Can shadow toll pricing be an alternative to investment grants?

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CAN SHADOW TOLL PRICING BE AN ALTERNATIVE TO INVESTMENT GRANTS ?

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1. INTRODUCTION

The construction of efficient transport infrastructure networks is essential for economic growth, in order to facilitate trade. For several decades, industrialized nations have been investing considerable sums in such projects, but increasing traffic and the desire to ensure balanced regional development mean this effort must be continued (Barrett, 1999). However, the changing economic climate forces national, local and regional governments to stabilize or drastically cut public infrastructure investment budgets. Furthermore, the existing networks are ageing, which raises the question of maintaining these infrastructure assets. Too frequently, in order to cope with these budgetary restrictions, the easy solution of delaying preventive maintenance has been applied and many countries now need to devote a considerable percentage of their budget to costly renovation works, or even reconstruction, to the detriment of new construction (Spackman, 2002). In addition, economic logic has meant that the most profitable infrastructures, i.e. those with the highest traffic levels and time savings, were constructed first, and current projects often have a lower economic rate of return and are financially unprofitable. Public-Private Partnerships (PPPs) (Section 2), are therefore becoming more common, in particular as a result of budgetary restrictions, but these may require large public investment grants. Shadow tolls (Section 3) were first introduced as a means of guaranteeing the necessary revenue in the light of the considerable risks as regards traffic levels for tolled infrastructures, or as a means of financing the maintenance of existing untolled infrastructure. We have developed (Section 4) a theoretical financing model in order to investigate the conditions under which shadow tolls can provide an alternative to investment grants. Using a few key financial structure variables, we have then conducted a number of simulations (Section 5) to investigate the conditions under which a system of this type could be of interest to public authorities. The conclusion (Section 6) discusses some ideas for improving the model with a view to increasing the use of shadow tolls to finance infrastructure.

2. THE DEVELOPMENT OF THE PPP IN ORDER TO COPE WITH THE SHORTAGE OF PUBLIC FUNDS

In response to the shortage of available public funds, to mobilize private capital and to share the risks that are inherent to infrastructure projects the public authorities in an increasing number of countries have decided to make use of Public-Private Partnerships. The shift from traditional arrangements such as BOT (Build-Operate-Transfer) to more complex ones such as DBFO (Design-Build-Finance-Operate), aims to involve a private consortium in all or part of the process of constructing and funding, rehabilitating and increasing the capacity of a piece of infrastructure. In the case of tolled infrastructure the benefit of this system is that it brings in private capital, the return on which is provided by commercial revenue in the framework of a long-term concession contract. The use of such partnerships is often justified not only on the grounds of budgetary constraints but also because of their high efficiency, in particular with regard to the management of invested capital (Spackman, 2002).

In France, use of Public-Private Partnerships (PPP) were essentially developed with the creation of the interurban motorway network and took a specific form. Companies with either public or private capital were assigned the task of constructing motorway sections as part of a specific type of linkage; the financing of new sections was facilitated by the possibility of using the toll revenue from existing sections. Future motorways were thus to a considerable extent funded by the users of the existing ones. This system has now become problematic as the European Commission has decided that it infringed the principal of free competition as it does not permit a new player to enter the market for motorway concessions on a level footing with existing companies. It would therefore appear that for new motorways a financial set-up is required which provides profitability when only a single section is constructed. However, as has been mentioned already, the forecast traffic on these new sections is not sufficient for them to be profitable. A contribution from public funds is therefore required to ensure adequate profitability for the operating company (Bonnafous, 2002).

Usually, a contribution of this type takes the form of grant that reduces the capital costs that must be met by the concessionary. A number of simulations performed with current projects show that at the present time the level of subsidies can amount to between 50% and 90% of the total capital cost, which in some cases casts doubt on the benefits of entrusting these projects to the private sector. On the other hand, national government is unable to release investment funding on this scale, which means that the project could be postponed indefinitely. In order to mobilize the necessary funding, the national government usually attempts to involve the regional and local government which will benefit from the projects in question (Départements, Cities and Regions). While this solution has the advantage that it requires less central government funding and therefore lowers the public debt, all it does is to transfer the problem to a lower level. This has the advantage that it may help to quell the zeal of elected representatives who are forced to face up to their responsibilities, but local and regional governments are themselves in financial difficulty and do not always have ready access to loans. Thus, they too are looking for alternative modes of finance to ensure that the construction of infrastructure which is necessary for their economic development is not prevented.

While the shortage of public funds encourages governments to turn towards Public-Private Partnerships, they are nevertheless aware that the mobilization of private funds imposes faster returns on investment and that the overall result of this is to increase the total cost of their projects. On the basis of the experience of neighbouring countries, they are now becoming interested in funding by means of shadow tolls, a system which they consider will enable them to spread out the expenditure, even if it involves a wager on future resources. This provides a potential means of avoiding the difficulty of raising the loans that are necessary to provide investment grants.

3. SHADOW TOLLS AS AN ALTERNATIVE MEANS OF FINANCING

The principal of the shadow toll is familiar in the transport context, but until now it has only been used in two specific areas.

