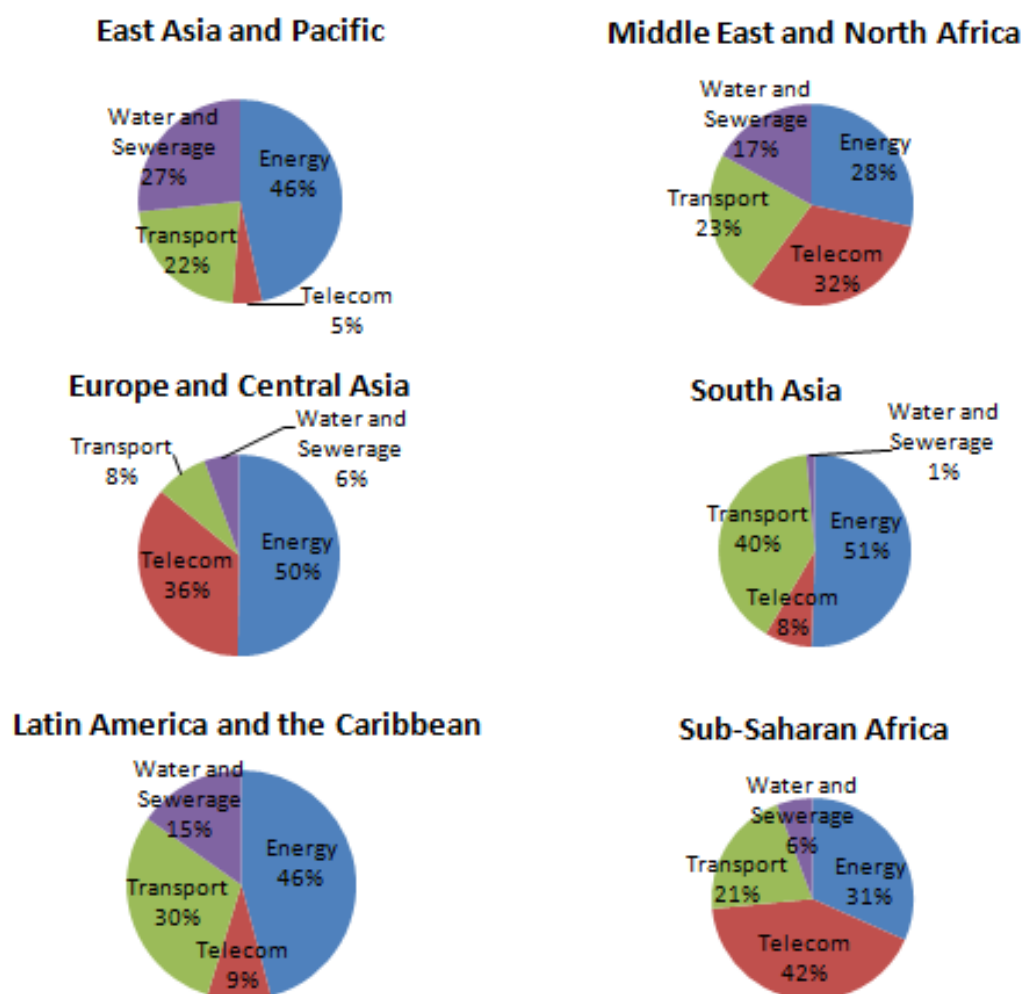
Figure 3.
Number of PPP projects in 1990-2012 according to sectors



Source: own elaborations

When analysing the type of sector in which most projects are undertaken, from Figure 3 we can learn that the great majority of projects take place in the energy sector, followed by transportation and telecoms, with water and sewerage receiving the smallest number.

Figure 4.
Share of number of PPP projects by sector and region

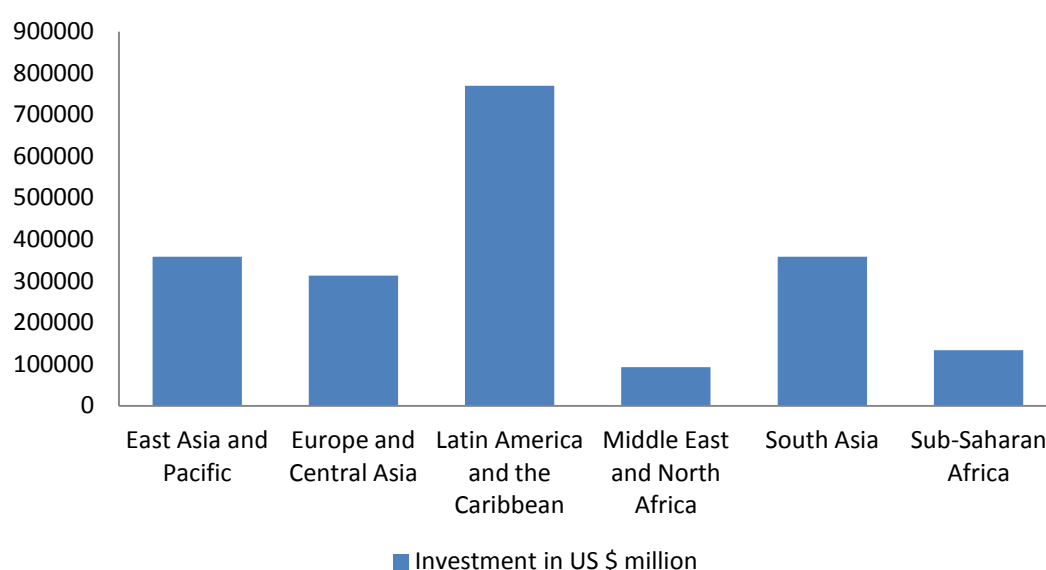


Source: own elaborations

When taking a look at each region in Figure 4, we can see the share of projects in each sector. Only in Sub-Saharan Africa and the Middle East and North Africa is the energy sector not a leading one. In these two regions the majority of projects are in the telecom sector, followed by the energy sector, while transport and water and sewerage have altogether 40% of the projects in the Middle East and North Africa and 37% in Sub-Saharan Africa. Analysing the energy sector, more than half of all projects in South Asia are in this sector, while 50% of projects in Europe and Central Asia are in this sector and 46% of projects in the remaining

two areas, East Asia and the Pacific and Latin America and the Caribbean. Telecoms is the second most popular sector in Europe and Central Asia, whereas it is of low importance in East Asia and Pacific where only 5% of projects are undertaken in this sector. Also water and sewerage projects are of low importance in South Asia as only 1% projects are done in this sector as well as in Europe and Central Asia where 6% of projects are of this kind.

Figure 5.
Investment in PPP projects in 1990-2013 in regions

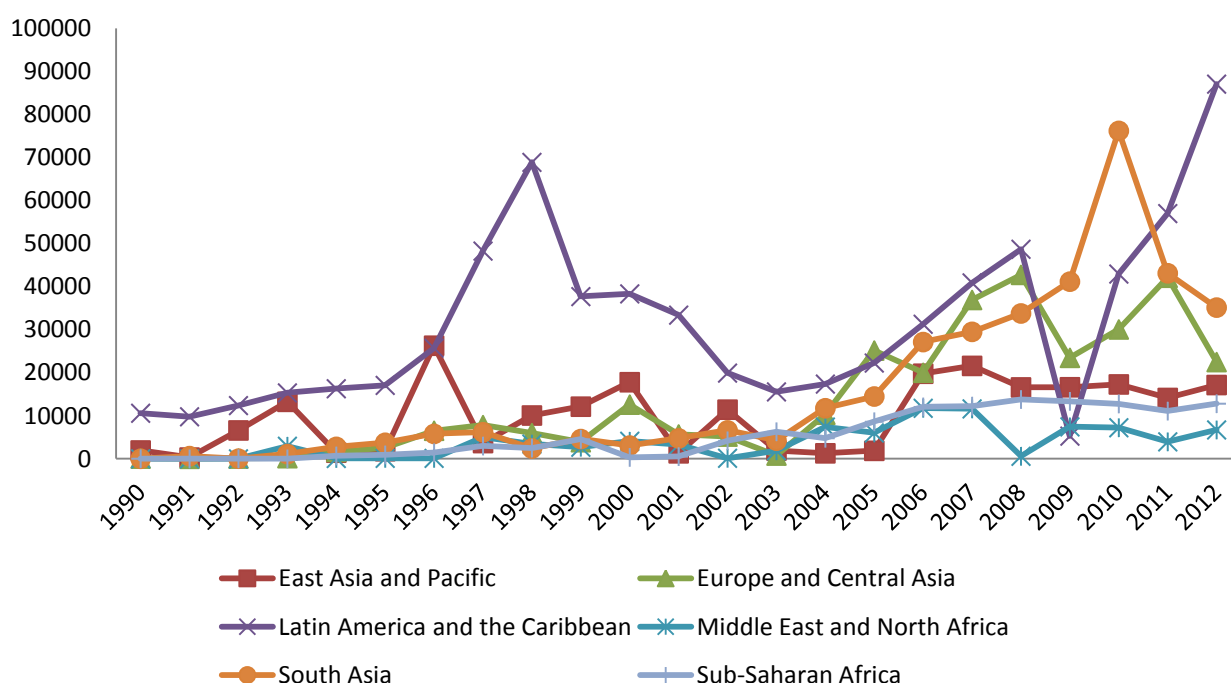


Source: own elaborations

When we look at Figure 5 representing private investment into PPP projects, we observe that most investment is in Latin America and the Caribbean, which corresponds to the fact that in these region the number of PPP projects is the highest. In East Asia and the Pacific and in Europe and Central Asia we see that the level of investment is comparable in both regions, in East Asia and Pacific it is 313 billion US \$ and in Europe and Central Asia it is 360 billion US \$. However, when we compare it with data on the number of investments, in East Asia and Pacific there are two times more projects than in Europe and Central Asia, so in Europe and Central Asia there are fewer projects so either their size is bigger than in East Asia and Pacific or this outcome is connected with the level of prices in both regions and it is difficult

to state much about the scope of the projects given these data only. Similarly, in East Asia and the Pacific and in Latin America and the Caribbean the number of projects is comparable, whereas the amount of investment in Latin America and the Caribbean is more than twice as large as that in East Asia and the Pacific. The level of investment is roughly the same in East Asia and the Pacific, Europe and Central Asia and South Asia. Whereas it is the smallest in Middle East and North Africa and Sub-Saharan Africa.

