

**ROLE OF INSTITUTIONAL ARRANGEMENTS IN FINANCING PROJECT
COMPANIES IN ASIA**

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Abstract

Within institutional economics perspective of project finance, this paper empirically examines the potential influence of factors on debt capacity in project companies when financed through bank-dominated financial systems with weak legal, regulatory and political institutions. The econometric results confirm that in order to capture the potential debt capacity of project companies financed through project finance arrangements in weak institutional environments, credit enhancements in the form of participation by multi-lateral/bilateral institutions, supplemented with specifically created institutional and informational infrastructure are frequently employed. These findings highlight the effectiveness of institutional and contractual arrangements in long-term investment schemes in infrastructure development. *JEL* Classification: G19, G21, G39, K49, L29.

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INTRODUCTION

The establishment of special-purpose vehicle company (SPV) for capital-intensive projects is prompted by its ability to spread risk and the expanded borrowing capacity for new investments. In financing infrastructure projects through BOO/BOT (Built-Operate-Own/Built-Operate-Transfer) type arrangements, some time it is an institutional requirement that private sponsors have to create SPV companies to finance, built and operate the infrastructure service. Sponsors are compelled to develop infrastructure projects on an individual basis due to statutory requirements for particular infrastructure services such as private power projects (i.e. Individual Power Producer-IPPs) for which project companies are established under BOO/BOT arrangements. In many countries, title to assets of national importance like physical infrastructure cannot be vested in foreign corporations. They must generally be held by companies incorporated in the country where the project is located and such companies are often formed in a form of special purpose company (i.e. project company) mainly for the project (Merna and Njiru, 2002). Because of the size, risk and range of abilities needed, a consortium of companies representing the skills needed in different phases of the project is often formed in a form of project company. Under the project company, the operational and external risks (i.e. legal, regulatory, and political) are managed through a contractual structure. Those risks are shared through the contractual arrangement among many parties to the project, so that the risk level of the individual participant can be on an acceptable level and therefore the project becomes feasible. Depending on legal, tax, and accounting considerations in the relevant host country, the sponsor can establish a project company in the form of a corporation, a general partnership, a limited partnership, a joint venture or a trust (Kleimeier, 1993).

However, when a project is considered for debt financing from external sources, firms will decide methods of incorporation and the structure of debt contracts based on the decision whether the project will be financed separately or not. For example, firms may elect to finance infrastructure as a separate investment, which is not supported by the firm's balance sheet. The necessity for separate project financing could partly arise due to corporate balance sheet constraints. Under such circumstances, if a

project is financed as a separate legal entity then project finance (PF) principles may be followed instead of conventional corporate finance¹. The key requirement for financing infrastructure projects through PF is a creation of SPV company to finance, built and operate the infrastructure services. Creation of the project company as a separate legal entity allows achieving non-recourse position to the project's liabilities. According to Lang (1998) PF is suitable to finance capital intensive projects, which initially incur a high cost during the construction period, since the majority of the revenues are only received in the future. In infrastructure project finance risk profile undergoes important changes as the project comes to fruition, with a relatively stable stream of cash flows that is subject to market and regulatory risks once the project is completed. Therefore, a project company in this research is referred to a separate legal entity which is solely established to finance greenfield infrastructure project according to PF principles.

Furthermore, according to Estache and Strong, (2000) financing infrastructure project companies through PF allows keeping the gross assets and liabilities of the project off the sponsor's balance sheet. The project's cash flow alone is the principal basis for returns for both debt and equity investors. From the point of sponsors, the PF arrangement is itself a strategic option since non-recourse structures can address political risk issues by transforming the burden from project sponsors to lending institutions or international agencies that occupy a better position to work with the government (Pollio, 1999). According to Pollio (1999) commercial banks are attracted to PF arrangements in preference to traditional balance sheet loans as project resources are devoted to, and must be used solely within, the project. Legally, they cannot be deployed elsewhere within the firm. The financial and commercial merit of the project gives an additional degree of security in respect to the project being able to meet its repayment obligation. Furthermore, a lender can more easily monitor his agent's behaviour, i.e. the

¹ A widely followed articulation of PF is that it is "a financing of a particular economic unit in which a lender is satisfied to look initially to the cash flows and earnings of that economic unit as the sources of funds from which a loan will be repaid and to the assets of the economic unit as collateral" (Nevitt and Fabozzi, 1998). The economic unit in this definition typically refers to a capital investment project incorporated as a single venture company (project company) with a set of legally and economically independent assets with a single industrial use. Nevitt and Fabozzi (1998) suggest that the key to a successful PF is structuring the financing of a project with as little recourse as possible to the sponsor, while at the same time providing sufficient credit support through guarantees or undertakings from a sponsor or third party, so that lenders will be satisfied with the credit risk. Under such circumstances the particular PF becomes limited-recourse finance, rather than non-recourse.

project company, thereby minimizing agency conflicts under PF arrangements. Additionally, lenders may also benefit from reduced information costs compared with more traditional loans. Pollio, (1999) argues that in PF lenders have only to evaluate and audit project company rather than having to assess both project and sponsors assets, as would be the case in secured corporate financing. Pollio (1999) further states that lenders bear only the operational risk and not the equity risk, for which the loan spread is considered to be adequate for compensation. Therefore, PF as a financial mechanism effectively function to mobilise private capital into infrastructure project companies.

