

A Study of the Growth of Private-Public Partnership in India

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Abstract

Private-Public Partnership (PPP) represents cooperation between the government and the private sector for the delivery of public infrastructure and/or public utilities/services, drawing on their relative strengths, expertise, and capacity of both in order to establish complementary relationships between them. The public and private parties function as partners throughout project development and delivery, and often in operation and maintenance.

PPP is a new way through which the public and private sector work together, keeping the project and outcomes in focus rather than maximizing their own interests, and collaborate for mutually enduring value. PPP has witnessed tremendous growth over the last decade. This study analyses some of the factors affecting the growth of PPP in India for the period 1991-2011.

Keywords: Private-Public Partnership (PPP), infrastructure, utilities, services, growth, factors.

1. Introduction

Private Partnership (PPP) refers to an arrangement between the public and private sectors with clear agreement on shared objectives for the delivery of public infrastructure and/or public services. It is an approach that public authorities adopt to increase private sector involvement in the delivery of public services. The main features of PPPs include:

• Cooperative and contractual relationships

PPPs represent cooperation between the government and the private sector. PPPs are not the same as privatization in that both public sponsors and private providers function as partners throughout project development and delivery, and often in operation and maintenance. The most successful partnership arrangements draw on the relative strengths of both the public and private sector in order to establish complementary relationships between them.

PPP arrangements are long-term in nature, typically extending over a 15 to 30 year period. This is a factor which helps to which establish productive and lasting relations between the public and private sectors. Demonstrating an enduring public sector commitment to the provision of quality services to consumers, under terms and conditions agreeable to both the government and the private sector, PPPs are used to develop and operate public utilities and infrastructure. These collaborative ventures are built around the expertise and capacity of the project partners and are based on a contractual agreement, which ensures appropriate and mutually agreed allocation of resources, risks, and returns

Shared Responsibilities

While the specific responsibilities for delivery will vary according to each project, a key feature of PPPs is that these responsibilities will be shared between the public body and the private consortium. In some initiatives, this might require the private sector company to play a significant role in all aspects of delivery of the service, while in others its functions may be more limited.

• *A method of procurement*

PPPs are instruments for government bodies to deliver desired outcomes to the public sector, by making use of private sector capital to finance the necessary assets or infrastructure. The private company is rewarded for its investment in the form of either service charges from the public body, revenues from the project, or a combination of the two. This renders affordable those projects that might not otherwise have been feasible, because the public body was unwilling or unable to borrow the requisite capital. PPPs allow the private sector to play a greater role in the planning, finance, design, operation and maintenance of public infrastructure and services than under traditional public procurement models. Moreover, where traditional procurement models begin with the question of what assets the public body has as its disposal and how these might be used to deliver required services, PPP arrangements place the emphasis on the desired service or outcome as identified by the public organization and how the private sector might help to make this happen.

• *Risk transfer*

A key element of PPPs is their potential to deliver public projects and services in a more economically efficient manner. At the beginning of the relationship, potential risks associated with the project are identified and each party adopts those, which it is best equipped to manage. The public sector can therefore transfer appropriate risks to the private partner, who has the necessary skills and experience to manage them. For example, overall risk to the public sector can be reduced by transferring those associated with design, construction and operation to the private partner. The incentive for the private body comes in the form of higher rates of return related to high standards of performance.

• *Flexible ownership*

PPPs enable flexible arrangements between public and private bodies, where the public body may or may not retain ownership of the project or facility that is produced. In some cases, the private organization may be contracted only to construct facilities or supply equipment, leaving the public body as owners, operators and maintainers of the service. Alternatively, the public sector may decide it is more cost-effective not to own directly and operate assets, but to purchase these instead from the private entity. Services may be purchased for use by the government itself, as an input to provide another service, or on behalf of the end user.

1.1. STRENGTHS OF PPPS

The major strength of PPPs is their ability to deliver value for money in public service procurement and operation. By utilizing the differing skills, resources and experience of each party, they allow the public and private sectors to complement each other – the public sector provides its expertise in identifying public needs, service requirements and desired outcomes, and the private sector brings its capacity to effectively utilize assets and manage the construction and operation of services.

