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HELPING TO
ELIMINATE POVERTY
THROUGH PRIVATE
INVOLVEMENT IN
INFRASTRUCTURE

How Profitable Are Infrastructure Concessions in Latin America?

Empirical Evidence and Regulatory Implications

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ABSTRACT

This report estimates the returns that private investors in infrastructure projects in Latin America really made on their investments, and assesses the adequacy of these returns relative to the risks taken—the cost of capital—and the impact that the quality of regulation had on the closeness of alignment between returns and the cost of capital. This is done by estimating both historical and projected future returns earned by a sample of private infrastructure concessions, across a variety of Latin American countries and infrastructure sectors, and comparing them against expected returns given the level of risk taken—the cost of capital. In this way, it is possible to evaluate whether private investors did indeed earn abnormally high returns on their investments. The report develops a quality of regulation index and examines the extent to which the quality of the regulatory framework contributed to maintaining a closer alignment between rates of return and cost of capital, or did allow for the capture of excessive rents by the investors or of excessive benefits by the users at the expense of the investors. The findings of this report are that contrary to general public perceptions, the financial returns of private infrastructure concessions have been modest and that in fact for a number of concessions the returns have been below the cost of capital. On average telecom and energy concessions have fared better than transport and water. It also shows that the variance of returns across concessions and countries is considerable; that the variance of returns across concessions can be partially explained by the quality of regulation; and that the better the quality of regulation the closer the alignment between financial returns and costs of capital, as is desirable. Thus this report shows and validates the claim that regulation indeed matters.

EXECUTIVE SUMMARY

Background and objective

During the 1990s many countries in Latin America implemented broad privatization and concession programs for infrastructure services, with the aim of raising fiscal revenues and improving sector performance. A decade later many are questioning whether private sector participation yielded the anticipated benefits, and whether those benefits were equitably distributed among the different stakeholders to the privatization process. A frequent complaint is that investors may have captured a disproportionate share of the benefits in the form of excess profits over and above what was necessary to attract private capital into these sectors. However, to date there has been very little empirical evidence against which to assess this claim.

The objective of this study is to estimate the returns that private investors in infrastructure projects in Latin America really made on their investments, to assess the adequacy of these returns relative to the risks taken, and the impact that the quality of regulation had on those returns relative to the cost of capital. The study does not attempt to evaluate the overall impact of privatization and concession programs, but simply focuses on the narrow aspect of profitability. This is done by estimating both historical and projected future returns earned by a sample of private infrastructure concessions across a variety of Latin American countries and infrastructure sectors and comparing them to expected returns, given the level of risk taken. In this way it is possible to evaluate whether or not private investors earn abnormally high returns on their investments. In addition, the study examines the extent to which the quality of the regulatory framework put in place at the time of privatization contributed to maintaining a closer alignment between rates of return and hurdle rates, or the cost of capital.

Sample and methodology

The study is based on a sample of 34 concessions that are representative of global privatization trends in Latin America from close to 1,000 infrastructure concessions in the region. It includes companies from nine countries with widescale privatization programs: Argentina, Bolivia, Brazil, Chile, Colombia, El Salvador, Mexico, Peru, and Venezuela. The number of concessions in each country has been chosen to be representative of the relative importance of privatizations in that country. The sample includes companies in four sectors: telecommunications, water, electricity (generation and distribution), and transport. On average these concessions have been in operation for seven years. It must be noted the data used run to 2001. They are thus largely exempted from the impact of the recent crisis in Latin America, and it is likely that returns would have looked significantly worse had 2002 and 2003 been included in the analysis.

To ensure sufficient quality of information, only audited financial statements and official company press releases were used. The study does not attempt to adjust financial statements for differences in accounting standards. It is recognized that *regulation by return* may create incentives for concessionaires to dress up their accounts to present the lowest profitability or return possible. As a consequence the profitability results imputed here ought to be construed as lower bound estimates of the true profitability of those regulated firms. However, the scope for such accounting distortions are limited because 56 percent of the sample concessions are listed companies or part of listed groups and financial statements are audited.

Recognizing that private investors can be remunerated in various ways, two sets of returns are computed. First, the *financial returns* resulting from the distribution of dividends from the concession to the concessionaires' parent companies (mostly abroad) are computed. Second, the *adjusted returns* are computed by attempting to include indirect forms of dividends. The most common of these are management fees, based on the assumption that all the explicit management fees paid by concessions were in fact dividends to their strategic shareholders. Another adjustment is made for the possibility of investment cost markups, which arise when intragroup purchases are priced above cost, thereby implicitly transferring dividends out of the concession toward the parent company.

