A STUDY ON INCENTIVE STRATEGIES FOR PUBLIC/PRIVATE PARTNERSHIP TOLL ROAD PROJECTS

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Abstract: Incentives given by governments in a Public-Private-Partnership can be costly; hence it is important to properly structure incentive packages to achieve minimal financial exposure. This study presents the development of the project incentive design model, an analytical framework for designing optimal incentive strategies.

1. BACKGROUND

1.1 Social Background

Throughout history, the development of economic and social systems has been closely linked to phases of infrastructure development (Akastuka and Yoshida, 1999). The World Bank Report of 1994 analogizes infrastructure as the wheels, if not the engine, of economic activity. Thus, adequate infrastructure is fundamental to the social and economic activity of the human society. Investment in infrastructures is therefore vital for a country to improve its competitiveness. However due to high investment costs, the need for government investment in social services, and the need to curb down sovereign loans; the pursuit of infrastructure improvement and expansion has been severely constrained by the lack of financial resources.

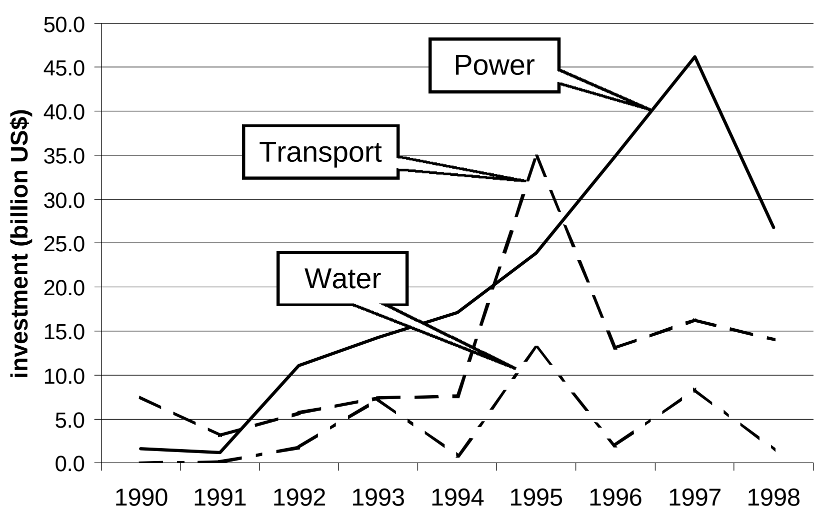


Fig. 1.1 Investment in Privatized Infrastructure in Developing Countries[1]

[1] Roger, 1999

The emergence of public/private partnership (PPP) concepts has provided an opportunity for governments to address this constraint and increase investment in its infrastructure. In the PPP approach, the government and the private sector cooperatively undertake a project that is traditionally provided by the government. Thus, PPP relieves the government's fiscal resources and provides investment opportunities for the private sector. The seemingly "*win-win*" situation PPP promises and the pursuit of governments to upgrade their infrastructure systems and also the efficiency gains private initiative brings; have been key factors to the growth of PPP worldwide. **Fig. 1.1** demonstrates the progression of privatized infrastructure. And indeed PPP has become an integral component in the infrastructure development plan of many governments. The case of transport infrastructure development in Metro Manila demonstrates this point (**Fig. 1.2**).

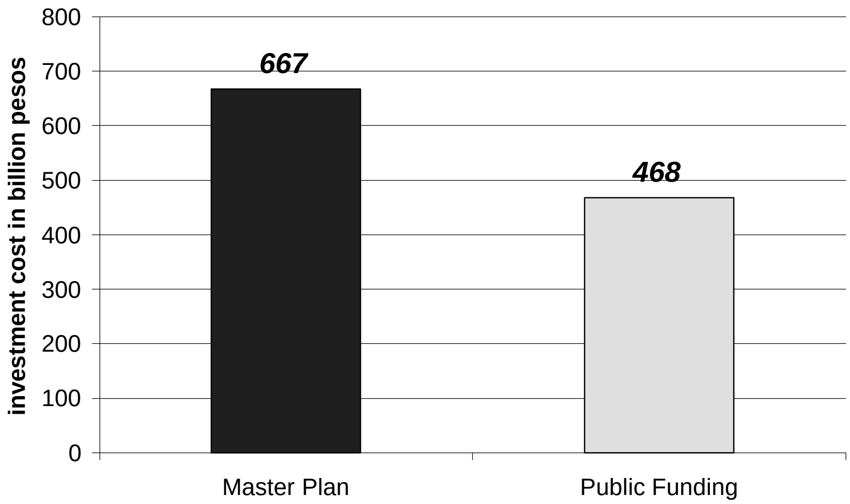


Fig. 1.2 The Importance of Private Sector Involvement in Transport Infrastructure[2]

The shortfall in the available Philippine government public fund against the cost of the proposed developed transport infrastructure master plan up to 2015 for Manila have to be raised primarily through PPP mechanisms. Private participation is particularly needed for expressway and rail projects. Financing of maintenance, improvement and construction of non-toll roads will remain in the domain of the public sector.

Despite the "*win-win*" solution PPP promises, projects are beset with a lot of issues and problems. A significant cause of these problems can be traced to the clash of commercial interests of the private sector and the spirit of providing infrastructures for the benefit of society of the public sector. This is especially apparent if one looks at the estimates of FIRR and EIRR of transport projects in the Philippines and the Colombo-Katunayake Expressway project in Sri Lanka in **Fig. 1.3**. At a rough FIRR hurdle rate of 20%, these priority projects would not materialize not unless toll rates are further increased or if project incentives are offered.