• **Benefits to the public sector**

The foremost benefit of PPPs, alluded to above, is the scope such partnerships allow for public authorities to raise capital for high priority works that might otherwise not be possible in the face of budgetary and borrowing constraints. Here, PPPs can draw on private sector expertise in order to deliver services and infrastructure efficiently and cost-effectively, and to bridge the gap between the resources required and those available from the public purse.

Gains in efficiency and effectiveness can be realized in a number of ways. Most importantly, the PPP approach encourages private sector innovation by allowing government to delegate responsibility for service design and construction to the private contractor. This enables the public body to identify desired services, outcomes and outputs, while allowing room for the private contractor to innovate in the search for the most appropriate solution to meet those requirements.

Additionally, PPPs can enable the optimum allocation of public resources in the pursuit of infrastructural development. Whereas traditional models of public procurement focus on achieving the lowest upfront costs in delivering infrastructural projects PPPs concentrate on delivering cost effectiveness over the duration of the asset – including, in particular, those costs associated with operation and ongoing maintenance. This allows the public sector to realize value for money for the entire life of the project or service, rather than just in its initial construction phase.

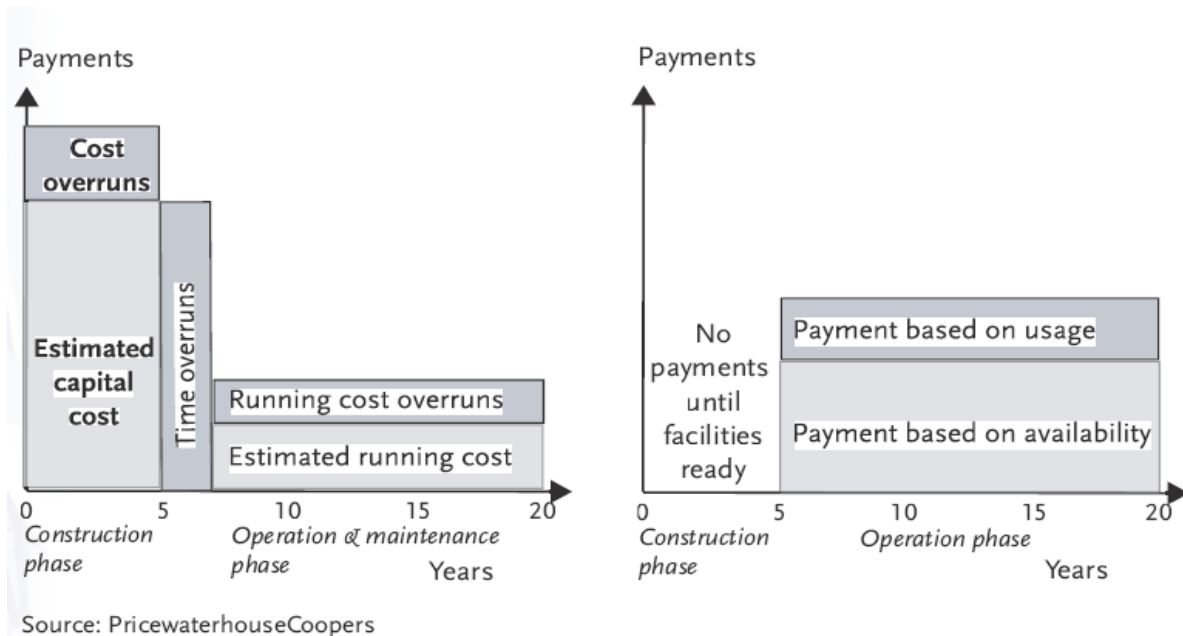


Figure 1: Conventional vs. PPP procurement

• **Benefits to the private sector**

Engaging in PPPs offers private sector companies a wide range of business opportunities that were previously confined to public agencies. Given the long-term nature of these relationships, undertaking work under PPP arrangements provides a stable foundation for the growth of the business. In addition, PPP arrangements encourage the private sector to engage in a broader spectrum of activities, throwing open the possibility of designing and delivering innovative solutions, rather than merely constructing assets to existing standards and designs.

• ***Benefits to the public***

By combining the skills and expertise of public and private partners, PPPs are able to provide services, which meet the needs of the public in a more efficient and cost effective manner. When appropriately designed and implemented, PPPs can yield better quality services without compromising public policy objectives or broader public need.

