Contracts, Governance, and Country Risk in Project Finance: Theory and Evidence

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Abstract

Project finance links financial structure to the operational characteristics of the project to optimize the allocations of various project risks. We develop a model in which concession grants and offtake agreements benefit both the public and the private sponsor in the presence of political risk. The public can use these contracts to incentivize the private sponsor to undertake an otherwise unacceptable project while benefiting from delegating the process of financing, building, and operating the project to the private sponsor. For the private sponsor, the government concession grant, while improving financial returns, entails political influence. We develop hypotheses connecting these contract choices to the public-private partnership governance structure of project finance and provide supporting evidence. Our findings suggest that a country's political and financial risks have significant impacts on the contract choice as well as the public-private governance structure in project finance. Projects in greater political risk countries tend to be structured with less government involvement in order to avoid political influence of the local government. Projects with the private finance initiative end up with more government involvement and control in order to protect the public interest.

Keywords: Project Finance; Political Risk; Government Grant; Offtake Agreement;

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1. Introduction

Project finance (PF) is an organizational form with the sole purpose of executing a project with the use of non-recourse debt. The legal separation of the project company segregates project cash flows from the sponsor's other assets, preventing inefficient investment or cross-subsidization of other divisions (Scharfstein and Stein (2000)). Moreover, the various features of the contracts involved in project finance work to minimize various agency costs. For example, in addition to the contract to complete the construction with certain conditions, many other contracts are united in vertical chain from input suppliers to output buyers in order to reduce the various agency problems (Esty (2003)) and to increase the verifiability of the cash flow from the project (Subramanian et al. (2008)). The contracts among multiple parties to project finance also shift a variety of project risks to those who are best able to appraise and manage them (Brealey and Habib (1996), Engel et al. (2010), and Byoun et al. (2013)).

For the analysis of governance issues, PF provides an attractive controlled environment free from various influences that are present in corporate finance. For example, PF is a standalone entity with highly concentrated equity ownership and capital structure comprised almost entirely of a single tranche of bank debt. As a stand-alone entity, PF's structural details are easily observable to outsiders, whereas structural decisions of corporations can be obscured by other corporate activities (Esty (2004)). Moreover, exclusive reliance on external finance with high leverage for PF removes the agency problem related to managerial discretion on the use of free cash flow, which is the main issue in corporate governance (Jensen (1986)). Furthermore, there is no agency problem of asset substitution (Jensen and Meckling (1976)) or underinvestment (Myers (1977)) because there are no assets in place at the time of PF. Thus, PF is free from various agency problems arising from the existence of assets in place, different tranches of debt, and controlling versus non-controlling shareholders. For

these reasons, PF is particularly attractive to examine broader governance issues related to project risk in a relatively controlled environment. The highly concentrated ownership and capital structures for PF provide strong incentives for capital providers to make long-term assessments of project, industry, legal, and political risks associated with PF. The ensuing extensive contracts reflect a unique governance mechanism for PF. Accordingly, we can observe the determinants and impacts of various structural decisions in a cleaner and more transparent way in PF than in a corporate setting (Esty (2004) and Byoun et al. (2013)).

In contrast to the much advancement in understanding how the structures of PF address various project-specific risks, there is little research on whether and how political risk affects the basic contract form and the public-private partnership governance structure of PF. This is an important omission because the impact of political risk on project cash flows is the utmost concern for the feasibility of PF due to its non-recourse nature of financing. Besides, we have little understanding on the interaction between contract forms and governance structure in PF. Because the lender has recourse only to cash flows from the project, mitigating the effect of political risk on project cash flows is a vital aspect of the feasibility of project finance. So the fundamental questions are: Can the public or the private better manage the exposure to political risk? Are the contracts in PF structured to address the country's political risk? Is the public-private joint undertaking of the project a solution to addressing the political risk? Are the contracts and the public-private governance structure systematically interconnected? This paper seeks answers to these questions.

Yescombe (2007) and Engel et al. (2010) argue that the growth and spread of the public-private partnership (PPP) are closely linked to the development of project finance. In addition to the explicit form of the public-private partnership in PF, however, the local government is often involved indirectly in PF. For example, even for a privately controlled project (e.g., with the "build-own-operate" provision), the government (the public) may have an indirect involvement through a concession grant or an offtake agreement. The government often has a keen interest in the quality of the project because it will be transferred to the

public at the end of its life. When a socially desirable project is not financially viable for private investors, the government may intervene with the provision of incentives or subsidies. Even for a seemingly public-controlled project (e.g., with the "build-operate" provision), the private sponsor finances, builds and operates the project. Thus, most PFs are, directly or indirectly, undertaken jointly by the public and the private in various forms.

In this study, we examine the issue of the public-private joint undertaking of the project in the presence of political risk and the agency problem of the private sponsor. In particular, we first analyze the benefits of government concession grants (or supports) and offtake agreements. We then investigate the public-private governance structure of PF in relation to political and financial risk of a country and the use of concession grant and offtake agreement. The public is concerned for an agency problem of which the private sponsor, focusing only on financial return, may not take the long-term operation of the project into consideration in its design and construction plans. When a project generates substantial externalities, which cannot be captured or priced by the project sponsor, social welfare is improved by undertaking such a project with government support. From the private sponsor's standpoint, the PF needs to provide adequate return for its risk. However, political risk and market demand risk reduce incentives for the private sponsor to take on the project with an innovation effort that improves the long-term quality of the project. The local government can thus provide a concession grant to reduce the effect of political risk against the project company or offer an offtake agreement to mitigate price and demand risk of the project output. Thus, both contracts provide financial benefits for the private sponsor. However, a government concession comes with government influence which may increase the financing cost of PF relative to an offtake agreement. An offtake agreement controls the holdup potential associated with the investment in the project—i.e., opportunistic behavior by a key supplier or purchaser from asset-specificity (Williamson (1983, 1985)). Accordingly, the offtake agreement may reduce the effect of the holdup problem on the price of the project output.

A key insight of the model is that there is a Pareto improvement in those contractual

agreements. By bundling finance, construction, and operation together with concession grant and/or offtake agreement, the government can incentivize the sponsor to undertake the project with an innovation effort. These agreements reduce the effect of political and market risk on the private sponsor's return. The private sponsor's innovation effort in turn benefits the public by enhancing the quality of the project output consumed by the public. The resulting outcome is the Pareto improvement. We derive conditions for the minimum government concession and offtake agreement that are sufficient to provide incentives for the private sponsor to undertake the project and make an innovation effort in the design and construction stages of the project.

The main results from the model suggest that greater political risk requires greater government concession grant and offtake agreement in order to attract the private sponsor to undertake the project. The local government may be best able to absorb political risk by increasing the amount of government concession as political risk increases. However, government concession grants and offtake agreements create explicit and implicit costs for the public, and the government can be better off by taking the full control of the project rather than granting excessive concessions. Thus, the feasibility of such grants diminishes with political risk. Moreover, government concessions entail government influence on the project. From the private sponsor's standpoint, therefore, more government influence implies the loss of management control over the project. Future renegotiation costs increase with government involvement which in turn increases the financing cost of the project. Thus, political risk has more negative effects on the the probability of a government concession than on that of an offtake agreement.

Our model also suggests that the government concession is less costly, but the offtake agreement is more costly to the public when the cash flow volatility is higher. This is because the value of offtake agreement which reduces demand/holdup risk by agreeing to purchase/sell a certain portion of the project output at a pre-specified price will be greater when the cash flow volatility is higher. Thus, the cash flow volatility is expected to have a

positive effect on the probability of a government concession grant but a negative effect on the probability of an offtake agreement.

The model also suggests that the public derives additional benefits from the private financing when it faces higher public debt costs due to various restrictions on public debt. Given that a government concession grant incurs more costs to the private sponsor due to the government influence than does an offtake agreement, the model suggests that the likelihood of offering offtake agreement would increase with financial risk, to the extent that the additional public debt cost is a function of the country's financial risk.

Based on the implications of our theoretical analysis, we make empirical inquiries into the motivation for the public-private governance structure in PF. There are four broad types of structures in PF representing different degrees of government control: i) Build-own-operate (BOO); ii) Public-private partnership (PPP); iii) Build-operate (BO); and iv) Build-lease-transfer (BT). For the BOO, the private sponsor assumes all the risks with a full control of the project from design to operation. PPP represents the shared governance of the project between the public and the private sponsor. BO has less private involvement, in which the control of a project is assumed by the public and the private sponsor operates the project until service is delivered and a suitable return has been earned. Finally, BT represents the separation of construction and operation in which the private sponsor assumes only the role of building the project without operating the project. Our basic inquiry is whether the varying governance structures of PF are related to political and financial risk of a country as predicted by the model.

We also examine the roles of government concession and offtake agreement in the governance structure of PF. In particular, the local government is likely to grant government concessions as financial incentives for the private sponsor while demanding more government control in order to protect the public interest. In this regard, we predict that financially motivated projects obtain more government concession to improve the financial returns while giving up the control to the government. To the extend that projects with the private finance

initiative (PFI) are more financially motivated, we expect that PFI is more likely to involve government concession and control.

Using the PF data for the period of 1990-2012, we find that projects in greater political risk and financial risk countries are less likely to obtain government concessions or offtake agreements. The cash flow volatility increases the likelihood of obtaining government concessions, while it decreases the likelihood of offtake agreements. Thus, project sponsors for projects in greater political risk countries appear to keep away from the local government's concession grants in order to avoid its political influence.

We also find that most projects are based on BOO provision and there are few projects with construction and operation separated, suggesting that most projects attract the private sponsor to finance, build and operate the project. This finding is consistent with the argument that the bundling of financing, building, and operating to a private sponsor benefits the public welfare—e.g., by reducing the public debt cost and the life cycle costs of the project during the design and construction phases. We further find that BO and PPP types are associated with lower political risk and more government concessions, whereas the BOO type is associated with greater political risk and more offtake agreements. These findings suggest that private sponsors for projects in high political risk countries prefer less government control and they obtain more offtake agreements but less government concessions in order to avoid government influence while improving financial returns.

Our results further suggest that there are more likely to be government concession grants but less likely to be offtake agreements for privately initiated projects. According to our model, private sponsors improve their financial returns on some projects that include government concession grants, whereas the local government is willing to grant government concessions to bring the private expertise and at the same time to exert some control over the project. After all, both the public and the private benefit from the joint undertaking of the project.

Overall, a country's political risk plays an important role in forming the contract and

governance structure in PF. The contract and governance are structured to provide adequate financial returns on investment, while balancing the control over the project to protect the public interest. Our study is the first to analyze this issue and to provide evidence from a comprehensive database.

Our findings provide new insights on existing theories of corporate governance and risk management. In particular, our results suggest that organizational and contract forms can be important governance mechanism and risk management tools in the presence of agency conflicts and external risks. In contrast, corporate finance research narrowly focuses on managerial discretion and risk management through financial instruments (Esty (2004)). Our results suggest that the bundling of financial, organizational, and operational contracts together can reduce the agency conflicts of involved parties and the effect of external risks on the project performance.

The rest of the paper is organized as follows: In section 2, we develop the model. In section 3, we apply the implications of the model to develop hypotheses on the public-private governance structure of PF. Section 4 describes the data with detailed sample selection procedures. Section 5 provides the characteristics of PF in the sample. Section 6 presents the multivariate results with their implications. Section 7 provides robustness of the results. Section 8 offers summary and concluding remarks.

2. The Model

Here, we present a model to analyze the decision process of project finance (PF) when the private sponsor and the public have diverse risk exposures to uncertainty affecting their respective payoffs. For example, the public faces an agency risk as it delegates the construction of the project to the private sponsor. When the private sponsor builds the project but does not operate the project, the public may face low quality output or higher operating costs because the sponsor will not take into consideration the life cycle costs of operating the project. Bundling of construction and operation of the project may induce the private

sponsor to internalize the long-term operating costs and output quality during the design and construction phases. In that case, however, political risk is a key concern for the private sponsor because it can affect the expected stream of revenues. In addition to traditional expropriation and restrictions on currency conversion, political risk can be government actions called "regulatory takings" (p.46, Engel et al. (2010)) imposed in various forms: e.g, the local government may force the project company to pay higher taxes or to lower prices (e.g., highway tolls), or impose restriction on transferability of cash flows. Consequently, the private sponsor may be unwilling to go ahead by itself. Moreover, if there is uncertainty in the target market to absorb the project's output, it may be best for the sponsor not to proceed. The local government's averse actions and demand uncertainty on the project output impose direct effects on the cash flows from the project which are the main source of repayment of PF. In non-recourse PF, there is little option for a loan recovery if the project fails due to these risks. The model focuses on how to form government concession or offtake agreement in such a way that it reduces the agency risk of the private sponsor and at the same time mitigates the effects of political risk or uncertainty about the output demand.