Accordingly, project companies in most of infrastructure projects have been financed through popular PF arrangements, namely BOO/BOT mechanisms. According to the World Bank’s Private Participation of Infrastructure (PPI) Database, BOO/BOT arrangements or merchant financing have been the most common type to finance greenfiled infrastructure project companies in developments in developing countries (DCs) in the 1990s (see **Table-1**). The above-mentioned arrangements have functioned to mobilise US \$ 320 billion in 1,233 project companies, in particular private power and telecommunication projects in East Asia and Pacific in 1990-2001 (World Bank, 2003).

*******Table 1 about here*******

However, the popular application of PF for infrastructure project companies in Asia in the 1990s has highlighted a number of issues that PF transactions have to address, when arranged through bank-dominated financial systems in DCs with comparatively weak economic institutions. While the underlying strategy for designing contracts to manage economic risks in PFs continued to emphasize exogenous risks, we thus continued to observe normally expected attempts to match a project’s cash flow profile with debt service requirements through off-take contracts, and both foreign and local currency arrangements to overcome the issues arising from local currency instability in foreign debt financing. Other than the management of demand and supply risks, several additional phenomena have however gained prominence, including attempts to manage risks emanating from informational and institutional factors surrounding PF arrangements. Possibly the most significant of these include the

role of additional financial intermediation functions such as credit enhancement and/or guarantees provided by multilateral agencies, third party guarantees for off-taker's creditworthiness, and extensive use of export credit facilities for capital intensive imports, all of which have become the norm for mobilizing (almost exclusively) bank-led syndicated loans for project companies in Asian DCs. Despite these developments, informational problems such as the inadequacy of public information (i.e. information about governing rules and regulations of the transactions) and the instability and often poor enforceability of institutions in some countries where projects were located, have continued to contribute to the instability and unpredictability of project cash flows and thus to project debt service capacity. Given the condition that the institutional environment governs loan syndication in bank-dominated financial systems, we observe that to promote projects through PF arrangements specifically designed institutions, particularly project specific institutions created by legislation, have been put in place in many Asian countries, in addition to the participation of additional multilateral financial intermediaries.

Although it is accepted that traditional PF arrangements can effectively control the traditional agency and informational problems in project companies (see Cheemmanur and John, 1996; and Shah and Thakor, 1987) within good economic institutions, structuring of PF transaction into project companies in unstable institutional environments is required to address not only the traditional agency and informational issues but also associated difficulties in achieving full potential with respect to project debt capacity. This becomes a key issue when the PF transaction in project companies faces problems arising from the underdeveloped nature of institutions and poor accessibility to and/or availability of information. Therefore, our motivation is to empirically investigate the potential influence of factors that govern debt capacity in project companies when financed through PF arrangements in weak institutional environments. This is very important since PF arrangements function as long-term investment schemes in infrastructure development, and are thus expected to respond to institutional issues such as credibility and enforceability of contracts and creditor rights. Therefore, the principal focus is on governance impact on debt capacity of the project company rather than traditional determinants of capital structure choice. It is in this light that this research offers some useful insights

into role of institutional and contractual arrangements in long-term private investment in current infrastructure delivery in developing environments.

Structure of the paper is as follows. First, typical financial arrangement in project companies is analysed under an institutional economic perspective of PF. Following this theoretical analysis, methodology for empirical analysis is explained. Finally, analysis and discussion of results on debt capacity of project companies are presented leading to conclusions of this paper.

INSTITUTIONAL ECONOMIC PERSPECTIVE OF FINANCIAL ARRANGEMENT IN PROJECT COMPANIES

Drawing strongly on transaction cost economics and agency theory applied to finance; institutional economic perspective is used to explain the governance structure of the financial arrangement (i.e. PF arrangement) in the project company. Nature of the PF transaction, namely asset specificity, uncertainty/complexity and behavioural characteristics of parties to the transaction, namely bounded rationality and opportunism warrant the consideration of these two interrelated theories.

When an investment is made to develop a specific asset which has a specialized function and cannot be redeployed without incurring greater costs, then such an investment is said to be “asset specific”. According to Williamson (1985) such asset-specific transactions are characterized by increased difficulty in finding substitutes or redeployment to alternative uses. Therefore, asset-specific transactions are risky and have a lower value in their next best application. They also isolate the relevant parties from alternative trading, particularly in relationship-specific investments (Williamson, 1985). The importance of asset specificity in infrastructure project finance can be identified from the point of both lender and sponsor². From the sponsor point of view the necessity to avoid negative

² Financing of infrastructure projects in accordance with PF principles is an asset-specific investment. Although some plant and equipment (like in power projects) may be movable (at high cost), the nature of the whole asset is very asset specific in infrastructure project finance. In infrastructure project finance the frequency of transactions is occasional since such investment takes place on a project by project basis under a different set of circumstances (i.e. transactions take place only if, and when, there is a necessity to develop the particular

consequences of transaction-specific investment is due to huge sunk investments; while it applies to the demand side in the form of the greater cost of alternative supply. This situation demands the strong close coordination through contractual arrangements to manage the asset-specific investment in infrastructure. This subsequently leads to the necessity for the governance mechanism to design and execute contracts to support it in the project company. Lissowska (2001) shares a similar view with respect to credit transactions in long-term financing. He states that long-term financing in newly created enterprises (such as project companies) are subject to an important level of uncertainty while the funds engaged are necessarily non-transferable, and transaction frequency is typically low. The financial asset, once engaged by the lender, cannot be withdrawn. Even if there is the legal possibility to sell the creditor's rights to another party, this is rarely applied and often not without loss. According to Lissowska (2001) these features would necessarily require a special governance structure for certain types of credit contracts, particularly in the long-term financing of investment projects such as infrastructure project finance.

