

# DISCUSSION PAPER

## Sharing Risk and Revenues from PPPs: Perspectives from current practice in the road sector

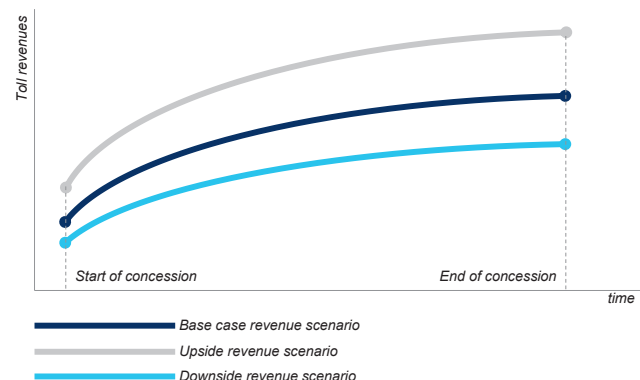
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Accurately forecasting traffic demand is a key component in the planning process for a highway transportation project. Traffic levels are particularly crucial in tolled highway projects, as they typically represent the main (and often sole) source of revenue for the project. Indeed, achieving a predefined revenue level is required to recover the investment costs and cover the costs of operating and maintaining the facility.

In a conventional procurement, in which the government is responsible for managing the construction and operation of the highway, the public sector bears the full financial cost associated with lower than expected levels of traffic. If traffic levels are higher than expected, the public agency also reaps the full benefit, potentially allowing it to collect more revenue than originally anticipated. In a public-private partnership (PPP), however, the risks associated with traffic and toll revenues may be transferred from the public agency to a concessionaire. Under such a PPP model, bidders will examine traffic levels as the primary driver of the financial feasibility of the project. The project will be “bankable” from a financier’s perspective, and it will be possible to obtain private financing for the project, only if revenues are expected to comfortably exceed financing costs (reflecting the initial investment) and operating and maintenance costs.

Traffic levels in practice rarely exactly correspond to the forecasts. To assess the consequences of

revenue uncertainties, upside and downside traffic scenarios are typically developed. Figure 1 shows toll revenues associated with three sample traffic scenarios.



**Figure 1: Toll revenues under various scenarios**

Downside revenue scenarios are particularly important, as they represent a risk to the feasibility and bankability of the project. Just like any other risk in a PPP structure, the risk of lower than expected revenues must be allocated between the government and concessionaire. This risk can be fully retained by the public agency, fully transferred to the private party, or shared between the two parties. The upside revenue scenario, on the other hand, is not so much a risk to the project, but rather a potential (additional) gain. Again, the two parties in a PPP contract must decide on how these additional revenues will be shared. Allocating all upside revenues to the private party may result in



concerns about the private party reaping “excessive returns” at the expense of taxpayers.

This paper will seek to provide recommendations on how to address downside and upside revenue scenarios in PPP contracts. This paper will present two separate but related approaches:

1. The “**revenue risk sharing**” approach seeks to protect the concessionaire against lower than expected revenues (the “downside” scenario). The goal in revenue risk sharing is to create an optimal risk allocation (see next section for more details) between the government and the concessionaire, which in turn generates value for money (VFM).
2. The “**upside revenue sharing**” approach seeks to share any “upside” (or higher than expected revenues) between the two parties. The goal of revenue sharing is to avoid excessive returns for the concessionaire.

Rather than transferring the full revenue risk to a concessionaire, under “revenue risk sharing” the government retains some (or all) of the revenue risk, for example by providing a minimum revenue guarantee. As a result, the project is “de-risked,” as the concessionaire is protected, to a certain degree, from the potential downside. This de-risking makes the project more attractive, potentially resulting in a greater number of interested bidders (more bidders results in better pricing), and reduces the risk profile for bidders, which will result in more attractive financing conditions. Both effects will help lower the cost of a project to the procuring agency.