The first is tolled infrastructures, such as motorways, bridges or tunnels. In order to achieve financial equilibrium and cover high investment costs, the private sector operator needs to calculate the level of toll that is required to recover the initial outlay, repay loans and provide a return on invested capital. An excessively high toll will lead to a commensurate reduction in traffic as there are limits to users' willingness to pay. The consequence of this is lower benefit in the socioeconomic evaluation of the infrastructure. In this case, one option that is available to the public authority is to try to find the optimum price which maximizes the benefit for society and to pay the private operator the difference between the equilibrium toll and the optimum toll. A shadow toll which is calculated in this way therefore becomes an annual expenditure which changes according to the traffic on the infrastructure. This solution has the disadvantage of generating recurring expenditure, unless an adjustment mechanism is included that allows the total amount of the shadow toll to be reduced to a point where it becomes non-existent when there is enough traffic to achieve financial equilibrium.

The second area is in the framework of a Public-Private partnership. This is a device aimed at limiting the risks associated with uncertainty as regards changes in traffic. The profitability of a piece of infrastructure is still considered in the long term (in excess of 20 years), because of the high investment cost. Industrial risks aside, (cost of works, operating costs), the operator is faced with a large number of uncontrollable events: political instability in some countries, an uncertain economic climate (which can reduce transport demand), a change in transport policy (which can lead to the construction of competing projects), etc (Grimsey & Lewis, 2002). Another major risk is a consequence the shortcomings of demand forecasting models, which are unable to take account of long term changes in user behaviour. To deal with this risk, concessions include a number of features, such as partial guarantees of revenue if the real traffic differs excessively from the forecasts. One mechanism that protects the private operator this lays down rules for sharing the risk with regard to traffic, according to a four band system (Fisher & Babbar, 1996): if traffic falls below a specified level, the public authorities contract to top up revenue by means of a shadow toll in order to guarantee the financial viability of the private operator: in the same way, if traffic exceeds the forecasts, the additional profits can be shared between the operator and the public authorities. This is therefore a conditional mechanism, but one which may, in the long term, result in rising costs for the community, if traffic changes out of line with forecasts.

These two examples demonstrate that the shadow toll is in this case a discontinuous corrective mechanism rather than a genuine tool for financing new infrastructure construction. However; in recent years a different use of the shadow toll has appeared. As a consequence of the ageing of infrastructures and the need to undertake costly road renovation/reconstruction programmes, some countries have introduced shadow tolls of a specific type. Whether the project involved is to maintain untolled roads or to increase their capacity (building an extra lane), private road operators are used in a partnership arrangement: the public authority therefore pays a shadow toll that varies according to the traffic in order to provide the resources required to pay for works (Spackman, 2002). In the framework of concessions, private firms are therefore given the responsibility of maintaining the infrastructure asset.

A system of this type opens the way for wider use of shadow tolls to finance the creation of new infrastructure. However, it is necessary to identify the conditions under which this system can be of greater benefit to the public authorities than the conventional investment grant mechanism. The aim of this paper is to investigate, using theoretical simulations, the areas in which this alternative could be appropriate.

4. A MODEL FOR COMPARING DIFFERENT FUNDING MODES

Our comparison between the two modes of funding (grants versus shadow tolls) will, in principle, involve tolled infrastructure projects whose profitability is not certain, that is to say for which the forecast cash flows over the duration of the concession do not allow a private operator to be sure of meeting the costs associated with operation, servicing debts and providing a return on invested private capital. In order to analyze the various possible situations the simulation model incorporates a number of simplifications, based on the work of (Bonnafous, 2002). The main hypotheses are as follows (see Table 1):

- The total investment cost (denoted by INV) is spread out equally over the entire concession duration (DT);

- Financing is limited to three sources:
    - private capital (FP) which includes any “quasi” private capital_or capital linked to the subordinated debt; the amount of private capital depends on the concession duration (DC), the required financial internal rate of return (TO) and, of course, the cash flows for the project;
    - total loans (EM) which, correspond to the principal debt; to simplify, the amount involved depends on average values: the interest rate (XI), the duration of loans (DE) and the cash flows; these loans

generate repayment annuities (AN) which are constant throughout the loan period;

- in some cases an investment grant (SUB) whose purpose is to ensure the private operator remains in profit. This corresponds to the total investment cost minus private capital and loans;

* the expected raw surplus corresponds, in this case, to the difference between the toll revenue and the total operating costs; this will be used to meet the repayment annuities (AN) and provide a return on the private capital (FP) at the required rate TO;

* to have simple functions to work with, it is considered that the cash flow will increase linearly in accordance with the equation:

  CF(n) = EB*(1+XB*n),

  where EB is the raw surplus at opening, XB is the annual rate of growth of EB and n the year in question. According to (Bonnafous, 2002) this is an acceptable simplification for long durations. In the case of shadow toll funding, the cash flow becomes:

  CFS(n) = EBX*(1+XBX*n) = (EB+ST)*(1+(XB+XST)*n)

* the raw surplus on opening is distributed between servicing the debt and providing a return on private capital on the basis of a distribution ratio (RR). If RR = 100%, all the raw surplus at opening is allocated to repayment of the principal debt.