[2] Metro Manila Urban Transport Integration Study (MMUTIS), 1999; transport master plan up to 2015

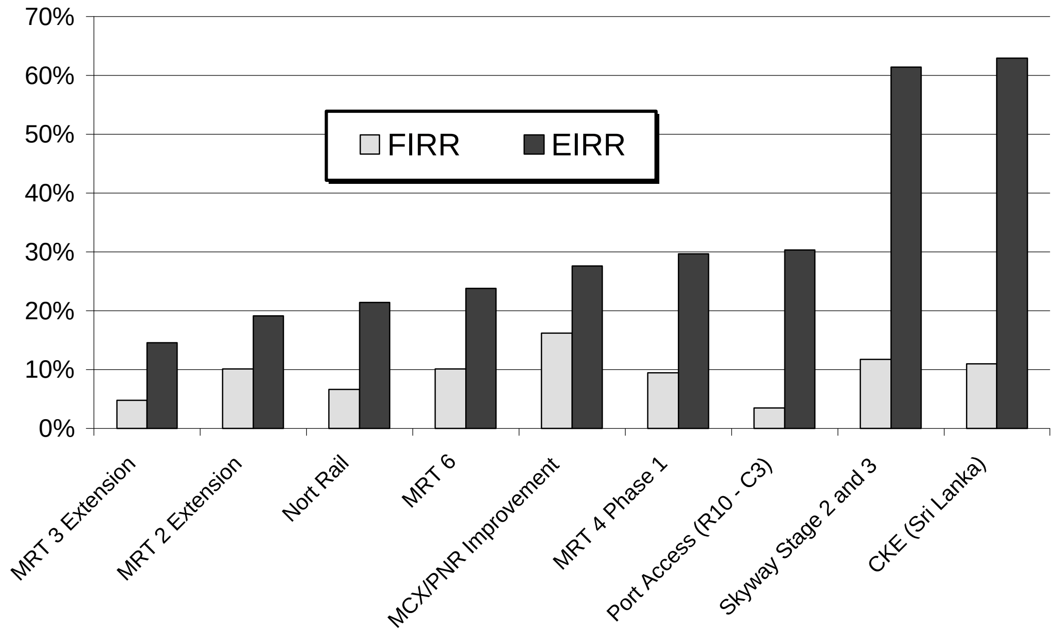


Fig. 1.3 Financial Viability and Economic Merit of Toll Road Projects[3]
(Examples in Manila and Sri Lanka)

The option of increasing toll rates has been one of the key policies in PPP as the "beneficiary-pay-principle" is advocated in the PPP concept. There are however, limitations to this approach because usage is related to tolls rates/tariff rates as well; thus, toll increases can improve profitability only to a certain extent. Further, the issues in "social minimum" are also representing powerful forces that limits the beneficiaries pay principle. Thus, governments need to take a compromise position in dealing with this issue through the use of project incentives[4]. Project incentives are actions by the government designed to improve the viability of the project; or more broadly, actions that affect the risk/reward profile of the project. Thou, project incentives have demonstrated to be effective in improving the attractiveness of infrastructure projects; they put much financial burden to the government, as evidenced by **Table 1.1**.

Table 1.1 Government Support for Toll Roads in Asia[5]

	Philippines	Malaysia	Thailand	Hong Kong
Operational Projects		**9**	**5**	**4**
Cost		4.4	2.6	2.5
Estimated Private Funding		3.3	1.9	2.1
Private Funds at Risk		Est. 0.8	1.9	1.9
Direct Public Funds		1.1	0.7	0.4
All Projects	**15**	**40**	**15**	**5**
Cost	6.6	21.5	19.9	3.4
Estimated Private Funding	4	12.9	9.9	2.9
Private Funds at Risk	Est. 2	Est. 5	9.9	2.6
Direct Public Funds	2.6	8.6	10	0.5
Estimated Foreign Funds	3	1	Est. 10	Est. 2

[3] MMUTIS (1999); and, Senevirante and Ranasnghe (1997)
[4] It could also argued that since benefits of a tollway do not concentrate only to the users but also to the general public, it is therefore consistent to the beneficiary-pay-principle to partially use general taxes in the provision of expressway services.
[5] World Bank (1999)

All Cost figures in US$ billion, converted at post-economic crisis exchange rates.
Notes:
1. Direct Public Funds = Government funds in cash or kind. Government may also have contingent liabilities, which are called if projects fail to perform as expected.
2. All projects include those in operation, under construction and in planning or pre-planning.
Source: Adapted from Asian Development Bank, Developing Best Practices for Promoting Private Sector Investment in Infrastructure: Roads, 1999 (Forthcoming)

From **Table 1.1**, public sector participation can range form around 15% to 50% in direct public funds alone. Considering the explicit (and implicit) guarantees, the government's financial exposure is substantial. It is thus important to effectively manage the government's financial exposure to best benefit from the opportunities of privatized infrastructure.

1.2 Range of PPP Project Incentives Options Available

The following lists most (if not all) of the project incentives that have been used in toll roads so far; each has its own characteristics, focus and are applied in varying degrees and along with varying combinations with other incentives.

i. Subsidies
ii. Currency Exchange Rate Guarantee
iii. Loan Guarantee
iv. Interest Rate Guarantee
v. Traffic Guarantee
vi. Concession Extension
vii. Construction Risk Guarantee
viii. Political Risk Guarantee
ix. Force Majeure Risk Guarantee
x. Land Acquisition
xi. Land Development Rights
xii. Toll Adjustment Risk Guarantee
xiii. Inflation Risk Guarantee (incorporated in the toll adjustment mechanism)
xiv. Revenue sharing
xv. Profit Cap
xvi. Low interest government loans
xvii. Revenue guarantee
xviii. Grants of existing assets
xix. Stand-by loans at favorable rates
xx. Tax incentives

With the social background in mind, a question then arises:

How to design an incentive package for a specific project that will yield the most beneficial outcome for the government considering the range of options available?

1.3 Managing PPP Project Incentives

General
Drawing form the works of Chaterjee (1996), Dailami and Klein (1997), Shoji and Yamagishi (1997), MOC-Japan (1999) and World Bank (2000), the following lists observations, suggestions and conclusions regarding the general management of PPP project incentives.

i. Project incentives plays an important role in the realization and success of PPP projects
ii. Market mechanisms alone cannot provide enough stimulation for private participation in infrastructure. Interventions are necessary from the state, which may also utilize the assistance of aid agencies.

iii. The public assistance for PPP projects should be kept to a minimum level to prevent excessive dependence by the private sector
iv. Adequate risk-sharing arrangements are of critical importance to the success of a BOT project
v. The importance of policy reforms
vi. Incentives can increase flow of funds
vii. Appropriate toll rates are important
viii. Importance of clear definitions of responsibilities
ix. Positive approach to project incentives
x. Importance of financial exposure quantification
xi. High sensitivity of toll road projects to project incentives<u>Project Incentive Packaging Guidelines</u>

In terms of guidelines in designing a project incentive package the following suggestions were made.