Nevertheless, providing a minimum revenue guarantee can have significant downsides for the public agency that are not always immediately visible. When the government guarantees a certain level of revenue, it implicitly assumes a liability on its balance sheet (also known as a “contingent liability”). Contingent liabilities require expenditures only if an uncertain event (lower than expected revenues) actually occurs, which distinguishes them from direct liabilities such as regular payments. The uncertain nature of contingent liabilities makes them particularly difficult to manage, as determining the value of the liabilities and whether they are worth incurring

may be challenging. For example, the Portuguese government—with one of the largest PPP programs in the world—assumed significant contingent liabilities, which have resulted in a considerable fiscal burden as the country has struggled to recover from the recession (International Monetary Fund, 2014).

The “upside revenue sharing” approach is about sharing the potential upside of a transportation infrastructure project. The main driver of upside revenue sharing is to avoid excessive returns for the concessionaire, which may come at the expense of the users. For example, under a toll concession, higher than anticipated traffic growth could result in very high financial returns for the concessionaire that may not be socially acceptable. In some jurisdictions, the PPP authorizing statutes may define a specific level of equity returns that are deemed reasonable (Federal Highway Administration, 2014). By requiring the concessionaire to share some level of revenues with the government, the risk of excessive returns can be reduced or eliminated.

Of course, a government can also decide to combine both approaches, creating mechanisms to share both upsides and downsides. Governments often prioritize one mechanism over the other depending on their motivation for undertaking PPPs. A government that is more concerned with generating maximum VFM will tend to focus on revenue risk sharing, as a more efficient risk allocation will result in lower overall costs to society. In that case, the government may be willing to accept the future budgetary implications of contingent liabilities. On the other hand, governments that are mostly driven by considerations beyond the balance sheet will be less interested in VFM and—to the extent they are interested in revenue sharing mechanisms—may focus more on upside revenue sharing. In those cases, governments often emphasize the ability to access private financing through PPPs while avoiding taking on additional liabilities. This balance sheet–driven approach may result in a suboptimal risk allocation, resulting in less VFM.

The remainder of this paper will analyze optimal risk allocation for highway projects and assess various revenue risk sharing and upside revenue



sharing mechanisms in an effort to provide guidance on these mechanisms to PPP policy-makers and practitioners around the world.

## 1. Revenue risk: a brief analysis

One of the key drivers of VFM is an optimal risk allocation between the public agency and the concessionaire. Optimal risk allocation means that a risk should be transferred to the party that is best positioned to manage that risk, at the lowest costs. Given the importance of revenue risk for tolled highway projects, it is essential to understand the underlying sources of revenue risk, which include uncertainties in traffic levels, the tolling regime and toll collection.

One important driver of traffic is population growth, which in turn is caused by changes in migration patterns, fertility, life expectancy and/or mortality. Furthermore, traffic also depends on macroeconomic developments, such as job creation or a higher demand for goods. Changes in the demand for different transportation modes and the development of competing facilities also contribute to uncertainties in traffic. Finally, the construction of a highway may itself generate additional demand (“induced traffic”), as it can attract new economic activities.

The tolling regime and toll levels can also carry significant risks. If a government agency is responsible for setting toll levels, there may be a risk of the agency changing toll levels in response to political pressure. This can be seen as both a revenue risk and a political risk. Allowing the concessionaire to set the tolls can reduce this uncertainty.

Toll collection generates uncertainty too, mostly because of technology risks and the risks associated with violation and enforcement. The successful installation and operation of electronic tolling systems, however, has significantly reduced technology risks in recent years. Violation/enforcement risk may still be a concern, depending on the project’s location.

In conclusion, the concessionaire may be able to manage certain revenue-related risks (such as toll-collection technology risk), whereas other risks (such as population growth or changes in

trade patterns) are largely beyond its control. As a result, fully transferring the revenue risk to a concessionaire may be suboptimal. A more nuanced analysis of optimal revenue risk allocation is therefore required.