Figure 1 shows the two structures of financing. It should be noted that the shadow toll increases the available cash flows and therefore provides a means of either increasing the annuities (if the distribution ratio RR is identical) , or increasing the return on or the amount of private capital.

4.1 Calculating the grant and the shadow toll

Risk is not considered explicitly in the analysis we are conducting here. It is assumed that it is either taken into account within the investment cost or bank interest rates. The risk as far as cash flows are concerned can easily be simulated by modifying the values of the variables EB and XB.

* Determining the grant involves several stages. The first consists of estimating the total loans (EM) which is a direct consequence of the duration of loans (DE), the interest rate (XI) and the sum of the annuities (AN = RR*EB). For the purposes of simplification, it is assumed that a single loan was taken out the year before the infrastructure was opened. The total loan is in this case equal to the sum of discounted annuities at the interest rate XI, i.e.:

$$EM = \left(RR \times EB\right)\sum_{j=1}^{j=DE} \frac{1}{(1+XI)^{j}}$$

* Private capital FP (finance by a grant) is calculated using the following formula:

$$FP = \frac{DT}{A^O}\left[EB \times B^O + EB \times XB \times C^O - AN \times B^E\right]$$

Where:

$$A^O = \sum_{j=1-DT}^{j=0} \frac{1}{(1+TO)^j} \qquad B^O = \sum_{j=1}^{j=DC} \frac{1}{(1+TO)^j}$$

$$B^E = \sum_{j=1}^{j=DE} \frac{1}{(1+TO)^j} \qquad C^O = \sum_{j=2}^{j=DC} \frac{j-1}{(1+TO)^j}$$

The amount of private capital (FP) is calculated as follows: the sum of the cash flows (minus the annuities), discounted by the financial internal rate of return (TO), must be equal to the discounted value of private capital, equally distributed over the duration of works.

- The grant is then calculated thus:

SUB = INV – FP – EM

In the case of shadow toll funding, the variables ST and XST are determined such that the investment grant (SUB) is equal to zero, i.e.: FPX + EMX = INV, and it is assumed that the other conditions remain the same (interest rate, duration, etc.).

Introducing this constraint is not enough to allow us to solve the equation, it merely links the variables ST and XST. The public authority's objective of cost minimization therefore leads to the calculation of the sum of discounted shadow tolls (VAST), which will be compared with the sum of discounted investment grants (VASUB).

- The loans are calculated (in the case of shadow toll finance) in an identical manner using the formula:

$$EMX = \left(RR \times \left(EB + ST\right)\right)\sum_{j=1}^{j=DE} \frac{1}{(1+XI)^j}$$

- Likewise, the value of private capital (in the case of shadow toll finance) becomes:

$$FPX = \frac{DT}{A^O}\left[\left(EB+ST\right)\times B^O + \left(EB+ST\right)\left(XB+XST\right)\times C^O - RR\times\left(EB+ST\right)\times B^E\right]$$

4.2 Use of continuous functions

To simplify calculation of the discounted sums, they can be transformed into continuous functions which take the following form:

$$\sum_{j=n}^{j=0} \frac{1}{(1+x)^j} \Rightarrow K1_n^0(x) = 1 - \frac{1}{x}\left(1 - e^{-x\times n}\right) \qquad \sum_{j=1}^{j=n} \frac{1}{(1+x)^j} \Rightarrow K1_1^n(x) = \frac{1}{x}\left(1 - e^{-x\times n}\right)$$

$$\sum_{j=2}^{j=n} \frac{j}{(1+x)^j} \Rightarrow K2_2^n(x) = \frac{1+x}{x^2}\left[1-(1+x\times n)-e^{-x\times n}\right]-\frac{1}{x}\left(1-e^{-x\times n}\right)$$

The values of the parameters K1 and K2 are linked and shown in Figure 2 for different values of n and x. It is clearly apparent that the variable x is dominant with regard to the variable n, except when x takes on a low value; in this context x can be the bank interest rate (for loans), the reference rate (for discounting public funds) or the required financial internal rate of return for private capital.

With these functions, we express the sum of the discounted investment grant as follows:

$$VASUB = -\frac{SUB}{DT} K1_{1-DT}^{0}(\mathrm{TR}) = -\frac{SUB}{DT}\left[1-\frac{1}{\mathrm{TR}}\left(1-e^{-\mathrm{TR}(1-DT)}\right)\right]$$

Similarly, the sum of the discounted shadow tolls is expressed by

$$VAST = ST\left[K1_1^{DC}(\mathrm{TR})\right] + \left[K2_2^{DC}(\mathrm{TR})\right] \times \left[(EB+ST)(XB+XST) - EB \times XB\right]$$

As a result of the fact that with the shadow toll the grant must be nil, it is necessary that FPX+EMX=INV, which leads to a fairly complex expression of the following form that links ST and XST:

$$XST = \frac{\alpha}{ST+\beta} \ldots\ldots\ldots\ldots(1)$$

This allows us to express VAST as a function of ST. However, this is a decreasing function for ST > 0, which means that we cannot calculate a minimum value for VAST in a straightforward manner. An additional condition must be introduced. We decided to impose the condition ST(DC)=0 in order to adjust the amount of the shadow toll to the duration of the concession. This implies that:

$$ST(DC)) = \left[(EB+ST)(1+(XB+XST)\times DC) - EB(1+XB\times DC)\right] = 0$$

Or:

$$XST = -\frac{ST\times(1+DC\times XB)}{DC\times(EB+ST)} \ldots\ldots\ldots\ldots(2)$$

Table 2 shows an example of a simulation for a project whose economic internal rate of return is close to the reference rate of 8% that applies in France. Classical financing by means of grants requires the public purse to contribute more than one third of the total investment cost in order to guarantee the financial feasibility on the basis of the bank interest rate and the required return on private capital. Financing by means of a fairly moderate shadow toll gives an interesting result in this case, as its discounted cost is only very slightly higher than the discounted cost of the envisaged grant. This solution seems acceptable when the public authority is subjected to severe budget constraints.