At the outset of the PPP relationship, the desired quality of service to be achieved from the development of the infrastructural asset is clearly specified, and the expectation is that high standards will be maintained throughout the duration of the project. This contrasts with traditional procurement methods, where the construction of assets is formally separated from operation and maintenance, and consequently, levels of service and conditions of assets will frequently decline over time.

1.2. Weaknesses/Risks of PPPS

PPPs, like conventional service delivery mechanisms, also have disadvantages and drawbacks. In order to minimize or eliminate these, it is vital that public sector managers recognize and understand them in order to better address problems as they arise, through careful contractual arrangements and negotiations.

Firstly, there is the possibility that the public sector may lose managerial control of its services. Under PPPs, the management of outputs is transferred to the private sector, meaning that the public sector has very limited ability to intervene, as long as services are being delivered. The public body has no day-to-day control over the management of the project and is reduced in its capacity to change the project or cooperate with wider public sector services, and indeed may not be able to make use of its own expertise in the area.

Secondly, the process of PPP procurement can be time consuming and expensive. In order for a PPP to be successfully realized, it is vital that before bidding starts, a detailed, clearly structured project appraisal and specification of desired outputs is drawn up. Although this is important to the development of projects that are affordable and provide value for money, it has the potential to make procurement a lengthy and costly procedure.

Thirdly, there is the problem of the higher cost of finance in the private sector. The weighted cost of finance in the private sector, including both debt and equity, is typically between 1% and 3% higher than the public sector's cost of debt on a non-risk adjusted basis. This has the effect of increasing the overall cost of PPP in comparison to traditional procurement methods, unless this can be offset by the increased cost efficiencies that the private sector should deliver.

Fourthly, PPPs can sometimes prove to be rather inflexible instruments – especially given the long term nature of most PPP contracts. While there can be significant financial benefits in setting rigidly defined output specifications for the life of the PPP, these should be weighed against the inflexibility this inevitably brings. Under PPP arrangements, there is limited potential for modifying services or flexible spending.

Fifthly, in some areas of public service provision there may be greater public demand for accountability and responsiveness than in others. This may give rise to public criticism or even hostility towards PPP arrangements. Moreover, under PPP arrangements, lines of accountability can be less straightforward (and transparent) than under traditional methods of procurement where lines of accountability (for example, to government ministers) are more direct and immediate. In these circumstances, there may be a need for greater government involvement in the relationship, to ensure compliance and responsiveness to public concerns.

However, there are various reasons, which have given rise to increase in desire for cooperation between public and private sector. These reasons include:

1.3. Growing Popularity

All around the world, developed countries or the developing countries, governments are encouraging PPP in various sectors. This not only reduces the burden on the exchequer but also improves the quality of the infrastructure service. Governments are building transport (roads, railways, toll bridges), education (schools and universities) and health care (hospitals and clinics), to waste management (collection, waste-to-energy plants), and water (collection, treatment, and distribution). Over the past few years, PPP has become the preferred model for infrastructure and infrastructure services. In addition, this partnership between the private players and the government is only going to increase in the times to come for obvious reasons.

1.4. Limitations of Government Resources and Capacity to Meet the Infrastructure Gap

The last two decades have seen tremendous change in the world. Apart from the demographic changes, there has also been increased geographical migration of labor from one part of the country to another. With most of the opportunities being available in the cities, huge populations are moving away from the rural areas to the urban areas. This increased urbanization has brought with it many complexities like the increasing gap between the supply and demand for basic facilities. The governments are facing increasing pressure from their citizens as well as civil societies to provide the basic facilities. On the other hand, the governments are facing severe constraints not only from the financial side but also from the technical side. The technical resources with the governments are just not enough for the massive projects.

1.5. Need for New Financing and Institutional Mechanisms

The governments around the world are facing huge budget deficits and the financial resources are scarce. In most cases, the governments do not have even sufficient funds to maintain the existing infrastructure or build new infrastructure. Under these circumstances, providing finance for new and huge infrastructure projects would be just impossible. This indirectly is pushing the governments towards innovative financing models and PPP is one of them. So by making it attractive to the private investors to enter into a PPP, the governments hope to tide over the difficulty of the financial constraints.

1.6. Access to Project Finance

The PPP is an innovative model where the government would not have to worry about financing infrastructure projects due to inadequate availability of finance with them. Earlier the governments used their limited resources of finance for funding their priority projects, but now through PPP they can accelerate the infrastructure development, as the private partner would also get the necessary funds. In addition, the private and the public capital can be leveraged and this would enable the new projects to receive more finance in the form of project finance from institutions and banks.