## 2. Optimal risk allocation through revenue risk sharing

To determine an optimal revenue risk allocation for a PPP highway project, we need to consider both the value of retained risks (including contingent liabilities) and direct costs to the public agency. Figure 2 presents a graphical interpretation of revenue risk sharing. The level of revenue risk transfer to the PPP concessionaire, expressed as a share of total revenue risk, is shown on the horizontal axis. The red curve shows the concession fee (dashed line) to be paid by the PPP concessionaire or the government contribution (solid line) to be paid by the government to the PPP concessionaire. The blue curve shows the value of the retained risk (from the perspective of the government). The grey curve, reflecting the total net cost to the government, is the sum of the concession fee/government contribution (red curve) and the value of the retained risks (blue curve). Transferring revenue risk from the public agency to the concessionaire lowers the contingent liabilities but increases the direct costs to the public agency.

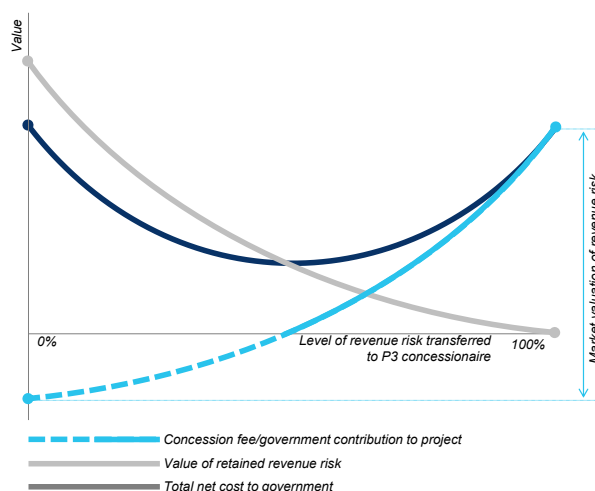


Figure 2: Concession fee/subsidy to project versus value of retained risks



Under a full transfer of revenue risk to the concessionaire (far right of the graph, 100 per cent revenue risk transfer), the concessionaire will price the full revenue risk, most likely through increasingly expensive project financing conditions. As a result, the government will incur a high net direct cost<sup>1</sup> for the project, either through a low concession fee from the concessionaire to the government (in case of a financially feasible project) or a high government contribution (in case of a financially unfeasible project). Although the government incurs a high net direct cost, full risk transfer also diminishes the value of the retained revenue risk, which is a contingent liability for the government. As explained earlier, contingent liabilities are those a government may or may not incur, depending on the project's actual revenues.

Under a more optimal risk allocation (for example, through a minimum revenue guarantee from the government to the concessionaire), the direct cost to the government is lower whereas the value of the contingent liability will be higher. The optimal level of revenue risk sharing between government and private sector should ultimately depend on the total net cost<sup>2</sup> to the government. In the graph above, this would occur at the lowest point of the grey curve. The exact location of the lowest total net cost to the government depends on the shape of the red and blue curve, which in turn depends on how the private sector values revenue risk.

In some cases, a project may be financially feasible without a government subsidy, even after transferring the full revenue risk to the concessionaire. In this scenario, governments may be tempted to simply transfer the full revenue risk to the concessionaire. Full revenue risk transfer may be particularly appealing for governments that are primarily motivated by a PPP's ability to mobilize private financing, and unwilling to assume any contingent liabilities or direct costs. Even under this scenario, however, governments should strive to allocate revenue risk in an optimal manner. When concessionaires are asked to assume the full revenue risk, they will inevitably price this risk in their bid and offer the government a lower concession fee. A

lower concession fee from the concessionaire can therefore result in a lower VFM.

Sometimes, revenue risk transfer is driven by a need to incentivize the concessionaire. For example, if the government's objective is to maximize traffic throughput yet control the toll rates, transferring revenue risk to the concessionaire will ensure that the concessionaire will do whatever it can in terms of toll road operations to maximize throughput and thereby revenues. As a result, the concessionaire's interests are fully aligned with the government's interest. However, the concessionaire's cost of capital will be relatively high, as it reflects the full revenue risk. If only a portion of the revenue risk is transferred (for example, the concessionaire receives a guaranteed minimum revenue plus 25 per cent of collected tolls), the concessionaire is still fully incentivized (as its compensation is directly linked to throughput), but its capital costs can be significantly lower, ultimately leading to a lower cost to the government.