i. The most advantageous project incentives for the concessionaire are those which provide early funding streams (when revenues are low or non-existent during the construction period) and which give guarantees for unexpected problems (e.g. exchange rate guarantees). (World Bank, 2000)
ii. The least significant are those which themselves are unpredictable (e.g. additional rights for development around a toll road). (World Bank, 2000)
iii. Assign risks to the party who can best control it. (MOC-Japan, 1999)

The preceding project incentive package guidelines were basically derived through abstractions from a review of PPP issues and experiences. An appraisal of these guidelines however, reveals inadequacies. The following comments illustrate this point.

i. No theoretical basis – The guidelines above are derived through abstractions from case studies without the aid of theoretical techniques.
   - Without theoretical basis, strategies could not identify and explain the intricacies and tendencies of project incentive packaging.
   - The lack of theoretical basis would not enable the policy makers to adapt to the varying conditions and scenarios of PPP projects.
   - The lack of theoretical basis would not allow the identification of which set of incentives would yield the most efficient result *a priori*.

ii. Incomplete – These guidelines do not provide a workable and clear directive to efficient incentive packaging, thus leaving much to guesswork.
   - The present guidelines do not provide any support in formulating a complete incentive package as it deals only with risks and incentives individually.
   - There are many risks in PPP projects that have no identifiable party who has more strategic control over the other party. Thus, it is unclear on how to deal with these types of risks.
   - The present guidelines do not provide any guidance in dealing with profit enhancing incentives or profit sharing schemes.
   - In considering multiple risk-sharing strategies, the present guidelines could not identify the proper mixture and proportions of risk sharing that would yield the best outcome for the government.

1.4 Goal of the Study

The objective of this study is to contribute to the development of guidelines/strategies that could aid in effectively managing project incentives. There are two primary sides to the efficient management of project incentives; namely, the implementation issues and the systematic issues (i.e. issues pertaining to investment science). Because it is felt that it is important to understand the mechanisms of project incentives first, this study attempts to tackle the systematic issues.

1.5 Scope of the Study

This study primarily focuses on toll roads. Nonetheless, the framework presented here is general and can be applied to any project type.

2. PROJECT INCETIVE DESIGN MODEL

2.1 Formulation of the problem

The stakeholders in PPP toll road projects and their general concerns are as follows:

i. *Public Sector*: Minimize government financial exposure
ii. *Private Sector*: Invest in a financially viable project
iii. *Public/Users*: Socially acceptable toll rates

Thus, the problem of efficient management of project incentives is structured in the **Fig. 2.1**. The risk/reward profile of the project is the basis of the decision of the private sector to invest in the PPP or not and it is as well the determining factor in the toll rate setting. It is however often that the risk/reward profile is insufficient to satisfy these constraints that incentives are necessary from the government. The problem is therefore to minimize the government's financial exposure while satisfying the concerns of the society (socially acceptable toll) and the private sector (financially viable project).

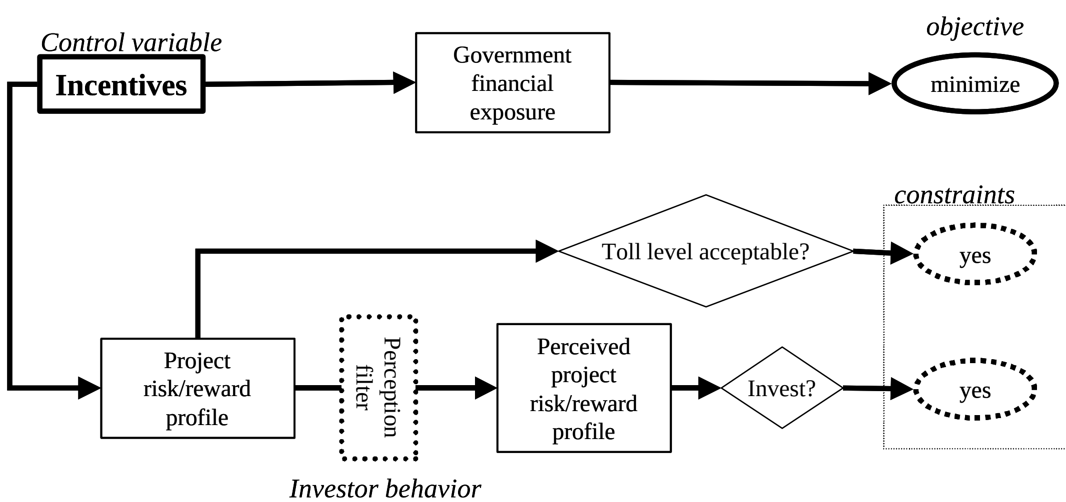


Fig. 2.1 Components in the Optimal Incentive Package Problem

The reason why the incorporation of the investor's behavior is important is (*i*) to be realistic in the analysis, (*ii*) take advantage of the tendencies of investors to better design incentive packages and (*iii*) perception tendencies have a significant effect on decisions.

To solve the problem in **Fig. 2.1**, the following steps are mapped:

Step 1: Identify a set of variations of the project's risk/reward profile with the same perceived project viability.
Step 2: Select one of the elements of the set defined by step 1, based on the least financial exposure of the government.

Socially Acceptable Toll Level

The following maximum socially acceptable toll rate have been suggested:

i. ECU 0.045/km or approximately PhP1.25/km[6] (Hungary)
ii. 70% of user cost savings in reference to the shortest non-toll alternative (Indonesia)
iii. Resulting to 10-15% traffic diversion (World Bank suggestion to Vietnam)

A socially acceptable toll rate will not be suggested in this study, but it will only be stated that to minimize government financial exposure, the toll rates should be set to the lesser of the revenue-maximizing rate or the socially acceptable rate.

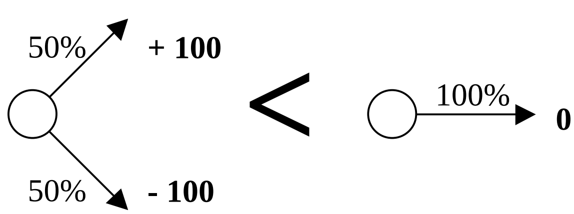
Project Viability

This section first defines the behavior of a typical investor and then formalizes a definition of project viability.