However, the essence of design and execution of the contracts are the institutions and property rights. While the institutions should be credible and stable, the property rights should be characterized by credible commitment and the security of expectation in this institutional environment³. In particular, the latter condition is important since in PF bundles of property rights are transferred over the asset through contract. In PF, contracts provide inputs and create necessary relationships with the external environment. A combined view of corporate finance and institutional economics perspectives explain conception of the asset specific nature of PF⁴. Following a combined perspective, Devapriya (2003) defines financial arrangement (i.e. PF arrangement) in the project company as

physical asset. Also, assets are generally geographically fixed). According to Williamson's (1985) identification of four distinct types of transaction-specific investments, three of them, namely site specificity, physical specificity and dedicated assets appear to be relevant to infrastructure project finance.

³ The "institutional" refers to the legal, administrative and customary arrangements for repeated human interactions (Pejovich, 1998).

⁴ In earlier research, Devapriya (2003), link the corporate finance view with the institutional economic perspective of PF and established a generic PF model, which explains a PF arrangement from both the agency and informational view points and transaction governance principles.

"Mobilisation of non-recourse/limited recourse finance to a transaction specific structure within which input contracts, financial contracts including guarantees and incentives, supply and output purchase contracts are initiated, executed and negotiated in a particular institutional environment to develop a physical asset and thereby to address a specific demand".

Institutions are considered at two levels in this definition. First, at a macro level they refer to the institutional environment that affects the organization of PF arrangements in a particular project company. They can be identified as "rules of the game". Institutions associated with the derivation of a transaction-specific structure for a particular PF arrangement are considered at a micro level as the second level of institutions. They represent "the game" itself. According to Williamson (1996) the institutional environment can be a constraint on institutional structure at the micro level. They on the other hand facilitate sharing any form of risks that puts asset specificity at risk directly or indirectly. Their institutional effect on PF arrangements in the project company come from two levels; the macro institutional environment and institutions at the transaction and corporate level itself. While the institutional environment determines the derivation of transaction governance, risk trading through contractual arrangement in the governance is governed by the institutions at the transaction level⁵. This indicates that both institutions at the transaction level and external environment interact in derivation of transaction governance structure for PF arrangement. Also, transaction governance and corporate governance interact in project companies when they are financed through PF since legal requirements of the host country will impose restrictions on the selection of the legal structure of the project company. Therefore, under the transaction governance structure, the PF arrangement is organised in a form of hybrid organisation to manage the asset specificity risk⁶. We therefore view arranging the credit contract in PF as the primary contract in a project company, while other contracts are viewed as secondary contracts in the distribution of risk in asset specific investment. The interaction of the credit

⁵ According to Palay (1984) transaction governance could be defined as the institutional framework within which contracts are initiated, negotiated, monitored, adapted, enforced and terminated.

⁶ Hybrid refers to a diverse collection of relationships that either combine contracting and vertical integration or lie somewhere between markets and hierarchy in terms of incentive intensity, adaptability, and bureaucratic costs (Williamson, 1985).

contract with the secondary contracts takes place under a transaction-specific governance structure so that the lenders' risk arising from asset specificity is properly managed in the project company.

The governance mechanism of PF arrangements should be able to adjust to control and minimize the risk of post contractual opportunism, and the cost of transacting with different agents. Indeed, other than managing the asset specificity, the transaction governance should facilitate distributing risk through contractual arrangements. Destais (1999) states that opportunistic behaviour originates from contractual arrangements on the grounds of high asset specificity in PF arrangements. In nature, PF minimizes debt and managerial agencies, however, at this juncture it should be noted that a risk of agency problems arises in risk distribution through the contractual arrangements, mainly due to opportunism. Therefore, governance mechanism of the project company has significant impact on the loan contract as the primary contract. That is exactly why, in order to set up a loan contract, other contracts should also be put in place as a pre-qualified condition in PF arrangement to address the lenders' concern. The costs of agency issues, such as the agency cost of debt, managerial costs of agency, and the cost of incentive alignment in other contractual arrangements, and renegotiation should be able to be addressed under the governance mechanism of the project company. This reinforces the importance of the adaptability of the transaction governance for circumstances that could possibly arise *ex post*. The effectiveness of the governance mechanism in PF arrangements depends on the strength and weakness of the institutional environment. In the event of weak institutional arrangements or the absence of proper institutions, incentive is necessary to achieve appropriate governance structures in order to make the PF transaction feasible by enhancing the close coordination necessitated by bilateral dependency. The incentive is not really for effective risk distribution, but rather for additional comfort for a particular party to bear the risk in the transaction governance. **Table 2** shows characteristic features employed to manage asset specificity risk in financing project companies. As such, institutional environment-specific variables are largely reflected in the characteristics of transaction governance (i.e. mechanism designed to address asset specificity issues), while transaction-specific variables can be observed in the features of the arranged capital structure in the project company.

*****Table 2 about here*****

Therefore, following the mentioned definition of the PF arrangement, we identify two categories of variables that govern financing project companies, namely transaction-specific and institutional environment-specific variables. Interaction of these two categories of variables in weak institutional environments is reflected in credit support, third party guarantees, comparatively higher credit risk premia, and a higher cost of transaction (Devapriya 2003). Thus, two principles are observed. Firstly, in order to finance a particular project company through PF in weak institutional environments, project specific institutions are created to improve the viability of the transaction, and secondly, notwithstanding the ability of PF mechanisms to overcome asymmetrical information problems as well as traditional agency issues in the governance, additional measures are required to address these matters in mobilising private capital to project companies in unstable environments. It is in this light that this paper proceeds to empirically examine whether transaction-specific and/or institutional-specific variables affect the leverage ratios of project companies in Asia.