The study is built on the Capital Adequacy Pricing Model (CAPM), which formalizes the observation that expected returns are related to risk. A two-pronged approach is used. The first step is to measure the overall return which shareholders in each selected project earned on the capital they invested in that project. The second step is to determine whether those returns were commensurate with the risk taken. Thus, the expost returns that investors effectively earned on the asset or project they invested in (*effective returns*) are compared with the threshold minimum return given the risk profile of the project-cost of capital (*hurdle rates*).

The study uses four measures of the effective returns: the shareholders' internal rate of return (Shareholder IRR), the return on equity (RoE), the project internal rate of return (Project IRR) and the return on capital employed (RoCE). The first two are measures of the returns earned by equity investors; the last two are measures of the profitability of the concessions overall, independent of their financing structure.

The measure of returns chosen dictates the nature of hurdle rates one needs to use. The Shareholder IRR and the RoE, both of which measure returns earned over equity capital, must be compared to the appropriate cost of equity (CoE), which is a measure of the return investors require on equity investments, given the level of risk of such investments. The Project IRR and the RoCE, which measures returns earned on the concession's overall capital structure, must be compared to the weighted average cost of capital (WACC), which represents the expected return on all of a company's securities. Importantly, the appropriate benchmark value for each hurdle rate varies for each project depending on the country and sector of investment, reflecting that market risks also vary across countries and sectors.

Conclusions and implications

The analysis shows that concessions are capable of generating adequate returns in the long term, and are potentially interesting business proposals. Concessions in the water sector appear relatively the least attractive, while concessions in the telecommunications sector appear to be the most profitable overall. On average, concessions seem to become profitable after about 10 years of operation. However, about 40 percent of the sample concessions do not seem to have the potential to generate attractive returns, with this number climbing to 50 percent in the energy and transport sectors. Concessions are thus risky businesses.

Low dividend distribution ratios have, however, not translated this overall profitability into adequate returns for shareholders to date. In fact, on average, concession shareholders have so far earned negative returns on their investments, even including management fees, estimated accumulated capital gains, and potential investment markups.

With historical growth maintained into the future, only telecom concessions would seem to have an inherent profitability high enough to generate adequate returns to their shareholders in the long term, this, provided they can capture annually the capital gains accumulated in their concessions over all years of operation and that the full value of their management fees correspond to dividends. In all other sectors, shareholders can hope to earn long-term returns commensurate to the risk taken only if the sectors consistently and significantly outperform historical market growth. This conclusion would not change if the concessionaires had paid up to 20 percent less for their concessions. The implication is that to build an adequate return, shareholders must rely both on various sources of remuneration (including dividends, management fees, and capital gains), and on outperforming historical market growth consistently, over the entire length of their concession.

These results suggest that concessionaires operate with long-term perspectives, giving priority to growth-enhancing investments in the early years (at the cost of depressing returns in the short term), and relying on the entire concession period to build an adequate return. This may be driven by their contractual obligations, which usually require high investments in the early years. It implies that early breaks of concession contracts may have a highly negative impact on expected returns.

The results also highlight that management fees may be needed to build adequate returns, but that their treatment—from an accounting stand point they ought to be treated more like dividends than costs—ought to be more transparent. In addition, allowing concession shareholders to be fairly compensated at the end of the period for the capital gains accumulated during the life of the concessions is also an important component of their return.

The relatively low returns earned so far by concession shareholders also suggest that either regulators have been tough at setting tariffs or that concession bidding processes have been successful in creating strong competition (aggressive bidding) among bidders, bringing their offered price to the limits of what made concessions interesting investments for them. That old concessions are on average more profitable than young ones suggests that returns may be depressed in early concession years by inadequate prices, corrected after the first price control period (high investments in the first years of operation may also have a toll on young concession returns). This squares with the arguments and data presented in Guasch (2004), where it appears that a significant number of concessions were won by aggressive bidding, perhaps too aggressive, and that shortly afterward the contracts were renegotiated, often granting better terms to the operators. That would at least partially explain why old concessions tend to be more profitable than young ones.

The analysis also highlights that returns (in particular shareholder returns) are highly volatile across sectors, concessions, and from year to year. Thus infrastructure concessions, in Latin America are a high-risk investment proposal, which explains why the required rates of return on such investments are high.

Given that virtually all the concessions included in this study are regulated monopolies, their profitability is not only a consequence of market conditions and managerial skills, but also partly a reflection of regulatory decisions on service tariffs. A good regulator should aim to maintain alignment between a company's rate of return and its cost of capital in the medium term. This is because a rate of return in excess of the cost of capital inappropriately penalizes consumers, while a rate of return beneath the cost of capital inappropriately discourages further investment.