2.1. Model Setting

The financing decision of the PF is made at the start of the project in order to finance the completion of the project (say $t = 0$). At $t = 1$ the project is completed and generates the output q at $t = 2$. The output quantity is stochastic and unknown before $t = 2$. The total cost of building the project is K due at $t = 0$. An important feature of PF is that the project is transferred to the public at the end of the fee-based operation, after which the public derives utility without any additional cost. We assume that the private sponsor is operating for only one period and then transfers to the government who will then operate for another period.

To keep the model simple, we assume that both the public (government) and the private sponsor are risk-neutral. However, the political risk directly affects the size of the expected cash flow to the private party. The risk-free rate is normalized to zero. Through this

framework, we present a model that motivates our empirical inquiries.

2.2. The Private-Sponsor's Problem

If the private sponsor finance and own the project, it can generate revenues from its output, $q(K)p$, where p is the uncertain price of the output. In addition to the market demand, the price can be affected by a potential holdup—once the project is completed and in operation, the transacting partner has the ability to appropriate some of the returns the private sponsor expects to earn on the investment. For convenience, we set the cash flow resulting from the uncertain price as $q(K)p = c$ and assume that it follows the uniform distribution on the range of $[\underline{c}, \overline{c}]$.

The private sponsor faces political risk affecting the project cash flow. The exposure to the political risk translates directly into a reduction in the expected cash flow by a proportion of $\theta \in [0, 1]$. The sponsor can utilize a new innovation with an additional effort. Specifically, if e is spent for an innovation effort, there will be savings in operating costs for a certain output quality. Otherwise, there will be an additional fixed cost of v during its operation to achieve the same quality. We assume that $e < v$: i.e., the saving in operating costs exceeds the cost of an innovation effort. Thus, the sponsor should always exert effort e when it builds and operates the project in the absence of political risk. However, the innovation is not contractible.[1] This setting allows us to analyze the potential agency problem in the presence of political risk.

Under these assumptions, the expected value of the project finance to the private sponsor is given by the following:

$$V_a = E[c(1-\theta)] - K - e \tag{1}$$

[1]This assumption is consistent with the literature. For example, Martimort and Iossa (2008) and Bentz et al. (2002) develop a model analyzing the issue of bundling the building and operating of a project in the context of private-public partnership. They show that the private-public partnership emerges optimally in incomplete contracting environments.

with effort e, or

$$V_b = E[(c - v)(1 - \theta)] - K \tag{2}$$

without the effort. Thus, the sponsor will undertake the project only if $\max\{V_a, V_b\} > 0$. Note the following difference:

$$V_a - V_b \;\; = \;\; (1 - \theta)v - e. \tag{3}$$

The difference in equation (3) is positive (V_a is preferable) when there is low political risk ($1 - \theta > \frac{e}{v}$), whereas the difference is negative (V_b is preferable) when there is high political risk ($1 - \theta < \frac{e}{v}$). Thus, the political risk affects not only the sponsor's decision on PF but also on its innovation effort.

2.3. The Public's Problem

The government can construct the project by hiring a private company at a cost of K. However, this "build-transfer" transaction or separating the constructor and operator of the project is subject to agency problem and public debt problem. The agency problem arises because the construction company does not exert an "innovation" effort to save the long-term operating costs. Without such an innovation effort, the government or the third party operator may incur the fixed operating cost of v and face a low quality output after the transfer of the project to the public.

The public debt problem is additional cost associated with public debt that arises when the local government is constrained by legal or fiscal limits on the amount of debt that may be issued. For such countries, the private sponsor can be an important source of financing for a project because private lenders may be more comfortable with the project that is separated from the political influence. We denote the public debt cost as $r = r(\gamma)$, a function of the country's financial risk, γ, which reflects its ability to borrow. Thus, without the involvement

of a private sponsor, the public surplus is given by

$$S = E[U(q) + U(q_L) - v] - (1 + r)K, \tag{4}$$

where E is the expectation operator, $U(q)$ is the utility function of the public consumption for the the project output, q, during the privately operated first period, and $U(q_L)$ is the public utility of consuming low quality output, q_L, after the transfer of the project to the public. Thus, the government faces the problem of whether and how to incentivize the private sponsor to finance and build the project with the innovation effort in order to save the operating costs (v) and the public debt costs (r), and to increase the quality of the long-term output (q_L) to high quality q_H.

2.4. Concession Grant

In this section, we show that there is a Pareto efficient arrangement between the private sponsor and the government. In particular, the local government can provide some concessions (e.g., land and tax exempt) and/or government grants (supports) to attract a private sponsor, the presence of which mitigates the impact of political risk on the project cash flow. In other words, the government concession works as the compensation for the local government's adverse actions against the PF, which increases the incentive of the private sponsor to finance the project. However, there is an issue of the credibility of the government concession in its face value. The government can promise any level of concession when it does not intend to keep the promise. Moreover, the concession grant increases the government's influence over cash flows from the project because the local government can now claim its stake in the project. These increase future renegotiation costs among stakeholders. We assume that the future renegotiation costs are reflected in the financing costs of the private sponsor ($\rho > 1$). Specifying ρ as a function of government concession G does not alter our results. Thus, for simplicity, we use constant ρ. Under these assumptions, we show that the

government concession can be chosen optimally to incentivize the private sponsor to exert its innovation effort so that the public can secure the quality of the long-run output and reduce the operating cost.

We denote the government concession by G ($\underline{c} \leq G \leq \bar{c}$) which is a guaranteed amount of the project cash flow for the private sponsor that is free from the effect of the political risk. With concession grant G, the project value to the private sponsor with an innovation effort is given by:

$$V_a(G) = E[c|c \leq G] + E[c(1-\theta) + G\theta|c \geq G] - \rho K - e. \tag{5}$$

The first term in equation (5) is the expected cash flow at time 2 to the sponsor conditional on the cash flow less than the concession amount G. The second term is the expected cash flow conditional on the cash flow greater than the concession amount, which reflects the expected loss of θ from the adverse government action for any amount above the concession grant G because the effect of the government's adverse action is not compensated when the cash flow from the project exceeds the guaranteed concession amount G.

In order for the private sponsor to build the project with an innovation effort, $V_a(G)$ should be positive and exceed the value without the effort, $V_b(G)$: i.e., $V_a(G) > 0$ and $V_a(G) > V_b(G)$. In Appendix A.1, we derive the incentive compatible minimum G as follows:

$$G^* = \bar{c} - \frac{v}{2} - \frac{\sigma}{\theta}\left(1 - \frac{e}{v}\right). \tag{6}$$

Equation (6) suggests the following proposition:

Proposition 1: *The minimum level of government concession to incentivize the private sponsor increases: i) when the political risk is greater ($\frac{dG^*}{d\theta} > 0$); ii) when the cost of innovation effort is greater ($\frac{dG^*}{de} > 0$); and ii) when the cash flow volatility is lower ($\frac{dG^*}{d\sigma} < 0$).*

Thus, the incentive-compatible minimum government concession increases when the political risk is greater, the cost of innovation is greater, and the cash flow volatility is lower.

We also derive in the appendix (A.2), the incentive compatible conditions for the public to agree on the government concession G as follows:

$$S_a(G) = E[U(q) + U(q_H)] - \mu + \frac{\theta}{2\sigma}(G - \overline{c})^2 > 0, \tag{7}$$

where $S_a(G)$ is the public surplus when the government concession G is granted so that the private sponsor exerts the innovation effort and q_H is high quality output after the transfer of the project to the public. Additionally, the public surplus should be greater with the concession than without the private sponsor, that is,

$$S_a(G) - S = E[U(q_H) - U(q_L)] + rK + v - \mu + \frac{\theta}{2\sigma}(G - \overline{c})^2 > 0 \tag{8}$$

Under conditions (7) and (8), the government will choose minimum G to induce the private sponsor to exert the innovation effort.

Proposition 1 and equation (8) imply that there will be a greater Pareto improvement when the minimum required concession is lower. On the other hand, if the minimum concession is too high, the public will be better off without the private sponsor's participation. Thus, the government concession is more likely to be granted when the minimum government concession required to induce the private sponsor is lower. Thus, we summarize the implications of the results as the following testable hypothesis:

H1: *Greater political risk is associated with the lower probability of government concession grants, while greater cash flow volatility is associated with the higher probability of government concession grants.*

Equation (8) also suggests that the public benefits from the saved public debt cost (r). This implies that the incentive of the local government to attract the private sponsor increases

with the country's financial risk. This may also increase the government's incentive to grant government concessions. However, the government concession increases its influence over the project, which in turn increases the financing cost of the private sponsor. Thus, the private sponsor may not participate in the project with government concession.

2.5. Offtake Agreement

With an offtake agreement, a producer and a buyer agree to sell/purchase portions of the producer's future production at pre-determined prices and conditions. Thus, instead of relying on an uncertain market base and potential holdups, the offtake agreement reduces uncertainty as to price and demand, providing certain cash flows when the demand is low. If lenders can see that the project will have a purchaser of its output, it will be easier for the sponsor to obtain financing for the project. Under the agreement, the offtaker makes a commitment to take a certain quantity of output made available from the project and to pay the price set forth in the contract. Thus, the level of payment that seller and buyer are able to negotiate and agree upon is key for addressing the market risk and the holdup problem facing the private sponsor of PF. Both the government or the private party can act as the offtaker in PF, which implies that the government influence through the offtake agreement is much less prominent relative to that through the government concession. The offtake agreement may also reduce the agency problem of the private sponsor by pre-specifying the quality of the project output. We now analyze the role of an offtake agreement in the presence of political risk.

With the fixed amount of offtake, F, we denote the value to the private sponsor with the innovation effort as $V_a(F)$, and without the effort as $V_b(F)$. The incentive compatible conditions for the private sponsor are derived in Appendix A.3 as follows:

$$F \geq \underline{c} + \sqrt{2\sigma\left(\frac{K+e}{1-\theta} - \mu\right)} \tag{9}$$

and

$$V_a(F) - V_b(F) = (1-\theta)v - e \geq 0. \tag{10}$$

The difference in equation (10) does not depend on F, which implies that the offtake agreement does not affect the incentive of the private sponsor to exert the innovation effort. For PF with greater political risk, the sponsor will not exert an innovation effort regardless of an offtake amount. However, the offtake agreement can increase the incentive of the sponsor to undertake an otherwise unacceptable project due to the political risk.

From the condition (9), we obtain the incentive compatible minimum offtake as:

$$F^* = \underline{c} + \sqrt{2\sigma\left(\frac{K+e}{1-\theta} - \mu\right)} \tag{11}$$

F^* represents the minimum offtake agreement to ensures the private sponsor for minimum cash flow above the lower bound of the project cash flow so that the sponsor can have non-negative value from the project. Thus, conditional on $1-\theta > \frac{e}{v}$, we have the following result:

Proposition 2: *The incentive compatible minimum offtake increases: i) when the political risk is greater ($\frac{dF^*}{d\theta} > 0$); ii) when the cost of innovation effort is greater ($\frac{dF^*}{de} > 0$); and iii) when the volatility of the cash flow (σ) is greater ($\frac{dF^*}{d\sigma} > 0$).*

Similar to the incentive compatible condition for the public regarding the government concession in equation (8), we have the following condition regarding the offtake agreement:

$$S_a(F) - S = E[U(q_H) - U(q_L)] + rK + v - (1-\theta)\mu - \frac{(1-\theta)}{2\sigma}(F - \underline{c})^2 \geq 0, \tag{12}$$

Equation (12) suggests that the public surplus is greater when the the offtake amount is close to the minimum cash flow. Furthermore, condition $1-\theta > \frac{e}{v}$ suggests that the public reaps

the benefits of the private sponsor's innovation effort when the political risk is relatively low. Thus, these results imply that an offtake agreement is more likely to be a Pareto improvement for PF with smaller political risk and lower cash flow volatility, which leads to the following hypothesis:

H2: *Greater political and greater cash flow volatility are associated with the less probability of offtake agreements.*

3. Public-Private Partnership Governance

The model in the previous section focuses on the role of government concession and offtake agreement as incentives for the private sponsor. In practice, however, these contracts are also combined with a public-private governance structure. For instance, government concession may give the financial incentive for a private sponsor, but it can also allow the government to exert some control over the project. Our inquiry in this section is whether government concessions and offtake agreements interact with the governance structure in PF. We also examine if varying degrees of government control are related to political and financial risk. An interesting issue here is whether contracts intended for financial incentives for the private sponsor also work as a means of control by the local government. In the following, we develop hypotheses with this view.