METHODOLOGY FOR EMPIRICAL ANALYSIS

For empirical analysis we proceed from the perspective of structuring credit transactions for project companies in weak institutional environments, using Asian private infrastructure projects as data source. Principles of decomposition of credit transactions in bank-dominated financial systems provide a valuable interface to link the theoretical concepts of the research with the empirical analysis. Decomposition of credit transactions is related to traditional factors that affect credit transactions, such as informational and agency issues and other issues that affect the performance of the loan, such as legal and economic conditions (Geenbaum and Thakor, 1995). In the current setting, our focus is on measures for the traditional agency and information issues in decomposition of PF credit transactions when factors affecting the performance of the loan contract occur in weak institutional environments. Because traditional agency and information issues are minimized in PF governance, lenders' main

attention in screening, searching, contracting and post-contractual monitoring is thus largely associated with the project company as the nexus of contracts through which credit risk is managed with respect to the institutional environment. Given this background, related empirical work in this research includes two parts.

First, the underlying theoretical constructs are built into a regression model and use the governing variables to test relationships. For this purpose, we follow the previous linear functions on loan syndication used by Esty and Megginson (2000) and Dennis and Mullineaux (2000). Esty and Megginson (2000) estimated a model on syndicated structure as explained by institutional variables, such as the ability to enforce loan repayment terms and efficient enforcement mechanisms to protect creditors against strategic default. The syndicated structure was expressed in relation to the debt concentration level and syndicate size. Similarly, Dennis and Mullineaux (2000) estimated a regression model relating the syndicate size and decision to syndicate with information, agency and loan characteristics. In the current setting, their variable on information characteristics represents information infrastructure, while agency and loan characteristics indicate transaction-specific characteristics of PF arrangement. Following these studies of loan syndication, we propose the following regression equation (1) on debt concentration level of PF in the project company.

$$Y1 = P1 + a1X1 + b1X2 + c1X3 + d1X4 + e1X5 + f1X6 + g1X7 + h1X8 + C1 \text{ -----(1)}$$

Where,

Y1 = Non-recourse/ limited recourse debt capacity in the capital structure (debt/leverage ratio)

X1 = Stability of political environment

X2 = Guarantees and incentives for the loan

X3 = Stability and enforceability of institutions

X4 = Instability of local currency

X5 = Credit support for the loan

X6 = Availability of public information

X7 = Availability of private information

X8 = Level of local financial market development (Control variable)

C1 = Error term

As previously mentioned the variables are classified into two categories: institutional environment-specific variables (*X1, X3, X4, X6 and X8*), and transaction-specific variables (*X2, X5, and X7*). The institutional variables capture the creation of project-specific institutions to facilitate PF transactions in project company in Asian countries concerned. From the point view of institutional economics, they work to derive appropriate transaction governance mechanisms to manage asset specificity risk in the PF transaction. The transaction-specific variables capture the agency and information issues, as well as credit enhancement in the form of participation of additional financial intermediaries in structuring syndicated loans in PF arrangements. According to the institutional economic perspective, these indicate the incentives and guarantees that effectively allocate risk through long-term contractual arrangements under the transaction governance. The measurement of the dependent variable *Y1*, represents project financial structure as *proxy* for debt capacity, following the example of Chemmanur and John (1996), who confirmed a linear relationship between the level of debt ratio and the ability of PFs to minimize traditional agency and information issues in debt contracts. In the current setting, we consider debt ratio as the outcome arising from the decomposition of the credit transaction in relation to the riskiness of project company in weak institutional environments. Our analysis is further informed by attempts, typical in practice, to structure project financed companies with maximum possible non/limited recourse project debt, given the corporate finance purpose of economizing on capital that often drives PFs. Our intuition here is founded on the implication that the *actual* level of debt observed in a PF financial structure is close to the optimal debt that the riskiness of a particular project's circumstances would normally allow, given the nature of institutional environment-specific variables and transaction-specific variables that govern financing the particular project company.

The **Second** stage of the methodology involves the construction of measurements for variables and screening of the project companies loan sample to establish a data set in order to conduct the empirical tests. For these purposes, we searched for similar measurements of institutional environment specific variables, with the main focus on measures of *political stability, general and specific institutions and availability of public information* that facilitates the structuring of PF transactions in infrastructure

sectors such as power generation in DCs in Asia. While the measures in the existing literature on political environments offer measurements for the *stability of political environment*, previous measures on institutional variables accompany measurements mainly for the general institutional environment. Similarly, existing measurements for other institutional variables, namely *instability of the local currency* and *level of financial market development* are not available for all-Asian countries and the period concerned, while previous research could not be identified for the *availability of public information*. Therefore, new measurements are proposed for all institutional environment specific variables except for the *stability of political environment* where precedent will be followed. We thus follow the common approach adopted in finance research to construct measurements for institutional variables, namely scaling systems for content-related analysis of secondary sources and variance analysis of longitudinal data.

The measurements for transaction-specific variables come from a sample of syndicated PF loans selected from six DCs, namely China, Thailand, India, Philippines, Pakistan, and Indonesia where PF arrangements have widely been used for financing project companies in private power projects in the 1990s (see **Table 1**). The sample selection consists of two stages. First, we select a sample of suitable PF arrangements from the World Bank's PPI (Private Participation in Infrastructure) database to represent PF arrangements in private power project companies in Asia from 1990 to 2001⁸. Second, using this PF sample, we screen the Projectware database to identify a syndicated PF loan sample, which includes measures for the transaction specific variables⁹. While financial closures of most of PF loans have taken place in the late 1990s, these loans have been arranged to finance project companies in greenfield power projects in Asian countries concerned¹⁰.