An evaluation of the quality of the regulatory regimes faced by concessionaires in the study sample finds that these do not score very high on average, and that there is a high variance in the quality of regulatory frameworks across concessions. Furthermore, the quality of regulation is found to be a significant determinant of the divergence between the overall profitability of the concession and its corresponding hurdle rate, explaining around 20 percent of the variation. Thus regulation does matter. However, regulatory efforts seem to be more closely associated with minimizing the simple IRR-WACC differential (and thereby keeping tariffs as low as possible for current consumers), than with minimizing the absolute IRR-WACC differential (and thereby keeping profitability well aligned with hurdle rates of return). A striking feature of the results is that regulatory quality variables seem to have overall significance, more than individual significance, in determining IRR-WACC differentials. This is in fact consistent with the fact that performance along different dimensions of regulatory quality is not highly correlated, and that the benefits of high regulatory quality along one dimension can be completely offset by low regulatory quality along another dimension. Thus, for regulation to be effective, one needs the whole package of regulatory characteristics. If some of the key ingredients are missing the effectiveness of regulation is highly diminished.

1.

OBJECTIVES OF THE STUDY

During the 1990s many countries in Latin America implemented broad privatization and concession programs for infrastructure services. In aggregate, private participation in infrastructure in less developed and emerging countries amounted to US$690 billion during the 1990s (World Bank 2003). The Latin America and the Caribbean Region (LAC) proved to be the investors' preferred destination, receiving 50 percent (US$345 billion) of worldwide private capital flows to the infrastructure sectors during the same period (figure 1a). Within LAC, these flows were predominantly channeled to the telecommunications and electricity sectors (Figure 1b), and, moreover, heavily concentrated in a handful of the larger economies: Brazil, Argentina, Mexico, and Chile (figure 1c).

LAC's ability to attract such an inordinate share of infrastructure investment flows can be explained by the region's early opening of its infrastructure sector to private sector participation, the existence of substantial levels of unmet demands in practically all infrastructure sectors, and perspectives of macroeconomic stability and reasonably high growth. In addition, to a much greater extent than in other regions, LAC went ahead with major divestitures of public enterprises. Thus, it is estimated around 60 percent of these capital flows were captured by the state as fiscal revenues associated with asset sales, while the remaining 40 percent were invested directly within the infrastructure sectors

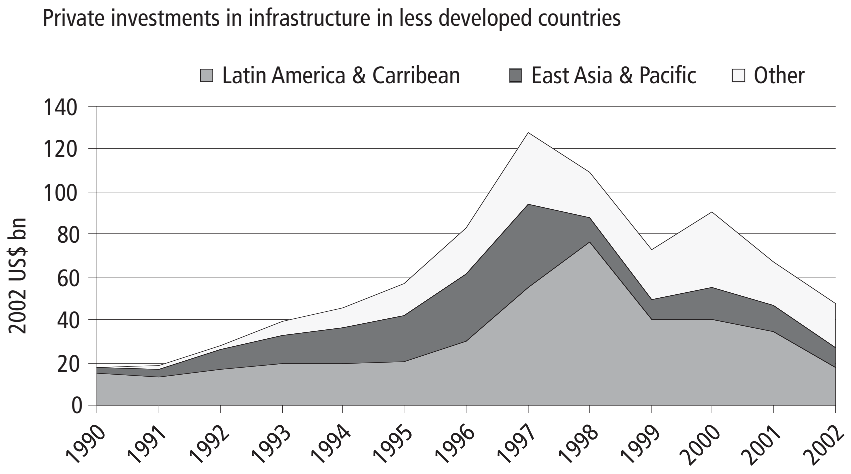
Latin America's private sector participation in infrastructure programs was generally part of a broader set of policy reforms. The reforms were expected to improve much needed sector performance, increase levels of service coverage, and attract private sector financing for long-delayed investments in infrastructure expansion and upgrading, thereby enabling scarce public funds to be used for investment in the social sectors and for the creation of fiscal benefits by creating sale revenues and reducing ongoing subsidies. After a decade of reform, popular support for privatization around the region has dwindled, and public debate increasingly questions the extent to which these reforms delivered the anticipated benefits, and (if so) whether these benefits were equitably distributed among different stakeholder groups.