Behavior of an Investor

To formulate the investor's behavior the following assumptions are made.

assumption 1. Investor's are typically risk-averse – investor will reject a fair lottery



assumption 2. Gains are perceived at a lower rate than their real value and losses are perceived at a higher rate than their real values
assumption 3. Gains are never perceived as losses and losses are never perceived as gains
assumption 4. Decision-makers are rational (i.e. consistent)
assumption 5. More gain/less loss is always perceived better than less gain/more loss respectively
assumption 6. Perception proceeds in a smooth function

[6] At pre-crisis rates

The following can be deduced of the nature of the perception of gains and losses of wealth of a risk-averse investor as (*i*) strictly increasing; (*ii*) strictly concave (because a positive premium is necessary for a risk adverse to accept a fair lottery); and, (*iii*) crosses the origin (because otherwise abstraction 3 will be violated). Therefore, the following perception filter can be illustrated as follows:

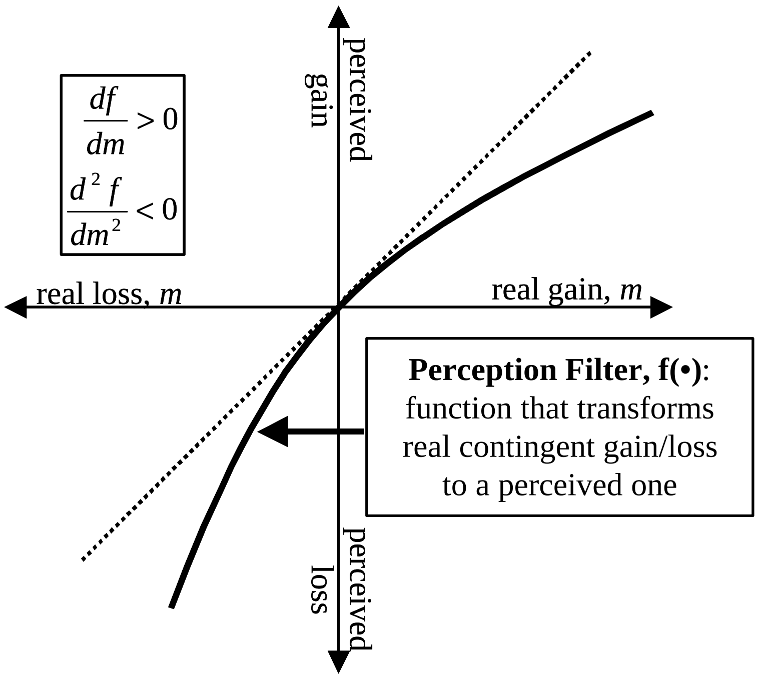


Fig. 2.2 Perception Filter

Swalm (1966), conducted experiments to assess the perception of risks of real world decision makers (executives in a certain company). Fundamentally the thrust of Swalm's research is toward the question "How do businessmen act in situations where they recognize risks?"

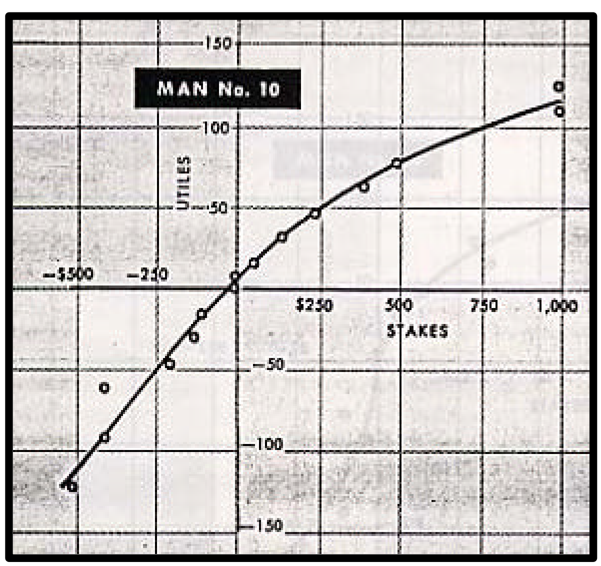


Fig. 2.3 Perception Filter of Investors Based on Empirical Experiments

The experiments involve a series of questions in which they are made to express their preference between two options with uncertain payoffs. From the stated preferences, utility functions were developed. A total of 100 people were interviewed and the **Fig. 2.3** is a representative sample of the results. From the empirical evidence provided by the experiments illustrated, the developed perception filter can be deemed reasonable.

Definition of Project Viability

The project here is represented as a chance tree (**Fig. 2.4**), to compactly enumerate the set of possible payoffs of the project. The payoff of the project is the net present value of the project, which is a function of the variables of the project. A project variable is a set of possible mutually exclusive events that can influence the project payoff. Variables for a PPP toll road project for example are demand, inflation, currency exchange rate, construction cost, etc. In **Fig. 2.4** each level of the chance tree is represented by a project variable. A branch in each level represents an event (an element of the corresponding variable). An example of an event for a construction cost variable is a cost overrun of 30% of the estimated. A certain project payoff is therefore a function of the events identified by its corresponding path along the chance tree and has the probability equal to the joint probability of all the variable events along the path.

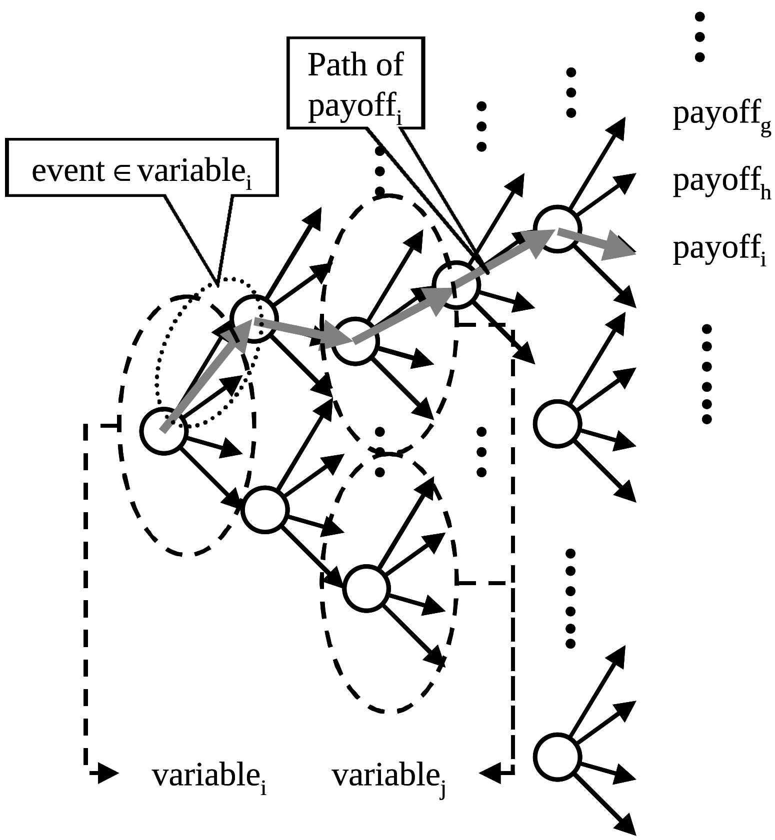


Fig. 2.4 Project Representation Using a Chance Tree

In determining the viability of the project using the preceding project representation, two properties are primarily considered, i.e. the risks and reward of the project. There are two traditional ways to assess this; namely, the expectations and variance approach and the expected utility theory approach. Both approaches are practically consistent in terms of ordering projects.