Figure 6.
Investment in PPP projects across 1990-2012 in US \$ million

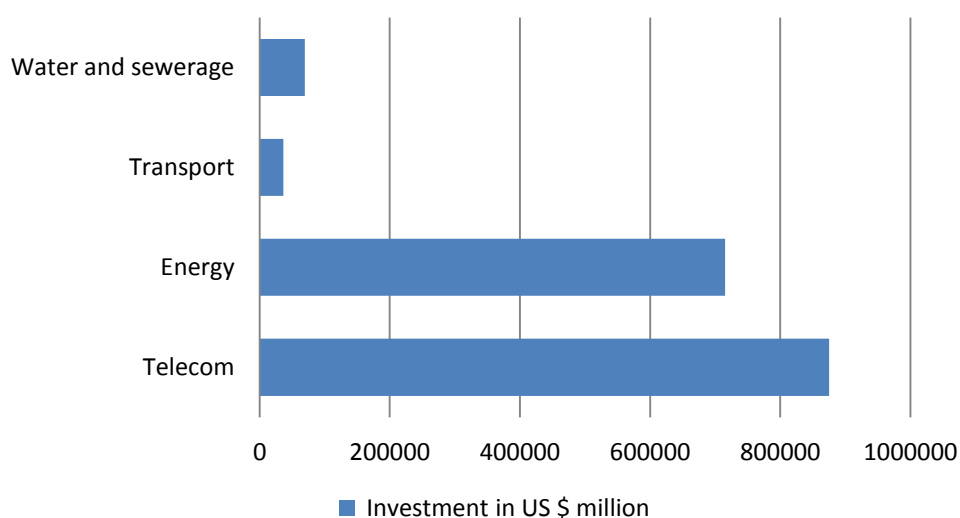


Source: own elaborations

The trend in investment in PPP in the last two decades was less volatile as compared to the trend in the number of PPP projects for the same period. The investment in Latin America and the Caribbean differs significantly from the rest of the regions. For this region, in comparison to the others, the level of investment was the highest up to the year 2008, whereas in 2009 it reached its lowest level before recovering in the following year and obtaining the second position for the region having the most investment, and finally in 2012 Latin America and the Caribbean took the lead once again. Sub-Saharan Africa and the Middle East and North

Africa had almost the same level and trend in investment in PPP projects, with one exception, namely in the year 2008 in Middle East and North Africa there was a drop to almost no investment whereas in Sub-Saharan Africa the size of investment did not change in the years 2006-2012. Also in South Asia and Europe and Central Asia the level of investment is similar, especially in the years 1990-2008. In 2010 there is the greatest difference in investment in PPP in both regions. The region East Asia and the Pacific had the most changing pattern of invested resources in PPP projects. The level rose to the year 1993, before falling to rise again in 1996, decreasing again before remaining stable from 1998 to 2000. The trend was then volatile and since 2006 has remained at the same level.

Figure 7.
Investment in PPP projects in 1990-2012 according to sectors

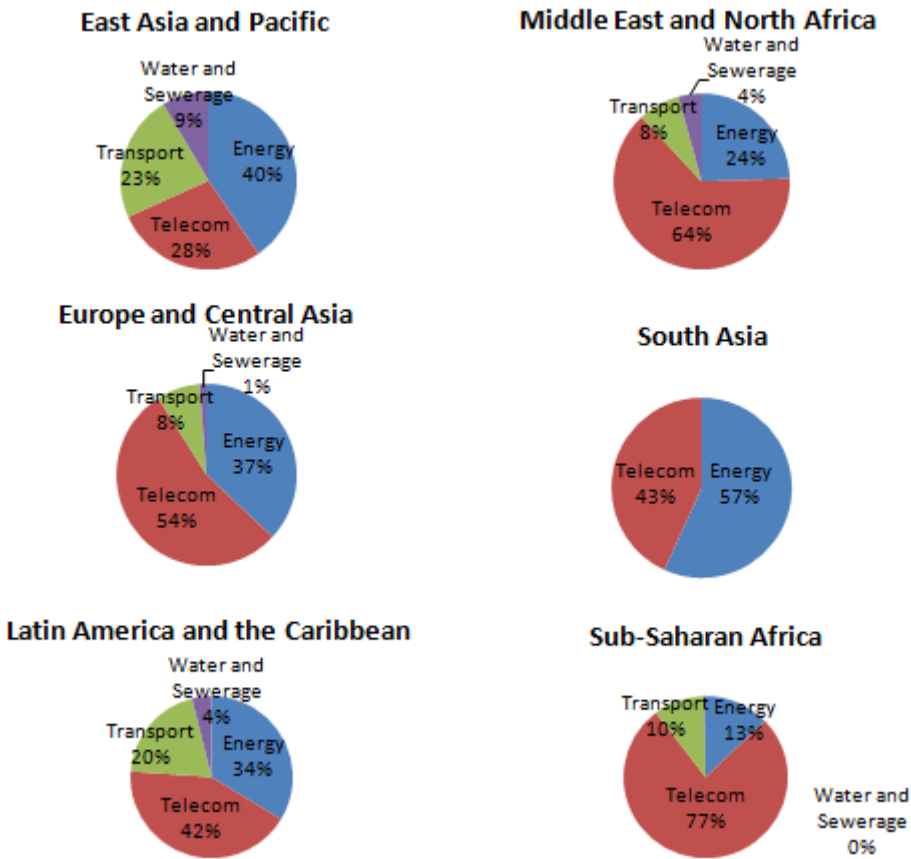


Source: own elaborations

From figure 7 we learn that the sector which receives the most resources is the telecom sector, which when it comes to the number of PPP projects was the second lowest, so we can say that telecom projects require substantial expenditures. The second sector when analyzing the amount of investment was the energy sector in which there was the greatest number of PPP projects. The transportation sector receives the smallest amounts, while it had the second largest number of PPP projects, so we may say that the transport projects do not on average

generate much expenditure when compared to other sectors. When analyzing the water and sewerage sector, we can observe that the number of PPP projects into this sector is very similar to the number of telecom projects, however the amount of investment is incomparably smaller in the water and sewerage sector than in the telecoms sector.

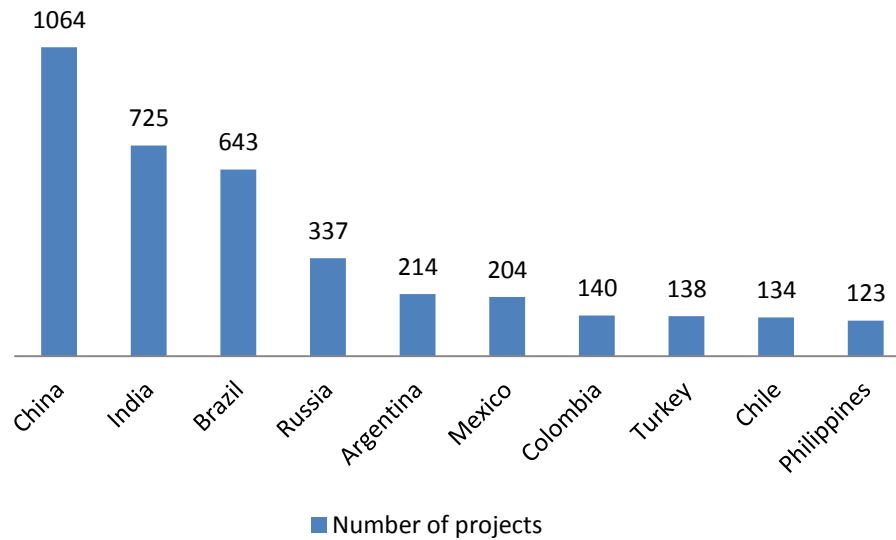
Figure 8.
Share of PPP investment into sectors in the regions



Source: own elaborations

In figure 8 we study the share of investment in each sector by region. We observe that the energy sector is invested in most in East Asia and the Pacific and in South Asia. Whereas in the remaining regions, the telecoms industry absorbs the most investments, reaching up to 77% of total investment in Sub-Sahara Africa. The second most invested sector is the energy sector for those regions where the telecoms sector took the first place.

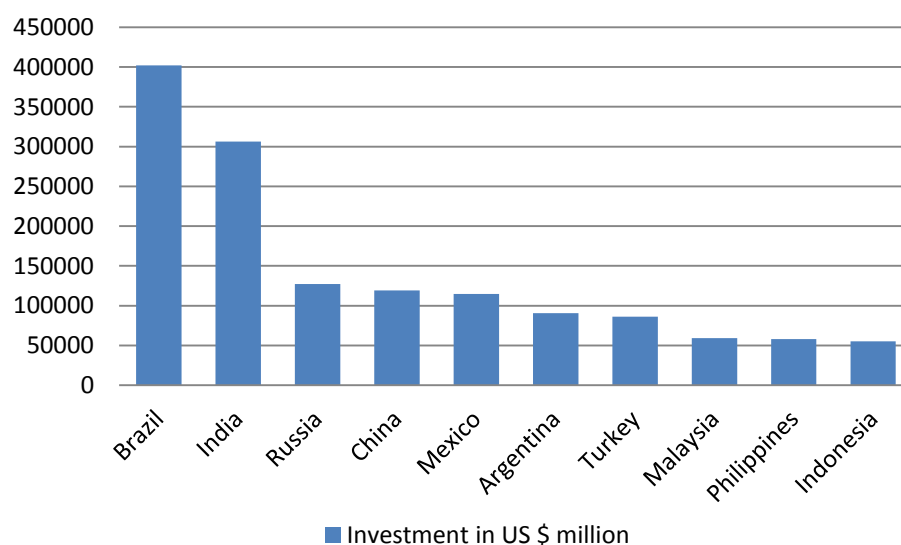
Figure 9.
Top 10 countries by PPP projects in 1990-2012



Source: own elaborations

Having a brief look at figure 9, we get to know the top 10 countries by PPP projects in the years 1990-2012. As we can see, China takes the leading position with more than 1000 PPP projects, which gives around 50 projects per year. In second position is a South Asian country, India, though it has a lot fewer PPP projects. Third position goes to Brazil with almost 650 projects. The remaining places in the top ten all have more than 100 projects and these countries are Russia, Argentina, Mexico, Colombia, Turkey, Chile and Philippines.

Figure 10.
Top 10 countries by PPP investment in 1990-2012



Source: own elaborations

Figure 10 provides information on the top 10 countries by investment in PPP in the last two decades. The leading position is taken by Brazil, which obtained the third place when it comes to the number of PPP projects. The second position is taken by India, followed by Russia, China and Mexico that have a comparable level of investment. What is surprising is that in China there are the most projects, yet when it comes to the invested resources, China takes fourth position. Argentina and Turkey have investment at a similar level to Malaysia, Philippines and Indonesia.¹

¹ A list of countries included in the sample in the Appendix 1. A frequency table for the countries from the sample in the Appendix 2.