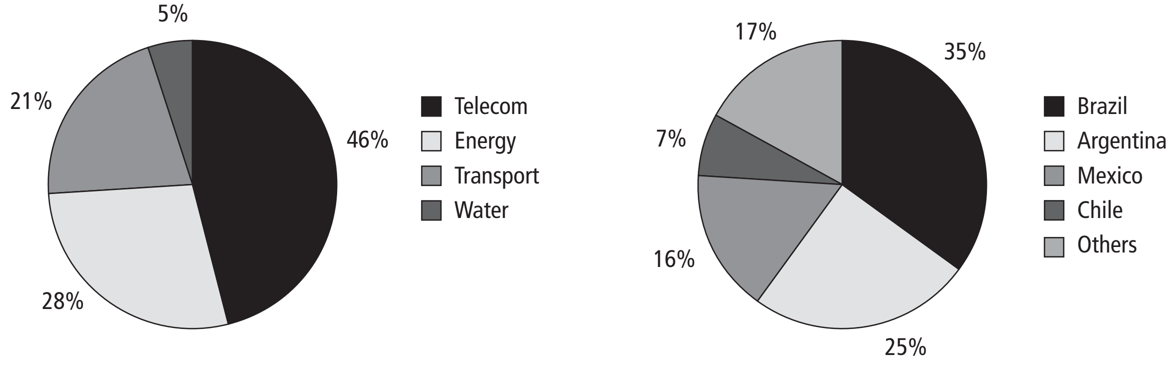
With any privatization process, there are a number of distinct stakeholder groups whose interests are likely to be affected. First, the state has major fiscal interests in privatization transactions, standing to gain from privatization proceeds, as well as from any reductions in subsidy or increases in tax revenues, often made possible as a result of privatization. Second, the interests of current consumers will be affected by the resulting changes in the price and quality of the services provided, while new consumers may be incorporated as service areas expand. Third, the interests of employees will be affected as a result of potential layoffs and changes in the pattern and conditions of employment. Fourth, the extent to which transactions are designed to generate benefits for the other stakeholder groups, as well as the quality of subsequent regulatory decisions, will affect the residual profitability of the enterprise to the private investors.

The huge complexity of privatization transactions, as well as their major ramifications for the economy's general equilibrium, make it difficult to generalize as to how the costs and benefits of privatization will play out across the different stakeholder groups in any particular case. However, a relatively new, but growing, literature aims to document the economic and distributional impact of privatization (Andres, Foster, and Guasch 2004; Birdsall and Nellis 2002; Nellis 2003; McKenzie and Mookherjee 2004; Ugaz and Waddams-Price 2003; and Chong and Lopez-de-Silanes 2005). The emerging conclusions of this literature are that the efficiency gains and increases in quality in the provision of infrastructure services and fiscal payoffs of privatization have

Figure 1: Private investment in infrastructure, 1990–02

(a) Across regions





(b) For Latin America, by sector

(c) For Latin America, by country

Source: World Bank 2003.

been substantial; that while the layoffs of workers have been large relative to the size of the industry but small relative to the workforce as a whole, overall sector employment levels have increased on average after a few years from the transactions; that existing customers have generally seen quality improve but have sometimes had to pay higher prices in return; and that service expansion has accelerated bringing major benefits to those previously unserved.

So far this literature has had relatively little to say about the extent to which private investors have benefited from the privatization process. There are popular perceptions that investors have profited excessively from privatization transactions, repatriating dividends to their countries of origin instead of reinvesting them in the host country. However, there had been no systematic empirical evidence from which to evaluate such a claim.

The objective of this study is, therefore, to estimate the returns that private investors in infrastructure projects in Latin America really made on their investments and to assess the adequacy of these returns relative to the risks taken. The study does not attempt to evaluate the overall impact of privatization and concession programs, since this, as mentioned, has already been undertaken elsewhere, but simply focuses on the narrow aspect of concession profitability. The study estimates the historical and projected future returns of a sample of private infrastructure concessions, across a variety of Latin American countries and infrastructure sectors, and compares them with expected returns given the level of risk taken—the cost of capital. In this way, it evaluates whether private investors earned abnormally high or low returns on their investments. In addition, the study examines the extent to which the quality of the regulatory framework put in place at the time of privatization was a factor in aligning rates of return and cost of capital.

2.

THE SAMPLE

As of 2003, there were more than 1,200 infrastructure concessions in Latin America with private sector participation. From that universe of private contracts, a sample of 34 concessions was selected, using the following criteria: (a) to include most Latin American countries with meaningful privatization programs; (b) to include companies from all main infrastructure sectors; (c) to focus on companies with at least five years of operation (to have a time series of data of adequate duration for the analysis); and (d) to focus on companies publishing good quality financial statements.

The resulting sample of 34 companies are representative of global privatization trends in Latin America. It includes companies from nine countries with wide-scale privatization programs in the region: Argentina, Bolivia, Brazil, Chile, Colombia, El Salvador, Mexico, Peru, and Venezuela. The number of concessions in each country has been chosen to be representative of the relative importance of privatization in each country. The sample includes companies in four sectors: telecommunications, water, electricity (generation and distribution), and transport. In the latter case, the sample is restricted to four companies in the road and port subsectors. They cannot, therefore, be considered representative of the entire transport sector. Airport concessions in particular are not included in the sample. On average the sample concessions have been in operation for seven years.