From the public's standpoint, the main advantages of the build-own-operate (BOO) provision are the financing arrangement of the private sponsor to eliminate the additional public debt cost and the benefits of the private innovation. However, there is a tradeoff in employing a private sponsor for the project: it yields the control of the project into the private hand. If the local government desires a control over the project in order to protect the public interest, it can do so through government concessions or more directly through the build-operate (BO) provision, which still addresses the agency problem of the private sponsor by bundling together building and operating of the project. If the control of the project is

important, the local government will grant concession in exchange for the shared control of the project and offer fewer offtake agreements. The government concession is less costly when the political risk is low. Also, there is less government surplus when the additional public debt cost (financial risk) is lower. The government concession grant provides added security for the loan payment, which makes PF feasible. Thus, we have the following hypothesis:

H3: *Build-operate (BO) projects are associated with less political risk and less financial risks, more government concession grants, and less likely to include offtake agreements.*

From the private sponsor's perspective, government concession and offtake agreement can be helpful in making the acceptable return from the project. The local government will have more concessions or offtake agreements in order to induce financing through the private sponsor when the financial risk is high. However, government concessions come with the local government's shared control of the project. When the political risk is high, the private sponsor will prefer the sole control of the project with minimum government influence. Thus, the private sponsor will prefer offtake agreement as an incentive to undertake the project to government concession which entails added government control. Thus, we propose the following hypothesis:

H4: *Build-own-operate (BOO) projects are associated with greater political risk and financial risk, less government concession grants, and more offtake agreements.*

The public-private partnership (PPP) is between BO and BOO in terms of the local government involvement. PPP can induce more political influence than BOO because the government can claim the right to terminate or step into a project and take it over from the private sponsor. For example, the political risk resulting from frequent changes in government can lead to added risk because an incoming government may have a different perception or opinion of PPP than the outgoing government had. The survey study of Sachs et al. (2007) suggests that the costs of PPP increase with political risk. Accordingly, the PPP can be

more costly for the private sponsor for projects in greater political risk countries. Thus, from the private sponsor's perspective, PPP is more viable in countries with low political risk to obtain greater government concession. On the other hand, countries with high financial risk have more incentives to prefer PPP with most government concession in order to attract PF. PPP may secure the sales of the project output, reducing the demand risk, because the local government will act as a purchaser of the project output (Valila (2005) and Debande (2002)), which requires less offtake agreements. Thus, we propose the following hypothesis:

H5: *Public-private partnership (PPP) projects are associated with less political risk, greater financial risk, more government concession grants, and less offtake agreements.*

Finally, we examine how the private finance initiative (PFI) affects contract and governance choices. PFI is a PF method that uses private finance capacity. If a private sponsor initiate PF, the local government may be willing to grant concessions in order to have shared control over the project. The private sponsor, on the other hand, may be willing to give up the control over the project in exchange for government concession to improve the return on its investment. In fact, the private finance initiator may have the control over project cash flows as a condition for financing the project, while the government has control over other aspects of the project such as the management and distribution of the project output.[2] It is even possible that the government is the contractual owner of the project, while the private initiator has the full control over project cash flows. Thus, we propose the following hypothesis:

H6: *The private finance initiative (PFI) has positive effects on the likelihood of government concession and the government control of the project.*

[2]Consistent with this argument, Byoun et al. (2013) suggest that lenders in PF is willing to lend more when they have a greater control over cash flows. Aghion and Bolton (1992) and Dewatripont and Tirole (1994) also show that banks are willing to provide more funds when they have greater control over the cash flows.

4. Data and Proxy Variables

Our primary data on project finance come from the Project Finance database of the Thomson Financial Securities Data Corporation (SDC) for the period 1990-2012. The Project Finance database is a separate and comprehensive database included as part of the SDC Global Public Finance data. We follow Byoun et al. (2013) for the process of cleaning up the data. During the sample period, there were 18,452 project announcements in 151 nations. We exclude projects classified by the SDC as "Non-Classic" which involve syndicated banks but are not financed with limited or non-recourse debt. The majority of excluded observations (11,963) are in this category. We also delete acquisitions and privatizations (552 observations). The SDC Project Finance database tracks projects from their preliminary stages, and some project proposals in the database do not materialize into project companies. Thus, we exclude 29 uninitiated projects (classified as "Canceled," "Inactive," or "Rumored" by the SDC). Our initial sample consists of 5,908 projects, which is larger than any of the samples used in previous studies. Each observation represents a unique project (as opposed to panel data) in various stages.

Fig. 2 shows the yearly total amount of project costs and the number of projects over the sample period. In 1990, the total costs for 23 projects in the sample amount to $24 billion. Both the number and the dollar amount of projects have increased significantly over time. The total number of projects hits the highest point, 493 projects, in 2008, after which it has been reduced to about 333 projects in 2012. The total project costs reach the highest to $195 billion in 2007.

Fig. 2

We acquire political risk and financial risk ratings from the International Country Risk Guide (ICRG). The ICRG political risk rating reflects various risk components such as gov-

ernment stability, socioeconomic conditions, and internal/external conflicts, etc. The ICRG financial risk rating reflects a country's ability to finance its official, commercial, and debt obligations. The financial risk components include foreign debt as a percentage of GDP, international trade balance, and international liquidity. A yearly score is defined as the average of monthly scores for a given year. As alternative measures to the ICRG political and financial risk ratings, we also consider political risk and banking sector risk scores from the Economist Intelligence Unit (EIU). We also use the Moody's sovereign credit rating and the measure of the strength of creditor rights developed by Djankov and Shleifer (2007) and La Porta et al. (1998). We identify a country by the project nation code provided by the SDC.

In order to measure the expected cash flow (CF) and cash flow volatility (VOL), we follow Byoun et al. (2013). Using the Global Compustat database, we first estimate the expected cash flow and cash flow volatility based on firms in the same country and industry (according to the 2-digit standard industry classification (SIC) code) as those of project companies. We require matching firms' asset value to be greater than \$3 million. We also drop firms with cash flows in the 1st and 99th percentiles. We first obtain time series of yearly cash flows (the industry median or average of income before interest, taxes, and depreciation and amortization (EBITDA) divided by total assets) over 7 years centered around the project announcement date from $t-3$ to $t+3$, with t being the announcement year.[3] We then measure the expected cash flow and cash flow volatility by the mean and the standard deviation of the seven-year time series of country-industry matched cash flows.

[3]We try different estimation windows from 5 to 10 years and industry average instead of industry median. The results are similar.

5. Project Characteristics

We first examine the distribution of governance types along with country risk scores, offtake agreements, and government concession grants in Table I. For the total of 5,908 non-recourse projects, about 84% are "build-own-operate (BOO)" projects which do not directly involve the local government, suggesting that the majority of projects rely on private governance. About 7% of sample projects are with "build-operate (BO)" provision in which the local government has the full control but the private sponsor builds and operates the project. The public-private partnership (PPP) consists of about 8% of sample projects in which the public and the private sponsor jointly control the project. Finally, "build-lease-transfer (BT)" is comprised of a very small portion (1.37%) of sample projects, suggesting that construction and operations are rarely separated in PF. These findings are consistent with the argument that PF is particularly attractive when the private sector designs, builds and operates the project because the private sponsor then has an incentive to internalize life cycle costs of operating the project during the design and construction phases.

Table 1

The ICRG political risk rating ranges from 0 to 100 and financial risk from 0 to 50, higher numbers representing lower risks. For ease of interpretation, we define political and financial risks as 100 minus the ICRC political and financial risk ratings, respectively. BO and PPP types are associated with lower political risk and more government concessions, whereas BT and BOO types are associated with greater political risk and more offtake agreements. About 21 percent of BOO projects also include government concessions. These findings suggest that projects in greater political risk countries are associate with governance types involving less government control and less government concessions, consistent with the prediction we make in the previous section. Overall, about 19% of sample projects include

at least one type of offtake agreements, while about 29% of the projects are granted at least one type of government concession. The findings in Table 1 suggest that projects often involve indirect government participation through concession grant or offtake agreement.

Table 2

We also report the types of government concessions and offtake agreements in Table 2. As shown in Panel A, there are 1,776 government concessions. Some projects are associated with more than one type of concessions. About a half of the government concessions are in the form of equity participation. It is also noticeable that most concessions are financial benefits. The equity participation of a local government does not necessarily imply the public control of the project. Given the non-recourse nature of PF, the local government often provides the financial buffer for PF through its equity participation. We examine the issue of the potential endogenous contract choice in the later section. Panel B shows that the total number of offtake agreements is 1,550 and the majority (about 50%) are power purchase agreements. Some projects are also associated with more than one type of offtake agreements.

Table 3

Table 3 provides project distribution across Fama and French (FF) 48 industries plus an unspecified industry. Before we classify each project into FF industries, we had to correct some of standard industry classification (SIC) codes provided by the SDC. For example, many projects are associated with SIC 499A. The majority are power-related projects. However, some are in gas and oil industries and others are in transportation, communications, or water services industries. Thus, we make the appropriate adjustment according to each project's industry description. Out of 5,908 projects in the sample, there are 2,349 (or 39.76%) projects in utilities, of which 95.53% are on the basis of BOO. The projects in

utilities also have the largest percentage (34.31%) of offtake agreements. The construction, petroleum and natural gas industry, and the transportation industry are also associated with relatively large number of projects. Projects in entertainment, healthcare, electrical equipment, and personal services industries are associated with more government concession grants as well as more PPP relative to other industries. The average total project cost is the highest in the aircraft industry ($1,385.83 million) followed by those of the petroleum and natural gas industry, the restaurants, hotels and motels industry, and the communication industry, all exceeding $800 million.[4]

Table 4

Table 4 shows that the number of projects in the sample has been increasing but the average size of the projects has been decreasing over time. The fraction of BO type projects are noticeably lower after 2003. Government concession grants and offtake agreements tend to be declining over time. The fractions of PPP projects are higher in recent years than in earlier years.

6. Multivariate Results

6.1. Government concession and Offtake Agreement

In order to test whether project companies' government concession and offtake agreement are structured as predicted by our model, we estimate the following regression:

$$Y_i = \alpha + \beta_2 PRisk_i + \beta_3 FRisk_i + \beta_4 Vol_i + \beta_5 PFI_i + \gamma X_i + \varepsilon_i, \tag{13}$$

[4]We adjust the project cost to the 2005 constant dollars using the GDP deflator.

where Y_i is the dependent variable: a dummy variable for government concession grants ($CONG$); a dummy variable for offtake agreements ($OFFT$); or the number of offtakers ($NOFFT$). $PRisk_i$ is political risk, $FRisk_i$ financial risk, and Vol_i country-industry matched cash flow volatility for project i. PFI_i is a dummy variable for the private finance initiative.

We also include control variables that may affect the concession/offtake agreement decisions. Multilateral agency involvement can lower the effect of an adverse government action. For example, the World Bank, International Finance Corporation, and regional development banks often act as lenders or co-financers to projects in developing counties. They also provide political risk insurance to protect a project sponsor against the risks of capital controls, expropriation, or other adverse and unexpected political events. The expected cash flow (country-industry matched cash flow) may affect the decisions. Additional control variables are project size, leverage ratio, and the number of sponsors that may be related to the contract choice in project finance.