2. Economic effectiveness of PPP

One of the supposed advantages of PPP is its potential economic effectiveness, which means that the benefits of PPP for society are higher in comparison with other methods of provision of public goods. This means that the PPP project will be cheaper or of a higher quality. This is possible thanks to the involvement of private entities into the project and the greater effectiveness of PPP might be due to advantages of private ownership. The private sector is guided by the principle of profit maximization and can make better use of the resources in comparison with the public sector. In the case of the public sector, government officials frequently lack incentives to reduce costs, improve the quality of services, introduce innovation or increase effectiveness measures. In addition, the interests of government officials do not have to be in line with the interests of society as a whole because as well as other market participants, officials are trying to maximize their own utility. Their objective is to be promoted, reelected, to enrich themselves or destroy political opponents (Kopańska et al. 2008). Therefore the provision of public goods through private sector participation can improve the efficiency of operations and contribute to a maximization of the utility of a society.

Due to its public nature, the choice of the project and its implementation should be an effective and fair allocation of resources and the project should successfully meet the public need, meaning that the goal of the venture is achieved. Economic efficiency means that during the evaluation of the profitability of the investment it is necessary to take into account its benefits and costs from the perspective of society as a whole, the value of which is measured in money. When the social benefits outweigh the social costs, the project is cost-effective. Fair allocation of resources is when the benefits and costs of investment are divided among the parties interested in using the service or the product. Thus, a fair allocation of resources

assumes a distribution of the benefits and participation in the costs of those who use the public good (Kopańska et al 2008).

In the case of public goods investment it is rarely possible to observe the income due to its public nature. Therefore, it is impossible to determine the effectiveness of investments on the basis of revenues and costs. That is why when choosing an investment project, Cost-Benefit Analysis (CBA) is conducted, which is an assessment of the effectiveness of the results of the investment (Brzozowska 2006). Using this method in the selection process of projects to undertake, different variants are compared with the existing situation and a project is chosen which improves social welfare. Such projects, which bring the greatest value for the public interest are referred to as having the best value for money, meaning they create the highest social benefit (Kopańska 2008).

Another method of assessing the profitability of infrastructure investments is for example evaluation of the process effectiveness, which is based on an administrative monitoring of financial accounting systems, management and data archiving (Brzozowska 2006).

In the further parts of this section Cost-Benefit Analysis will be discussed in detail as this method has the greatest economic justification in the selection process of public investment. Also the concept of value for money is commonly used in the literature on PPP. Both methods are used to assess the effectiveness of projects and to select a project for implementation which will bring the greatest benefit to the whole society.

To create an effective PPP investment certain economic and project conditions have to be met. Guidelines for successful and effective PPP cover such areas as inclusive development and affordability, trust and cooperation, stability and predictability,

accountability and risk management as well as infrastructure financing optimization (Le Bideau et al. 2006), which will be discussed in more detail below.

2.1. Inclusive development and affordability

Effective PPP investment would engage in infrastructure projects which aim at ameliorating living conditions and enabling people to access basic services indispensable for life. Infrastructure decreases poverty across two dimensions, first of all, it enhances growth and secondly it helps the poor to have an access to elementary services. That is why infrastructure is a decisive factor for sustained economic growth and is needed for any sector to operate. It is also an important production input as it delivers goods to markets, workers to industry, facilitates trade and generally decreases transportation costs. Hence, involvement of private partners in projects supporting inclusive development i.e. projects contributing to development of poor communities from developing countries, is one of the aspects that constitute an effective PPP.

PPP projects have the potential to improve the socio-economic situation of developing countries while maintaining socially affordable charges. The role of the public party is to keep the cost at a level acceptable to the final consumer. The public sector decides on the objectives of the project and the extent to which the autonomy of private party should be granted. Its responsibilities also include ensuring through an appropriate structure of the partnership that the private company provides the service at a proper quality. Government should also control and have an influence on the price setting process, so that the price policy is consistent with government's policy and the service is affordable to the local community. Besides, public entities should maintain favorable conditions for the private sector e.g. launching supporting policy, carrying out institutional and judicial reforms that prevent corruption and improve governance.

2.2. Trust and cooperation

To develop effective PPP, trust and cooperation between partners is necessary. Long term contracts, of which PPP is clearly one, cannot function successfully without trust and mutual assistance between partners. It is also important to remember that the parties are partners and not opponents and that their collaboration throughout the duration of the partnership, which may be 10-50 years, has to continue for the investment to achieve success. Although PPP projects are usually long-term contracts, they should also be adaptable to changing needs throughout the course of the partnership. To obtain a full optimization of the project long-term arrangements are preferable, with such duration ranging from 10 to 50 years. Nevertheless shorter commitments, like 5 to 7 years, may also be efficient. For long-term contracts it is important to plan the operational framework of the investment. It ought to be predetermined what impact of the investment there would be on the service price over the years as well as the service price increases should be moderated. Besides, a private partner should obtain a decent return on the invested funds. Also the level of control of the PPP venture has to be set up. Even though the reason a private party is invited into such projects is that the private sector can better manage the project, there is the need for a high level of control of the private company by the public entity due to the social context of the partnership. The control is vital to ensure the required level of performance of the private firm.

To obtain a partnership based on trust between public and private parties but also among other participants such as staff, customers, suppliers etc., requires that certain conditions concerning the partnership are met. First of all, there has to be a clear division of tasks and roles between the partners. A stable regulatory environment is required, which ensures that the rules would not change during the contract, and which has to be prepared with great detail as inappropriate simplifications may jeopardize the success of the PPP project

(Marques and Berg 2010). What is also important is the transparency of procedures, decision making process and transfer of information. Besides, the public party has to pay deep respect to the autonomy it has given to the private company throughout the partnership. In addition, performance evaluation criteria have to be set and obeyed and the contract should state the procedure for solving possible problems and misunderstandings between partners. In general, the more clearly the contract is prepared i.e. the objective of the project and performance criteria are explicitly stated, the more trust is present between the partners. What is more, to build trust with the stakeholders, all interested parties have to have access to information as without the support of staff and customers in the decisions taken by the public authority, effective and sustainable PPP investment is impossible. A relationship of common respect and dialogue is a prerequisite for successful PPP.

2.3. Stability and predictability

In establishing PPP contracts certain prerequisites concerning stability and the predictability of a country should be present to have an effective PPP contract. These are stable macroeconomic conditions, the presence of local well-developed financial markets, the availability of legal procedures and contract frameworks as well as effective measures against corruption and illegal actions. However, before any formal PPP contract is signed, transparency and legal security should be present to obtain confidence and prevent any possibility of corruption (Marques and Berg 2010). That is why the public party's duties include providing an efficient regulatory scheme to make the environment as predictable as possible and to avoid changing the rules of the game. What is also important is that related markets are open to competition between private companies and the private sector establishes rules for access to the infrastructure. Also efficient and comprehensive terms and conditions for procurement ought to be present to assure open access. To build a long term contract between the private and public sector, both parties should concentrate on the stability of their

cooperation. The public side supports the quality of the service provided by the private firm and emphasizes its continuity. As there is no one pattern or legal tool on how to establish a PPP contract, each project is an individual case, with the private company expecting that the legal conditions will be stable during the partnership in order to have a successful and effective project. However, all parties involved in PPP projects should aim at establishing standards in designing PPP contracts which will help to maintain stability throughout the whole venture.

To obtain stability and predictability of the partnership, an efficient distribution of risks between the parties should be defined as well as a proper contractual framework of the project. Risk allocation should be conducted according to the partners' ability to assess, control and cope with various risks since an optimal and efficient risk allocation is of critical importance to succeed with an effective PPP project (Jin and Zhang 2011). Moreover measures for the renegotiation of the partnership should be determined in the case of unpredicted situations. In addition conflict solution procedures ought to be settled to help resolve isputes and prevent a disruption in service supply. The private partner should comply with agreements that were set by both partners to promote stability and predictability, it should also provide procedures for resolving complaints from unsatisfied users and should track the provision of the service and monitor it in case of momentary loss of control of the public entity.

2.4. Accountability and risk management

Managing accountability and risk management in PPP projects is not a trivial matter due to possible misunderstandings which may occur between private and public parties. For this reason, integration of the underlying risks and end efficient management of the entire project cycle is a key factor (Doloi 2012). Since it is known that public and private accounting

are different, each party must know the principles and rules which are in effect to evaluate performance. Accounting in the private sector may not reflect the true evaluation because it does not take into account risk management and might not adequately cope with accountability. It uses the budgetary concept, expenditures and receipts are presented as a function of changes in cash flows. It is difficult in the public sector to evaluate performance since revenues and expenditures are not connected with the provision of the public service or the transfer of public goods. There is also no balance sheet and there is no differentiation between expenses and fixed assets as well as no concept of commitments given and received. Thus, public sector accounting does not provide an accurate outlook of the asset base of the public sector. The public sector does define financial aggregates in a sound way and does not publish full financial statements differentiating the income statement. As a consequence, the public entity's performance can be counted on the basis of the funds allocated to it in the budget and cannot be evaluated using the operating income it creates. Cooperation with the private partner through a PPP in managing infrastructure or public services enables the public sector to have access to the "best practice" that functions in business to ameliorate the effectiveness and conduct decent measures of public sector's performance.

Also according to Robertson and Acar (1999) there are three dimensions of accountability, which together help to create effective PPP that would serve the public interest. These are community accountability, which ensures that the project effectively addresses the needs of the community for whom the service will be provided and incorporates different views and perspectives that are crucial in the decision making process to enhance the responsiveness of the partnership to the public interest; Partner accountability, which is defined as a mechanism, which holds each partner accountable to gain effectiveness from the project and which requires partners to work towards obtaining a consensus definition of the objectives and strategies to obtain the desired aims of the project; and moral accountability,

which serves to guide the actions of the parties and individuals of the PPP to increase their commitment to serve the public interest despite there existing significant variations of the participants' values and norms.

3. Advantages of PPP and Cost -Benefit Analysis

3.1. On time and within budget

Experience shows that when a public task is carried out throughout PPP, it is more likely that the investment will be completed on time and within a budget (Tang et al. 2010). A private entity receives a payment from the users or a operational readiness fee from the public sector when the investment is completed. It is a strong incentive for the investor to complete the construction on time and not to exceed the budget. In addition, conducting thorough analyses before a partnership allows for more accurate cost assessment and investment plan. According to the UK Treasury, 73% of traditional public investment exceeds the planned budget and 70% of the projects are not completed on time. In the case of PPP investment only 20% of the projects are over budget and 24% are delayed (Thomson and Goodwin 2005, Duffield and Raisbeck).