Table 1: The sample of concessions used

Number of concessions	Telecom	Water	Energy	Transport	Total
Argentina	2	3	4	2	11
Bolivia	1	1	1	-	3
Brazil	1	1	4	-	6
Chile	1	3	-	1	5
Colombia	-	2	-	-	2
Mexico	1	-	-	-	1
Panama	-	-	-	1	1
Peru	1	-	3	-	4
Venezuela	1	-	-	-	1
Total	8	10	12	4	34

3.

THE METHODOLOGY

The study uses a two-pronged methodology. First, it measures the overall return which shareholders in each selected project earned on the capital they invested in that project. Second, it determines whether those returns are adequate given the risk taken by comparing them to appropriate hurdle rates.

Absolute measures of returns are meaningless since they fail to recognize that private investors are not willing to invest in all potential projects for the same returns. This is because risk-averse investors perceive that the risks associated with various investments differ. The higher their perception of the riskiness of a specific investment, the higher the return they will require in order to make that investment.

Intuitively, this is because financial managers realize that, all else being equal, risky projects are less desirable than safe ones. Therefore, they demand a higher expected rate of return from risky projects. The observation that expected returns are related to risk has been formalized in the Capital Adequacy Pricing Model developed in the 1960s (Sharpe 1964; Lintner 1965).

The Capital Asset Pricing Model

The CAPM model is based on the idea that investors demand higher expected returns if asked to take on additional risk. More precisely, it tells us that investors in a project will require earning an expected return which compensates adequately for the risk embedded in the project. This *required rate of return,* called the *hurdle rate,* is the expected return above which an investment makes sense and below which it does not. For a company, this hurdle rate is equivalent to its *opportunity cost of capital;* that is, the rate of return the company can otherwise earn at the same level of risk as the investment it is considering (see box 1).

The CAPM model shows that this return should be at least equal to the return the company can earn on a risk-free investment plus a *risk premium* that compensates for the *nondiversifiable risk* embedded in the project.

Some risks can be eliminated by appropriate diversification. These risks are called *unique risks,* because they measure the perils that are peculiar to one particular company or project, but can be eliminated by an appropriate portfolio diversification. Investors are not remunerated for these risks, since it is their job to adequately diversify their portfolio to eliminate them. However, there are some risks which cannot be avoided however much you diversify. These are called *market risks*. They stem from the fact that there are economy-wide perils which threaten all businesses in an economy. Since investors cannot diversify these risks away, they will only accept to invest in a risky asset (that is, an asset sensitive to market risks) rather than in safe ones (that is, an asset nonsensitive to market risks) if they are adequately compensated for the extra risk taken.

BOX 1

The required rate of return on an asset

$r_a = r_f + \beta * (r_m - r_f)$

Where: r_a = required return on the asset, i.e. the hurdle rate to use when deciding whether to invest in the asset or not

r_f = risk-free rate, i.e. the return of a risk-free investment

β = beta of the asset

r_m = market return, i.e. the return on the market as a whole, that is on a fully diversified portfolio

$\beta * (r_m - r_f)$ is the asset risk premium

Therefore, it is futile thinking about how risky an investment is in isolation. One needs to measure how sensitive that investment is to market movements. This sensitivity is called beta (ß). The CAPM theory shows that the premium investors require in exchange for holding a riskier (more volatile) asset (called the asset risk premium) varies in direct proportion to its beta.

As the formula suggests, hurdle rates are asset- or project-specific. Since they represent the rate at which a specific project makes sense for an investor, given that project's own degree of risk, it is logical that their values differ from project to project.

Effective returns are the ex-post returns that investors effectively earned on the asset or project they invested in. They may be very different from the returns investors expected to earn ex-ante and on the basis of which they made their original investment decision. Excess returns are returns an investor has gained in excess of those required originally according to the CAPM.

This study intends precisely to investigate whether the effective returns earned by private investors in infrastructure projects in Latin America have been commensurate to their expectations, given the risks taken. Using the two-pronged methodology described previously, one first needs to define adequate measures of the effective returns earned by private concessionaires in Latin America, and then one needs to compare them with appropriate hurdle rates. Each of these issues will now be looked at in turn.

Measures of returns

Several measures of the effective returns earned by concessionaires can be used. In this study, the Shareholder Internal Rate of Return (Shareholder IRR), the Return on Equity (RoE), the Project Internal Rate of Return (Project IRR), and the Return on Capital Employed (RoCE) is used. Appendix 1 provides detailed definitions of each of these measures.

The first two (the Shareholder IRR and the RoE) are measures of the returns earned from dividends by equity investors in the project company (the shareholders), while the last two (the Project IRR and the RoCE) are measures of the concession's overall profitability, independent of their financing structure. These last two are measures of the average return earned by equity and debt investors into the project company, while the first two indicators are measures of the returns earned by equity holders only.