Table 5

Table 5 shows the summary statistics for the variables used in regressions. The average number of offtakers is 0.26 and the maximum is 8. In panel B, we also show the frequency distribution for the number of offtakers. It is highly skewed to the right. Because of this reason, we run Poisson regressions when we use the number of offtakers as the dependent variable. There is much more variation in political risk ($PRisk$) than in financial risk ($FRisk$). Because country and industry matched cash flows are not available for some observations, we are able to match the expected cash flow (CF) and cash flow volatility (VOL) for 3,735 projects. Project cost is total project costs adjusted for inflation. We use the logarithm of total project costs as a measure of project size ($SIZE$). Project size can affect the contract type because a larger project attracts more attention from the public. The number

of private sponsors for a project ($SPON$) is on average 2.03, and the maximum is 16. A sponsor originates and structures the project company. There is no sponsor specified for 285 projects. Excluding these observations does not affect our results. The maximum and minimum leverage ratios (LEV) are 100% and 0.07%, respectively, and the mean value is 84%, consistent with high leverage of projects reported in Esty (2002, 2005), Esty and Megginson (2003) and Byoun et al. (2013). $MULTIA$ is a dummy variable indicating whether project finance involves multilateral agencies. There are 368 projects (6.23%) involving multilateral agencies. Lastly, projects with the private finance initiative (PFI) represent 9.06% or 535.

Table 6

Table 6 reports the estimation results of the probit regressions for the presence of government concession and offtake agreement, and the Poisson regressions for the number of offtakers. Because of the unavailability of additional variables for some observations, the sample size is reduced to 3,590. Since the decision on PF can be affected by unobserved industry characteristics, we estimate each model with and without industry effects based on FF 48 industry classification. In Panel A, the dependent variable is one for projects with government concessions and zero otherwise. The coefficient estimates on political risk ($PRisk$) and financial risk ($FRisk$) are all negative and highly significant, suggesting that projects in greater political and financial risk countries obtain less government concessions. The coefficients on cash flow volatility (VOL) are all positive and significant. Thus, the industry cash flow volatility increases the likelihood of obtaining government concessions. The coefficient estimates on PFI are all positive and significant, which finding suggests that the local government is more likely to grant concessions when the project is initiated by a private sponsor.

The coefficients on leverage ratio (LEV) are all negative and significant, suggesting that projects with high leverage tend to receive less government concession grants. Given the

non-recourse nature of PF, project sponsors may seek less government concession grants when they use more debt. This is also consistent with the findings in Byoun et al. (2013) that project sponsors use high leverage to mitigate their exposures to project risk. The coefficient estimates on the number of private sponsors ($SPON$) are all positive and highly significant. This result suggests that PF obtains more government concessions when there are multiple sponsors for the project. The size of the project ($SIZE$) and the presence of a multilateral agency ($MULTIA$) in PF also have significant and positive effects on the likelihood of obtaining government support.

In Panel B, the dependent variable is one for projects with offtake agreements and zero otherwise. The coefficient estimates on political risk ($PRisk$) are all negative and significant, whereas those on financial risk ($FRisk$) are insignificant without the industry effects but negative and significant when the industry effects are included. Thus, we have evidence for the negative relation between offtake agreement and political and financial risk. The coefficient estimate on cash flow volatility (VOL) is negative and significant when we do not include the industry effects. But it becomes positive and significant when the industry effects are included. Thus, evidence on the effect of cash flow volatility appears mixed. The coefficient estimates on PFI are all negative and significant, which suggests that privately initiated projects are less likely to involve offtake agreements.

When we use the number of offtakers in Panel C, Poisson regression results show that the coefficient estimates on political risk and financial risk are all negative and significant, whereas the coefficient estimates on cash flow volatility are negative and significant without the industry effects. The coefficient estimates on PFI are all negative and significant. Thus, these findings suggest that projects are likely to involve more offtakers when the political risk and financial risk are smaller and the cash flow volatility is lower. The PFI requires less offtakers. In both Panels B and C, the number of sponsors and the size of the project have negative effects on the inclusion of offtake agreements in PF.

Overall, we have evidence for hypothesis H1 that higher political and financial risks affect

negatively the likelihood of government concession, whereas cash flow volatility affects positively its likelihood. In addition, consistent with hypothesis H2, political and financial risks also have negative effects on the likelihood of offtake agreement, whereas cash flow volatility tends to have negative effects on its likelihood. There is more likely to be government concession but less likely to be an offtake agreement for privately initiated projects. Private sponsors may find the opportunity to improve their financial returns on some projects by obtaining government concession grants. They also appear to initiate projects with the prospect of sufficient demand on the project output, which secures financial return on their investment. On the other hand, the local government appears to be willing to grant government concessions to attract the private sponsor and at the same time to exert some control over the project in order to protect the public interest. These findings are consistent with the implications of the model; both the public and the private benefits from the joint undertaking of the project.

6.2. The Public-Private Governance Structure

In order to understand the relations between the public-private governance structure and contract types and country risk in PF, we estimate the following regression:

$$Z_i = \alpha + \beta_2 PRisk_i + \beta_3 FRisk_i + \beta_4 Vol_i + \beta_5 PFI_i + \beta_6 CONG_i + \beta_7 NOFFT_i + \gamma X_i + \varepsilon_i, \quad (14)$$

where Z_i is the dependent variable representing the governance structure in PF. $CONG$ is the dummy variable for the presence of government concession and $NOFFT$ is the number of offtakers in the project.[5] In addition to the control variables used in equation (13), we also include a dummy variable for French civil law countries ($French$). La Porta et al. (1999) classify nations' legal origins into four families: English common law; French civil law; Ger-

[5]When we use the dummy variable for offtake agreement ($OFFT$) instead of $NOFFT$, the results are similar.

man civil law; and Scandinavian civil law. According to La Porta et al. (1997, 1998), in terms of investor legal protection, common law countries are in general the strongest, and the French civil law countries are the weakest among the four legal families. Even though we include a dummy variable only for French civil law for the main results, the conclusions are similar when we include additional dummy variables for other legal families. Table 5 shows that about 47% (2800 projects) are in countries of the French civil law origin.

Table 7

Table 7 reports the estimation results of the probit regressions for each governance type. In models (1) and (2), the dependent variable is equal to one for build-own-operate (BOO) and zero otherwise—representing the choice between the private control and the non-private control. The coefficient estimates on political risk are all positive and significant, whereas the coefficient estimates on financial risk are all insignificant. These results suggest that projects are more likely to be privately owned when the political risk is greater. The coefficient estimates on PFI are all negative and highly significant, suggesting that privately initiated projects end up with less privately controlled projects. For the private sponsor, there seems to be a tradeoff between shared control and financial return in government concession grants. The private finance initiator may increase the security of cash flows from the project by making the public the residual claimant through financial participation. On the other hand, the government gains control over the project by providing financial incentives to the private finance initiator. The coefficient estimates on government concession grants are negative and significant, whereas those on offtake agreements are positive and significant. These results suggest that government concessions entail less private control while offtakers are connected to more privately controlled projects. These findings are consistent with H4; private ownership reduces government influence in high political risk countries and the local government concessions increase the government control.

In models (3) and (4), the dependent variable is equal to one for build-operate (BO) and zero for BOO—representing the choice between the public control and the private control. The coefficient estimates on political risk and financial risk are all negative and significant, which finding suggests that the projects are more publicly controlled when both political and financial risks are smaller. The coefficient estimates on government concession grants are positive and significant, whereas those on offtake agreements are negative but significant only when the industry effects are not present. These results suggest that the local government is more likely to grant concessions and less likely to offer offtake agreements for BO projects. Thus, these findings are consistent with H3; the government concession is less costly when the political risk is low and the private control of the project is less beneficial for the public when the additional public debt cost (financial risk) is lower. The coefficient estimates on PFI are all positive and significant, suggesting that the privately initiated projects are more likely to run under the government control.

In models (5) and (6), the dependent variable is equal to one for PPP and zero for BOO—representing the choice between the public-private joint control and the private control. The coefficient estimates on political risk are all negative and significant, whereas those on financial risk are all positive and significant. These results suggest that projects are more likely to be based on the PPP when political risk is smaller and financial risk is greater. The coefficient estimates on government concession grants are all positive and significant, whereas those on offtake agreements are all negative and significant. Thus, consistent with H5, PPP is more viable in countries with low political risk to obtain government concessions and countries with high financial risk have more incentives to prefer the PPP with most government concessions in order to attract PF. The coefficient estimates on PFI are negative but significant only when the industry effects are present, suggesting that the privately initiated projects end up with more government control.

In models (7) and (8), the dependent variable is equal to one for PPP and zero for BO—representing the choice between the public-private joint control and the public control. The

coefficient estimates on political risk are not significant, whereas those on financial risk are all positive and significant. Also, the coefficient estimates on government concession grants are all positive and significant. Thus, PPP is more viable than BO in countries with greater financial risk because PPP takes advantage of the private finance capacity. Also, the greater government concession leads to the shared control of the project through the PPP. The coefficient estimates on PFI are all negative and significant, which suggests that privately initiated projects end up with more government control.

The findings in Table 7 suggest that political risk has positive (negative) effect on the likelihood of private (public) control of the project, which is consistent with the hypothesis (H1) that project sponsors in a greater political-risk country tries to avoid the local government's influence. Financial risk and government concessions lead to more public-private joint control of the project, which is consistent with hypothesis H5. Finally, PFI leads to less private control or more government control, which is consistent with hypothesis H6.

7. Robustness

7.1. Endogenous Selection Model

One of the issues in previous regressions is that the decision on governance type is likely to be endogenous with government concession grant. To address this issue, we use the methodology developed by Miranda and Rabe-Hesketh (2006) for an endogenous choice. In particular, we formulate a system of equations for two choices, in which we assume that the contract choice between the private control ($BOO = 1$) and the joint or public control ($BOO = 0$) depends on the endogenous dummy variable $CONG$ as well as other explanatory variables as in equation (14). The endogenous dummy variable $CONG$ also depends on a vector of explanatory variables as in equation (13).

Table 8

We report the estimation results in Table 8. The correlation between the two error terms (not reported in the table) is insignificant, which justifies the assumption of exogenous government concession choice in early estimations. Moreover, the signs and significance of the coefficient estimates do not change much from those reported in Table 7. We also try the different combinations of public-private governance choices as in Table 7 with the endogenous government concession grant, but the results are similar (not reported). These results show that the potential endogeneity of government concession grant in the public-private governance choice does not cause serious biases in our estimation results.

7.2. Time Effects

Our results show that there are significant industry effects: e.g., the signs of coefficient estimates on cash flow volatility change in the presence of industry fixed effects. It is also quite possible that our estimates are affected by omitted time fixed effects. In order to examine this potential bias, we reestimate our previous regressions by including year fixed effects as well as industry fixed effects. The results are reported in Table 9. Compared to the results in Tables 6 and 7, the coefficient estimates on political ($PRisk$) and financial ($FRisk$) risks for some regression become insignificant, while coefficient estimates on private finance initiative (PFI), the number of sponsors ($SPON$), and concession grants ($CONG$) all remain intact.

Table 9

The weaker results with time fixed effects may be due to relatively time-invariant political and financial risk scores. Accordingly, instead of including time effects, we examine our results for varying subperiods. The results are qualitatively similar in most cases. However, there are some subperiods yielding somewhat different results. As an illustration,

we report separate results for pre- and post-financial crisis periods. The results in Panel A of Table 10 for the pre-crisis period are similar to those reported in Tables 6 and 7. For the post-crisis period in Panel B, however, the overall results for ownership structure regressions are much weaker. Our investigation reveals that almost all non-PPP projects involves multilateral agencies. As a result, control variable $MULTIA$ is dropped in the PPP regressions. It appears that given the increased uncertainty caused by the crisis, the financial support from multilateral agencies become important consideration for the initiation of PF after the crisis.