In PPP projects, the costs of preparing the partnership are usually higher than the costs of preparing the project to be carried out in a traditional way. This is connected with detailed risk and investment analyses, which have to be done in the case of PPP. Although the increase in costs is significant, the whole investment is more reliable due to the better preparation of PPP projects. Thus, the value for the whole society is greater (Kopańska et al. 2008).

3.2. Division of tasks

The idea of cooperation between the sectors is based on the belief that both the public entity and the private sector can perform some of the tasks better. At each stage of a PPP project, a public and a private partner have different tasks to perform. Firstly, at the stage of

project preparation, the public partner prepares the initial documentation, establishes a team responsible for the preparation of the project, forms a team of advisors, and carries out tender documentation. The private side determines the optimal structure of the project, identifies and assesses the risk of the project and prepares a competitive offer for project implementation (Tang et al. 2010).

During the project implementation stage, the public party acquires the funds for periodic payments to the investor, purchases land needed for investment, and acquires the necessary permits. In turn the private partner collects capital for carrying out the investment, develops a payment mechanism, determines the price of the project implementation, negotiates the terms of cooperation with subcontractors, etc. At the end of this stage, the public party selects a private partner and negotiates the final terms of the project.

The next step is to design and construct the object. The main tasks of the public side at this time are to monitor the investor - the private firm. A private entity conducts the preparatory work and carries out the project. It develops detailed technical documentation and carries out the construction in accordance with the agreed schedule.

During the operation and maintenance phase of the project, the same as at earlier stages, the public entity controls and monitors the private partner. Then it pays the investor the previously agreed amount, depending on the availability of facility and level of use. At that time, the private partner operates and maintains the facility and conducts necessary repairs arising in the course of the contract. A private party is responsible for the maintenance of an object until it is transferred to the public party (Cenkier 2009).

A public partner is competent to define a service, which will meet the social need of citizens, if it can determine the extent and location of the service which will ensure sustainable socio-economic development of a given region or country. Whereas a private

partner is more experienced in managing challenging projects and has more practice in collaboration with stakeholders and partners. The private investor, who usually operates in a turbulent environment can quickly adapt to changing conditions and adjust its business to the new environment. It is also more prepared for management of the facility during the life cycle (Gajewska-Jedwabny 2007).

By combining the competencies of both sectors, project efficiency increases in comparison with a traditional way of providing public services. In addition, both parties benefit from the cooperation: the state provides a service of a good quality and at a reasonable cost and the private party receives a fair return on the invested capital.

3.3. Additional investment

An important benefit of PPP is that it enables additional investments which might not have been made but for PPP. State budget constraints often do not allow extended investment in infrastructure, which is why PPP is frequently an alternative form of carrying out a project, which otherwise would have to be postponed.

Although from the macroeconomic point of view, a rise in public investment leads to a decrease of private investment and the total investment remains at the same level, there is no evidence that PPP projects crowd out private investment, except in the construction industry, where such a situation may occur. Moreover, this feature of PPP makes it attractive from the political point of view as PPP projects can reduce government spending on infrastructure investment since the private sector may cover the costs of investment (Yescombe 2008). It is also believed that the move towards private participation in infrastructure does not substitute private sector capacity for public private capacity, rather it promotes new forms of public sector capacity to be designed and implemented in order to face and overcome different challenges that infrastructure encounters (Jooste et al. 2011).

3.4. Cost-Benefit Analysis and value for money in PPP

It seems obvious that not every project can be carried out in the PPP form. In order to benefit from intersectoral cooperation, the projects should be characterized by certain features. First of all, it is important that the assets involved in the project are easy to evaluate in the subsequent years of the project. A fair estimate of their value will be needed to carry out financial analysis of the project, so that the project is financially transparent and would not raise concerns for a society, who can understand the PPP as privatization. Also PPP projects have to be large and of high value due to the considerable costs associated with legal preparation for PPP as well as its long-term nature. In the case of smaller projects a series of risk and profitability analyzes, preparation of legal formalities and other procedures necessary for the implementation of the PPP could increase significantly the cost of investment, which in turn might lead to project ineffectiveness. In addition, on the market there should operate a sufficient number of companies, which have experience in this type of projects so that the chosen investor is the most competitive one (Kopańska et al. 2008).

PPP is often used in the transportation sector, the health service, water and sewerage systems, etc. Frequently the transportation industry is the first in which PPP projects are implemented in a given country. Then a private party provides an integrated service, so in the case of the transportation industry this could include: building infrastructure components such as roads, bridges, viaducts; providing means of transportation, e.g. buses; and providing other facilities such as parking lots or waiting areas. As a result, the private partner becomes a comprehensive supplier of transport infrastructure. The scope of the application of PPP into transportation is not limited to road infrastructure as PPP may also be implemented in water, rail and air transport. In health care the activities ascribed to a private party might include the construction of hospitals, clinics; the provision of non-clinical services such as cleaning, washing, catering, the purchase and maintenance of equipment, or pharmaceutical services. In

the water and sewerage sector a private party might be contracted to construct or renovate existing sewerage treatment, sewerage or water systems and to operate the facility. Other areas in which PPP might be carried out could include waste management, sports and leisure facilities etc. (Gajewska-Jedwabny 2007).

In addition, PPP projects would be an effective way of providing social services, provided that the quality of the built assets by the private party has a negative impact on the cost of the service in the future. Then the private entity that is responsible for the construction, operation and long-term service delivery is motivated to build a facility of sufficient quality. A private entity which maximizes the revenue would provide an object of satisfactory quality, which in the future will reduce the maintenance and renovation costs (Kopańska et al. 2008).

It is worth mentioning those cases when PPP would not be an optimal way of carrying out a public task. Firstly, if the quality of the constructed assets does not affect the cost of providing services, in other words, regardless of whether the investor builds a facility of high or low quality, the cost of the service will be unchanged. Then a private investor does not have an incentive to construct an object of high quality, so PPP will not be the optimal solution if the public sector cares about the quality of the delivered facility (Kopańska et al. 2008). Secondly, there exist sectors where operation should remain in the hands of the public sector e.g. the armed forces due to security reasons. However, private companies can provide various services to the military services such as catering or accommodation (Yescombe 2008).

In order to obtain an effective PPP investment, the aggregate benefits should be greater than the aggregate social costs. The social benefits may include the construction of a public facility, an increase in the investment attractiveness of a region, the development of local workforce skills by training programs, increased tax revenues or the development of local capital markets (Brzozowska 2006).

There might be distinguished four steps in conducting analysis of social costs and benefits, so-called cost-benefit analysis (CBA) (Brzozowska 2006).

1. Identification of factors which affect society in a positive and negative way in relation to the planned infrastructure investment.
2. Valuation of the costs and benefits expressed in monetary terms.
3. Choice of the discount rate in order to calculate the present value of the investment and other calculations.
4. Selection of the project which generates the highest surplus of total benefits over total costs.

The first step is to identify the benefits and the costs to society, which include, for example, services of a higher quality or better access to services and in the case of costs may include higher charges. The next step is to measure the benefits and costs. To do this it is necessary to determine consumer's surplus coming from the completed investment. If the project aims at reducing maintenance costs of a facility for example, then consumer's surplus will be captured in lower costs and will be measured by the decline in the price of the service. In the analysis indirect i.e. external costs and benefits should not be ignored, which together with direct costs and benefits constitute social costs and benefits.

It is worth mentioning that in the analysis of the costs and benefits of public investments we deal with the valuation of non-market goods and intangible assets. That is why apart from determining the direct value of the benefit, it is also possible to evaluate it on the basis of intermediate market value or refer to social values. In the case where it is impossible to estimate the benefit, the effectiveness of the project can be determined on the basis of cost analysis. This method of effectiveness calculation is called the minimum cost

method. Then among projects with similar operating parameters, there should be selected the one which has the lowest total investment and operating costs.

The next step is the selection of the discount rate. This is a crucial choice since with a too high discount rate a profitable investment might be rejected whereas a too low discount rate can affect the overall rate of investment and the project might be ineffective. Among many variants of the project, there is selected one which ensures the greatest net benefit, so the investment should be carried out when there is achieved a surplus of total benefits over total cost.

4. Existing Evidence - empirical studies concerning PPP

The concept of PPP is a relatively new form of cooperation between sectors and thus there is little empirical research on the determinants of PPP projects. Probably the first study concerning PPP was conducted in 2006 by the International Monetary Fund (Hammami et al. 2006). In this paper the researchers investigated the factors which influence the number of PPP projects and the quantity of private investment in infrastructure in low and middle income countries. In the study 7 regressions were estimated, which attempted to explain the following issues: the determinants of the number of PPP projects in aggregate infrastructure and in particular sectors i.e. energy, telecommunications, transportation, and the water sector. In addition, the factors affecting the size of private investment as well as the share of private sector participation in the implementation of PPP projects were investigated. The dependent variables were: the number of PPP, private investment in PPP as well as the index of involvement of the private sector in the PPP investment in particular countries in the years 1990-2003. The observations were taken from the database 'Private Participation in Infrastructure' (PPI), which collects information on the involvement of the private sector in infrastructure in 137 low and middle income countries. The authors studied the determinants

of PPP by focussing on 7 areas, namely: the state of public finances, political conditions, market conditions, macroeconomic conditions, preparation of institutions, legal system and previous experience in carrying out PPP projects.

The authors argue that the implementation of a PPP project in many countries is the only possibility of the realization of the investment due to budgetary constraints. (Hammami et al. 2006, Brzozowska 2006, Mausen and Krumm 2011) At this point, the PPP project can bridge the gap between society's expectations concerning the state of infrastructure and the financial resources of the government. (Davies and Eustice 2005). That is why a country which has budget deficits and is struggling with debt will be more willing to participate in a PPP (Shediak and Najjar 2008). In addition, the theory shows that countries with external sources of income, coming from exports of natural resources undergo economic crises more smoothly and are less motivated to open up to the market. Rentier countries having income from abroad can ease the fiscal shock in that way, thus they are less determined to liberalize the economy and open up to private investors. Therefore, in these countries there will be fewer PPP projects PPP (Hammami et al. 2006). In the literature one can also find that political conditions affect the development and implementation of PPP projects. Countries with market economies will be more open to the involvement of private capital in infrastructure projects. Countries not having a market economy will be more closed to collaboration with the private sector and therefore in these countries there will be fewer PPP projects (Yescombe 2008). In Hammami et al. the variables testing this hypothesis were the number of opposition parties and the ruling party orientation (left-wing, centrist, right-wing). Governments of countries where the diversification of citizens in terms of culture, linguistics or religion is significant, they must respect the diversity of their citizens and will try to satisfy their heterogeneous needs, including those related to infrastructure. So, the more ethnically diverse a country the greater the need for infrastructure investment, which will lead to a larger

number of projects PPP (Hammami et al. 2006). The above mentioned conditions (a level of indebtedness of a country, diversity of citizens, political attitudes) may stimulate or discourage public entities from engaging in PPP projects.