The Shareholder IRR and the Project IRR measure returns earned over several years, while the RoE and the RoCE are annual measures of returns (see Table 2).

Note that the Shareholder IRR used in the analysis is based on dividends (and other direct financial flows to shareholders) only. It does not incorporate the value created by re-investing part of the generated earnings into the concessions. This value is captured in the overall Project IRR. Shareholders capture it through increases in the share price or value of their company.[1] This value has been incorporated in the calculation of Shareholder IRRs by way of a terminal value only. This is because, since most concessions are not listed or sellable, accumulated capital gains cannot be cashed-in by shareholders. The only way shareholders can really cash-in the accumulated value is at the end of the concession, when it is re-bid, and this, provided they get a fair compensation for the value created. The value added created by retaining earnings into the concessions by way of a terminal value has been included instead.

The measures of shareholder returns used would, therefore, underestimate the returns earned by concession shareholders if the latter could freely sell their shares in the concession companies to cash-in accumulated capital gains, or if the value accumulated in the concessions was fully reflected in the value of their own companies.

To conclude, the four measures of return used can be interpreted as summarized in Table 3.

The Shareholder IRR and the Project IRR have been calculated over three distinct horizons. The first includes historical dividends/free cash flows only. They then measure the effective return earned by shareholders/the concession to date. Second, they have been computed to include historical dividends/free cash flows and the future value (FV) of dividends/free cash flows to be received annually until the concession's last year of operation. They then measure the potential return which shareholders/the concession can hope to earn until the end of the concession from annual flows. Finally, they have been computed including historical and future dividends/free cash flows and a terminal

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[1] It is, however, difficult to isolate share price movements resulting from earnings announcements in concession subsidiaries from other events influencing share prices. In addition, recognizing that the value accumulated in concessions is subject to political risk, as examples of expropriations have shown, the markets tend to value it only partly.

Table 2: Measures of return used

	Measures of shareholder returns		Measures of concession returns	
Characteristics:				
Remunerate:	Equity holders		Equity and debt holders	
Indicate:	Return earned by shareholders on equity investment		Profitability of concession as business entity and investment proposal	
Based on:	Flows available for dividend distribution or actual dividends		Free cash flows available after investment and working capital financing	
Interpretation:	**Indicator:**	**Based on:**	**Indicator:**	**Based on:**
Annual return	RoE	Net income	RoCE	Earnings before interest charges
Total return earned up to today	Shareholder IRR	Historical annual dividends	Project IRR	Historical annual free cash flow (FCF)
Total return earned over entire life of the concession	Shareholder IRR with FV	Historical annual dividends and future annual dividends until last year of concession	Project IRR with FV	Historical annual FCF and future annual FCF until last year of concession
Total return earned over entire life of the concession, including for residual value added	Shareholder IRR with TV	Historical and future annual dividends, plus shareholder compensation for fair value of concession at the end	Project IRR with TV	Historical and future annual FCF, plus fair value of concession at the end

Table 3: Interpretations of various measures of return

Indicator	Interpretation
Shareholder Internal Rate of Return (Shareholder IRR)	Net financial return earned from dividends by shareholders on their equity investment in the project company
Return on Equity (RoE)	Measure of the annual after tax return the concession is earning on its equity capital
Project Internal Rate of Return (Project IRR)	Net financial return generated by the concession in the form of free cash flows available to remunerate its various financing sources (including debt and equity)
Return on Capital Employed (RoCE)	Measure of the annual net operating profitability of the concession, measuring its ability to service its overall long-term financing structure

value (TV) measuring the fair compensation shareholders should receive for the value added they created in the concession. They then measure the potential return which shareholders/the concession can hope to earn until the end of the concession from annual flows and from the compensation they should receive at the end of the concession for the value added created.[2]

Hurdle rates–Cost of capital

Once the effective returns earned by project shareholders have been calculated they need to be compared with appropriate hurdle rates. The appropriate hurdle rate depends on the measure of returns used. In addition, the appropriate benchmark value for each hurdle rate will vary for each project, depending on the country and sector of investment (since market risks vary across countries and sectors).

The measure of returns chosen dictates the nature of hurdle rates one needs to use. In particular, the Shareholder IRR and the RoE, both of which measure returns earned over equity capital, must be compared to the appropriate *cost of equity,* while the Project IRR and the RoCE, which measure returns earned on the concession's overall capital structure, must be compared to the *weighted average cost of capital.*

The cost of equity

The cost of equity is a measure of the return investors require on equity investments, given the level of risk of such investments. It is the appropriate hurdle rate for measures of returns on equity investments. It is usually estimated using the CAPM.