5. UNDER WHAT CONDITIONS IS A SHADOW TOLL AN APPROPRIATE ALTERNATIVE?

A number of simulations have been performed in order to establish the conditions under which the use of shadow tolls can provide an acceptable, or even a less costly, alternative to investment grants. Many factors affect the values of the shadow toll and these are displayed in Table 3.

Firstly, we must stress that the value of the raw surplus on opening (EB) and its annual rate of growth have an impact on the amount of private capital (FP and FPX), and the size of loans (EM and EMX), the grant (SUB) and the shadow toll (ST and XST), but as these effects are proportional, they have no impact on the VAST / VASUB ratio. In other terms, the outcome of a comparison between financing by means of a grant and by means of a shadow toll is not affected by the values selected for EB and XB.

Applying the scenario described in Table 2, Table 3 sets out the values for the various parameters which provide a VAST / VASUB ratio of unity, which means the cost for the two modes of finance are the same. From this table we can see that the following are required in order to reduce the VAST / VASUB ratio:

- An increase in the duration of works (DT)
- An increase in the reference rate (TR)
- A reduction in the concession duration (DC)
- An increase in the distribution ratio (RR)
- An increase in the duration of loans (DE)
- A reduction in the interest rates on loans (XI)
- A reduction in the required financial internal rate of return (TO)

However, the first three variables change the general economics of the project, and increase the discounted value of the grant. In particular, reducing the duration of the concession does not appear to be an appropriate means of improving financing.

The last three variables are of more interest, insofar as they will tend to reduce both the value of the grant (SUB) and the shadow toll on opening (ST).

- The distribution ratio (RR) is a strong hypothesis in the model, as it indicates the proportion of the raw surplus that is allocated to servicing the debt. It is therefore the result of a trade-off between the repayment of loans and the return on private capital. In view of the demands made by banks and the need to cover the risks associated with traffic levels, it is reasonable to expect high values of RR (of the order of 90%). This means that in the structure of financing, the amount of loans is significantly greater than the amount of private capital. The decision to implement such a strategy depends entirely on the private consortium that has been granted the concession, and the public authority cannot directly influence this choice. However, we can suggest that shadow toll financing is a form of guarantee against risks which can encourage high RR values.

- The duration of loans (DE) can probably be increased for the same reasons as in the previous case, as the shadow toll is an annual flow that is guaranteed by the public authority.

- The interest rate on loans (XI) is a variable that depends on the state of the financial markets. Without going into further detail here, we can simply state that the lower this is, the more possible it becomes to use shadow tolls.

- Finally, it would seem possible to negotiate a reduction in the required financial internal rate of return (TO) as long as the shadow toll provides a guarantee with regard to future revenue.

The VAST / VASUB ratio can thus be adjusted on the basis of the interest rate on loans (XI) and the percentage of the raw surplus that is allocated to the payment of annuities (RR). Figure 3 shows how this ratio changes for XI values of between 1% and 10% and RR values of between 50 % and 100 %. These charts show that, for the basic scenario we have considered, use of the shadow toll is always more costly when the RR is below 55%. However, when RR is higher, use of a shadow toll can be advantageous, even when interest rates are high.

Likewise, the influence of the interest rate XI must be analyzed as a function of the financial internal rate of return (TO). Figure 4 shows how the VAST / VASUB ratio changes for various values of these rates in the case where RR = 80 %. It can be seen that XI has a greater influence than TO.

6. CONCLUSION

These first simulations demonstrate that under certain conditions it would seem to be possible to use a shadow toll as an alternative to an investment grant. The analysis we have conducted here essentially involves a comparison between the discounted costs of the two modes of finance, but the scale of these costs in absolute terms must, of course, be borne in mind.

Also, when we compare the discounted values of the grant and the shadow toll, it is assumed that public money is available, but in view of the constraints on public budgets a loan is likely to be needed, under financial terms that may be different. It would therefore be necessary to take account of the financial costs for the public authority generated by each alternative.

Likewise, the choice of a cost equivalence for the two modes of funding does not take account of the real difficulties involved in mobilizing public funds. For example, if shadow toll finance is chosen when the project's VAST / VASUB ratio is 1.3, this will reveal that the local authority has strong preference for this infrastructure project, compared to other possible investments in its area of competence (education, health, or alternative transport projects).