i. *Expectation and Variance of Payoffs:* $E[P]$ and $V[P]$ Eq. 2.1-a

ii. *Expected utility approach*: $E[u] = E[f(P)]$ Eq. 2.1-b

E[.] = expectation
V[.] = variance
u = perceived expected payoff of the project
f(.) = perception filter
P = project payoff = resulting change of wealth derivable from the project

As the expected utility approach can readily incorporate the effects of project due to its more simple formulation, this approach is used for the ensuing analysis. Further, for the sake of practicality, the expected utility equation is simplified through the following assumptions.

Assumptions

assumption 1. The project variables are independent.

assumption 2. The probability of deviation from the base or expected events is small.[7]

assumption 3. The project payoff is a linear function of all project variables.

The project payoff is therefore (by assumption 3) equal to the summation the event payoffs along its path, where an event payoff is the corresponding gain or loss due to an event (e.g. a loss of US$150M is the event payoff due to a 50% construction cost overrun of an estimated US$100M project). Along with the other assumptions, Eq. 2.1-b can be simplified as follows.

$$C = \prod_{A \in T} p_{base}^{A} \times f\left(\sum_{A \in T} X_1^A\right) + \sum_{A \in T} \sum_{\substack{a \in A \\ a \neq base}} p_a^A f\left(X_a^A + \sum_{\substack{B \in T \\ B \neq A}} X_1^B\right) \qquad \text{Eq. 2.2}$$

Where,

C is the perceived payoff of the project an index of project viability
T is the set of all project variables
X_a^A is the event payoff of event *a* of variable *A*
p_a^A is the probability of event *a* of variable *A*
X_{base}^A is the base assumption or expected event of variable *A*

Here events are defined as either a risk events or reward events.

i. **Risk events** are events that tend to decrease the viability of the projects; and,
ii. **Reward events** are events that tend to increase the viability of the project.

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[7] Thus the product of the probabilities of events deviating from the base or expected value can be assumed to be zero, or at least small enough. This assumption is a strong assumption but is justifiable as events in a PPP project have small probabilities. This is especially true for developed countries but it may create some biases in developing countries. Still, even in developing countries the probabilities are small, that thou they may create bias it can be assumed that it would not affect the subsequent conclusions.

STEP 1: Identifying Variations of the Project's Risk/Reward Profile

The analysis will now begin with the identification of a set of variations in the project's risk/reward profile while maintaining the same viability level. To achieve this, two events are isolated (taking that the incentive package will influence these two events). Then, their event payoffs are dithered and the cross-substitution effect is observed. It can then be shown through the manipulation and examination of equation 2.2 that the iso-viability curves[8] (shown in **Fig. 2.5**) considering of event payoffs X_i^I and X_j^J, is negative and convex.

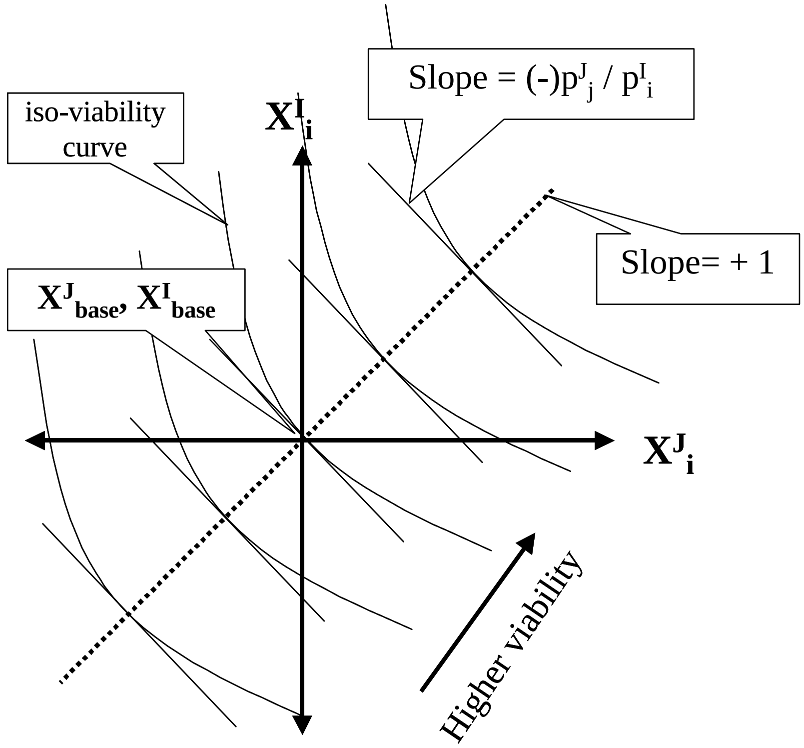

Fig. 2.5 Properties of the Iso-Viability Curves

STEP 2: Identifying an Efficient Strategy

Firstly, the financial exposure function for the government needs to be defined. Here, it is assumed that the government takes a risk neutral stance, which is reasonable because the government acts for the interest for the country thus, risks are shared between a large number of people, thus the effects of risk-averseness is negligible. Thus,

$$F = p_i^I D_i^I + p_j^J D_j^J$$

$$D_i^I = \frac{F}{p_i^I} - \frac{p_j^J}{p_i^I} D_j^J$$

$$\frac{\partial D_i^I}{\partial D_j^J} = -\frac{p_j^J}{p_i^I}$$

Where,

[8] May be termed as an event payoff substitution function

F = expected financial exposure of the government

D^I_i = the portion of the event payoff, X^I_i the government guarantees (for risk events) or the government enhances (for reward events).