In our calculations, the risk premium was broken into two components: (a) the stock market risk premium, measured by $ß * (r_m - r_f)$, corresponding to the extra return investors require to invest in stocks rather than in a risk-free asset; and (b) the country risk premium (CRP), corresponding to the extra return investors require to invest in stocks of companies in a country deemed riskier than a less risky country used as benchmark (see box 2). More details on these two components are provided in appendix 2.

The weighted average cost of capital

The weighted average cost of capital (WACC) represents the expected return on all of a company's securities. It is measured as the average of the returns required on each source of capital, such as stocks, bonds, and

BOX 2

Definition of the cost of equity

$C_E = r_F + ß * (r_m - r_f) + Crp$

Where: r_f = risk-free rate

ß = beta of the project

r_m = expected stock market return

Crp = country risk premium

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[2] Such compensation is usually calculated on the basis of the non-amortized value of the concession's assets, or of the new bidding price if the concession is re-bid to new private investors. The second method was preferred in this study since it is dynamic and forward-looking. Therefore, the terminal value as a perpetuity of average dividends/free cash flows over the last three years of operation of each concession was calculated, adjusting for exceptional items.

Table 4: Guide to interpretation of results

Result:	Interpretation:
Shareholder IRR > appropriate CE	The shareholders in the project have earned excess returns compared with those commensurate to the risk taken
Shareholder IRR < appropriate CE	The shareholders have not earned returns commensurate to the risk taken
RoE > appropriate CE	The concession has returned a post-tax profitability on its equity capital superior to that of alternative investments of similar risk
RoE < appropriate CE	The concession has returned a post-tax profitability on its equity capital inferior to that of alternative investments of similar risk
Project IRR > appropriate WACC	The concession has generated positive net financial flows
Project IRR < appropriate WACC	The concession has generated negative net financial flows
RoCE > appropriate WACC	The concession's net operating profitability exceeds the level necessary to adequately service its debt and equity
RoCE < appropriate WACC	The concession's net operating profitability is insufficient to adequately service its debt and equity

other debts, weighted by the shares of each source of capital in the company's financing structure. The calculation is often simplified by grouping the various sources of financing into two categories only, equity and fixed income instruments. It is the appropriate hurdle rate to use for measures of returns on a concession's overall liabilities (see Box 3).

Interpretations of results

In the analysis, the Shareholder IRR and RoE of each concession is compared to the appropriate CE and the Project IRR, and RoCE is compared to the appropriate WACC. The results will be interpreted as summarized in Table 4.

BOX 3

Definition of the weighted average cost of capital

$$WACC = E / (D + {}_{E}) * CE + D / (D + E) * (1\text{-}T) * C_D$$

Where: E = book value of equity

D = long-term debt

C_E = cost of equity (as measured above)

C_D = cost of debt

T = nominal corporate income tax rate

4.

ISSUES IN MEASURING RETURNS AND HURDLE RATES: COST OF CAPITAL

Data related issues

Data consistency, quality, and availability

To ensure sufficient quality of information, only audited financial statements and official company press releases were used. Concessions have to follow each country's particular accounting standards. Therefore, the data provided by each concession in the sample may not be fully consistent since the concessions may use different accounting rules to prepare their financial statements. Although accounting standards in all the countries under consideration are broadly based on international accounting standards (IAS), there remain some significant discrepancies which may generate differences in earnings. No attempt has been made to adjust financial statements for differences in accounting standards.

In addition, some data that would have been important for the analysis are generally not published by companies, whatever the country in which they operate. This applies for instance to the fair value of some assets, depreciation/amortization rules, and the detailed classification of costs. It also applies to the market value of assets and liabilities, so that the analysis is based on their book value.

Finally, some argue that regulation by return sometimes creates incentives for concessionaires to dress up their accounts in order to present the lowest profitability or return possible. This would happen when regulated tariffs are set so as to ensure a minimum return to concessionaires, who, therefore, have the incentive to minimize their historical return in order to maximize future tariff increases. However, many of our sample concessions are listed companies (56 percent)[3] or part of listed groups. In this case their managers might have some level of the opposite incentive to maximize the concession's profitability to create as much shareholder value as possible (through a share price increase). In any case, financial statements are audited; so with all the appropriate caveats, the leeway to window dress balance sheets remains limited. Balancing both effects, the former is bound to dominate the latter. Thus, overall the imputed estimated profitability or return estimate here is at least a lower bound of the true profitability.

Hurdle rates' time sensitivity

Some of the data used to estimate the appropriate hurdle rates vary constantly over time. This is, for instance, the case of country risk premiums and betas. Both tend to vary as the market incorporates new information on the country, sector, or company.

The cost of equity and weighted average cost of capital have been computed at three different points in time: (a) at the start of each concession—this represents the hurdle rate which investors would have used when they assessed whether to invest in a concession or not; (b) on average over the concession's life to date—this represents the opportunity cost that investors have faced on average since they invested into the projects; and (c) today—this represents the current opportunity cost of having invested money in a specific project.