It is also worth pointing out the factors that incline a private company to invest in PPP projects. Private entities joining a partnership in many cases are obliged to commit to long-term cooperation, which is subject to various kinds of risk. Therefore, a very important factor for PPP projects will be the economic situation a country (Brzozowska 2006). Countries with stable macroeconomic conditions attract investors. Stable and predictable policy, low inflation as well as stable exchange rates reduce the risk of failure of the project and encourage investors to PPP projects (Hammami et al. 2006, Moszorno 2010). Investing in infrastructure requires a significant amount of effort and the payback period of investment is long. That is why the size of demand and the size of the population is important for the introduction of PPP projects. Hence, a factor that encourages the private sector to engage in PPP projects is a large market. The bigger the population and the greater the size of aggregate demand, the smaller the risk of failure of an investment and of achieving a lower than expected rate of return by the private investor. The higher the value of the GDP, the greater the rate of return for the investor (Hammami et al. 2006). Furthermore, cooperation between public and private entities is carried out through detail legal agreements, and therefore, an important role in the formation of PPP projects is played by legal and government institutions. Corrupt civil servants undermine investor confidence in the state and increase the risk of failure of the investment. So, if the level of compliance with law is high, then the law is more efficient and investors demonstrate greater willingness to cooperate with the public sector, because they anticipate that their rights will be respected. On the other hand, a complicated and lengthy process of the formation of PPP projects, which requires the preparation of comprehensive documentation, discourages private entities to join PPP projects (Davies and Eustice 2005,

Hammami et al. 2006). Therefore, in countries where bureaucracy is too developed there will be fewer PPP projects. At the same time, countries having experience in conducting PPP will better attract investors to the formation of partnerships than countries in which this form of cooperation is not established (Gajewska-Jedwabny 2007). Hammani et. al. (2006) used the following variables to verify the research hypotheses concerning the determinants of the number and size of private investment in PPP: the budget deficit, debt levels, ethnic diversity (ethnic fractionalization), population size, the size of the real GDP, an index of corruption, information on legal systems, earlier commitment and experience in PPP, export of fuels, and inflation. Other explanatory variables were: the number of opposition parties and the ruling party orientation (left-wing - negative impact, centrist - neutral, rightist - a positive impact on the number of PPP projects). The researchers obtained the following results: the largest impact on the number of PPP projects was from population and the size of GDP, which affected the formation of PPP in a positive way. Inflation also proved to have negative impact on the implementation of PPP projects. These factors were the most important. In addition, theoretical considerations about the determinants of PPPs have been empirically supported in the following areas: the state of public finances (public debt, the negative impact), the strength of institutions (control of corruption, the positive impact), the legal system (the indicator of legal terms, a positive effect), and previous experience in carrying out PPP projects (positive impact). The political environment of a country was found to not affect the number of PPP projects (number of opposition parties, the orientation of the ruling party, the ethnic differentiation of the index were not statistically significant). The size of private investment in PPP projects is affected by the same variables as the number of PPP projects. In addition, the size of investment is affected by the variable 'number of opposition parties', which has a positive impact when explaining the number of PPP projects this variable was not statistically significant. This enables us to assume that the size of investments, not the number

of PPP projects, will be affected by the political conditions of the country. The study also tested whether the country's geographic location affects the number of projects and investments in PPP. All regions except the region of Europe and Central Asia are less susceptible to a number of PPP investment in the region compared to the baseline, which was Latin America and Caribbean (Hammami et al. 2006). It has been shown by Davies and Eustice (2005) that although in the non-European markets fewer PPP projects are conducted, when it comes to the level of investment, it is similar to Europe.

Another paper addressing the issue of the determinants of PPP is the work by Reside and Mendoza (2010). In this paper the researchers study the factors affecting the successful formation of PPP projects in East Asia in the years 1984-2009. One of the reasons for carrying out the study was the fact that there are in this region a significant proportion of PPP projects, in comparison with other areas, that were not completed due to the withdrawal of a private partner. The authors conclude that the successful implementation of PPP is affected by a stable macroeconomic situation; the level of GDP per capita; openness of the market, open markets better attract foreign capital; the structure of property rights - the greater the part of assets of PPP investment is in the hands of a private entity, the more likely the success of the partnership. When it comes to country's political system, a presidential system carries a significantly higher probability of success of a PPP project. Also the existence of profit regulation of the private firm promotes the success of PPP project (Reside and Mendoza 2010).

Sharma (2012) analyses the determinants of PPP in infrastructure in developing countries. He investigates the factors influencing PPP in panel estimations on 22 countries in the years 1990-2008 and runs two regressions to account for the number of PPP projects and total investment under PPP arrangements. It is the first attempt to investigate PPP determinants exclusively for developing countries, which is also the main aspect in which it

differs from Hammami et al. (2006). In the research the author checks whether such factors as the government's resources constraint, stable macroeconomic conditions, size of the market, country risk, political environment or regulatory and effectiveness environment influence PPP in developing countries. The results prove that macroeconomic stability, the size of markets and regulatory environments are important determinants of the number PPP projects in developing countries. Government effectiveness is also significant and it turns out to have a negative impact, so if the public sector is effective, private firms are less motivated to engage in PPP projects. The remaining factors did not turn out to have a significant impact. In determining the factors for total investment, the results are similar, macroeconomic conditions, the size of the market and regulatory environment prove to be important. That is why the results suggest that developing countries with a stabilized macroeconomic situation, substantial market size and good regulation with reliable institutions attract more investment into PPP. A stable and predictable economic situation limits the risks of investment, which otherwise might be high due to long-term arrangements which PPP involves. In determining factors for the number of PPP, the results are in line with Hammami et al. (2006), who also found a role for economic stability and market size. Yet the outcomes are different when it comes to investment into PPP. Sharma's (2012) study implies that market size plays a role whereas Hammami et al. (2006) did not find any relation in this matter. In addition, governance proved to be a considerably significant determinant whereas in the Hammami et al. (2006) study it turned out to have a marginal importance in accounting for PPP investment. The difference in results might be caused by the use of different country samples for both studies, Sharma focused on only 22 developing countries, whereas Hammami et al. (2006) worked on all countries from PPI World Bank's database.

Public-Private Partnership or Private Finance Initiative, as was used primarily in UK, as a form of provision of public goods was introduced in Great Britain for the first time on a

large-scale (Gajewska-Jedwabny 2007, Doloi 2012). The potential benefits coming from PPP meant that other countries have begun to follow Great Britain in implementing PPP projects. Since PPP may be an economically effective form of cooperation between sectors, which may be used to improve social welfare, it is important to investigate the factors which affect the number of PPP projects in different countries (Kopańska et al. 2008). Knowing the determinants of PPP could contribute to the development and implementation of this attractive form of providing public goods from the point of view of efficiency.

As PPP projects can be an attractive option when compared with a standard way of provision of public goods i.e. only by the public sector, it is worth understand what influences the implementation of PPP. In my research I would like to find out what impacts the number of PPP projects in low and middle income countries. The structure of the research part is as follows. First of all, the hypotheses that I make are summarized, which are stated on the basis of the theoretical considerations discussed above. Then the methodology of the research is described. In the next parts, the reader can learn about the data set used in the study and the analysis of the variables. Then the estimation is discussed, where the variables in the model, diagnostics, measures of model fit as well as partial effects are all discussed. Further I provide an interpretation of the results, and a verification of the hypotheses as well as conclusions.

Table 1 summarizes the research hypotheses which are tested in the present work. According to the theory on PPP determinants discussed above, the expected influence on PPP of the following factors is presented in the table below.

Table 1.
Research Hypotheses

Variable	Influence on number of PPP
Control of corruption	Positive
Rule of law	Positive
Fractionalization	Positive
Inflation	Negative
Population	Positive
GDP	Positive
South Asia	There are no precise hypotheses referring to the influence of geographic location on the PPP projects. However, due to cultural differences concerning various regions substantially different results are expected.
Europe and Central Asia	
Middle East and North Africa	
Latin America and Caribbean	
East Asia and Pacific	
Sub-Saharan Africa	
Number of observations	

Source: Own elaborations.

5. Methodology

As a dependent variable, a discrete variable referring to the number of PPP projects is used, with data collected over the period 2000-2009. The literature suggests that the number of PPP projects in a given economy can accelerate GDP growth after exceeding some cut-offs. Therefore, the number of PPP projects is ascribed to three groups: low if in a given country there were 1-3 projects, medium if there were 4-10 and high where the number of projects was greater than 10. Hence, Ordered Logistic Regression is used as the dependent

variable takes three values 1, 2 and 3 accordingly to the described groups.² Additionally, the variable has been analysed according to the number of observations in each group.

All explanatory variables have been analysed in order to check the relevance of including them in the model and to determine the proper form in which to introduce them into the research. The proper form of continuous variables were chosen on the basis of histograms. The discrete variables have been checked to see if the particular categories contain a similar number of observations. On the other hand, the mean values of the discrete variables with more than two categories have been compared with the Kruskal-Wallis test. To check whether there are significant differences in mean values across groups the Sidak and Bonferroni procedure was performed. This allows one to change some categories in the case when a group consists of few observations.

After the initial estimation which included macroeconomic variables, a second estimation was run which contained the variables from the first regression and additionally microeconomic variables³, i.e. other potential determinants of PPP projects. In the final regression I add regional dummies. The three regressions were conducted to check the robustness of the obtained results. Joint significance was checked by the Wald test, and additionally a Likelihood-Ratio test was performed to compare the model without restrictions to the one with restrictions.

After the regressions were estimated the diagnostics tests were conducted. In order to check if the model is correctly specified, the link test was performed, which is a generalised form of the test RESET used in OLS estimation. The null hypothesis of the test informs us that the model is properly specified.