The theoretical model we have proposed should therefore be further refined with reference to more complex structures of finance, for example different durations of loans or concession for the two modes of finance. In the same way, a more realistic separation between the different sources of funding is necessary, and risk as regards future revenue should be taken into account in an explicit manner. Nevertheless, this analysis shows clearly that while Public-Private Partnerships are frequently considered as being a more costly solution than direct investment by the public authority, different forms of finance can significantly reduce the anticipated additional costs and provide a means of avoiding the budgetary constraints that are tending to delay infrastructure construction.

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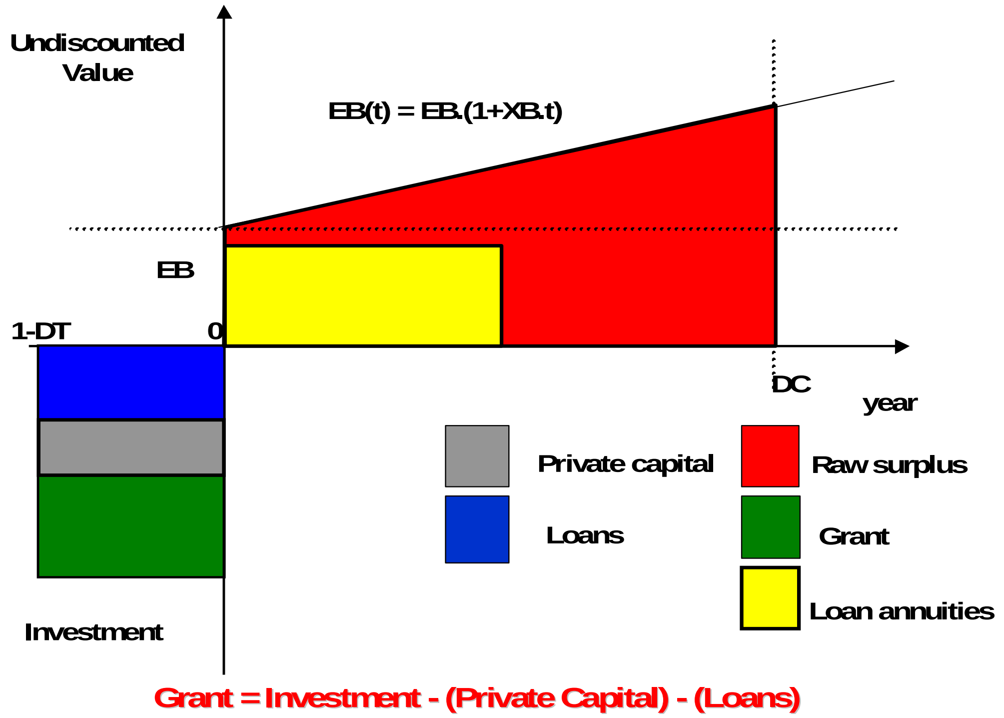
1) FINANCING WITH A GRANT