Table 10

7.3. Ordered Probit Regressions

Given various combinations of contracts and governance structures in PF, we also estimate ordered probit models where the ordinal dependent variables are defined according to the degree of government involvement. For the contract type, the dependent variable ($Contract$) is: 0 if $CONG = 0$ and $OFFT = 0$; 1 if $CONG = 0$ and $OFFT = 1$; 2 if $CONG = 1$ and $OFFT = 0$; and 3 if $CONG = 1$ and $OFFT = 1$. Similarly, for the public-private governance structure, the dependent variable ($Control$) is: 0 if $BT = 1$; 1 if $BOO = 1$; 2 if $PPP = 1$; and 3 if $BO = 1$. Thus, the ordinal dependent variables (0 to 3) represent the degree of government involvement/control from low to high.

Table 11

The results are reported in Table 11. For the contract type (models (1) and (2)), the coefficient estimates on political risk and financial risk are all negative and significant, whereas those on PFI are all positive and significant and those on the cash flow volatility are positive but significant only with industry effects. These results lead to the same conclusion as in the previous section; political risk and financial risk lead to less government involvement and

privately initiated projects bring more government involvement. Other variables also carry the same sign and significance as in the previous regressions. For the governance type (models (3) and (4)), we also include *Contract* and *French* as additional explanatory variables. The coefficient estimates on political risk are all negative and significant, while those on the *PFI* and *Contract* are all positive and significant. These results are also consistent with earlier findings in that greater political risk leads to less government control and privately initiated projects and government concessions lead to more government control.

7.4. Other Specifications

Even though we do not report for brevity, we also check for robustness of our results for various alternative specifications in addition to those mentioned already. First, we estimate logit models instead of probit models. The results are similar. Second, we use alternative measure of a country's political and financial risks. Specifically, we use political risk and banking sector risk scores from the Economist Intelligence Unit (EIU) as alternative measures of political risk and financial risk, respectively. We also use the Moody's sovereign credit rating and the measure of the strength of creditor rights developed by Djankov and Shleifer (2007) and La Porta et al. (1998) as alternative measures of financial risk. Even though the significance of some variables change in the presence of these alternative proxies, our conclusions remain the same. Finally, we consider different subsets of samples by some project characteristics such as completed versus under construction. We find no material differences.

8. Conclusion

We investigate the contract and governance structures in project finance (PF) and bring new insights into the literature. In particular, we develop a model to analyze the contract choices involving government concession and offtake agreement which are two prominent features in PF. We argue that there is enhanced welfare in engaging the private sector

to implement a project. An interesting insight is that the contract choice can mitigate political risk facing the private as well as the agency problem facing the the public. Government concession and offtake agreement imply varying degrees of financial security and government influence and are traded off to obtain a better outcome from a social welfare perspective.

From the empirical examination of the cross-sectional determinants of contract and governance structures, we document new evidence on project companies' use of government concession grants and offtake agreements as well as their governance structures. Political risk has negative effect on the likelihood of obtaining government concession or offtake agreement because they increase the government influence. Furthermore, financially motivated projects (e.g., those with the private finance initiative) are more likely to involve government concessions by turning the control of the project over to the public in exchange for financial security. On the other hand, the local government may be willing to grant concessions in exchange for the control over the project. In obtaining government concession grants or choosing the private-public governance structure, project companies appear to trade off between financial security and government control. As the first attempt to understand the contract and governance structures of PF in relation to external risks, our study provides a useful framework for further discussions on the issue.

The structural attributes of PF provide an attractive controlled environment to examine broader governance issues related to project risks. In particular, PF allows us to observe the determinants and impacts of various structural decisions in a cleaner and more transparent way than in a corporate setting. Our findings provide new insights on existing theories of corporate governance and risk management: the bundling of financial, organizational, and operational structures together can be an important governance mechanism in order to address the agency conflicts of stake holders and to mitigate the adverse effects of external risks.

Appendix

A.1. Derivation of Condition (6)

We can rewrite $V_a(G)$ as follows:

$$\begin{aligned} V_a(G) &= \frac{1}{\sigma}\int_{\underline{c}}^{G} c dc + \frac{(1-\theta)}{\sigma}\int_{G}^{\overline{c}} c dc + \frac{\theta}{\sigma}\int_{G}^{\overline{c}} G dc - \rho K - e \\ &= \frac{1}{2\sigma}(G^2 - \underline{c}^2) + \frac{(1-\theta)}{2\sigma}(\overline{c}^2 - G^2) + \frac{\theta G}{\sigma}(\overline{c} - G) - \rho K - e \\ &= \frac{1}{2\sigma}\left\{\overline{c}^2 - \underline{c}^2\right\} - \frac{\theta}{2\sigma}(G - \overline{c})^2 - \rho K - e = \mu - \frac{\theta}{2\sigma}(G - \overline{c})^2 - \rho K - e \end{aligned} \quad (15)$$

where $\sigma = \overline{c} - \underline{c}$ and $\mu = \frac{\overline{c}+\underline{c}}{2}$. Equation (15) suggests that $V_a(G) > 0$ for

$$\overline{c} - \sqrt{\frac{2\sigma}{\theta}(\mu - \rho K - e)} < G < \overline{c} + \sqrt{\frac{2\sigma}{\theta}(\mu - \rho K - e)} \quad (16)$$

Now the payoff to the private sponsor without the innovation effort is given by

$$\begin{aligned} V_b(G) &= E[c - v | c - v \leq G] + E[(c-v)(1-\theta) + G\theta | c - v \geq G] - \rho K \\ &= \frac{1}{\sigma}\int_{\underline{c}}^{G+v}(c-v)dc + \frac{(1-\theta)}{\sigma}\int_{G+v}^{\overline{c}}(c-v)dc + \frac{\theta}{\sigma}\int_{G+v}^{\overline{c}} G dc - \rho K \\ &= \frac{1}{2\sigma}\left\{G^2 - (\underline{c} - v)^2\right\} + \frac{(1-\theta)}{2\sigma}\left\{(\overline{c} - v)^2 - G^2\right\} + \frac{\theta G}{\sigma}(\overline{c} - G - v) - \rho K \\ &= \frac{1}{2\sigma}\left\{\overline{c}^2 - 2v(\overline{c} - \underline{c}) - \underline{c}^2\right\} - \frac{\theta}{2\sigma}\left\{G - (\overline{c} - v)\right\}^2 - \rho K \\ &= \mu - v - \frac{\theta}{2\sigma}\left\{G - (\overline{c} - v)\right\}^2 - \rho K \end{aligned} \quad (17)$$

Equation (17) suggests that $V_b(G) > 0$ for

$$\overline{c} - v - \sqrt{\frac{2\sigma}{\theta}(\mu - v - \rho K)} < G < \overline{c} - v + \sqrt{\frac{2\sigma}{\theta}(\mu - v - \rho K)} \quad (18)$$

For the government concession to incentivize the sponsor to exert the best effort, the following condition should also be satisfied:

$$V_a(G) - V_b(G) = v + \frac{\theta}{2\sigma}\left\{v^2 + 2v(G - \overline{c})\right\} - e \geq 0 \tag{19}$$

Equations (15) and (17) suggest that $V_a(G)$ is maximized at $G = \overline{c}$, while $V_b(G)$ is maximized at $G = \overline{c} - v$. The maximum value is also greater for $V_a(\overline{c})$ than for $V_b(\overline{c} - v)$. Based on these observations, we sketch the sponsor's payoffs with and without the innovation effort in Fig. 1. In order to incentivize the private sponsor to exert the innovation effort, the public should choose the level of concession grant above G^* in the figure. Thus, we obtain the incentive compatible minimum G as in equation (6).

Fig. 1

A.2. Derivation of Condition (8)

The condition for the public to agree on the government concession is that the increased public utility with the private innovation effort under the build-operate provision is greater than the cost of the government concession. In order to derive this condition, we can obtain the public surplus with the government concession G as follows:

$$\begin{aligned}
S_a(G) &= E[U(q) + U(q_H)] - E[c|c \leq G] - E[c(1-\theta) + G\theta|c \geq G], \\
&= E[U(q) + U(q_H)] - \frac{1}{\sigma}\int_{\underline{c}}^{G} c dc - \frac{(1-\theta)}{\sigma}\int_{G}^{\overline{c}} c dc - \frac{\theta}{\rho\sigma}\int_{G}^{\overline{c}} G dc \\
&= E[U(q) + U(q_H)] - \frac{1}{2\sigma}(G^2 - \underline{c}^2) - \frac{(1-\theta)}{2\sigma}(\overline{c}^2 - G^2) + \frac{\theta G}{\sigma}(\overline{c} - G) \\
&= E[U(q) + U(q_H)] - \frac{1}{2\sigma}\left\{\overline{c}^2 - \underline{c}^2\right\} + \frac{\theta}{2\sigma}(G - \overline{c})^2 \\
&= E[U(q) + U(q_H)] - \mu + \frac{\theta}{2\sigma}(G - \overline{c})^2 > 0
\end{aligned} \tag{20}$$

which is condition (20). The condition (8) follows from equations (20) and (4).

A.3. Derivation of Conditions (9) and (10)

The value to the private sponsor with the innovation effort is given by:

$$\begin{aligned} V_a(F) &= E[F(1-\theta)|c \le F] + E[c(1-\theta)|c > F] - K - e. \\ &= \frac{(1-\theta)}{\sigma}\int_{\underline{c}}^{F} F dc + \frac{(1-\theta)}{\sigma}\int_{F}^{\overline{c}} c dc - K - e \\ &= \frac{(1-\theta)}{\sigma}(F^2 - \underline{c}F) + \frac{(1-\theta)}{2\sigma}(\overline{c}^2 - F^2) - K - e \\ &= \frac{(1-\theta)}{2\sigma}(F^2 - 2\underline{c}F + \overline{c}^2) - K - e \\ &= \frac{(1-\theta)}{2\sigma}(F-\underline{c})^2 + \frac{(1-\theta)}{2\sigma}(\overline{c}^2 - \underline{c})^2 - K - e \\ &= \frac{(1-\theta)}{2\sigma}(F-\underline{c})^2 + \mu(1-\theta) - K - e \end{aligned} \tag{21}$$

Equation (21) suggests that $V_a(F) > 0$ for condition (9).

The payoff without effort is given by

$$\begin{aligned} V_b(F) &= E[F - v|c - v \le F] + E[(c-v)(1-\theta)|c - v \ge F] - K \\ &= \frac{(1-\theta)}{\sigma}\int_{\underline{c}}^{F}(F-v)dc + \frac{(1-\theta)}{\sigma}\int_{F}^{\overline{c}}(c-v)dc - K \\ &= \frac{(1-\theta)}{\sigma}(F^2 - \underline{c}F - vF + \underline{c}v) + \frac{(1-\theta)}{2\sigma}(\overline{c}^2 - 2\overline{c}v - F^2 + 2vF) - K \\ &= \frac{(1-\theta)}{2\sigma}\left\{F^2 - 2\underline{c}F + \overline{c}^2 - 2(\overline{c}-\underline{c})v\right\} - K \\ &= \frac{(1-\theta)}{2\sigma}(F-\underline{c})^2 + \frac{(1-\theta)}{2\sigma}(\overline{c}^2 - \underline{c})^2 - \rho v(1-\theta) - K \\ &= \frac{(1-\theta)}{2\sigma}(F-\underline{c})^2 + (\mu - v)(1-\theta) - K \end{aligned} \tag{22}$$

From equations (21) and (22), we have condition (10).

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Figure 1: Payoffs to Private Sponsor with ($V_a(G)$) and without ($V_b(G)$) Innovation Effort and the Minimum Government Concession

The figure sketches the private sponsor's payoffs with ($V_a(G)$) and without ($V_a(G)$) the innovation effort as functions of the government concession G. G^* is the minimum level of government concession that incentivizes the private sponsor to undertake the project and exert the innovation effort.