² More details on the choice of Ordered Logistic Regression in the section Dataset

³ By microeconomic variables, in contrast to macroeconomic variables, which express the total stance of the economy like growth, inflation or unemployment, I mean the variables like rule of law, control of corruption and fractionalization, which express and concern the behaviour of the individuals, rather than they are a sum of economic activity, which is the case of macroeconomic variables.

As the ordered logistic regression is used, it is also necessary to check if the proportional odds assumption is satisfied so if the relationship between each pair of outcome groups is the same. To do that the Brant procedure and a likelihood-ratio test of the proportionality of odds across the response categories is carried out. In the case when the proportional odds assumption is violated the model should be estimated by generalised ordered logistic method.

The above described methodology has been used to determine factors that influence the likelihood that the number of PPP projects in a given country would be low, medium or high. On the basis of the literature, the proper functional form for the variables included in the model was chosen, the data set has been analysed and the diagnostics conducted. In the next section I provide a description of the data.

6. Dataset and analysis of variables

6.1. Dataset

The World Bank's Private Participation database⁴ is used to obtain information on the dependent variable. Explanatory variables: population size, GDP and inflation measured accordingly to CPI are taken from the International Monetary Fund database⁵. The index of corruption and the legal conditions come from World Bank database⁶. Ethnic fractionalization is taken from The Macro Data Guide⁷. Observations in this model are the mean of 10 years for the years 2000 - 2009. The use of mean values was necessary to obtain a relatively large sample size, with samples for each year being too scarce.

⁴ World Bank's Private Participation database: <http://ppi.worldbank.org/>

⁵ International Monetary Fund database: <https://www.imf.org/external/data.htm#data/>

⁶ World Bank Group, CPIA database: <http://www.worldbank.org/ida/>

⁷ Macro Data Guide database: <http://www.nsd.uib.no/macrodataloguide/>

To conduct the estimation with the use of Ordered Logistic method it is necessary to decompose the dependent variable into levels. Having studied the literature on Public-Private Partnership, I have come to the conclusion that the dependent variable – the number of PPP, may be decomposed into 3 levels: low, medium and high. A low level corresponds to 1-3 PPP, a medium level corresponds to 4-10 PPP, and a high level corresponds to 11 and more PPP infrastructure projects. All of the intervals contain comparable number of observations. The division is made on the basis of the Davies and Eustice (2005) study concerning PPP. In their study one can observe clear-cut thresholds concerning the number of PPP and the authors therefore ascribe them to the three categories. This research deals with low and middle income countries, most of which are located outside Europe. Even though Davies and Eustice review the activity of PPP across Europe, it provides a comparison of the European and the non-European PPP projects and the authors come to the conclusion that the pattern for non-European countries implementing PPP projects is similar to that of Europe. That is why on the basis of their calculations the sample is divided into 3 above mentioned categories. Additionally, according to study by Shediak and Najjar (2008), evidence shows that the more PPP projects the higher the rate of economic development. The researchers argue that exceeding certain number of projects in a country, causes higher GDP growth. In light of the existing evidence, the decision on the division of the dependent variable and the choice of the regression method is justified.

6.2. Analysis of the variables

The dependent variable is a discrete variable, which takes three values: one, two and three. Each value represents the average of PPP projects in the period 2000-2009. As has been described above, the number of PPP projects has been found to accelerate GDP growth after exceeding some cutoffs. The characteristics of the particular groups are presented in table 2.

Table 2.
Number of PPP projects ascribed two three groups

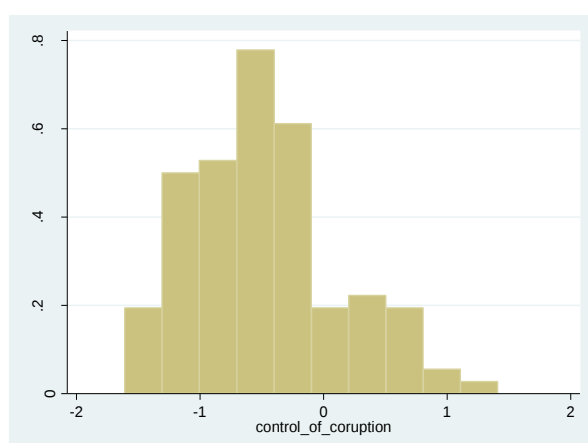
Number of the PPP projects	Number of countries	Percentage of sample
0 - 3 (low) (1)	44	36.97%
3-10 (medium) (2)	44	44%
10 and more (high) (3)	31	26.05%

Source: own elaborations

As can be noticed, the sample is balanced as each group comprises a similar number of observations.

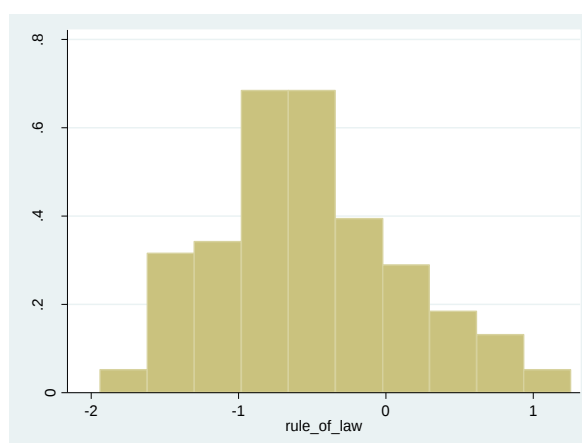
The independent variables in the model are mostly continuous. The proper forms of these variables were determined on the basis of analyses of histograms. The variables: control of corruption (Figure 11.) and rule of law (Figure 12.) are used in levels as they take negative values. The variables fractionalization (Figure 13.) and inflation (Figure 14.) do not take negative values, however they are also used also in levels.

Figure 11.
The histogram of the control of corruption



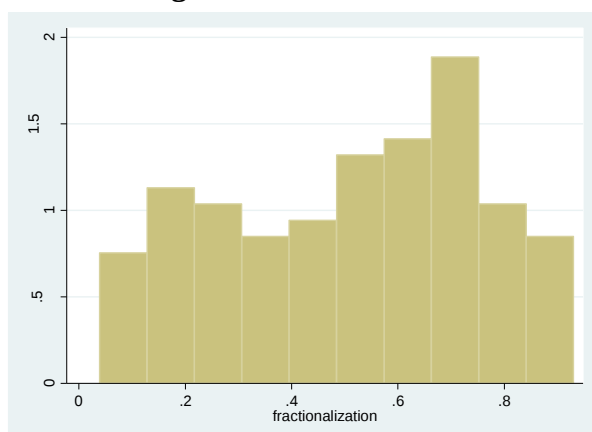
Source: own elaborations

Figure 12.
The histogram of rule of law



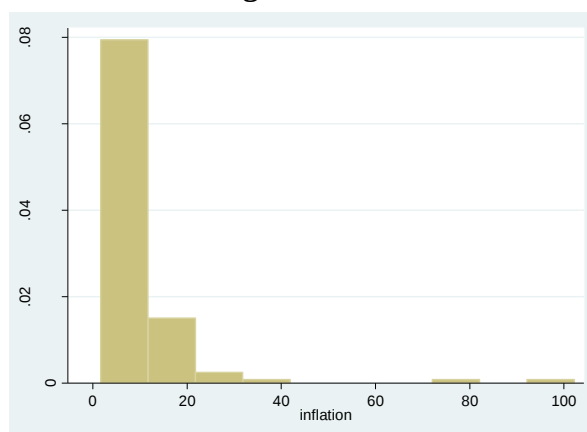
Source: own elaborations

Figure 13.
The histogram of fractionalization



Source: own elaborations

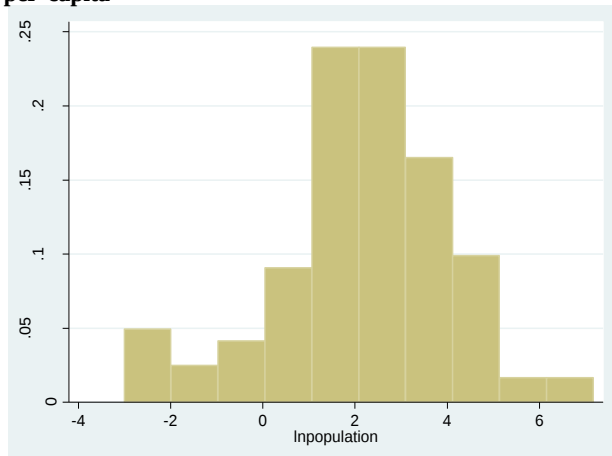
Figure 14.
The histogram of inflation



Source: own elaborations

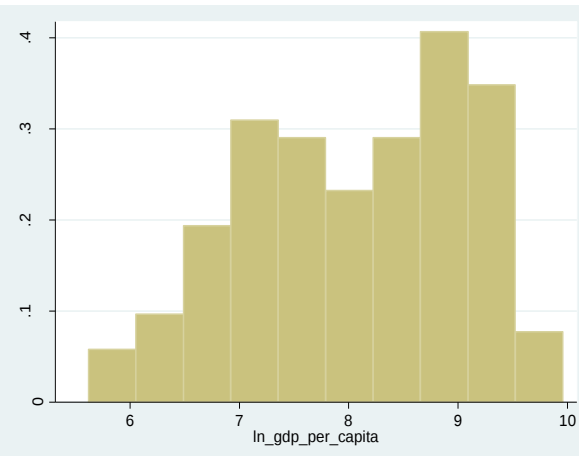
The variables population and GDP per capita were used in logarithmic forms as then their distributions take a more normal form. The histograms of these variables are presented respectively in Figure 15 and Figure 16.

Figure 15.
The histogram of the logarithm of population



Source: own elaborations

Figure 16.
The histogram of the logarithm of GDP per capita



Source: own elaborations

To determine whether a given country is more prone to establish PPP projects due to its geographical location, a dummy variable is introduced, which takes 5 values, each representing a different geographical region with a base level representing Sub-Saharan Africa. The variable composition is presented in table 3.

Table 3.
The composition of variable region.

		PPP level		
Group	Observations	Low	Medium	High
South Asia	7	1	3	3
Europe and Central Asia	22	7	8	7
Middle East and North Africa	9	0	6	3
Sub-Saharan Africa	39	19	17	3
Latin America and Caribbean	27	10	9	8
East Asia and Pacific	15	7	1	7

Source: own elaborations

Although the sizes of particular groups are slightly different, they are used in the presented form due to the fact that the aggregation or disaggregation of a given group is not possible in the case of geographical location. Moreover, this approach dominates in the literature, therefore the presented above 6 groups of variable region are used.