Here the incentives mechanism is examined. There are basically two general mechanisms of how incentives influence the project risk/reward profile.

i. Risk-sharing – improve a risk event (i.e. lessen its effect)
ii. Reward enhancement – improve a reward event (i.e. increase its effect)

Thus using the iso-viability curve to represent the set of risk/reward profile variations of a marginally viable project and the government financial exposure line as the objective function, a number of strategies can be formulated. For example the optimal risk-sharing strategy can be determined from the following illustration.

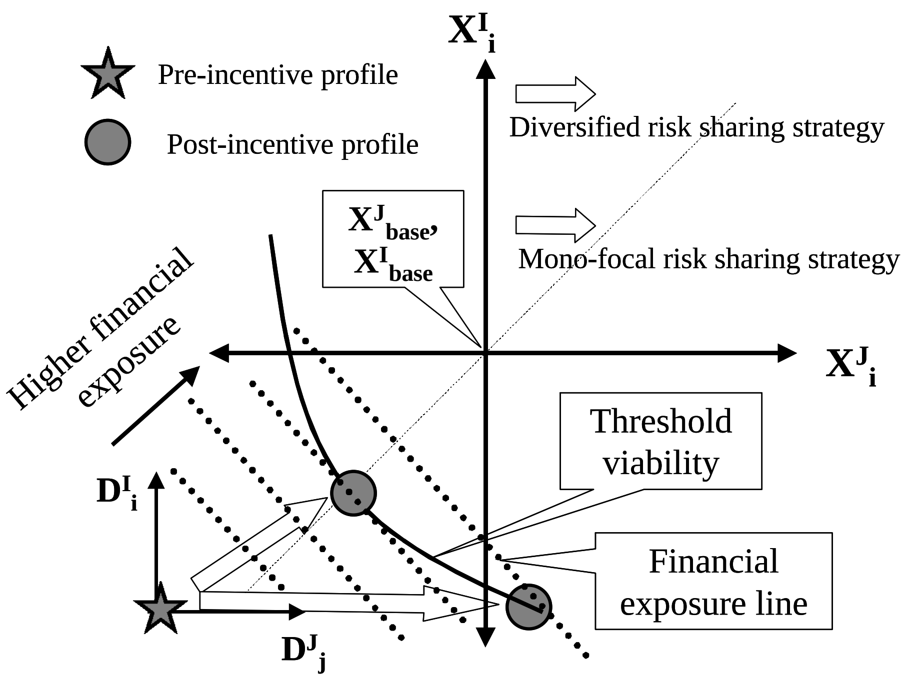

Fig. 2.6 Optimal Risk-Sharing Strategy

Thou, many other more specific theorems can be derived from the model; only the broad strategies are analyzed here; namely,

i. Risk-sharing: Incentives that influence downside events payoffs
ii. Reward enhancement: Incentives that influence upside event payoffs
iii. Subsidies: Incentives that shift up the entire set of project payoffs

The ordering of strategies (in terms of efficiency) shown in **Fig. 2.7** can be obtained from the project incentives design model using similar methods presented above in analyzing risk-sharing strategies.

Reward enhancement < Subsidies < Risk-Sharing

Higher financial exposure Lesser financial exposure

Fig. 2.7 Ordering of Broad Incentive Strategies

In terms of designing a project incentive package the following strategies are ordered (**Fig. 2.8**). From here subsidies are considered as a type of reward enhancement strategy.

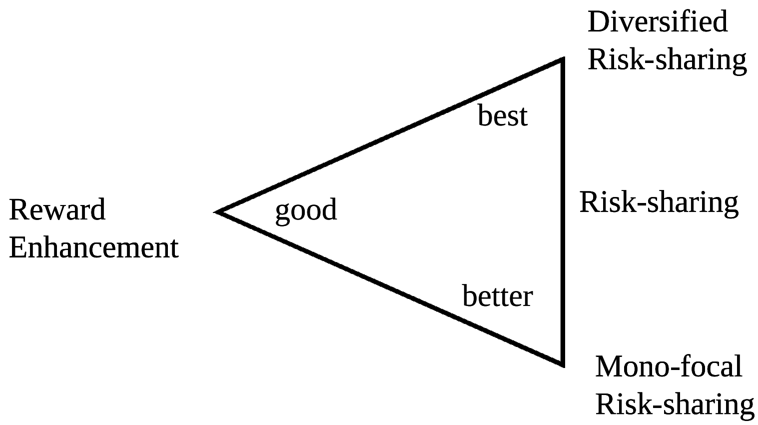

Fig. 2.8 Ordering of Project Incentive Package Strategies

3. CASE STUDIES: PROJECT INCENTIVE DESIGN MODEL VERIFICATION

This section presents case studies[9] aimed at verifying the project incentive design model. The case studies would be examined by checking if the strategies adopted diligently by governments would tend towards the optimal condition (i.e. convergence towards diversified risk-sharing strategies)

Case Study 1: Hungary's Transition of Approach

With the need to reduce public spending and improve its road infrastructure, Hungary turned in the early 1990's to the development of a toll motorway network on a BOT basis. Hungary's tollway program was initiated in the national highway plan of 1992, which called for the development of four motorway corridors.

*M1/M15 Project***:** Of the four major corridors, the M1/M15 project was the first implemented. It involves the construction of the last missing 43 km segment along the 260-km M1 motorway, which links the Hungarian and Austrian capitals and a 14-km component on the M15, which branches towards Bratislava. A 35-year concession was awarded and became effective in 1994.

Government support for the project included (i) preliminary design, building permits, and environmental clearance; (ii) land acquisition amounting to 5% of project costs; (iii) undertaking of no tolls on the existing 126-km of the motorway prior to 2005; (iv) acceptance of a phased approach; and (v) some restrictions on heavy goods vehicles on a parallel road. There was no state guarantee for traffic or cash flow levels and 15% of the profits were to be paid to the government's road fund. The allowed maximum toll rate was US$ 0.146/veh-km for passenger cars, with a 30% hike on some vehicles during the summer peak. Tolls are to be adjusted based on the domestic consumer price index and exchange rate differentials in proportion to loans in US dollars and German marks.

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[9] Drawn from the case documentations by World Bank and MOC-Japan (1999) and ADB (1998)

Users were discouraged by the high toll (amounting to about a day's wage of an ordinary worker) and actual traffic was only half of the expected usage. The toll was considered too high by the public and was brought to legal action and was subsequently reduced by half by the courts and apparently without government compensation. With the revenue shortfall falling below the "worst-case scenario", the concession is in need of financial restructuring. Proper government involvement could have avoided socially sensitive areas like unaffordable toll rates.