1.7. Rigorous Risk Appraisal and Optimum Allocation

Investing in infrastructure projects is difficult as they are prone to a lot of risks like the commercial and socio-economic risks. In addition, these projects would have long gestation periods. So, taking such huge risk for a private player would be the biggest challenge. Therefore, the PPP allows the private partner to share the risks with the government.

In this way, the risk is minimized. Also all the projects nowadays have to adhere to strict standards and risk appraisals. At the same time, the costs are to be kept in an acceptable range or else the project would not be viable. So rigorous risk appraisals at regular intervals of time would reduce the risks associated with the projects for the public as well as the private partner.

1.8. Legal Framework for PPP Projects

As evident from the previous sections, the private sector has a crucial role to play in financing the construction, operation and maintenance of infrastructure and development projects usually financed and carried out by the government. However, the private sector is not self motivated in political and economic setups like India. Therefore, the government has to insinuate the requisite role of the private sector as the foremost engine for community's growth and development and afford the most suitable enticements to activate private assets for the reason. However, involvement of private sector in this regard requires inducements like financial incentives as provided by law, an environment of least government regulations and actions, and explicit government deeds in support of the private sector. With the aim of providing all these inducements in PPP, varied modes of PPP projects have been operative with a slightly different legal framework.

• Build Operate Transfer

It is a form of project financing, in which a private body obtains a concession from the private or public sector to fund, plot the plan, build, and activate facilities stated in the concession contract. In this mode, the project proponent will be able to recover its investment, operating and maintenance expenses in the project. The countries that use BOT model for PPP projects are India, Croatia, Japan, China, Malaysia and Philippines. The infrastructure that is created as per this mode, traditionally, gets transferred to the government at the end of the dispensation period. The earnings of the project become the source of loan repayment for the lenders of the project. Under this mode, the credit appraisal of the lenders of the project is based on the project, not on the credit worthiness of the borrowing unit. Again, the security taken by the lenders is mostly restricted to the project assets.

• Build Own Operate and Transfer

It is a financial support model that involves a single party or consortium (BOOT provider) designing, building, funding, owning and operating the idea for a definite period of time and then transferring this possession across to an approved party. Under this deal, the developer designs and builds an entire project or facility at no cost to the government or a joint venture partner. The developer owns and manages the facility as a business for a specified period (usually 10 to 30 years) and transfers it to the government or partner at a formerly agreed-upon price or market price.

• Build Own and Operate

It is the most delicate of all the forms of PPP because here there's at least, up front, no government participation at all. Under this, all the activities of the project—building, owning and operating—lie with the private sector. It is almost equivalent to the private investment doing for private purpose, with a mere point of distinction that in BOO projects there is some continuing level of government involvement which is absent in the private investment.

• Build and Transfer

This model involves a contractual understanding in which the project promoter takes on the financing and creation of a given infrastructure or development facility and after its conclusion, the promoter turns it over to the concerned government agency or local government unit. The concerned government agency or local government agency, in turn, pays the total investments made on the project, plus a reasonable rate of return thereon to the proponent on an agreed schedule. Infrastructure projects including serious facilities, which, for safety or tactical reasons, need to be operated directly by the government, are taken care of by this model.

• Build Lease and Transfer

Under this model, a project proponent is approved to finance and construct an infrastructure or development facility. As the project gets completed, the proponent turns it over to the concerned government agency or local government unit on a lease arrangement for a fixed period. After the lease period, the ownership of the facility gets automatically transferred to the concerned government agency or local government unit.

• Lease Management Agreement

An agreement whereby the state government, the government agency or the specified agency lets out a project owned by the state government, the government agency, or, as the case may be, the specified government agency to the person who is permitted to operate and continue the project for the period specified in the accord.

2. Literature Review

There are a number of studies examining the growth of PPPs in different countries. The following reviews a few of the relevant studies.