As the example above shows, full revenue risk transfer is not required to align public and private interests. Furthermore, full revenue risk transfer can lead to a suboptimal risk allocation that may destroy VFM. From a VFM perspective, it is therefore advisable for the public agency to retain some of the revenue risk. The mechanisms that can be used to do so are discussed below.

### 3. Revenue risk sharing and upside revenue sharing mechanisms

To achieve a more optimal risk allocation as discussed above, a PPP contract must contain a well-functioning revenue risk sharing mechanism. Furthermore, in order to avoid excessive returns, the contract needs to address the issue of upside revenue sharing. Internationally, many revenue risk sharing and upside revenue sharing mechanisms for transportation infrastructure projects have been developed and tested. Broadly, these revenue risk sharing and upside revenue sharing mechanisms can be categorized along the following lines:

<sup>1</sup> Net direct cost = government contributions to the project (for a financially unfeasible project) – concession fee received from the concessionaire (for a financially feasible project).

<sup>2</sup> Total net cost = net direct cost + value of contingent liabilities.



- Protection: downside versus upside protection.
- Contract period: fixed versus flexible contract period.
- Return calculation metric: gross revenues, net revenues or return on investment.

### Protection: downside or upside?

As explained earlier, the objective of revenue risk sharing is to protect the concessionaire against lower than expected revenues. For example, a government could guarantee a minimum annual revenue level (“floor”). This minimum revenue guarantee serves as a protection for the concessionaire, which can help lower the concessionaire’s cost of finance and thereby potentially create VFM for the government and society.

Upside revenue sharing mechanisms are designed to limit excessive returns for the concessionaire. For example, if annual revenues are above a specified level (“cap”), revenues can either be shared with the government or fully transferred to the government. The level of upside revenue sharing can also be a progressive (“tiered”) function of the realized revenues/returns. For example, if a project realizes between 100 and 125 per cent of its base case revenues, the concessionaire could be asked to share 25 per cent of the revenues above 100 per cent with the government, whereas for revenues above 125 per cent, the concessionaire must share 50 per cent of the revenues with the government.

Of course, a PPP concession agreement can contain both revenue risk sharing and upside revenue sharing mechanisms.

### Contract period: fixed or variable?

Under a contract with a fixed duration, revenue risk sharing and upside revenue sharing mechanisms are valid for a limited and specified duration. Taking the earlier example of a government minimum revenue guarantee, the concessionaire will receive annual financial support from the government if revenues fail to reach a certain level for, for example, 20 years. The key feature is that the contract period cannot be extended if revenues are higher or lower than anticipated.

Under a contract with a variable duration, the contract’s end date can be modified such that the concessionaire can reach an agreed level of cumulative revenue or specified return on investment, which again limits the downside for the concessionaire. Once the revenue/return target has been met, the contract can either be terminated or revenues can be shared with the government for the remainder of the contract period, which limits the potential for excessive returns for the concessionaire.

### Return calculation metric: gross revenues, net revenues or return on investment

Although revenue risk sharing and upside revenue sharing mechanisms are all about sharing project revenues, this does not necessarily mean that revenue is the most appropriate measure to use in these mechanisms. In fact, there are generally three metrics that could be used to inform revenue risk sharing and upside revenue sharing mechanisms:

- Gross revenue
- Net revenue
- Internal rate of return (IRR)

Gross revenue is the simplest metric to use, as it is easy for both government and concessionaire to observe. However, gross revenues do not provide complete information on returns to investors, as they do not take into consideration operating expenses, which are typically correlated with revenues. Furthermore, the impact of capital expenses and the time value of money on investors’ returns are also not evaluated. However, as revenue risk sharing and upside revenue sharing mechanisms are mainly concerned with traffic and revenue risk, the impact of potential project delays and/or cost overruns may not need to be considered in this context.