2) FINANCING BY SHADOW TOLL

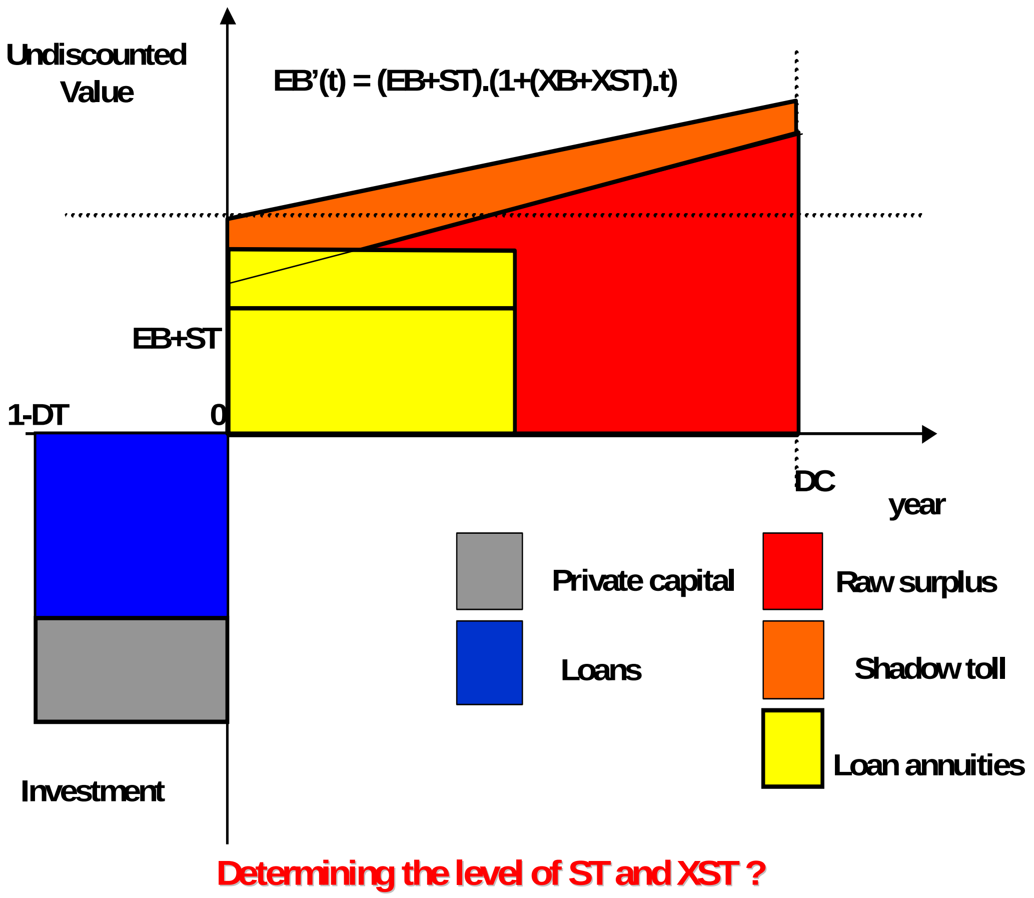


Figure 1: Comparison between the two financing structures

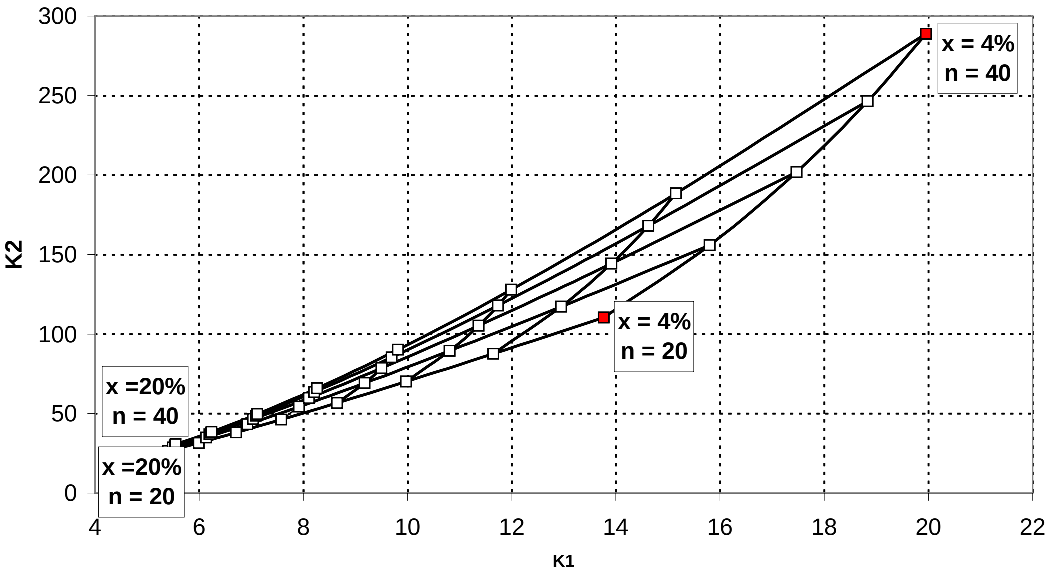


Figure 2: Change in factors K1 and K2 as a function of the duration n and the rate x