Cheung et al (2009) investigate the reasons for implementing Public Private Partnership (PPP) projects in Hong Kong, Australia and the UK. In Hong Kong, the top three reasons were: private incentive, economic development pressure demanding more facilities, and high quality of service required, which focused more on the overall performance of improving public projects. In Australia, the top three reasons were: high quality of service required, economic development pressure demanding more facilities, and inefficiency because of public monopoly and lack of competition, which focused more on the overall performance of improving public projects. In Britain, the top three reasons were: shortage of government funding, economic development pressure demanding more facilities, and avoid public investment restriction, which focused on financial elements. Satish and Shah (2009) outlines the need for private sector participation in infrastructure and examines the various initiatives taken by the government to attract private investment. They also study the viability of various models of public private participation, and they look at the issues and risks peculiar to infrastructure financing. They suggest the use of PPP maturity model and the adoption of various hybrid PPP models. Charles (2009) examines the effectiveness of policy and legal frameworks in place in selected Indian states to identify the critical factors that determine investment inflows in to PPP projects. The study focuses on the role of state policy formulation, legal frameworks, institutional frameworks, costs of corruption, transaction costs, availability of infrastructure, accessibility to land and external finance at state level, that make a state more conducive for PPPs, so that lessons can be drawn for building capacities in public sector for better use of PPPs. Their analysis shows that there is no clear link between policy environment and institutional structures in a state and its success in getting PPP investments.

There are no clear and obvious commonalities in policy environment among Indian states, which were successful in getting more PPP projects compared to other states. Mahalingam (2010) highlights five key barriers that PPP projects face in the urban Indian context: distrust between the public and private sector, a lack of political willingness to develop PPPs, the absence of an enabling institutional environment for PPPs, a lack of project preparation capacity on the part of the public sector, and poorly designed and structured PPP projects. The study suggests that the measures undertaken by the Government of India to enable PPPs address only three of these five barriers; a set of nine additional strategies are proposed, that, in addition to the existing measures outlined by the Government of India, can help comprehensively address the challenges that PPPs in urban infrastructure that India is facing. This could help improve the quantity and quality of infrastructure services in Indian cities. Verma (2010) focuses on certain aspects of competition and transparency in the award of PPP contracts, vis-à-vis normal public procurement contracts. The study compares the relevant regulations and case law in India applicable to unsolicited proposals (UNPs) with that in the United States and those under available international frameworks. The study emphasizes the legal dimensions of UNPs with reference to government obligations on transparency and competition in the procurement of PPP infrastructure projects. Ke et al (2011) provides an evaluation of the potential risks in China's PPPs. They identified the top ten risks as: government's intervention; poor political decision making; financial risk; government's reliability; market demand change; corruption; subjective evaluation; interest rate change; immature juristic system; and inflation. They analysed each of these risks in terms of their possible consequences, the most impacted parties, and the preferred allocation. Their up-to-date findings concerning the probability and consequence of key risks provides a valuable reference for private investors who are planning to invest in infrastructure projects in China. According to the Ernst & Young and FICCI report (2012), investment in infrastructure is envisaged to be doubled to US \$1 trillion during the Twelfth Five Year Plan, and about half of this is targeted to be achieved through private sector investment. The Indian government has taken a number of steps to encourage private investment in infrastructure through PPPs. This report especially focuses on various aspects of promoting PPPs in India. The report discusses the progression of PPPs over the years, existing frameworks and challenges for PPPs in India, state-level experience and sector-related opportunities, practices followed in other countries, funding options for financing PPPs, and recommendations for spearheading the usage of PPPs in India.

3. Research Motivation

There is increasing demand for infrastructure growth in India as it pursues its development path, and this has led to an increasing focus on the infrastructure sector by the Indian government. Over the last decade, the government is increasingly opening doors for private participation with public sector, particularly through Public-Private Partnership (PPP). PPP is a new way through which the public and private sector work together, keeping the project and outcomes in focus rather than maximizing their own interests, and collaborate for mutually enduring value.

There has been tremendous growth in PPPs over the last decade. However, the factors governing the process and growth of PPPs have not been investigated rigorously, particularly in the Indian context. This study is an attempt to address this research gap. This will help the decision makers associated to the infrastructure sector in India.

3.1. Research Design

The objectives of this study are to identify the presence of PPP projects in different states of India and most friendly states to private sector participation for infrastructure projects, to find the sector-wise allocation of PPP projects and investments, and to find a trend in the investment pattern by public and private sector in PPP projects.