⁸ The PPI database contains specific details on infrastructure project finance in DCs in different parts of the world from 1990 to the present.

⁹ Dealogic Capital DATA (Hong Kong) is a London-based joint venture company between Euromoney plc and Computasoft Ltd, The Projectware database contains information on PF lending in Asian countries after 1994.

¹⁰ Project companies in greenfield power projects reflect typical governance characteristics as per the Table 11 and the project company sample is so selected to control for other exogenous characteristics such as different regulatory practice in the power sector (merchant power financing, for example).

Following the above analyses, we expect the level of debt in PF in project company ($Y1$), to be related positively to all variables except *instability of local currency*, which is expected to be negatively related to the level of debt. The measurements of the variables take the following form:

(1) Stability of political environment ($X1$):

This variable represents the stability of the political environment in the host country. The International Country Risk Guide (ICRG) "political risk variable" is adjusted to reflect only the political characteristics of the selected Asian countries as at September 2001 in a scale from 0 to 10, with higher scores for more stable political environments. As described in the review of previous measurements, the ICRG's "political risk variable" has been widely used as a measure of political characteristics in finance empirical work.

(2) Stability and enforceability of institutions ($X3$):

Stability and enforceability of institutions indicates the general legal environment, specific legal and administrative mechanisms that govern financing project companies, such as the regulatory framework in the power sector, and BOO/BOT legal mechanisms in the host country. These institutional characteristics are captured by a composite measurement, which is constructed based on three individual measurements. The general legal environment is measured based on ICRG with an adjustment to reflect only the institutional characteristics in the "political risk variable", for the selected Asian countries as at September 2001. For specific institutions, another measurement is taken for the governance element of the regulatory framework in the power sector in the relevant Asian countries. Specific institutions such as BOO/BOT and related legal and administrative procedures is the third underlying factor in the composite measurement. A predefined criterion on Governance and Regulatory Regimes for Private Sector Participation in Infrastructure Development, namely the clarity of roles and objectives, autonomy, participation, accountability, and transparency drawn from the NARA (1998) was applied to measure the regulatory practice in particular Asian countries based on

content analysis of official and policy documents, and interviews with experts in the relevant area. This criterion was cross-checked with Standard and Poor's (2000) debt rating criteria for infrastructure project finance. Observations on 30 factors encompassing the above mentioned six criteria (which was explained by five sub factors in each) was performed under binary observations for each factor. Finally, they were converted to a scale score from 0 to 30, with higher scores for better regulatory practice. The same procedure was adopted to develop the measurement for specific institutions on a scale from 0 to 6, with higher scores for better specific institutional environments. The two scale scores of regulatory framework and specific institutions were adjusted to a 1 to 10 scale so that three different scales were transformed to a common form from 1 to 10 to indicate the level of stability and enforceability of institutions in a composite measurement for the countries concerned, with higher scores for better institutional environments.

(3) Guarantees and incentives for the loan (X2):

Guarantees and incentives indicate whether the loan has a third party guarantee or any incentive for the syndicated loan. The *guarantees and incentives* are identified quite differently from *credit support* in the way that the former provides a form of collateral for the lender, while the latter is represents more a measurement of the risk of debt agency problems. Following Nevitt and Fabozzi (1998) guarantees provide a basis for allocating certain risks in a PF transaction to interested parties, who have no desire to become directly involved in the operation of the project, or to provide directly the capital for the project. It is measured as a dummy variable taking the value of 1 if the loan has third party *guarantee and incentives* and 0 otherwise. Binary variables have been used to capture the same variable in a PF loan sample used by Kleimeier and Megginson's (2000) in an analysis of loan spread in PF.

(4) Instability of local currency (X4):

This is a measure of the change in the real exchange rate from 1990 to 2001 in the Asian countries concerned. The change is measured by the variance of real exchange rate movements during the period concerned. In order to build up the real exchange rate, a nominal exchange rate is multiplied by the ratio of foreign to domestic price levels with reference to a particular country. For this purpose, the nominal exchange rates and price level information is taken from International Financial Statistics (IFS)-2002. The nominal exchange rates in IFS-2002 are calculated based on a time series analysis of the fluctuation of domestic currency on a daily basis. The sampling of the underlying construct of *instability of local currency* is influenced by a similar measurement constructed by Edward and Ng, (1985) in the construction of an index for a real effective exchange rate. A higher change in the real effective exchange rate indicates higher fluctuations of the currency, higher instability, and a higher currency risk in the country concerned.

(5) Credit support (X5):

Credit support indicates whether the lenders enjoy any credit enhancement from multilateral institutions' participation in the capital structure, either as equity or debt holders. "Multilateral lender" also includes export credit agencies. The underlying theoretical construct of credit support is such that it functions as a bonding mechanism in the mobilization of non-recourse/limited recourse finance. This form of credit enhancement in the capital structure in the project company is deemed applicable to the syndicated loans, since all lenders may be party to the same inter-creditor or common term agreement and such a structure is expected to provide lenders with meaningful risk reduction. This is measured as a dummy variable taking the value of 1 if the capital structure has such credit enhancement and 0 otherwise. Kleimeier (1993) used the same procedure to measure credit supports in PF loans.