M5 Project: The M5 Project, the second tollway concession, involves 157 km from Budapest to the southern border and onward to Belgrade-Sofia-Istanbul. The concession reached financial close in 1995. Project costs have been estimated at abut US$634 M.

A substantial government contribution – estimated at 30% - 40% of project costs – was provided in the form of (i) land acquisition; (ii) provision of the existing road; (iii) a standby, semi-annual. And totally capped operational subsidy for the initial six years of operation as a cash flow deficiency guarantee; (iv) construction of a 15-km, two lane connecting road to channel excess traffic from Road No. 4 to M5; and (v) some restrictions on heavy goods vehicle movements on a parallel road. Tolls are automatically escalated based on the domestic consumer price index and/or exchange differential with the French franc. Toll rates are much lower than the M1/M15 project and were deemed reasonable by the courts.

The substantial contribution was in light of high uncertainty of traffic due to civil instability in the former Yugoslavia. The government in return has a profit-sharing arrangement with the concession company. Traffic volumes in 1997 were about 7,650 vpd (97% of forecast volume) and it is expected that only 25% of the operational subsidy will be needed. The concession details have largely been the result of extensive negotiations.

Case Study 2: Chile's Risk Sharing Strategies

The public works department of Chile has learnt from the lessons in the BOT projects in Mexico. Thus, the government instituted measures to ensure private sector participation in its toll road program. Understanding the importance of risk sharing in toll road concessions, the public works department established a clear risk sharing mechanism. It includes the following government guarantees, (i) loan guarantee; (ii) lowest traffic volume guarantee – profit from additional traffic will be shared by the government and project companies; and (iii) construction cost risk will subsidized by increasing the concession period. Moreover, some project could avail of government subsidies. Also, the government also established policies and legislation to support these measures and endeavored to have transparent and competitive tendering process. In 1996, 50% of the total investment in the national highway construction was shared by the private sector and the program appears to be encouraging. In view of the present status, the BOT projects of Chile were deemed successful. Moreover, the government has BOT projects planned for 2000 to 2010 in which the government expects to attract US$ 4.5B from the private sector.

Procurement procedures used was competitive bidding, which considers different type of support as aforementioned. Two parameters are usually used, toll rates and lowest government financial support.

Case Study 3: United Kingdom's Portfolio Approach

As the demand for investment in U.K. was increasing, the government began to consider the adoption of private financing for highway construction and so broaden the source of funds, transfer risks to the private sector, improve capital efficiency and introduce efficient management of the private sector. Although the British Law allows toll financing, the public would object to this scheme. Thus, the government uses the Design-Build-Finance-Operate (DBFO) Scheme which very similar to the BOT structure. The key difference is the use of shadow tolls. Shadow tolls refer to the government paying to investors in behalf of the toll road user. What is functional about the shadow toll system is that the charge per veh-km is higher if the traffic levels are low and lower (and eventually tapers to zero) when there is higher usage. Thus, the government effectively partially guarantees cash flows if traffic is below forecast and the system can effectively cap the rate of return of the concessionaire.

The Portfolio Approach: In 1995, the government concessioned two independent road projects to the Road Management Group Limited, the A1(M) between Alconbury and Peterborough and the A419/A417 between Swindon and Gloucester. The RMG was granted a 30-year concession to widen and improve the roads and to operate and maintain. This structure allowed cross application of dividends so each project could support the other. It also enabled projected interest coverage levels coverage levels to be tighter than they could otherwise have been, thus lowering total financing costs. In addition, combining the two roads diversified the lender's risks.

Case Study 4: Colombia's Toll Concessions

The Colombian toll road concession program uses competitive bidding in term of the minimum government financial exposure to select proponents for its toll roads. This, unique set-up of the Colombian toll road concession program would enable the testing of the developed concepts in terms of the convergence towards the optimal condition.
Detailed example of this procurement mechanism is as follows:

The toll project in focus is a US$572.2M tollway project intended to improve transport conditions along a strategic road corridor linking Bogotá with Medillin and ports on the country's north coast and it was intended by the government to pursue a public-private-partnership solution. The project is estimated to have an economic rate of return of 19.5% and a financial rate of return of 8.2% and a 12% equity rate of return (the latter values are based on the sponsor's base case).

The support offered during the bidding process included:

i. An up-front government contribution, with the amount of contribution required to be decided by bidding;
ii. Minimum revenue support with the bidders to bid on the level necessary and the support to be available only for the first nine years, including the four-year construction period, with any government compensation under this limited revenue obligation to be counted against the revenue target set in the concessionaire bid;
iii. Government support for tunnel contingencies, with the concessionaire to absorb the first 20% of such contingencies and the government will absorb costs above that level;

iv. World Bank Partial Risk Guarantee, an option given to bidders that would protect project lenders or bond holders against debt service default due to the government's inability to meet its payment obligations as a result of the Ministry of Transport not authorizing toll adjustments agreed in the concession contract, political force majeure, or changes in the law adversely affecting the project's ability to service its debt and leading to default.

Bidders were then asked to quote in their bidding documents (i) the cost of annual capital contributions requested from the government, (ii) the cost of eleven work activities associated with geologic risk in tunnel construction, (iii) the amounts requested for Minimum Revenue Support during the first nine years of the concession, (iv) the maximum portion of this Minimum Revenue Support that would become available to the concessionaire through the Liquidity Mechanism to be funded by World Bank and (v) the Total Expected Revenue that the concessionaire plans to realize during the concessionaire term. The bidding documents sets caps for items (i), (iii) and (iv). The contract will be awarded to the bid with the least cost to the government.

Four bidders participated in the tendering and as it happened two of the bidders requested for all four instruments and one bidder requested the use of one of the instruments. The winning bidder requested the lowest up-front capital contribution from the government and declined the use of the other instruments, but indicated the highest expected profit compensation.