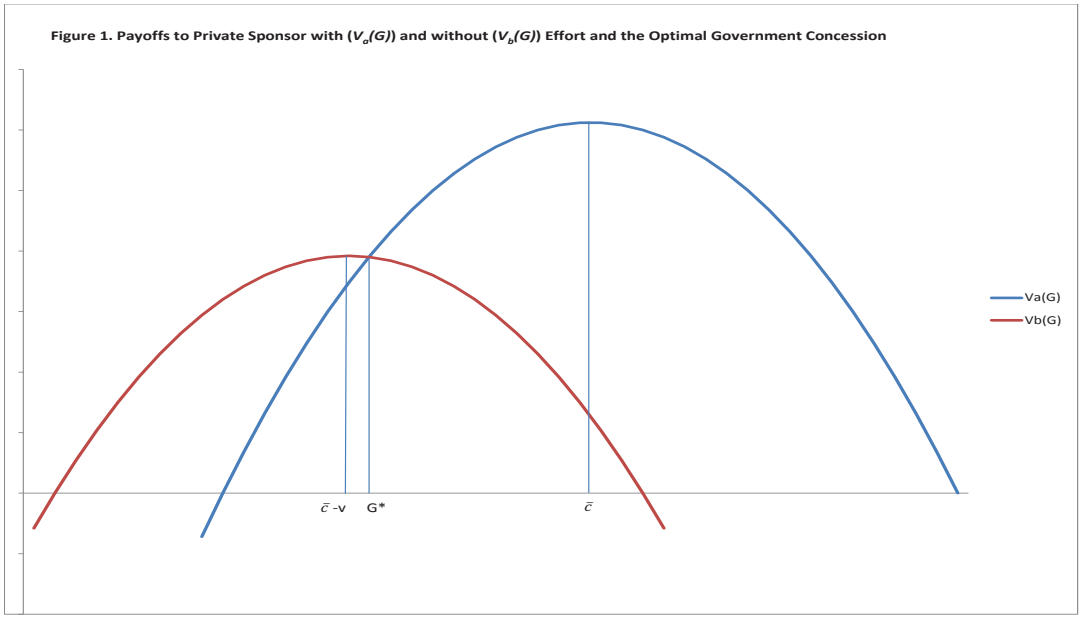

Figure 2: Yearly Total Project Costs and Number of Projects

The figure shows the total project costs (line) and the number of projects (bar) in each year over the 1990-2012 period. The project costs are in 2005 U.S. dollar and in the unit of billions.

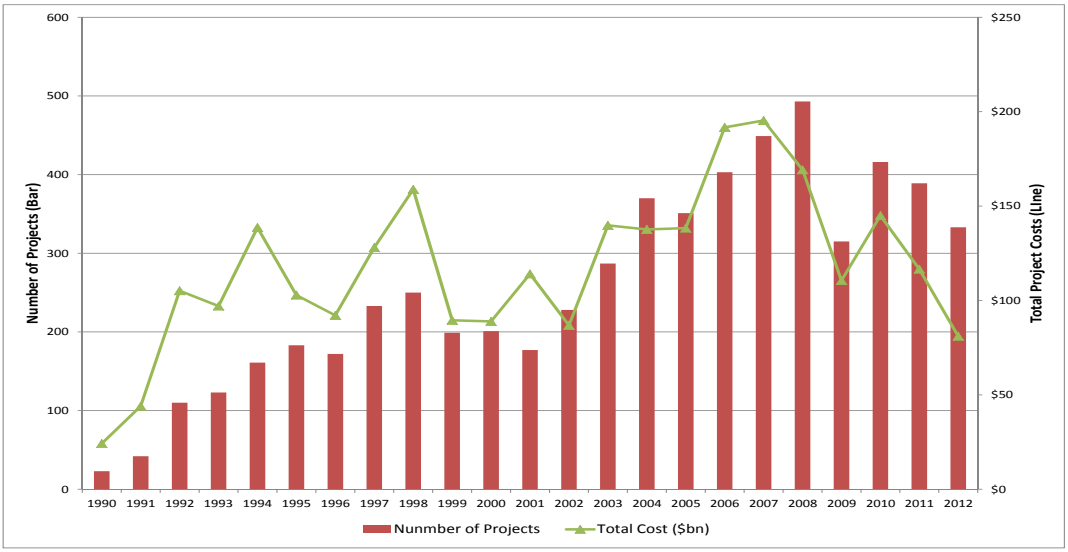

Table 1: Distribution of Contract Types, Country Risk, Offtake Agreements, and Concession Grants

The table presents the distribution of contract types along with political and financial risk scores, offtake agreements, and government concession grant. The sample consists of 5,908 non-recourse projects from the SDC Project Finance Database between 1990 and 2012. Political risk is the political risk score defined as 100 minus ICRG political risk rating, ranging from 0 to 100 points. Financial Risk is the financial risk score defined as 100 minus ICRG financial risk rating, ranging from 50 to 100 points. A larger value indicates a higher political or financial risk.

Project (Contract) Type	Obs.	% of Total	Political Risk	Financial Risk	% of Offtake	% of Concession
Build-Lease-Transfer (BT)	81	1.37	23.73	60.65	14.81	22.22
Build-Operate (BO)	396	6.70	18.88	60.40	4.55	58.33
Build-Own-Operate (BOO)	4,969	84.11	24.56	61.49	21.75	20.93
Public-Private-Partnership (PPP)	462	7.82	19.32	61.71	6.28	91.13
Total Green-Field Project Finance	5,908		23.72	61.43	19.30	28.94

Table 2: Types of Government Concessions and Offtake Agreements

The table presents types of government concessions and offtake agreements awarded to projects. The sample consists of 5,908 non-recourse projects from the SDC Project Finance Database between 1990 and 2012.

Panel A: Types of Government Concession			Panal B: Types of Offtake Agreement		
Government Support Type	Obs.	% of Total	Offtake Type	Obs.	% of Total
Equity Participation	854	48.09	Contract for Differences	9	0.58
Government Loan	49	2.76	Capacity & Tolling Agreement	17	1.10
Infrastructure Improvement	51	2.87	Energy Conversion Agreement	3	0.19
Loan Guarantee - Full	16	0.90	Energy Sales Contract	28	1.81
Loan Guarantee - Part	32	1.80	Merchant Power Plant	47	3.03
Letter of Comfort	10	0.56	Power Purchase Agreement	766	49.42
Letter of Support	13	0.73	Pulp Sales Contract	2	0.13
Letter of Understanding	2	0.11	Steam Host	81	5.23
Non Fossil Fuel Order (NFFO) Subsidy	11	0.62	Shadow Toll	7	0.45
Subsidy - One Time	71	4.00	Take and Pay	376	24.26
Subsidy - Yearly	8	0.45	Throughput Agreement	45	2.90
Infrastructure Improvement Tax Allowance	47	2.65	Tolling Agreement	41	2.65
Tariff Payment Guarantee	26	1.46	Take or Pay	109	7.03
Tariff Subsidy	12	0.68	Waste Supply Contract	19	1.23
Unspecified Back-up	574	32.32			
Total	1,776	100	Total	1,550	100

Table 3: Industry Distribution

The table presents the distribution of projects across the Fama-French 49 industries plus an unspecified industry. Project Cost is the industry average in 2005 million dollars. The percentages of the four types of contracts (Build-Lease-Transfer, Build-Operate, Build-Own-Operate, and PPP), projects with offtake agreements ($OFTT$), and projects with government concessions ($CONG$) in each industry are reported.

Industry	Obs.	Project Cost	Build-Lease -Transfer	Build -Operate	Build-Own -Operate	PPP	$OFFT$	$CONG$
Agriculture	6	86.70	0.00	0.00	100.00	0.00	0.00	0.00
Food	11	155.66	0.00	0.00	100.00	0.00	9.09	9.09
Recreation	1	92.78	0.00	0.00	0.00	100.00	0.00	100.00
Entertainment	92	295.46	2.17	15.22	58.70	23.91	1.09	53.26
Printing and Publishing	4	306.53	0.00	0.00	100.00	0.00	25.00	0.00
Household	7	110.57	0.00	0.00	100.00	0.00	0.00	14.29
Healthcare	170	212.46	0.00	18.24	35.29	46.47	1.76	74.71
Pharmaceutical Products	5	196.68	0.00	0.00	80.00	20.00	0.00	20.00
Chemicals	145	507.97	0.00	1.38	97.24	1.38	26.90	26.90
Rubber and Plastic Products	5	391.58	0.00	0.00	100.00	0.00	20.00	0.00
Textiles	6	260.24	0.00	0.00	100.00	0.00	0.00	0.00
Construction Materials	45	311.15	0.00	0.00	100.00	0.00	22.22	24.44
Construction	597	439.24	1.17	22.78	61.14	14.91	3.35	46.73
Steel Works Etc	88	772.79	0.00	0.00	100.00	0.00	17.05	20.45
Fabricated Products	3	152.92	0.00	0.00	100.00	0.00	33.33	0.00
Machinery	45	183.70	0.00	2.22	97.78	0.00	24.44	13.33
Electrical Equipment	20	144.40	0.00	10.00	75.00	15.00	5.00	75.00
Automobiles and Trucks	20	194.75	0.00	0.00	100.00	0.00	0.00	5.00
Aircraft	4	1605.00	0.00	25.00	75.00	0.00	0.00	25.00
Shipbuilding, Railroad Equipment	7	240.35	0.00	0.00	85.71	14.29	14.29	0.00

Industry	Obs.	Size	Build-Lease -Transfer	Build -Operate	Build-Own -Operate	PPP	OFFT	CONG
Defense	1	938.27	0.00	0.00	100.00	0.00	0.00	0.00
Precious Metals	81	278.09	0.00	0.00	100.00	0.00	8.64	12.35
Mines	130	535.83	0.00	0.00	100.00	0.00	23.08	16.15
Coal	42	402.06	0.00	0.00	100.00	0.00	11.90	2.38
Petroleum and Natural Gas	437	1055.42	0.92	0.69	96.80	1.60	26.54	25.40
Utilities	2,349	349.04	0.89	1.45	95.53	2.13	34.31	16.18
Communication	279	934.48	0.00	2.15	94.62	3.23	2.87	13.26
Personal Services	230	125.13	7.83	14.78	50.87	26.52	0.00	66.09
Business Services	86	292.42	5.81	27.91	61.63	4.65	9.30	46.51
Computers	1	163.57	0.00	0.00	100.00	0.00	0.00	0.00
Computer Software	2	84.19	0.00	0.00	100.00	0.00	0.00	50.00
Electronic Equipment	25	661.34	0.00	0.00	96.00	4.00	0.00	24.00
Measuring and Control Equipment	4	143.79	0.00	0.00	100.00	0.00	0.00	0.00
Business Supplies	24	405.94	0.00	0.00	100.00	0.00	4.17	29.17
Shipping Containers	3	167.27	0.00	0.00	100.00	0.00	33.33	33.33
Transportation	433	660.34	0.92	12.47	73.67	12.93	2.31	40.18
Wholesale	30	274.22	0.00	3.33	90.00	6.67	20.00	43.33
Retail	4	106.21	0.00	0.00	75.00	25.00	0.00	25.00
Restaurants, Hotels, Motels	31	877.25	0.00	0.00	100.00	0.00	0.00	12.90
Banking	15	892.30	0.00	6.67	93.33	0.00	13.33	26.67
Insurance	2	368.35	0.00	0.00	100.00	0.00	0.00	100.00
Real Estate	110	248.00	10.00	20.91	54.55	14.55	2.73	45.45
Trading	127	459.56	1.57	3.15	80.31	14.96	13.39	37.01
Other	81	188.57	8.64	2.47	79.01	9.88	7.41	33.33
Unspecified	100	205.25	0.00	23.00	47.00	30.00	9.00	71.00
Total	5,908	457.57	0.01	0.07	0.84	0.08	0.19	0.29

Table 4: Yearly Distribution of Projects

The table presents the distribution of projects over the 1990-2012 period. Project Cost is the industry average in 2005 million dollars. The percentages of the four types of contracts (Build-Lease-Transfer, Build-Operate, Build-Own-Operate, and PPP), projects with offtake agreements ($OFTT$), and projects with government concessions ($CONG$) in each industry are reported.