The study is based on secondary data for the period 1990-2012 collected from different sources. All the data relevant to PPP projects in India and different states are available in the Government of India official website www.pppinindia.com. In addition, information on infrastructure, investments, PPP's, etc. was collected from the official websites of the Committee on Infrastructure, Planning Commission and the Investment Commission of India. These websites are directly under control of Ministry of Finance, Government of India, and the data available on these websites are regularly updated.

4. Analysis of PPP in India: State-Wise and Sector-Wise

Development and use of PPPs for delivering infrastructure services has now at least 11 years of precedence in India, with the majority of projects coming in line in the last 5 - 7 years. Policies in favor of attracting private participation as well as innovation with different structures have met with varying degrees of success. Some states have undertaken far more PPPs than others have, and there has been a much heavier use of PPPs in some sectors such as telecommunications, power, and ports and roads than in other sectors. As on 31st July, 2011, as per database of Public Private Partnerships of India, there have been 758 PPPs in the main sectors of focus. The total project cost is estimated to be about Rs. 383,332.06 crore. The state-wise distribution of PPP projects is presented in Table 1, and the sector-wise distribution of PPP projects is presented in Table 2.

Table 1: State-wise distribution of PPP projects

State	# Projects	Value (Rs. crore)	per capita (Rs.)
Andhra Pradesh	96	66,918.30	7905
Assam	4	391.20	126
Bihar	6	2,093.80	202
Chandigarh	2	75.00	711
Chhattisgarh	4	838.00	328
Delhi	13	11,316.60	6755
Goa	2	250.00	1715
Gujarat	63	39,637.20	6564
Haryana	10	11,163.10	4403
Jammu & Kashmir	3	6,319.80	5036
Jharkhand	9	1,704.10	517
Karnataka	104	44,658.90	7305

Kerala	32	22,281.50	6674
Madhya Pradesh	86	14,983.40	2064
Maharashtra	78	45,592.00	4057
Meghalaya	2	762.10	2571
Orissa	27	13,349.70	3182
Pudducherry	2	3,366.80	27054
Punjab	29	3,562.50	1286
Rajasthan	59	15,027.30	2190
Sikkim	24	17,110.60	281569
Tamil Nadu	43	18,628.60	2582
Uttar Pradesh	14	26,595.80	1333
Uttarakhand	2	521.00	515
West Bengal	30	6,617.10	724
Inter-State	14	9,567.80	
Total	758	383,332.10	

Table 2: Sector-wise distribution of PPP projects

Sector	# Projects	Value (Rs. Crore)
Airports	5	19,111.0
Education	17	1,849.7
Energy	56	67,244.6
Health Care	8	1,833.0
Ports	61	81,038.2
Railways	4	1,569.6
Roads	405	176,724.9
Tourism	50	4,486.1
Urban Development	152	29,475.0
Total	758	383,332.1

Road projects account for 53.4% of the total number of projects, and 46% by total value. Ports account for 8% of the total number of projects, and contribute 21% in terms of total value. Excluding road and port projects, there is relatively low value, only Rs. 125,568.93 crores in basic infrastructure PPPs, suggesting a significant potential upside for PPP projects across sectors where states and municipalities have primary responsibility.

It is observed that the potential use of PPPs in e-governance and health and education sectors remains largely untapped across India as a whole, though of late there have been some activities shaping in these sectors.

Across states and central agencies, the leading user of PPPs was the state of Karnataka with 104 projects at an estimated value of Rs. 44658.9 crores, which is 11.7% of total value of projects, followed by Andhra Pradesh with 96 projects valuing of Rs. 66918.3 crores (17.5% of total value of projects), Madhya Pradesh with 86 projects valuing of Rs.14983.4 crores (3.9% of total value of projects), and the National Highways Authority of India (NHAI), with about 155 projects.

Sector-wise analysis indicates that the road sector dominates with 405 projects (53.4%), followed by urban development with 152 projects (20.1%), ports with 61 projects (8%), energy sector with 56 projects (7.4%), tourism with 50 projects, and education with 17 projects.

Trends in Public and Private Investment on Infrastructure

Table 3 presents the trend in public sector and private sector investment in infrastructure in the period 1990-2012.