Figure 3: Influence of the parameters RR and XI on the VAST / VASUB ratio

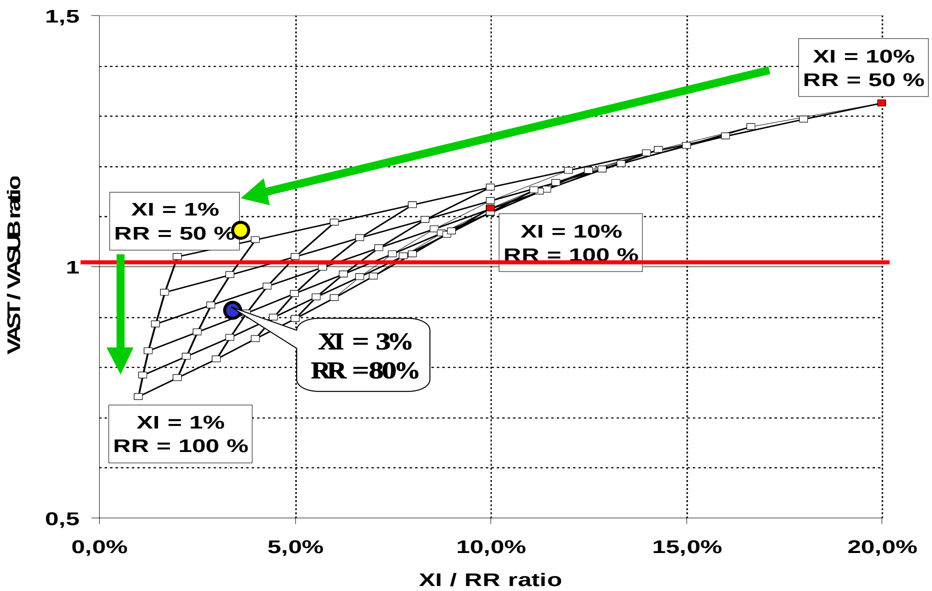


Figure 4: Influence of the variables TO and XI on the VAST / VASUB ratio

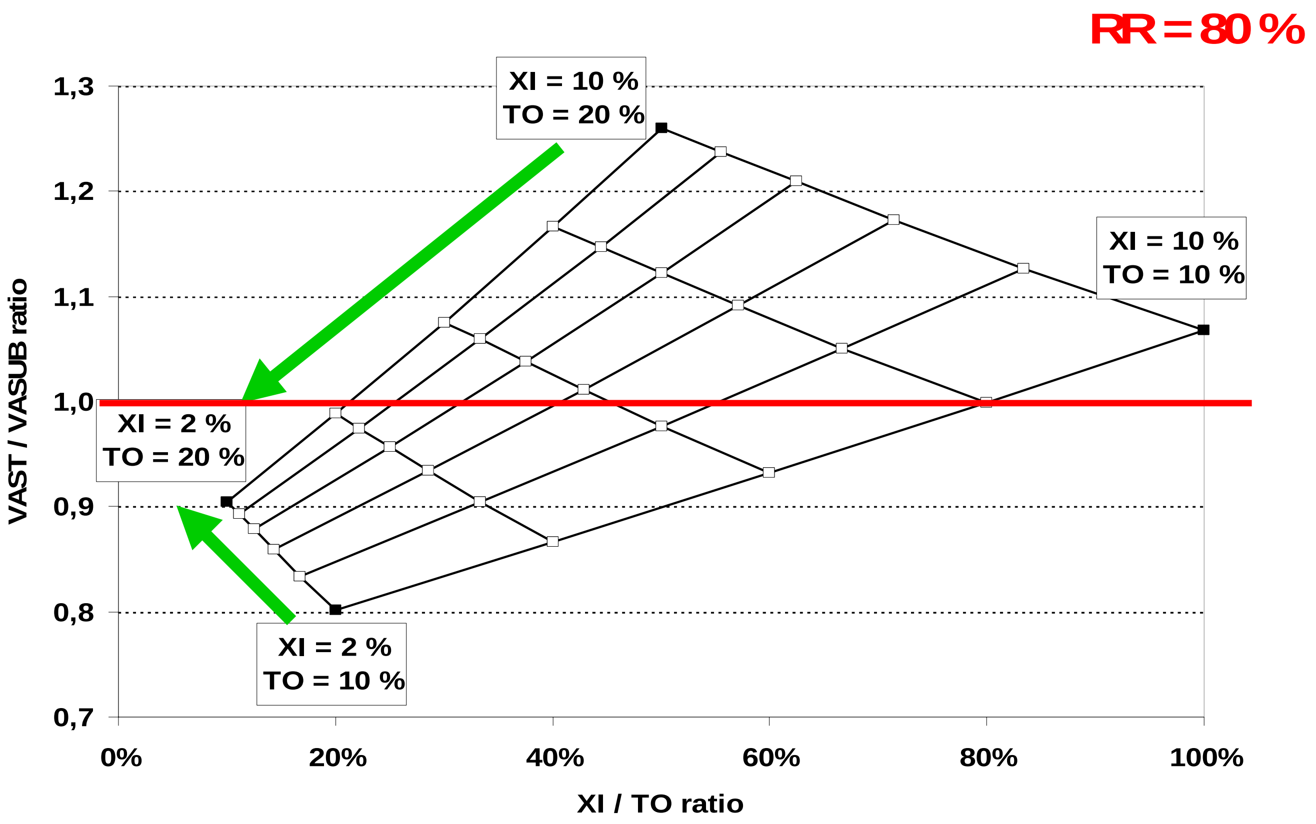


Table 1: Variables that influence the structure of financing

	Variable	Comments
Characteristics of project		
INV	Investment cost	Set at 100 by convention
DT	Duration of works	Variable between 1 and 10 years
EB	Expected raw surplus at opening	
XB	Linear rate of growth of EB over the duration of the concession	
EB(t)	Raw surplus in year t	EB(t) = EB*(1+XB*t)
VANe	Economic Net Present Value	Discounted with the rate TR
TRIe	Economic Internal Rate of Return	Economic IRR of project
FINANCING BY GRANT		
Community		
TR	Reference rate	Official value in France: 8 %
SUB	Investment grant	Calculated by the model – equally divided over the duration of works
Loan		
XI	Average interest rate for loans	
DE	Duration of the loan	
RR	Distribution ratio of raw surplus for servicing of debt	
EM	Amount of loans	Calculated by the model
Private capital		
TO	Required Financial IRR	
DC	Duration of the concession	More than 20 years
FP	Amount of private capital	Calculated by the model
FINANCING BY SHADOW TOLL		
ST	Shadow toll on opening	Calculated by the model
XST	Rate of growth of ST	Calculated by the model
ST(t)	Shadow toll in year n	=(EB+ST)*(1+(XB+XST)*t) – EB(t)
EBX	Raw surplus on opening	Calculated by the model such that SUB = 0 and STX(DC) = 0 EBX = EB + ST XBX = XB + XST
XBX	Linear rate of growth of EBX over the duration of the concession with shadow toll	
FPX	Amount of private capital	Calculated by the model
EMX	Amount of loans	Calculated by the model
ANX	Amount of annuities	ANX = RR*(EB+ST)
COMPARISON INDICATORS		
VASUB	Sum of discounted investment grants	Discounted with the reference rate TR
VAST	Sum of discounted shadow tolls shadow toll	Discounted with the reference rate TR
	VAST / VASUB ratio	A ratio of less than unity shows that financing by shadow toll is less costly for the community