Table 3.1 Summary of the Project Incentives Offered in the Project and Past Toll Concessions in Colombia[10]

Government undertaking	Earlier Concessions in Colombia	Project (Bidding Stage)
Capital contribution	For large projects exceeding financial viability, part of investment undertaken with public funding outside the concession, and transferred to concessionaire for exploitation upon completion	Up front capital contribution during construction stage in the form of a grant. The specific amount subject to bidding
Construction cost increases: -Roads and bridges -tunnels	 Full compensation of cost increases up to 30% of bid cost, and 75% of cost increases between 30-50% over bid cost -Initially no tunnels considered under concession (undertaken outside concession)	 Limited to geologic risk, first 20% to be absorbed by concessionaire
Minimum revenue support: - size and duration - form of compensation	 -Historic traffic throughout concession term -(i) term extension; (ii) toll increase; 50-50% share of additional traffic over 125%	 -Ceilings (targeted at debt). Nine years out of 24 year term -Cash payment capped at total expected revenue of bidder

[10] The World Bank, Finance, Private Sector, and Infrastructure (LCSFP), Country Management Unit for Colombia, Ecuador and Venezuela (LCC4C), Latin America and Caribbean Regional Office, *Project Appraisal Document on a Proposed Loan in the Amount of US$137.1M to Colombia for a Toll Road Concession Project*, Report No. 17986, June 11, 1998.

Case Study Results and Conclusions

In Hungary, the initial approach on the M1/M15 Project was to increase the profit potential of the project with limited direct government undertaking. The approach may have minimal cost to the government, but the high tolls encountered high social resistance and were eventually brought down. This leaves the project financially unsustainable and may have to be rescued by the government. Learning from the M1/M15 Project, the Hungarian government exercised diligence with the M5 Project by setting the toll levels to an acceptable level and undertook risk-sharing strategies. Moreover, the revenue recapture scheme, which reduced the windfall potential of the project did not wane investor's interest. Chile from the start exercised diversified risk-sharing strategies. The UK-portfolio approach also demonstrated a diversified risk-sharing strategy. Colombia whose strategy was to allow the project bidders freedom in selecting their incentive package and the winner based on minimal government financial exposure also confirmed the convergence towards a diversified-risk sharing strategy. **Fig. 3.1** illustrates this point.

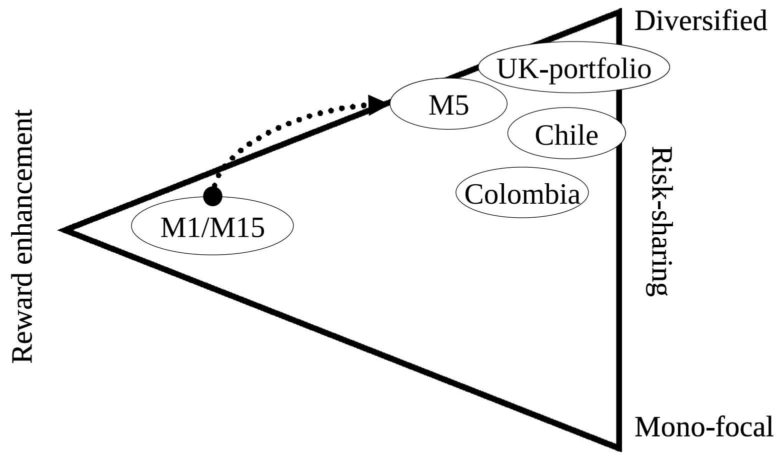

Fig. 3.1 General tendencies of PPP Project Incentive Strategies

An interesting discussion is the result of the bidding of a certain toll project in Colombia. The bidders have freedom (with certain constraints) to adopt an incentive strategy and will be judged on which strategy will result in the least government financial exposure. **Fig. 3.2** illustrates the bidder's tendencies.

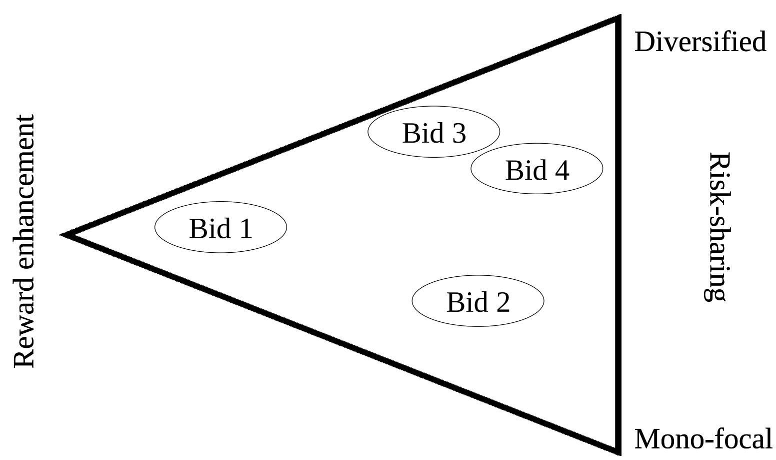

Fig. 3.2 General tendencies of PPP Project Incentive Strategies

Though not very distinct in this case, still the tendency of bidders is to locate towards the risk-diversification strategy. It is interesting to note that the winning bidder, bidder 1, rejected all risk-sharing instruments offered and requested the highest profit potential. If one examines the behavior of bidder 1, one may judge bid 1 as a risk-taking approach, as risk-adverse bidders would tend to minimize the downside potential of the project as much as possible. If the risk-adverse assumption of the investor were reversed to be risk-taking, the iso-viability curves would be concave. Thus, a risk-taker would tend towards the risk-enhancement strategy. Moreover, it could also be shown that the risk-taker investor's approach would always result to lower government financial exposure than a risk-adverse investor's approach, which could explain why bidder 1 won the concession.

As a summary, the presented case studies point towards merit to the functionality of the project incentive design model.

4. CONCLUSION

The emergence of PPP has brought about new challenges for infrastructure planners, and none is more besetting than the clash of social interests and commercial interests. Project incentives have been a key policy tool for government infrastructure planners to keep the delicate balance between serving the interest of the public and the commercial requirements of the private sector. As project incentives can be very costly, its effective management is key to assure maximum benefits in PPP projects.

This study aimed to contribute to the knowledge in efficient management of PPP project incentives. And its contribution is a general analytical framework that can aid in the design of PPP project incentive packaging. Thus, project incentive packages can be assessed *a priori*, enabling greater management control for the government policy makers.

This paper presented the development of the project incentive design model and derived broad incentive strategies to minimize government financial exposure. Case studies were then used to verify the project incentive design model. The results shown in this study, thou admittedly limited to some extent at this point, are nonetheless positive. Work is on ongoing to further extract more useful theorems from the project incentive design model and to incorporate other factors such controllability to make full use of the project incentive design model developed in this study.

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