7. The results

7.1. Estimations

Using the variables described in the previous section, an econometric model is built, which depicts the influence of macroeconomic and microeconomic variables and regional dummies on the number of PPP projects.

The estimation equation for the third regression is as follows:

$$Y = \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 \delta_1 + \beta_8 \delta_2 + \beta_9 \delta_3 + \beta_{10} \delta_4 + \beta_{11} \delta_5$$

where $\delta_i \in \{0,1\}$, $i \in \{0,1,...,5\}$

The model has been estimated with the Ordered Logistic method that has been discussed in the part Methodology. The results of the regression are shown in table 4.

Table 4.
The outcomes of the estimations

Category	Variable	Estimation 1	Estimation 2	Estimation 3
Macroeconomic Variables	X ₁ : Logarithm of GDP PER CAPITA	0.9476 (0.2263)***	1.2581 (0.1893)*	0.5895 (0.3451)*
	X ₂ : Logarithm of population	1.1898 (0.1800)***	1.2581 (0.1893)*	1.2827 (0.1954)***
	X ₃ : Inflation	-0.0287 (0.0170)*	-0.0258 (0.0173)	-0.0225 (0.0172)
Microeconomic Variables	X ₄ : Rule of law	-	-0.2567 (0.8829)	0.0883 (0.9862)
	X ₅ : Control of corruption	-	0.8639 (0.9509)	0.7233 (1.0498)
	X ₆ : Fractionalization	-	0.7257 (1.0133)	1.8495 (1.2213)
Region base level: Sub-Saharan Africa				
Regional	δ_1 : South Asia	-	-	0.8682 (0.9278)
	δ_2 : Europe and Central Asia	-	-	1.0257 (0.8235)
	δ_3 : Middle East and North Africa	-	-	1.4375 (0.9616)
	δ_4 : Latin America and Caribbean	-	-	1.3474 (0.8247)
	δ_5 : East Asia and Pacific	-	-	0.8189 (0.9235)
Number of observations		119	119	119
LR chi2(11)		85.37	87.84	91.26
Prob> chi2		0.0000	0.0000	0.0000
Pseudo R2		0.3302	0.3398	0.3530

Source: Own elaborations.

P-values of the statistics χ^2 show that the models are statistically significant at the level of 1%. However, p-values referring to particular independent variables show that the majority of the explanatory variables in the second regression are statistically insignificant at the level of 10%. Only the variables, the logarithm of population and the logarithm of GDP per capita are statistically significant in all three estimations.

The procedure described in the Methodology section has been followed. To check whether the insignificant variables should stay in the model, a likelihood-ratio test comparing the full model and its restricted version was performed. Additionally, the Wald test was conducted. The results of both test are presented in table 5.

Table 5.
The outcome of likelihood-ratio test and Wald test

The likelihood ratio test		The Wald test	
$\chi^2(8)$	5.8878	$\chi^2(8)$	5.7800
Prob > χ^2	0.0527	Prob > χ^2	0.6724

Source: Own elaborations.

As the outcomes of the test show, the restricted variables are jointly insignificant at the level of 5%. Therefore, they potentially could be excluded from the model. However, given the theoretical considerations about the determinants of PPP which link these variables with the number of PPP projects, the idea of removing insignificant variables from the model does not seem to be appropriate. Instead I conclude that some of the theoretical determinants cannot be confirmed on the basis of my research. Thus, the following variables: rule of law, control of corruption and fractionalization, i.e. microeconomic variables, appear to be insignificant and do not impact upon the number of PPP projects. The procedure I have followed proves that while adding the variables, the macroeconomic ones except inflation continue to be significant. After adding microeconomic variables and regional dummies,

inflation becomes insignificant. Thus, the logarithm of GDP _{PER CAPITA} and the logarithm of population seem to be robust to the inclusion of additional explanatory variables.

However, having said that, in the final regression I decide to conduct one more exercise. As it appeared in my research that the logarithm of GDP _{PER CAPITA} and the logarithm of population seem to be robust, in the final regression I exclude from the model the microeconomic variables. Since microeconomic determinants cannot be confirmed on the basis of my research, as well as other authors do not find such a link between the data and the theoretical consideration (except the variable rule of law) I assume for the time being that these factors are not the determinants of PPP (see Hammami at. al.). That is why the final regression has the logarithm of GDP per capita, the logarithm of population and inflation, which I have decided to leave in the regression as macroeconomic variables seem to be important on the basis of the obtained results. The results of final estimation are presented in Table 6.

Table 6.
The Final Estimation

	Final Ordered Logit Regression
Variable	Coefficient
Inflation	-0.0287 (0.0171)*
Logarithm of population	1.1898 (0.1800)***
Logarithm of GDP _{PER CAPITA}	0.9476 (0.2263)***
Number of observations	119
LR $\chi^2(3)$	85.37
Prob> χ^2	0.0000
Pseudo R ²	0.3302

Source: Own elaborations.

As is shown above, the variables the logarithm of population and the logarithm of GDP per capita are statistically significant at the level of 1%, while the variable inflation is significant at the level of 10%. P-value of the statistics χ^2 shows that the model as a whole is statistically significant.

7.2. Diagnostics

In this part the outcomes of the diagnosis tests are presented. The first test is the link test, which allows one to find out whether the correct form of the model has been chosen. Results are presented in the Table 7.

Table 7.
The outcomes of the link test.

	Coefficient	Std. Error	P>z
hat	-0.1120	8.6416	0.99
hatsq	-0.2228	1.7277	0.897

Source: Own elaborations.

The p-value for the variable hatsq equals 0.897. Therefore, there is no reason to reject the null hypothesis that the model has a correct form. Hence, the specification of the model is properly chosen.

Since Ordered Logistics regression is used the proportional odds assumption is satisfied, so if the relationship between each pair of the outcome groups is the same. Therefore, the next test, which should be performed to prove that the model is reliable, is the Brant test. The outcomes are in table 8.

Table 8.
The outcomes of the Brant test.

Variable	chi ²	p>chi ²	df
All	2.37	0.499	3
inflation	1.63	0.202	1
Ln population	1.13	0.288	1
Ln GDP per capita	0.39	0.535	1

Source: Own elaborations.

As can be seen in the table above, the $p > \chi^2$ equals 0.499, therefore, it can be concluded that the parallel regression assumption is not violated. Additionally, to check this, the likelihood-ratio test was performed, whose outcomes are presented in table 9.

Table 9.
The outcomes of the likelihood-ratio test

chi ² (3)	4.03
Prob > chi ²	0.2581

Source: Own elaborations.

Prob > χ^2 equals 0.2581, therefore, the results from likelihood-ratio test confirms that in our model the proportional odds assumption is satisfied.

7.3. Fit of the model

In this subsection the description of the measures of fit is provided. In table 10 the measures which characterise the model are depicted.

Table 10.
Measures of fit of the model

Log-Lik Intercept Only:	-129.253	Log-Lik Full Model:	-86.568
D(114):	173.136	LR(3):	85.37
McFadden's R^2 :	0.33	Prob > LR:	0
ML (Cox-Snell) R^2 :	0.512	McFadden's Adj R^2 :	0.292
McKelvey & Zavoina's R^2 :	0.616	Cragg-Uhler(Nagelkerke) R^2	0.578
Variance of y^* :	8.578	Variance of error:	3.29
Count R^2 :	0.689	Adj Count R^2 :	0.507
AIC:	1.539	AIC*n:	183.136
BIC:	-371.684	BIC':	-71.033
BIC used by Stata:	197.032	AIC used by Stata:	183.136

Source: Own elaborations

The McFadden's R^2 shows how better the estimated model fits to the data than the model with one explanatory variable – constant. According to the results presented in the Table 9., our model matches the data 33% better than a model only with constant as an independent variable. Referring to the value of McKelvey and Zavoina's R^2 , 61% of the variation of a hidden variable could be explained by the model if the variable was directly observed. The count R^2 tells us that in 68.9% of cases the model has predicted correctly the values of the dependent variable. The adjusted count R^2 shows that 50% of the values of the dependent variable can be correctly predicted on the basis of the estimated parameters of the explanatory variables.

7.4. Interpretation of the results and verification of the hypotheses

Since the coefficients in the Ordered Logistic regression do not give a clear interpretation of the influence of the independent variables on the dependent one, the partial effects are computed to show the importance of macroeconomic characteristics on the likelihood of establishing PPP projects in a given country. The partial effects are presented in table 11.

Table 11.
Partial Effects

Variable	Partial effects					
	1		2		3	
	Coeff.	P> z	Coeff.	P> z	Coeff.	P> z
Ln GDP PER CAPITA	-0.1855	0.000	0.0663	0.087	0.1192	0.000
Ln population	-0.2330	0.000	0.0833	0.082	0.1497	0.000
inflation	0.0056	0.093	-0.0020	0.209	-0.0036	0.105

Source: own elaborations

On the basis of the partial effects, the economic analysis are conducted and the hypotheses were verified, which is presented in the next section.

Based on the results described in the previous section, an economic interpretation can be conducted. The outcomes from Table 11. are used.

GDP per capita has a positive influence on the number of PPP projects. As can be noticed from table 11, a higher GDP per capita reduces the likelihood that the number of PPP projects in a given economy is low by 18.8 percentage points, whereas the likelihood that it would be medium or high is higher by respectively 6.6 and 11.9 percentage points. This is consistent with intuition. Namely, a high GDP per capita reflects the size of the purchasing

power of the population, hence, the size of an economy. Therefore, private companies would be more prone to invest in PPP in such a country, because they face a large and profitable market. Moreover, a higher level of GDP per capita determines the level of development. More mature economies indicate higher demand for new infrastructure investments, which additionally encourages the private sector, furthermore, the government system is better organised, which increases the government's incentive to cooperate.

Population size affects the number of PPP projects in a similar way to GDP per capita. The larger the population the higher the likelihood of a medium and high number of launched PPP projects. In particular, with a larger population the likelihood of establishing medium and higher number of PPP projects is respectively higher by 8.32 and 14.9 percentage points. Whereas the likelihood that the number of PPP projects is low is lower by 23.3 percentage points when population is higher by 1 percentage point. The reason for these results is similar to the case of GDP per capita. The size of the population reflects the size of the market. Moreover, a larger population increases the demand for infrastructure investments. These factors both increase private companies incentives to be involved in PPP projects.