(6) Availability of public information (X6):

This variable measures *availability of public information* about legal, administrative and customary systems and institutions, and information on the general economic environment that affect financing project companies through PF in the host country. A six-factor scale that explains the underlying construct of the variable was used as a criterion for the content analysis of official and policy documents from the six Asian countries and for interviews with experts. The factors included the legal mechanisms controlling BOO/BOT arrangements, administrative functions relating to BOO/BOT arrangements, level of accessibility to these institutions, regulatory practice with respect to the changes in these institutions, conduct of reviews of regulatory practice, and procedures on introducing and enacting new laws. The factors were from NARA (1998) and ADB (2000) and subsequently cross-checked with Standard and Poor's (2000) debt rating criteria for infrastructure project finance. An observation was recorded as a binary variable for each factor to arrive at a scale score from 1 to 6 with higher scores for a higher level of availability of particular information.

(7) Availability of private information (X7):

This variable captures the *availability of private information* about the main sponsor in the project company. This measurement is taken as a *proxy* for asymmetries of information, measured as a dummy variable taking the value of 1 if the main sponsor is a listed company either in the USA or in an Asian stock markets and 0 otherwise. Dennis and Mullineaux (2000) use the same measurement to measure the quality of the information available on borrowers in loan syndication.

(8) Level of local financial market development (X8):

This variable measures the level in credit provided by the domestic banking sector from 1990 to 2001. It is treated here as a *proxy* for the level of local financial market development in the Asian countries

concerned. Having referred to the International Financial Statistics (2002), the variable is constructed as the change in the level of credit provided by the banking sector to the private sector as a percentage of GDP, in each year within the particular period. A similar form of measurement was used by Aylward and Glen (1998) and Beck et al (2000) to proxy the level of domestic financial market development using the form of "domestic credit provided by the banking sector", based on the ratio of long-term private debt issues to GDP. A positive higher change in the current variable indicates an increasing level of credit provided by the local banking sector in the host country.

EMPIRICAL RESULTS AND DISCUSSION

While the **Table III** indicates descriptive statistics of first regression results of the model (*I*), the correlation matrix shown in **Table IV** indicates high correlation among the institutional variables namely *stability of political environment (X1)*, *stability and enforceability of institutions (X3)*, and *availability of public information (X6)*.

*******Table III** About Here*****

One possible reason for such a high correlation could be the similarities of the underlying constructs of these institutional variables. Therefore, comparatively less significant institutional variables (according to the t-statistics in **Table V**), namely *stability of political environment (X1)* and *availability of public information (X6)* were removed after the initial regression analysis to correct the model for multicollinearity.

*******Table IV** About Here*****

The corrected model is established under Reg 1-2 in **Table V**. This resulted in improvements in t-statistics of the remaining variables except *guarantees and incentives (X2)*. In the next step, the insignificant variable *availability of private information (X7)* was removed which yielded better

overall results, shown in Reg.1-3 (**Table V**). Additionally, *guarantees and incentives (X2)* were removed, which indicated a reduction in the significance level in the previous two regression cases, to identify a comparatively higher significant effect of *credit support (X5)* on debt capacity of the project company (see Reg 1-4 in **Table V**). Also, in order to check whether the *level of local financial market development (X8)* is complementary to a decrease in the *instability of local currency (X4)*, the former was introduced into the model in Reg.1-5 as a control variable instead of the latter.

***** **Table V** About Here *****

As such, the *level of local financial market development (X8)* indicates a significant positive effect on debt capacity, although the significance of *stability and enforceability of institution (X3)* and *credit support (X5)* are reduced in comparisons with Reg. 1-4. Against this background, the best overall results are indicated in **Reg. 1-3** in **Table V**. After correction for multicollinearity, results in subsequent tests (i.e. from Reg.1-2 to Reg.1-5) did not indicate violation of autocorrelation and heteroscedocity conditions. When the significance of t-statistics is considered along with model performance in all four cases, **Reg. 1-3** is identified as the benchmark for discussion of results and acceptance or rejection of hypotheses¹¹.

ANALYSIS AND DISCUSSION OF RESULTS ON DEBT CAPACITY OF PROJECT COPMANIES

Once the model is corrected all explanatory variables confirm the expected signs except the *instability of local currency* (i.e. results from Reg.1-2 to Reg.1-5). In keeping with expectations, t-statistics indicate that both institution-specific variables, namely *stability and enforceability of institutions (X3)* and *level of local financial market development (X8)*; and transaction-specific variables as represented

¹¹ As shown in **Table V**, once the regression model (**I**) is corrected for multicollinearity and for insignificant variables, the R-square values of all four regression cases vary from 23% to 21% while adjusted R-square varies from 17% to 18%. By conventional standards, R-Square and Adjusted R-Square values of the corrected models, appear low at less than 25%, but are generally in line with similar research on PF loans as conducted by Kleimeier (1993). Most importantly, F-ratios are well above 2.00 which is significant at $p < 0.022$ in all cases. These results suggest that the model performs sufficiently well for the proposed test and support the selection of best overall results in Reg. 1-3 for the discussion.

by the mechanisms to manage risk of agency problems, and mainly *credit support (X5)*; positively and significantly affect the debt capacity of project companies financed through PF. This suggests that stable institutional environment and appropriate mechanisms to manage risk of agency problems increase debt capacity in project companies financed through bank-type intermediaries. Under these two categories of variables, the significant nature of the above variables can be discussed in details as follows.