Table 3: Trends in Public and Private Investment on Infrastructure

Year	Public	Private	Public : Private	# Projects
1990	193.5	58.2	3.32	2
1991	217.3	70.1	3.10	1
1992	266.5	84.0	3.17	2
1993	278.4	108.9	2.56	3
1994	346.9	105.3	3.29	7
1995	387.1	107.0	3.62	21
1996	477.4	121.2	3.94	20
1997	511.1	163.9	3.12	11
1998	546.3	212.4	2.57	26
1999	587.2	265.2	2.21	17
2000	639.7	316.7	2.02	20
2001	693.4	382.6	1.81	16
2002	750.4	442.4	1.70	16
2003	806.4	518.1	1.56	27
2004	872.9	599.4	1.46	29
2005	938.0	701.1	1.34	17
2006	1019.4	806.7	1.26	88
2007	1736.8	708.2	2.45	79
2008	1995.4	1042.7	1.91	45
2009	2380.5	1211.4	1.97	50
2010	2629.6	1398.7	1.88	110
2011	2908.3	1692.3	1.72	113
2012	3199.0	2084.1	1.53	

The ratio between public sector investment on infrastructure and private sector investment on infrastructure has decreased from above 3.0 (i.e. the public sector invested $\frac{3}{4}$ and private sector invested $\frac{1}{4}$ of the total investment) in the 1990's to the 1.5 range, with increased private sector investment on infrastructure. The CAGR of public sector investment on infrastructure was 13.6%, while that of private sector investment on infrastructure was 17.7%. The CAGR of the number of PPP projects was 21.2%. Not surprisingly, the number of PPP projects was significantly negatively correlated with the ratio of public to private investment in infrastructure ($r = -45.96\%$, $p = 0.0157^*$).

Drivers of PPP in India

Table 4 presents the trends in the ratio between public sector investment on infrastructure and private sector investment on infrastructure and the number of PPP projects, along with the growth in the electricity, coal, steel, cement, crude oil, and petrochemical sectors.

Table 4: trends in Public : Private and number of PPP projects and growth in determinant sectors

Year	Public: Private	# Projects	Electr	Coal	Steel	Cement	Crude Oil	Petro-Chem
1991	3.10	1	11.9	4.4	-1.1	3.2	5.6	7.4
1992	3.17	2	8.5	8.3	20.5	10.9	-10.1	-0.8
1993	2.56	3	5.0	3.9	0.9	0.2	-10.9	4.2
1994	3.29	7	7.4	3.3	6.2	6.8	0.0	1.6
1995	3.62	21	8.5	3.0	17.3	8.8	19.3	5.9
1996	3.94	20	8.1	6.4	21.9	11.5	7.0	3.9
1997	3.12	11	4.0	5.7	5.7	9.7	-4.6	7.1
1998	2.57	26	6.6	3.6	6.3	9.1	2.9	3.6
1999	2.21	17	6.5	-2.1	1.4	5.7	-3.4	5.2
2000	2.02	20	7.3	3.1	15.1	14.2	-2.4	25.4
2001	1.81	16	4.0	3.6	6.4	-0.9	1.5	20.4
2002	1.70	16	3.1	4.2	3.6	7.4	-1.3	3.7
2003	1.56	27	3.2	4.6	7.3	8.8	3.2	4.9
2004	1.46	29	5.0	5.1	9.8	6.1	1.0	8.3
2005	1.34	17	5.2	6.2	8.4	6.6	1.8	4.3
2006	1.26	88	5.2	6.6	10.8	12.4	-5.3	2.1
2007	2.45	79	7.3	5.9	13.1	9.2	5.5	12.9
2008	1.91	45	6.3	6.3	6.2	8.1	0.4	6.5
2009	1.97	50	2.8	8.0	1.6	7.2	-1.8	3.0
2010	1.88	110	6.4	8.2	4.9	10.6	0.5	-0.5
2011	1.72	113	5.6	-0.4	3.6	7.0	5.9	5.3

The results of multiple regression of the number of PPP projects, increase in the number of PPP projects, growth of PPP projects, and the ratio of public to private sector investment in infrastructure on growth of the determinant sectors are presented in Tables 5-8.