Net revenues may be a more accurate metric than gross revenues. This metric considers both project revenues (which are easy to monitor) and the concessionaire’s operating costs (which are more difficult to monitor for the government, resulting in higher transaction costs), and is therefore a better indication of a project’s capacity to generate positive cash flows. Importantly, as the concessionaire can relatively easily exaggerate its operating costs, there is a risk of “gaming.”



Finally, revenue sharing and revenue risk sharing mechanisms could use (equity) IRR as a guiding metric. A project’s IRR depends on revenues (which are easy to monitor), operating costs and investment costs (which are more difficult to monitor). It also takes into account the time value of money. If equity IRR is used, the project’s financing structure must also be considered. IRR is arguably the fairest metric, as it reflects the investors’ actual returns from the project. However, it is also the most difficult metric to monitor, as it requires in-depth knowledge of the project’s expenses throughout its life cycle, which also makes it potentially subject to “gaming.”

Table 1 provides a summary of the advantages and disadvantages of the various metrics.

**TABLE 1: Advantages and disadvantages of different revenue and revenue risk sharing metrics**

METRIC	ADVANTAGE	DISADVANTAGE
Gross revenues	Easy to monitor	Does not consider operating costs
Net revenues	Captures project capacity to generate positive cash flows	Operating costs are difficult to monitor
(Equity) IRR	Captures project’s overall/equity return	Life cycle cost (and financing structure) are difficult to monitor

An ideal revenue and revenue risk sharing mechanism should capture the concessionaire’s actual expected returns and limit the need for monitoring to reduce transaction costs. In practice, for a revenue risk sharing and upside revenue sharing mechanism to be effective in creating optimal risk allocation and VFM, it needs to be easy to implement and monitor and should be cheat-proof. For this reason, it is important that these mechanisms be stress tested by the procuring agency, specifically taking into consideration the concessionaire’s perspective. Stress testing would reveal the impact of particular (detrimental) behaviour by the concessionaire and allow for timely adjustments before signing the concession agreement.

The next section will discuss a number of examples of revenue risk sharing and upside revenue sharing mechanisms that have been employed

internationally.

#### 4. International examples of revenue risk sharing and upside revenue sharing

In the United States, it is common practice to share gross tolling revenues above a certain threshold with a state government without protecting the concessionaire from potential downsides. Some state departments, including the North Carolina Department of Transportation (North Carolina Department of Transportation, 2013), are experimenting with contingent subsidies to effectively reduce the downside revenue risk for the concessionaire. In addition to the contingent subsidy, the agency expects to receive a share of the toll revenues that exceed the concessionaire’s base case projections. This twin approach of providing downside revenue risk protection through the contingent subsidy while also sharing in upside revenues can help the North Carolina Department of Transportation generate VFM in its PPP projects.

In the early years of PPPs, European governments experimented with a variety of payment mechanisms. In the Netherlands, the first large PPP project was the €272 million Wijker tunnel, mainly financed by banks and insurance companies (Nederlands Kenniscentrum voor Ondergronds Bouwen en Ondergronds Ruimtegebruik, n.d.). Because the tunnel was not tolled, there was arguably no actual revenue risk. However, under the 30-year concession agreement, the concessionaire received a shadow toll for every vehicle that passed through the tunnel. The payment mechanism thus created a revenue risk for the concessionaire, presumably resulting in higher financing costs due to the uncertainty of future revenues. As actual traffic exceeded the original traffic projects, the Dutch government’s shadow toll payments to the concessionaire have been significantly higher than initially anticipated. As a result, the concessionaire and its financiers have been able to realize unexpectedly high returns at the expense of taxpayers. The above shows that a poorly structured revenue risk sharing mechanism can reduce VFM. In this particular case, the mechanism created a revenue risk that did not exist before. Instead of using shadow



tolls, the Dutch government could have used an availability payment structure, which it did in many successfully implemented PPP projects in later years. Under such an availability payment structure, the concessionaire has very limited revenue risk, resulting in lower cost of capital and a better bid price (lower availability payment) for the government. Furthermore, the maximum government liabilities under an availability payment structure are known, creating budget certainty as well as reducing the risk of excessive returns for the concessionaire.