Tableau 2: Example of simulation

Hypotheses
(Characteristics of project)

Investment cost	INV	**100**
Duration of works	DT	**4 years**
Raw surplus	EB	**7.0**
Rate of increase in EB	XB	**3.0 %**
Reference rate	TR	**8.0 %**
Rate of interest	XI	**2.0 %**
Duration of loans	DE	**10 years**
Distribution ratio	RR	**50.0 %**
Required Financial IRR	TO	**15.0 %**
Concession duration	DC	**30 years**
Net Present Economic Value	VANe	**-1.1**
Economic IRR	TRIe	**7.9 %**

Results from model

Financing by grant			Financing by shadow toll	
EM	**31.7**	Loans	EMX	**57.2**
FP	**30.7**	Private capital	FPX	**42.8**
SUB	**37.6**	Grant		
		Shadow Toll	ST	**5.6**
		Rate of growth of Shadow Toll	XST	**-2.9 %**
VASUB	**41.3**	Discounted values	VAST	**43.5**
		VAST / VASUB Ratio		
		1.05		

Comparison of financing structures

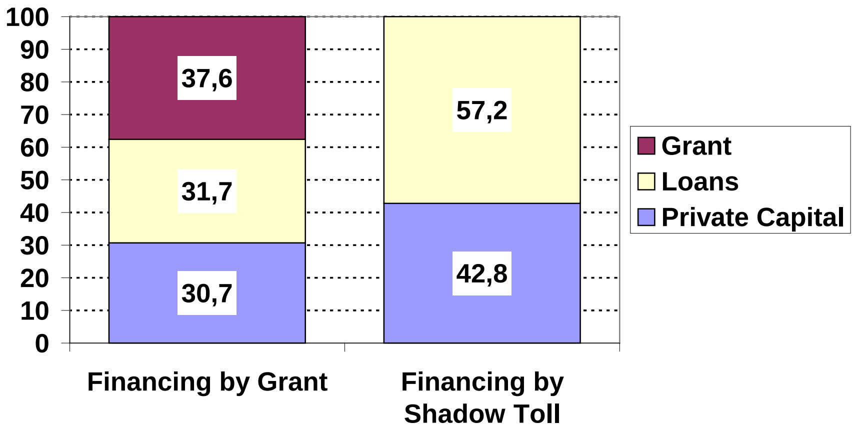


Table 3: Impact of the hypotheses as regards the discounted value of the shadow toll for VAST/VASUB ratio = 1

Simulation

		Base	**DT**	**TR**	**DC**	**RR**	**DE**	**XI**	**TO**
INV	Investment cost	**100,0**							
DT	Duration of works	4 years	7 years	4 years	4 years	4 years	4 years	4 years	4 years
TR	Reference rate	8,0%	8,0%	8,7%	8,0%	8,0%	8,0%	8,0%	8,0%
DC	Duraion of concession	30 years	30 years	30 years	25 years	30 years	30 years	30 years	30 years
EB	Raw surplus in year 1	**7,0**	7,0	7,0	7,0	7,0	7,0	7,0	7,0
XB	Rate of growth of EB	**3,0%**	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%
RR	Distribution ratio (debt)	50,0%	50,0%	50,0%	50,0%	57,6%	50,0%	50,0%	50,0%
DE	Duration of loan	10 years	10 years	10 years	10 years	10 years	11 years	10 years	10 years
XI	Loan interest rate	2,0%	2,0%	2,0%	2,0%	2,0%	2,0%	0,4%	2,0%
TO	Required IRR for private capital	15,0%	15,0%	15,0%	15,0%	15,0%	15,0%	15,0%	12,9%
Project profitability indicators									
VANe	Economic Net Present Value of project	-1,1	-16,2	-10,1	-4,4	-1,1	-1,1	-1,1	-1,1
TRIe	Economic IRR of project	7,9%	7,1%	7,9%	7,7%	7,9%	7,9%	7,9%	7,9%
Financing by grant									
SUB	Grant	37,6	44,5	37,6	38,5	35,1	35,1	35,1	30,0
EMC	Loan (1)	31,7	31,7	31,7	31,7	36,5	34,9	34,3	31,7
FP	Private capital (1)	30,7	23,7	30,7	29,7	28,4	30,0	30,7	38,2
VASUB	Discounted value of grant	41,3	55,6	41,6	42,3	38,5	38,5	38,5	33,0
Financing by shadow toll									
ST	Shaow toll at year 1	5,6	7,2	5,6	6,0	5,0	5,0	5,0	4,3
XST	Rate of growth of ST	-2,9%	-3,3%	-2,9%	-3,3%	-2,7%	-2,7%	-2,7%	-2,4%
EMX	Loan (2)	57,2	64,3	57,2	58,8	62,5	59,8	58,6	51,0
FPX	Private capital (2)	42,8	35,7	42,8	41,2	37,5	40,2	41,4	49,0
VAST	Sum of discounted shadow tolls	43,5	55,6	41,6	42,3	38,6	38,5	38,5	32,9
Comparison									
	VAST/VASUB ratio	1,05	1,00	1,00	1,00	1,00	1,00	1,00	1,00