Among the institutional environment specific variables, the positive significant t-statistics of *stability and enforceability of institutions (X3)* (in all three cases from 1-2 to 1-4) confirms that in order to mobilize private debt to project companies or to gain the full potential of project debt capacity in project companies in a weak institutional environment, existing institutions benefit from being supplemented with specifically created institutional infrastructure. However, the *instability of the local currency (X4)* shows a positive and significant impact on debt capacity, while a negative relationship with debt capacity was expected. The instability of the local currency is an important indicator for the riskiness of the stability of the cash flow in the project company. When a country's local currency is subject to considerable fluctuations and such fluctuations are unpredictable, then lenders' screening activity also becomes focused on the implication of the fluctuation of the local currency on the stability of the cash flow *ex post*. As a result, **Table II** shows that in financing project companies through PF, hedging mechanisms are contractually prescribed to manage negative effects of *instability of local currency (X4)* on PFs in private infrastructure projects in Asian DCs. A satisfactory *level of financial market development (X8)* complements the *instability of local currency (X4)* confirmed in regression Reg. 1-5. These results therefore confirm that inadequate long term financial sources in the domestic market result in dependency on foreign financing, which requires the contracts to be designed to address exogenous risks such as currency risk. The other institutional variables, namely *stability of political environment (X1)*, and *availability of public information (X6)* share a similar underlying construct with significant institutional variables. For example, a satisfactory level of *availability of public information (X6)* and *stable political environment (X1)* in the host country are closely associated with the creation, existence and *stability and enforceability of institutions (X3)*,

particularly of the legal system. It is apparent that when a political agenda promotes a private power policy to attract private investments for electric generation in many Asian countries and the policy framework guides establishment of project companies for power projects, information on the policies and institutions on procurement of private infrastructure projects become known to the relevant parties and accepted as the "rules of the game" (see **Table-II** under transaction governance). When the above explanations are coupled with the positive and significant effect of *stability and enforceability of institutions (X3)* and *level of local capital market development (X8)*, they collectively suggest that institutional variables, as represented by factors that reflect the riskiness of the transaction, have a significant positive affect on the debt capacity of the project company¹².

With reference to the transaction-specific variables as represented by mechanisms to manage the risk of agency problems, *credit support (X5)* reflects a significant positive effect on the debt capacity of project company. This reveals that participation of additional financial intermediaries or credit enhancement can increase debt capacity or help to reap the full potential of debt capacity in project companies when they are financed through PF in weak institutional environments. It functions to manage credit risk in the overall capital structure of the project company, thus effectively working to address loan default risk of agency conflicts associated with the project company. In effect, this confirms the importance of the presence of non-commercial financial participation in the capital structures in project companies in weak institutional environments.

One possible explanation for the insignificant level of *guarantees and incentives (X2)* and an increase of significance in *credit support (X5)* when it is removed in **Reg-4**, is the lender's higher level of concern for the former than the latter. This happens since enforceability of *guarantees and incentives (X2)*, for example government guarantees on the off-taker's payment obligations, is sometimes uncertain, while *credit support (X5)* is a form of guarantee to the lender which is more effective in

¹² These results are comparable to the findings of Esty (2002) who tested for a relationship between project risk as represented by the Standard and Poor's sovereign rating for the country and debt-to-total capitalization ratio. He found that debt capacity in a syndicated PF structure is reduced when the projects are exposed to sovereign risks like macro economic instability, currency inconvertibility, and civil unrest.

managing risk of default in a weak institutional environment¹³. Similarly, Lissowska, (2001) identifies that *guarantees* are subject to numerous deficiencies, such as the problem that their value and judicial status are often difficult or costly to verify. A combination of this empirical evidence with the typical characteristics needed to manage asset specificity as reflected in **Table I**, therefore suggests that *credit support (X5)* is a substitute for the unstable institutional environments in structuring credit transactions for project companies in Asian DCs.

The insignificant levels of *guarantees and incentive (X2)* and *availability of private information (X7)* lead to important insights into questions about structuring PF credit transactions into project companies in weak institutional environments. The *guarantees and incentives (X2)* represents a measure of the level of traditional agency conflicts that arise from (non-observance of) counterparties' contractual obligations, while traditional information asymmetry concerns are represented by the *availability of private information (X7)* in external debt financing through syndication¹⁴. The insignificant nature of these transaction variables compared with the significant institutional variables, suggests that structuring a credit transaction into project companies in an unstable institutional environment has more to do with addressing exogenous characteristics than with traditional informational and agency issues in the capital structure.

CONCLUSIONS

Within institutional economics perspective of PF, this paper presented the results of an empirical investigation into financing project companies through PF in Asian DCs, based upon the premise that structuring the PF transaction faces characteristic problems due to weak institutions and poor information accessibility. The empirical evidence confirmed that the traditional counterparty solutions of screening and monitoring debtors in granting credit seem less significant compared to the credit enhancements that function to manage overall credit risk in project companies. These findings support

¹³ The unsuccessful PF arrangement in the Dabhol power project in India provides evidence to support this. The failure was mainly due to failure of the security structure (Joshi, 2002, p31).

¹⁴ Our loan sample includes large well-known sponsors who have recognition and reputation in the power sector such as Enron, Hopwell and ABB.

the rationale that when formation of project companies is supported by specifically created institutional infrastructure in DCs, the nature of financing these project companies changes with associated changes in structuring the credit transaction. Therefore, in order to reap the full potential of debt capacity in project companies financed through PF arrangements in an underdeveloped institutional environment, credit support in the form of additional financial intermediation is often necessary even within specifically created institutional and informational infrastructure. Following the institutional economics approach this research reveals the importance of the stability and enforceability of institutions and stability of political environment to derive an appropriate governance mechanism for private investment in infrastructure. Therefore, at policy level, findings highlight that although some policy measures on promoting private investment in infrastructure such as specifically created institutions have attracted private capital into project companies in the 1990s, regulatory reforms and credibility of institutions are must to sustain the long-term private investment schemes such as PF in infrastructure development. In response to regulatory reforms and institutional development, sponsors will continue to formulate appropriate governance mechanisms to manage asset-specific risks in infrastructure development. Therefore, the role of institutional and contractual arrangements in long-term investment schemes is vital important for infrastructure delivery in developing environments for foreseeable future.