Although variable contract duration mechanisms are not very common, Chile has used this revenue risk sharing mechanism for highway projects (Lorenzen, Barrientos, & Babbar, 2001). The Chilean government has evaluated bids for several highway sections based on bidders' required present value of toll revenues. In the "least present value of revenues" approach, the public agency specifies the toll levels and awards bids solely based on the lowest present value of accumulated revenues. The concession ends once the present value of the tolls collected equals the present value listed on the winning bid. The advantage of this approach is that it mitigates the concessionaire's traffic risk and therefore plays a very limited role in the procurement process. Furthermore, the government retains full control over the toll rates. The variable contract duration provides significant protection for the concessionaire's downside (hence reducing financing costs) while simultaneously avoiding excessive returns. One negative aspect of this mechanism, however, is that the flexible contract structure may make it more difficult to attract debt financing given the uncertain repayment schedule.

As the above examples show, intelligently designed revenue risk sharing and upside revenue sharing mechanisms, such as those used by the North Carolina Department of Transportation and the Chilean government, can create VFM for the government and society as a whole. At the same time, poorly designed mechanisms, such as those used for the Wijkertunnel in the Netherlands, can result in a significant loss to society.

## 5. Conclusions

Maximizing VFM through optimal risk allocation ought to be the goal of all PPP transactions. As discussed in this paper, revenue risk sharing mechanisms can play an important role in devising an optimal risk allocation. However, governments may face budgetary restrictions that could keep them from achieving this optimal solution. Besides revenue risk sharing mechanisms, upside revenue sharing mechanisms can help create better VFM by limiting excessive returns for PPP concessionaires at the expense of users and taxpayers.

By combining revenue risk sharing, which protects a concessionaire's downside potential, with upside revenue sharing, which aims to limit excessive returns, a more optimal revenue risk allocation can be achieved when compared to a full transfer of revenue risk. As a result, these mechanisms can work together to reduce total cost to society and increase overall VFM.

To achieve the above results efficiently, revenue risk sharing and upside revenue sharing mechanisms need to be easy to implement and monitor in order to avoid high transaction costs and potential detrimental behaviour by the concessionaire. Furthermore, revenue risk sharing and upside revenue sharing mechanisms must be designed with the interests of both the procuring agency and future concessionaire in mind in order to ensure that the project is attractive for society (VFM) but also bankable.

As demonstrated in many infrastructure projects around the world, governments are increasingly learning how to structure PPP transactions intelligently. By integrating well-structured revenue risk sharing and upside revenue sharing mechanisms in concession agreements, PPP projects can help governments deliver more value to their countries.



## 6. Bibliography

Federal Highway Administration. (2014). *Model public-private partnerships core toll concessions contract guide*. Washington, DC: U.S. Department of Transportation.

International Monetary Fund. (2014). *Portugal: Fiscal transparency evaluation*. Retrieved from <https://www.imf.org/external/pubs/ft/scr/2014/cr14306.pdf>.

Lorenzen, C.C., Barrientos, M.E., & Babbar, S. (2001). Toll road concessions: The Chilean experience (PFG discussion paper series, no. 124). Washington, DC: World Bank.

Nederlands Kenniscentrum voor Ondergronds Bouwen en Ondergronds Ruimtegebruik (COB). (n.d.). *Beverwijk, Wijkertunnel*. Retrieved from <http://www.cob.nl/over-ondergronds-bouwen/voorbeeldprojecten/beverwijk-wijkertunnel.html>

North Carolina Department of Transportation. (2013). *Request for proposals: Instructions to proposers*. Raleigh, NC: State of North Carolina.



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