Table 5: regression of the number of PPP projects

	<i>Coeff.</i>	<i>S.E.</i>	<i>t Stat</i>	<i>p-value</i>
[Constant]	25.91	33.83	0.77	0.4566
Electricity	-3.01	3.89	-0.77	0.4520
Coal	1.33	3.50	0.38	0.7103
Steel	-2.35	1.73	-1.36	0.1957
Cement	5.12	2.72	1.88	0.0810
Crude Oil	1.65	1.33	1.24	0.2358
Petro-Chem	-0.21	1.33	-0.16	0.8755

Dependent variable: # of Projects (PPPs)

R² = 29.16%, F Stat = 0.9607, p-value = 0.4853

Table 6: regression of increase in the number of PPP projects

	<i>Coeff.</i>	<i>S.E.</i>	<i>t Stat</i>	<i>p-value</i>
[Constant]	-6.46	23.31	-0.28	0.7858
Electricity	-0.37	2.68	-0.14	0.8922
Coal	1.02	2.41	0.42	0.6793
Steel	-0.71	1.19	-0.59	0.5626
Cement	2.55	1.88	1.36	0.1948
Crude Oil	0.14	0.92	0.15	0.8839
Petro-Chem	-0.77	0.92	-0.84	0.4163

Dependent variable: increase in # of Projects (PPPs)

R² = 22.37%, F Stat = 0.6724, p-value = 0.6740

Table 7: regression of growth of PPP projects

	<i>Coeff.</i>	<i>S.E.</i>	<i>t Stat</i>	<i>p-value</i>
[Constant]	0.30	1.12	0.27	0.7929
Electricity	-0.02	0.13	-0.19	0.8543
Coal	0.03	0.12	0.27	0.7878
Steel	-0.03	0.06	-0.61	0.5518
Cement	0.08	0.09	0.86	0.4064
Crude Oil	0.01	0.04	0.11	0.9106
Petro-Chem	-0.06	0.04	-1.40	0.1823

Dependent variable: growth of Projects (PPPs)

R² = 25.33%, F Stat = 0.7914, p-value = 0.5915

Table 8: regression of ratio of public to private investment in infrastructure

	<i>Coeff.</i>	<i>S.E.</i>	<i>t Stat</i>	<i>p-value</i>
[Constant]	1.44	0.65	2.21	0.0446
Electricity	0.19	0.08	2.48	0.0267
Coal	-0.02	0.07	-0.30	0.7680
Steel	0.05	0.03	1.49	0.1581
Cement	-0.05	0.05	-0.93	0.3668
Crude Oil	0.00	0.03	0.11	0.9147
Petro-Chem	-0.03	0.03	-1.17	0.2622

Dependent variable: ratio of public to private investment in infrastructure

R² = 49.48%, F Stat = 2.2852, p-value = 0.0951

The regression results for the number of PPP projects, increase in the number of PPP projects, and growth of PPP projects were statistically insignificant, but generally indicated a positive association with growth of coal, cement, and crude oil, and a negative association with electricity, steel, and petrochemicals.

The regression of the ratio of public to private investment in infrastructure was statistically significant at 10%, explaining 49.5% of its variation. The regression results indicated a significant positive association with growth of electricity, and generally positive association with growth of steel and crude oil and negative association with growth of coal, cement, and petrochemicals. This suggests that electricity is the critical constraint necessitating private investment in infrastructure.

5. Discussion

The public sector's primary motivation for entering into PPP relationships is to bring greater efficiency, innovation and value for money. The involvement of the private sector enables a reduction in government expenditure, which government can use it for other developmental purposes, and the cost involved in infrastructure development can be shared completely or partially with private agencies. The increasing PPP agreements between public and private sectors will also transfer the risk to the private sector, and can help the public sector to focus on a larger number of projects across a larger geography with same financial capability.

The main objective of the study was to find the impact of investment by public and private sector and the growth of core infrastructure industries associated with infrastructure sector on the increasing number of the PPP projects in India. The results of the current study are in sync with some of the foreign studies. The results of the study indicate that as the private participation in infrastructure sector has increased, the number of PPP projects has also increased; however, the growth of the core industries associated to the infrastructure sector do not have a significant impact on the growth of PPP projects. On the other hand, the results of the study indicate that growth of electricity has had a critical role in inducing private sector investment in infrastructure.

The study has some inherent limitations. The study considered a limited period of time, viz. 1990-2012. In particular, the research period included the global recession of 2006-08, so the results may be contaminated. Also, the study considered only a limited set of determinants; there may be other factors which affect PPP projects. There is great scope for further research, particularly in identifying the determinants of PPP growth.

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