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Table 1 Financing project companies in private power projects in Asia: 1990-1999

Country	Financial mechanism			Project Cost* US\$ Million (Cumulative nominal figures in different Yrs.)	Total Project Capacity (MW)
	BOO	BOT	Total Nos.		
(1) China	15	50	65	16,050	3,443
(2) Thailand	38	3	41	4,845	5,774
(3) India	28	4	32	10,310	12,029
(4) Philippines	11	16	27	8,631	5,945
(5) Pakistan	19	None	19	5,533	4,929
(6) Indonesia	3	10	13	8,965	5,967
(7) Malaysia	8	None	8	4,523	4,293
(8) Sri Lanka	1	1	2	64	60
(9) South Korea	2	None	2	1,081	1,038
(10) Nepal	None	2	2	224	96
(11) LAO PDR	None	2	2	536	336
(12) Papua New Guinea	None	1	1	50	24
(13) Vietnam	None	1	1	81	72

* Nominal value of project costs has been totalled to view the scale of PF investment in each country for BOO/BOT projects.

(Source: PPI Project Data Base, World Bank)

Table I1 Typical characteristics to manage asset specificity in private infrastructure project finance

Characteristics and Functions Associate with Transaction Governance	Features of Private Debt Financing and Capital Structure
(1) Institutional environment in the host country affects the transaction governance. Concession agreements and standard off-take contracts function as <i>specific institutions</i> .	(1) Typically highly leverage in financial structure. In response to riskiness of the PF transaction, debt financing is largely included from non-commercial organizations, such as bilateral/multilateral agencies.
(2) External and specific institutions interact in derivation of the transaction governance.	(2) Measures like <i>credit support</i> work to address the risk of default in private debt.
(3) Typical secondary contractual arrangements manage the project risk.	(3) Hedging arrangement addresses the <i>currency risk</i> in foreign debt serving.
(4) Demand, supply and construction risks are hedged through off-take contract, supply contract and forward contract.	(4) Loan spread in relation to risk level reflected in the strength and weakness of the transaction governance.
(5) <i>Incentive and guarantees</i> as bonding mechanisms address risk of agency problems arising from failure of counterparty's contractual obligations.	(5) Third party <i>guarantees</i> work to cover political risk in commercial lending.

Table III Descriptive statistics of initial results of the model (I)

	Mean	Std. Deviation	N
Y1	66.30	16.27	70
(X1)	53.86	6.67	70
(X2)	0.40	0.49	70
(X3)	16.58	2.14	70
(X4)	278604.65	687346.28	70
(X5)	0.34	0.48	70
(X6)	0.66	0.11	70
(X7)	0.53	0.50	70

Table IV Correlation matrix of initial results of the regression model (I)

Variable	Y	X1	X2	X3	X4	X5	X6	X7
Non-recourse debt capacity	1.00							
Stability of political environment (X1)	0.021	1.00						
Guarantees and incentives for the loan (X2)	0.302	0.154	1.00					
Stability and enforceability of institutions(X3)	0.148	0.803	0.122	1.00				
Instability of local currency (X4)	0.152	-0.515	-0.083	-0.560	1.00			
Credit support for the loan (X5)	0.363	0.020	0.577	0.037	0.049	1.00		
Level of availability of information (X6)	0.154	0.822	0.176	0.746	-0.582	0.123	1.00	
Information about status of the promoters (X7)	0.196	-0.206	0.070	-0.140	0.222	0.381	-0.142	1.00

Table V Regression results on variables and model parameters on the debt capacity

Explanatory variable	Reg.3 -1	Reg.3-2	Reg.3-3	Reg.3-4	Reg.3-5
		Exclude-X1, X6 and X8	Exclude-X1,X6, X7 and X8	Exclude-X1,X2,X6, X7 and X8	Exclude-X1,X4,and X6 Include X8
Constant	29.405 (1.597)	20.075 (1.153)	21.546 (1.254)	21.527 (1.252)	30.376 (1.923)*
Stability of political Environment (X1)	-1.153 (-2.139)*	Excluded	Excluded	Excluded	Excluded
Guarantees and incentives for the loan (X2)	6.239 (1.404)	5.351 (1.179)	4.859 (1.092)	Excluded	4.605 (1.027)
Stability and enforceability of institutions(X3)	3.120 (2.156)*	2.306 (2.282)*	2.278 (2.267)*	2.341 (2.331)*	1.677 (1.838)
Instability of local currency (X4)	8.742xE-06 (2.684)	7.269xE-06 (2.285)*	7.557xE-06 (2.411)*	7.276xE-06 (2.326)*	Excluded
Credit support for the loan (X5)	5.328 (1.069)	7.254 (1.443)	8.542 (1.867)*	11.447 (3.070)*	8.702 (1.885)
Availability of public Information (X6)	60.131 (1.978)*	Excluded	Excluded	Excluded	Excluded
Availability of of private information (X7)	1.980 (0.505)	2.523 (0.632)	Excluded	Excluded	Excluded
Level of local financial market development (X8)	Not Included	Not Included	Not Included	Not Included	0.110 (2.133)*
Number of observations	70	70	70	70	70
R-Square	29.5%	23.3%	22.8%	21.4%	21.4%
Adjusted R -Square	21.6%	17.3%	18.1%	17.9%	16.6%
F-Statistic	3.712	3.892	4.810	5.998	4.344
Prob.> F-Statistics	0.002	0.004	0.002	0.001	0.003
DW statistic	2.489	2.342	2.355	2.459	2.317

* Significance at 95% confidence level