Considering inflation, it can be noticed that the higher the inflation rate the higher the likelihood of a low number of PPP projects in a given country. What is interesting is that inflation does not affect the likelihood of medium level of PPP projects. The p-value (0.105) suggests that inflation does not impact on the likelihood of a high level of PPP projects at conventional levels. However, at the 11% significance level it would be significant, and in what follows this assumption will be followed. Namely, inflation decreases the likelihood of high PPP projects by 0.003 per cent. These finding are consistent with our hypothesis. Namely, inflation reflects the risk of an increase in costs, and therefore decreases private sector incentives to invest in a given economy especially through PPP. In turn, low inflation increase the likelihood that number of PPP projects will be high as it determines low risk.

As the other variables in the model are statistically insignificant, it can be concluded that the rule of law and corruption do not influence the likelihood of introducing PPP projects in a given economy. Similarly, ethnic diversification does not affect the incentive to create PPP cooperation. Finally as was proven by our research the likelihood of establishing PPP projects do not vary over regions.

CONCLUSIONS

The empirical study shows that the determinants of the number of PPP projects are the size of GDP per capita, the size of population and inflation. The theoretical assumptions on the directions of the impact of these variables on the number of PPP projects have been confirmed in the study. As the theory shows, the impact of GDP per capita on PPP projects is positive. The study confirms that countries with higher GDP per capita will carry out more PPP projects. This is directly related to the fact that GDP per capita represents the value of the economy per capita. Higher GDP per capita minimizes the chance of a failure of an investment as it corresponds to higher demand, which is a key factor ensuring that a private company obtains a certain rate of return on investment. Private entities invest in order to obtain profits and that is why higher GDP per capita in a given country is an incentive for a private firm to invest, hence GDP per capita is a crucial determinant of the number of PPP projects.

It has also been confirmed empirically that population size positively affects the number of PPP projects. The larger the market the more willing the private company is to participate in the partnership. The same as with GDP per capita, a big market reduces the risk of a failure of a PPP project.

The last variable that has proved to be significant in the model is inflation, the direction of which is consistent with economic theory. The lower the inflation rate the greater the macroeconomic stability of the country. PPP investments are generally large projects, for example sewerage treatment plants, which often require the use of inputs or capital coming from abroad. The stability of prices and exchange rates is then very important, because lower rates of inflation means a lower risk of failure of the project.

The results of my study are very similar to the conclusions that come from the article by Hammami et al. (2006), on which this research has been based. Namely, according to the researchers the major determinant of the PPP projects are market factors - a large market and the purchasing power of citizens. In my study, population size and GDP per capita also appeared to be significant and their direction is in line with the theory. Moreover, it has not been confirmed empirically that the influence of ethnic diversification on the number of PPP projects, as described in the theory, is reflected in reality. The variable ethnic diversification, the same as in Hammami et al. (2006) study, has remained insignificant in the model. Although the ratio of legal conditions in our study is insignificant, in the quoted article, it was a variable that positively influenced the number of PPP. Also the variable regions in our study is not significant, while in the study by Hammami et al. (2006) all regions except Europe and Central Asia are less sensitive to the number of PPP projects compared to the base region, which was Latin America and Caribbean.

The differences in the outcomes may result from the estimation method and the approach to the study. Also the sample was taken from different times so on the number of PPP could have impact other factors not captured in study and which could not be controlled. Moreover, in the research I have not taken into account the recent financial crisis, which might also have influenced the number of PPP as the investing conditions deteriorated significantly during that time. Although there exists strong theory supporting the influence of legal conditions, lack of corruption environment as well as country ethnic diversification on the number of PPP projects, there has been few empirical evidence supporting the theory. Hence here is the possible area of future research to find out the empirical links between the data and the theory. Also studying the determinants of PPP in advanced economies could be intriguing, however, due to the lack of data, such exercise may not have been possible for the

time being as in the PPI database the statistics are gathered for low and middle income countries.

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APPENDIX 1. A list of countries from the sample.

Afghanistan	Georgia
Albania	Ghana
Algeria	Grenada
Angola	Guatemala
Antigua and Barbuda	Guinea
Argentina	Guinea-Bissau
Armenia	Guyana, CR
Azerbaijan	Haiti
Bangladesh	Honduras
Belarus	India
Belize	Indonesia
Benin	Iran, Islamic Rep.
Bhutan	Iraq
Bolivia	Jamaica
Bosnia and Herzegovina	Jordan
Brazil	Kazakhstan
Bulgaria	Kenya
Burkina Faso	Korea, Dem. Rep.
Burundi	Kosovo
Cambodia	Kyrgyz Republic
Cameroon	Lao PDR
Cape Verde	Lebanon
Central African Republic	Lesotho
Chad	Liberia
Chile	Lithuania
China	Macedonia, FYR
Colombia	Madagascar
Comoros	Malawi
Congo, Dem. Rep.	Malaysia
Congo, Rep.	Maldives
Costa Rica	Mali
Côte d'Ivoire	Mauritania
Cuba	Mauritius
Djibouti	Mexico
Dominica	Micronesia, Fed. Sts.
Dominican Republic	Moldova
Ecuador	Mongolia
Egypt, Arab Rep.	Montenegro
El Salvador	Morocco
Eritrea	Mozambique
Ethiopia	Myanmar
Fiji	Namibia
Gabon	Nepal
Gambia, The	Nicaragua
Niger	
Nigeria	

Pakistan
Panama
Papua New Guinea
Peru
Philippines
Romania
Russian Federation
Rwanda
Senegal
Serbia
Seychelles
Sierra Leone
Somalia
South Africa
Sri Lanka
St. Lucia
St. Vincent and the Grenadines
Sudan
Suriname
Syrian Arab Republic
Tajikistan
Tanzania
Thailand
Timor-Leste
Togo
Tonga
Tunisia
Turkey
Uganda
Ukraine
Uruguay
Uzbekistan
Vanuatu
Venezuela, RB
Vietnam
West Bank and Gaza
Yemen, Rep.
Zambia

APPENDIX 2. A frequency table of number of PPP projects in the years 2000-2009 for the countries from the sample (Appendix 1)

"X" - Number of PPP projects	Number of countries with "X" PPP projects
1	16
2	23
3	10
4	11
5	10
6	9
7	6
8	4
9	3
10	3
11	1
12	3
14	1
15	1
16	2
18	1
19	1
21	1
22	1
25	1
26	1
28	1
30	1
32	1
33	1
34	2
36	1
38	1
39	1
42	1
46	1
48	1
50	1
51	1
63	1
69	1
313	1
320	1
667	1

APPENDIX 3. Zusammenfassung

Eine der Arten der Bereitstellung von öffentlichen Gütern kann durch öffentlich-private Partnerschaften (ÖPP) durchgeführt werden, die dank ihrer Vorteile eine attraktive Methode bei der Realisierung öffentlicher Aufgaben darstellen könnte. Auf Grund dessen werden öffentlich-private Partnerschaften in vielen Ländern immer beliebter. Einer der wichtigsten Vorteile von ÖPP ist ihre potenzielle wirtschaftliche Wirksamkeit. Das bedeutet, dass im Vergleich mit anderen Methoden der Bereitstellung von öffentlichen Gütern, der Nutzen von ÖPP für die Gesellschaft höher ist. Diese Arbeit beinhaltet, neben der theoretischen Überlegungen und der Literaturübersicht zur öffentlich-privaten Partnerschaft, eine empirische Studie über Determinanten von öffentlich-privaten Partnerschaften in Ländern mit niedrigem und mittlerem Einkommen, da nur für solche Länder Daten in der Privaten Beteiligungsdatenbank der Weltbank (World Bank's Private Participation Database) gesammelt sind. Für diesen Zweck wird die geordnete logistische Regression verwendet. Die empirische Forschung zeigt, dass die Determinanten der Anzahl der ÖPP-Projekte die Größe des BIP pro Kopf, die Größe der Bevölkerung und die Inflation sind. Die theoretischen Voraussetzungen für die Richtung der Auswirkung dieser Variablen auf die Anzahl der ÖPP-Projekte wurden in dieser Studie bestätigt.

APPENDIX 4. Abstract

One of the ways of provision of public goods can be done through public-private partnerships (PPP), which, thanks to their advantages, may be an attractive method of implementing public tasks. That is why public-private partnerships are becoming increasingly popular in many countries. One of the most important advantages of PPP is its potential economic effectiveness, which means that the benefits of PPP for society are higher in comparison with other methods of provision of public goods. This work apart from theoretical consideration and literature review on public-private partnership contains an empirical study concerning determinants of public-private partnerships in low and middle income countries as there only for such countries the data is collected in the World Bank's Private Participation Database. Ordered Logistic Regression is used for this purpose. The empirical study shows that the determinants of the number of PPP projects are the size of GDP per capita, the size of population and the inflation. The theoretical assumptions on the directions of the impact of these variables on the number of PPP projects have been confirmed in this study.

APPENDIX 5. Curriculum Vitae

Agata Miliszkiewicz

EDUCATION

Academic year 2012/2013	University of Vienna , Austria International Economics , Master's Studies, full-time
September-December 2011	International Exchange Program Institute of Management Technology, Ghaziabad, India
2011-2013	University of Warsaw Faculty of Economic Sciences International Economics , Master's Studies, full-time
2011-2014	University of Warsaw Faculty of Modern Languages Institute of English Studies English Language and Literature Master's Studies, full-time
2008-2011	University of Warsaw Faculty of Economic Sciences Faculty of Management Interdisciplinary Economic-Management Studies Bachelor's Studies, full-time
2007-2010	University of Warsaw Faculty of Modern Languages Institute of English Studies English Language and Literature Bachelor's Studies, full-time

ACHIEVEMENTS

Academic year 2012/2013	Scholarship of the Central European Exchange Program for University Studies (CEEPUS) granted by the Austrian Agency for International Cooperation in Education and Research
Academic year 2011/2012	Scholarship for the academic accomplishments granted by the Rector of the University of Warsaw

WORK EXPERIENCE

October 2013-March 2014	Internship in KPMG in General Audit (Industrial Markets)
July-August 2013	Miliszkiewicz Company Work at the family operated company in the field of metal processing.
2012, 2011, 2010	Tasks: client search, customer service, designing marketing materials etc.

September 2010	Internship at the Polish Ministry of Finance at the European Union Department Assisting the preparations for Polish Presidency of the EU Council
LANGUAGES	
	Polish-native, English-fluent, Spanish-B1 level
SKILLS	
	Computer skills: Word, Excel, Power Point, Econometric package Stata
INTERESTS	
	Travelling, swimming, skiing
STRENGTHS	
	Communicative and analytical skills, resourcefulness, responsibility, ability to learn fast