Year	Obs.	Size	Build-Lease -Transfer	Build -Operate	Build-Own -Operate	PPP	OFFT	CONG
1990	23	1053.42	0.00	17.39	82.61	0.00	21.74	43.48
1991	42	1047.26	0.00	4.76	90.48	4.76	45.24	38.10
1992	110	955.97	0.91	2.73	93.64	2.73	45.45	39.09
1993	123	788.80	1.63	5.69	90.24	2.44	43.90	43.90
1994	161	861.04	0.62	10.56	86.96	1.86	40.99	47.83
1995	183	561.96	0.00	8.20	89.07	2.73	31.15	44.81
1996	172	535.40	2.91	10.47	83.14	3.49	33.72	41.28
1997	233	554.27	0.86	13.30	84.12	1.72	36.05	35.19
1998	250	645.80	2.80	16.00	76.40	4.80	32.00	36.80
1999	199	451.90	0.00	14.57	79.90	5.53	28.14	40.70
2000	201	444.43	0.50	6.97	85.07	7.46	19.40	29.35
2001	177	651.74	0.00	12.99	75.14	11.86	19.21	45.76
2002	228	380.82	0.88	13.60	66.67	18.86	16.23	40.35
2003	287	487.00	0.70	10.10	80.49	8.71	14.63	44.95
2004	370	373.00	1.62	4.32	82.16	11.89	14.32	51.35
2005	351	396.35	0.28	2.28	88.32	9.12	15.95	34.76
2006	403	478.00	0.50	4.22	85.86	9.43	12.66	26.30
2007	449	435.03	2.45	1.78	85.52	10.24	12.47	19.38
2008	493	343.15	1.62	3.45	87.42	7.51	11.56	15.82
2009	315	352.06	1.27	5.71	83.49	9.52	13.02	16.51
2010	416	348.43	4.57	5.53	82.93	6.97	13.94	11.78
2011	389	299.64	0.77	4.37	87.15	7.71	11.31	9.51
2012	333	244.81	1.20	2.70	89.19	6.91	12.91	6.01
Total	5,908	457.57	0.01	0.07	0.84	0.08	0.19	0.29

Table 5: Summary Statistics

The table presents summary statistics of variables used in regressions. $NOFFT$ is the number of offtake agreements for a project. $PRisk$ is the political risk score. $FRisk$ is the financial risk score. VOL is cash flow volatility measured as standard deviation of seven-year time series of cash flows matched by country and industry. Project cost is the total cost of a project in 2005 dollar. $SIZE$ is the natural logarithm of total project cost. SPON is the number of sponsors for a project. LEV is leverage ratio defined as total debt divided by total project cost net of government concession grants. CF is the expected cash flow measured as the average of seven-year time series of cash flows matched by country and industry. PFI is a dummy variable for projects with private finance initiative. $MULTIA$ is a dummy variable for the presence of multilateral agency. $French$ is a dummy if the country has the French legal origin. The percentages (%) are the number of projects with dummy equal to 1 (Sum) divided by the total number of projects.

	Panel A: Descriptive Statistics			
Variables	Average	Std. Dev.	Min.	Max.
$NOFFT$	0.2624	0.6497	0	8
$PRisk$	24.3623	10.0586	4.7500	67.2500
$FRisk$	61.0159	4.6663	50.0000	87.5000
VOL	0.0232	0.0280	0.0000	0.7105
Project Cost ($ million)	458	1007	0.0000	30050
$SIZE$	5.1742	1.4026	-2.3224	10.3106
$SPON$	2.0305	1.6421	0	16
LEV	0.8405	0.1967	0.0007	1.0000
CF	0.0928	0.0503	-0.2329	0.5799
Dummy Variables	Sum	% of Total		
PFI	535	9.06%		
$MULTIA$	368	6.23%		
$French$	2800	47.39%		

	Panel B: Distribution of Projects over the Number of Offtakers		
$NOFFT$	Freq.	Percent	Cum.
0	4,768	80.7	80.7
1	879	14.88	95.58
2	177	3	98.58
3	47	0.8	99.37
4	22	0.37	99.75
5	9	0.15	99.9
6	2	0.03	99.93
7	1	0.02	99.95
8	3	0.05	100
Total	5,908	100	

Table 6: Regression Estimation Results on the Presence of Government Concession and Offtake Agreement, and the Number of Offtakers

The table reports the estimation results of the probit regressions for the presence of government concession (Panel A) and offtake agreement (Panel B), and the ordinary least square (OLS) regressions for the number of offtakers (Panel C). $PRisk$ is the political risk score. $FRisk$ is the financial risk score. VOL is cash flow volatility measured as standard deviation of seven-year time series of cash flows matched by country and industry. PFI is a dummy variable for projects with private finance initiative. CF is the expected cash flow measured as the average of seven-year time series of cash flows matched by country and industry. LEV is leverage ratio defined as total debt divided by total project cost net of government concession grant. $SPON$ is the number of sponsors. $SIZE$ is the natural logarithm of total project cost. $MULTIA$ is a dummy variable for the presence of multilateral agency. In the brackets are the robust standard errors of the estimate. The 1%, 5%, and 10% significance levels are represented by ***, **, and *, respectively.

	Panel A: Concession		Panel B: Offtake		Panel C: Number of Offtakers	
	(1)	(2)	(5)	(6)	(7)	(8)
$PRisk$	-0.0106***	-0.0065**	-0.0102***	-0.0181***	-0.0211***	-0.0291***
	[0.0030]	[0.0033]	[0.0030]	[0.0035]	[0.0041]	[0.0044]
$FRisk$	-0.0268***	-0.0251***	-0.0169***	-0.0362***	-0.0424***	-0.0538***
	[0.0057]	[0.0062]	[0.0056]	[0.0064]	[0.0072]	[0.0074]
VOL	2.8091***	3.7475***	-4.3218***	2.5022*	-8.2631***	-0.2461
	[0.8409]	[0.9889]	[1.1477]	[1.2947]	[1.6983]	[1.9134]
PFI	1.7438***	1.1944***	-1.0693***	-0.3014*	-2.2123***	-0.8308***
	[0.0821]	[0.0953]	[0.1228]	[0.1604]	[0.2546]	[0.2762]
CF	-0.6788	-0.4588	0.3973	0.1680	1.8230**	1.8122**
	[0.5012]	[0.6053]	[0.5236]	[0.5981]	[0.7214]	[0.7398]
LEV	-0.3096**	-0.3869***	-0.0731	-0.0396	0.0121	-0.0168
	[0.1270]	[0.1353]	[0.1319]	[0.1529]	[0.1719]	[0.1814]
$SPON$	0.1213***	0.1209***	0.0603***	0.1145***	0.1266***	0.1751***
	[0.0161]	[0.0172]	[0.0167]	[0.0200]	[0.0165]	[0.0184]
$SIZE$	0.1042***	0.1448***	0.1842***	0.2467***	0.2629***	0.3038***
	[0.0197]	[0.0216]	[0.0209]	[0.0239]	[0.0264]	[0.0280]
$MULTIA$	0.3809***	0.3683***	0.1230	0.1465	0.0380	-0.0016
	[0.1217]	[0.1275]	[0.1240]	[0.1394]	[0.1573]	[0.1595]
Industry FE	No	Yes	No	Yes	No	Yes
N	3,590	3,563	3,590	3,283	3,590	3,590

Table 7: Regression Estimation Results on Ownership Structure

The table presents the estimation results of the probit regressions for each type of ownership structure. Dependent variable is equal to one for build-own-operate (BOO) and zero otherwise in models (1) and (2); one for build-operate (BO) and zero for BOO in models (3) and (4); one for PPP and zero for BOO in models (5) and (6); and one for PPP and zero for BO in models (7) and (8). Variables are defined in Table 5. The 1%, 5%, and 10% significance levels are represented by ***, **, and *, respectively.

	BOO=1 and Others=0		BO=1 and BOO=0		PPP=1 and BOO=0		PPP=1 and BO=0	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PRisk	0.0189***	0.0136***	-0.0146***	-0.0140**	-0.0320***	-0.0193***	0.0127	0.0128
	[0.0042]	[0.0047]	[0.0052]	[0.0059]	[0.0068]	[0.0074]	[0.0113]	[0.0122]
FRisk	0.0002	-0.0053	-0.0188**	-0.0145	0.0402***	0.0372***	0.0710***	0.0675***
	[0.0076]	[0.0086]	[0.0095]	[0.0109]	[0.0114]	[0.0128]	[0.0182]	[0.0204]
VOL	-1.1590	-2.0039*	-2.1963	0.3313	2.4890*	1.2272	6.1180**	2.3682
	[1.0085]	[1.1020]	[1.8028]	[1.6030]	[1.2720]	[1.5374]	[2.6994]	[3.1530]
PFI	-0.6808***	-0.3376***	1.2885***	1.0847***	-0.0171	-0.4852***	-0.8716***	-1.3025***
	[0.0870]	[0.0985]	[0.1080]	[0.1284]	[0.1218]	[0.1428]	[0.1625]	[0.1972]
CF	-0.5188	-0.7495	-0.0698	0.7306	1.3933	1.0826	1.4421	0.4527
	[0.6403]	[0.8561]	[0.9001]	[1.2107]	[0.8948]	[1.2028]	[1.3902]	[1.8456]
LEV	-0.2126	-0.1447	-0.0486	-0.0441	0.1971	0.0166	0.0519	-0.1443
	[0.1557]	[0.1662]	[0.1880]	[0.2059]	[0.2217]	[0.2355]	[0.2882]	[0.3120]
SPON	-0.0690***	-0.0523**	0.0916***	0.0697***	0.0361	0.0314	-0.0320	-0.0047
	[0.0191]	[0.0203]	[0.0223]	[0.0239]	[0.0283]	[0.0302]	[0.0372]	[0.0399]
SIZE	-0.0004	-0.0101	0.0116	0.0056	0.0671*	0.1160***	0.0264	0.1098*
	[0.0240]	[0.0267]	[0.0305]	[0.0342]	[0.0353]	[0.0395]	[0.0506]	[0.0589]
MULTIA	-0.2197	-0.2205	0.4196**	0.3888**	0.0224	0.0316	-0.3988	-0.2950
	[0.1476]	[0.1580]	[0.1695]	[0.1854]	[0.2142]	[0.2242]	[0.2670]	[0.2835]
CONG	-1.1283***	-0.9122***	0.3699***	0.2198**	2.1033***	1.9536***	1.8072***	1.8758***
	[0.0658]	[0.0724]	[0.0880]	[0.0955]	[0.1174]	[0.1315]	[0.1841]	[0.2096]
NOFFT	0.3757***	0.1269*	-0.2811***	-0.0432	-0.3963***	-0.2103*	0.1019	-0.0182
	[0.0680]	[0.0713]	[0.0839]	[0.0863]	[0.0986]	[0.1125]	[0.1576]	[0.1805]
French	-0.1184	-0.0857	0.1171	0.1301	0.3419***	0.2601**	-0.0880	-0.1487
	[0.0747]	[0.0815]	[0.0961]	[0.1063]	[0.1108]	[0.1213]	[0.1760]	[0.1939]
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes
N	3,590	3,292	3,336	3,015	3,302	2,682	570	560

Table 8: Estimation Results on Endogenous Contract and Ownership Choices

The table presents the estimation results of the system of equations for contract type and ownership structure. *CONG* is an endogenous contract choice for government concession grant. *BOO* is a dummy variable for build-own-operate projects and zero otherwise. Variables are defined in Table 5. The 1%, 5%, and 10% significance levels are represented by ***, **, and *, respectively.

	CONG	*BOO*
PRisk	-0.0106***	0.0188***
	[0.0031]	[0.0045]
FRisk	-0.0267***	-0.0001
	[0.0057]	[0.0083]
VOL	2.8054***	-1.1239
	[0.8411]	[1.0788]
PFI	1.7456***	-0.6574**
	[0.0846]	[0.2699]
CF	-0.6751	-0.5277
	[0.5025]	[0.6475]
LEV	-0.3095**	-0.2165
	[0.1270]	[0.1611]
SIZE	0.1043***	0.0007
	[0.0198]	[0.0271]
MULTIA	0.3801***	-0.2149
	[0.1221]	[0.1568]
SPON	0.1213***	-0.0675***
	[0.0161]	[0.0252]
CONG		-1.1678***
		[0.4347]
NOFFT		0.3757***
		[0.0680]
French		-0.1185
		[0.0746]

Table 9: Robustness Checks: Year Fixed Effects

The table presents the estimation results of the probit regressions for the presence of government concession, offtake agreement, and each type of ownership structure. Dependent variable is equal to one for the presence of government concession and zero otherwise; one for offtake agreement and zero otherwise; number of offtake agreements; one for build-own-operate (BOO) and zero otherwise; one for build-operate (BO) and zero for BOO; one for PPP and zero for BOO; and one for PPP and zero for BO. Variables are defined in Table 5. The 1%, 5%, and 10% significance levels are represented by ***, **, and *, respectively.

	Concession	Offtake	Number of offtakers	BOP=1 and Others=0	BO=1 and BOP=0	PPP=1 and BOO=0	PPP=1 and BO=0
PRisk	0.0041	-0.0053	-0.0121***	0.0207***	-0.0098	-0.0263***	-0.0128
	[0.0036]	[0.0038]	[0.0046]	[0.0053]	[0.0069]	[0.0085]	[0.0150]
FRisk	-0.0074	-0.0135*	-0.0182**	0.0171	-0.0365***	0.0076	0.0587**
	[0.0073]	[0.0075]	[0.0092]	[0.0106]	[0.0140]	[0.0160]	[0.0294]
VOL	1.4719***	2.3804**	-1.081	-1.2329	-0.972	0.929	3.8983
	[0.5696]	[1.0374]	[1.1311]	[1.0411]	[1.8571]	[1.4236]	[3.6036]
PFI	1.1480***	-0.3830**	-0.9353***	-0.2844***	1.0043***	-0.5617***	-1.1764***
	[0.0988]	[0.1641]	[0.2806]	[0.1017]	[0.1322]	[0.1515]	[0.2281]
CF	-1.5147**	-1.3680**	-0.1623	-1.2807	0.399	2.3152*	2.7502
	[0.6464]	[0.6392]	[0.8228]	[0.8873]	[1.3019]	[1.2810]	[2.3055]
LEV	-0.2932**	0.1476	0.1966	-0.2014	0.1746	-0.0963	-0.6867*
	[0.1409]	[0.1595]	[0.1811]	[0.1734]	[0.2154]	[0.2534]	[0.3527]
SPON	0.0982***	0.0420*	0.1095***	-0.0607***	0.0558**	0.0578*	0.0281
	[0.0179]	[0.0216]	[0.0196]	[0.0211]	[0.0255]	[0.0315]	[0.0454]
SIZE	0.1478***	0.2310***	0.2764***	-0.0115	-0.0055	0.1308***	0.1451**
	[0.0223]	[0.0252]	[0.0296]	[0.0274]	[0.0355]	[0.0416]	[0.0670]
MULTIA	0.4242***	0.1033	0.0932	-0.1967	0.3524*	0.0779	-0.071
	[0.1312]	[0.1437]	[0.1613]	[0.1610]	[0.1928]	[0.2339]	[0.3291]
CONG				-1.0470***	0.3062***	2.1244***	1.9579***
				[0.0771]	[0.1016]	[0.1395]	[0.2300]
NOFFT				0.1086	-0.1058	-0.1593	-0.0303
				[0.0750]	[0.0963]	[0.1210]	[0.2111]
French				-0.1686**	0.2657**	0.2585**	-0.1705
				[0.0844]	[0.1130]	[0.1281]	[0.2145]
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3,568	3,288	3,596	3,297	2,976	2,598	532

Table 10: Results with sub-periods: Pre- and Post-Crisis Periods

The table presents the estimation results of the regressions for the presence of government concession, offtake agreements, and each type of ownership structure for the pre-crisis period (Panel A) from 1990 to 2008 and the post-crisis period (Panel B) from 2008 to 2012. Dependent variable is equal to one for the presence of government concession and zero otherwise; one for offtake agreement and zero otherwise; number of offtake agreements; one for build-own-operate (BOO) and zero otherwise; one for build-operate (BO) and zero for BOO; one for PPP and zero for BOO; and one for PPP and zero for BO. Variables are defined in Table 5. The 1%, 5%, and 10% significance levels are represented by ***, **, and *, respectively.

Panel A: Pre-Crisis Period							
	Concession	Offtake	Number of offtakers	BOP=1 and Others=0	BO=1 and BOP=0	PPP=1 and BOO=0	PPP=1 and BO=0
PRisk	-0.0041	-0.0280***	-0.0368***	0.0225***	-0.0298***	-0.0168*	0.0177
	[0.0041]	[0.0046]	[0.0055]	[0.0066]	[0.0088]	[0.0097]	[0.0167]
FRisk	-0.0339***	-0.0443***	-0.0585***	-0.0196*	0.0035	0.0431***	0.0722***
	[0.0072]	[0.0073]	[0.0081]	[0.0104]	[0.0132]	[0.0154]	[0.0239]
VOL	4.7556***	2.6519*	-1.5275	1.9375	-1.4837	-7.8161**	-7.8308
	[1.2490]	[1.3532]	[1.4218]	[1.9426]	[2.6577]	[3.1969]	[6.6044]
PFI	1.2063***	-0.4383**	-1.0748***	-0.4404***	1.0324***	-0.4524***	-1.1794***
	[0.1067]	[0.1795]	[0.2998]	[0.1155]	[0.1489]	[0.1675]	[0.2228]
CF	-0.9397	0.6967	2.5463**	-2.7086*	2.7496	4.8254**	0.7271
	[0.8379]	[0.8098]	[1.0338]	[1.3949]	[1.8875]	[2.0425]	[3.5150]
LEV	-0.3598**	-0.1492	-0.0879	-0.1571	0.0469	0.1544	-0.0942
	[0.1545]	[0.1761]	[0.1984]	[0.1945]	[0.2398]	[0.2721]	[0.3673]
SPON	0.0990***	0.0829***	0.1600***	-0.0862***	0.1055***	0.0517	-0.0333
	[0.0193]	[0.0227]	[0.0203]	[0.0228]	[0.0266]	[0.0339]	[0.0439]
SIZE	0.1281***	0.2373***	0.2889***	0.0054	-0.0141	0.1185***	0.0961
	[0.0239]	[0.0271]	[0.0306]	[0.0304]	[0.0388]	[0.0450]	[0.0639]
MULTIA	0.5111***	0.3073*	0.1958	-0.2896	0.17	0.3405	0.1644
	[0.1732]	[0.1860]	[0.2077]	[0.2109]	[0.2761]	[0.2656]	[0.3470]
CONG				-0.9392***	0.2844**	1.9863***	1.6922***
				[0.0865]	[0.1106]	[0.1649]	[0.2540]
NOFFT				0.1395	-0.1299	-0.191	-0.0643
				[0.0861]	[0.1157]	[0.1240]	[0.2192]
French				-0.1738*	0.2288*	0.2530*	-0.2403
				[0.1011]	[0.1291]	[0.1486]	[0.2408]
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,681	2,373	2,714	2,389	2,051	1,979	425

Panel B: Post-Crisis Period							
	Concession	Offtake	Number of offtakers	BOP=1 and Others=0	BO=1 and BOP=0	PPP=1 and BOO=0	PPP=1 and BO=0
PRisk	-0.0206*	-0.0216**	-0.0286**	0.0076	0.0253	-0.0025	-0.0156
	[0.0111]	[0.0084]	[0.0114]	[0.0107]	[0.0177]	[0.0182]	[0.0575]
FRisk	0.0001	-0.0443**	-0.0464*	0.0478*	-0.0851*	0.0282	0.4205**
	[0.0226]	[0.0192]	[0.0249]	[0.0261]	[0.0489]	[0.0406]	[0.1646]
VOL	21.7838***	21.7759***	23.7763***	-15.9716***	21.3253*	3.998	38.1687
	[6.2739]	[6.0541]	[7.3546]	[6.0507]	[11.0612]	[7.9320]	[30.8021]
PFI	2.6911***	1.4574	0.9459	1.1487***	0.543	-1.4991***	-4.6877***
	[0.5843]	[0.9042]	[1.0241]	[0.3496]	[0.4809]	[0.4922]	[1.5597]
CF	-2.8827	0.089	2.0778	-1.42	2.2428	1.253	10.8581
	[2.8166]	[1.6668]	[1.9806]	[2.3310]	[2.9683]	[4.8286]	[16.4895]
LEV	-0.6786	0.5122	0.6472	0.3915	-0.8674	-0.7395	-0.6226
	[0.4596]	[0.4090]	[0.5649]	[0.4300]	[0.6101]	[0.6954]	[1.1983]
SPON	0.1353**	0.0512	0.0871	-0.0542	0.083	0.0979	-0.3029
	[0.0656]	[0.0687]	[0.0732]	[0.0678]	[0.0942]	[0.1080]	[0.2780]
SIZE	0.2432***	0.3777***	0.5498***	-0.0009	-0.0435	0.0612	0.491
	[0.0728]	[0.0590]	[0.0828]	[0.0684]	[0.1023]	[0.1133]	[0.3299]
MULTIA	-0.0133	0.2284	0.0321	1.2658**	-0.4835		
	[0.3426]	[0.3044]	[0.3433]	[0.6177]	[0.5812]		
CONG				-1.7048***	0.7835**	2.6113***	4.2965***
				[0.2180]	[0.3938]	[0.2949]	[1.1805]
NOFFT				-0.0695	0.3923	-0.3677	-0.1641
				[0.1765]	[0.2453]	[0.3808]	[0.6492]
French				0.0454	0.2221	0.2029	-0.7407
				[0.1963]	[0.3599]	[0.3084]	[1.0371]
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	862	617	925	861	776	730	105

Table 11: Ordered Probit Model Estimation Results on Contract and Governance Structures
The table reports the estimation results of the ordered probit models for contract type and governance structure. For the contract type, the dependent variable (*Contract*) is: 0 if $CONG = 0$ and $OFFT = 0$; 1 if $CONG = 0$ and $OFFT = 1$; 2 if $CONG = 1$ and $OFFT = 0$; 3 if $CONG = 1$ and $OFFT = 1$. Similarly, for the governance structure, the dependent variable (*Control*) is: 0 if $BT = 1$; 1 if $BOO = 1$; 2 if $PPP = 1$; and 3 if $BO = 1$. The 1%, 5%, and 10% significance levels are represented by ***, **, and *, respectively.

	Panel A: Contract Type		Panel B: Governance Structure	
	(1)	(2)	(3)	(4)
PRisk	-0.0128***	-0.0121***	-0.0147***	-0.0096**
	[0.0025]	[0.0027]	[0.0036]	[0.0039]
FRisk	-0.0255***	-0.0299***	-0.0031	-0.0002
	[0.0046]	[0.0048]	[0.0066]	[0.0072]
VOL	0.8443	3.2539***	0.9229	0.5688
	[0.7200]	[0.7889]	[0.8733]	[0.9564]
PFI	1.0364***	0.8029***	1.1463***	0.7921***
	[0.0624]	[0.0750]	[0.0774]	[0.0888]
CF	-0.2468	0.0225	0.2951	0.6323
	[0.4150]	[0.4565]	[0.5514]	[0.6348]
LEV	-0.2620**	-0.3069***	-0.0333	-0.0633
	[0.1036]	[0.1066]	[0.1359]	[0.1422]
SPON	0.1108***	0.1188***	0.0656***	0.0505***
	[0.0135]	[0.0139]	[0.0173]	[0.0181]
SIZE	0.1491***	0.1893***	0.0200	0.0226
	[0.0165]	[0.0173]	[0.0214]	[0.0230]
MULTIA	0.3171***	0.3049***	0.2374*	0.2341*
	[0.1011]	[0.1028]	[0.1305]	[0.1370]
Contract			0.3329***	0.2973***
			[0.0288]	[0.0312]
French			0.2711***	0.2152***
			[0.0660]	[0.0704]
*Cut*1	-0.7129**	3.798	-2.4662***	-2.1878
	[0.3261]	[404.8845]	[0.4653]	[1.6815]
*Cut*2	-0.2626	4.2748	1.4692***	2.0079
	[0.3260]	[404.8845]	[0.4602]	[1.6811]
*Cut*3	0.9557***	5.5444	1.9472***	2.5441
	[0.3267]	[404.8845]	[0.4606]	[1.6813]
Industry FE	No	Yes	No	Yes
N	4,838	4,804	4,838	4,545