It must be noted the data used is up to 2001. It is thus mostly exempted from the impact of the recent crisis in Latin America. It is highly probable that returns would have looked worse were 2002 and 2003 included in the analysis.

Concession data's time sensitivity

The concessions' financial results are usually sensitive to their life cycle. It is not uncommon to make losses in the first years as operational processes are optimized and heavy investments are often made. By contrast, profitability usually increases in later years as the system matures and reaches an appropriate level of efficiency. Therefore, mixing concessions at different stages of their life cycles is not ideal. As a result, the returns earned by individual concessions will not be compared, as they may not be comparable. The problem is not as acute, however, when computing averages for the whole sample since our sample includes several concessions at each stage of their life cycle.

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[3] The percentages vary by sector, however: Transport (0 percent), Water (30 percent), Energy (75 percent), and Telecommunications (88 percent).

Concessions versus industry-specific data

When estimating the cost of equity and the weighted average cost of capital, the salient choice is to use industry averages for the value of betas, the structure of capital, and the cost of debt, rather than those of the specific company under consideration. This is because industry averages are deemed representative of best practices in the sector. This ensures that risks that can be eliminated with prudent financial management are not remunerated. Using an industry average penalizes projects which are highly leveraged, since the hurdle rate resulting from industry averages would include a lower proportion of debt and, therefore, be higher (assuming the cost of debt is lower than the cost of equity) than the project's own hurdle rate. This means investors considering investing in a highly leveraged project may need to consider lowering its leverage—and, consequently, its financial risk—to make it attractive.

Another advantage of using industry averages is to ensure a higher comparability of results. Otherwise, it may be difficult to assess whether the extra return generated by a given project is not largely due to its higher leverage.

Finally, industry betas are often more reliable than individual betas. This is because individual betas must often be estimated from a limited-time series of data, which exposes the results to potentially large estimate errors. Fortunately, these errors tend to cancel out when one estimates betas of diversified portfolios.

Some, by contrast, argue that industry values are not relevant because the objective is precisely to assess the concession's specific cost of capital, given its existing financial structure.

This study favors arguments in favor of using industry averages, and they have been used in this study's calculations. In addition, for many of the concessions analyzed, specific betas were simply not available.

Estimating reasonable terminal values

In a net present value computation, the terminal value (TV) is often the largest amount. This is especially true for young concessions, for which the TV includes a large number of future years. Estimating the TV reasonably is important given the impact it has on results. This requires properly estimating the flows to be projected into the future and their growth rate.

As with any projection into a distant future, it is impossible to forecast it with certainty. In the case of infrastructure concessions, projecting future flows is made even more arduous by their high sensitivity to economic ups and downs, political events, and so forth. All one can do is be as reasonable as possible, which is often achieved by making simple assumptions.

The flows to be projected into the future were estimated on the basis of the average of those of the last three available historical years (1999, 2000, 2001). This means that for the Shareholder IRR the average dividends distributed by each concession over the last three years was used, while for the Project IRR the average net financial flows generated by each concession over the last three years was used. Averages over the last three years were taken to compute recurring flows independent of yearly variations and to be representative of the future.[4]

It was then assumed the resulting flows would grow at a constant rate. The same growth rate for dividends and concession cash flows were used (which may be interpreted as meaning that dividend payout ratios will remain constant). The latter was taken as equal to the long-term historical GDP growth rate of the country of each concession. This assumption means that each concession will grow at the same rate as the economy around it and that the future growth rate of the economy will be equal on average to its historical level. Each country's historical growth rate over a 39-year horizon, from 1961 to 1999, was used. This ensures that several economic cycles are included and that the data is not biased by particular economic circumstances. The resulting growth rates are: Argentina (2.7 percent), Bolivia (2.8 percent), Brazil (4.8 percent), Chile (4.4 percent), Colombia (4.2 percent), Mexico (4.7 percent), Panama (4.6 percent), Peru (3.2 percent), and Venezuela (2.7 percent).[5]

The resulting flows were projected into perpetuity to obtain the TV.

In practice, if the concessions were to be re-bid at the end of their current contract, a growing perpetuity of future flows would be only one of the methods used to estimate their value. Prospective bidders would also look at the net asset value of the concession and at trading and transaction multiples (that is, multiples of earnings and assets at which similar businesses trade or have been transacted). The perpetuity method was preferred because it is dynamic and forward looking, while the other methods are mostly static and based on historical numbers.

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[4] For a very young concession, this can underestimate returns, since the last flows may still be of a small amount. Note also that any exceptional amount from the calculation was removed.

[5] Source: IMF, 2002.

Adding a TV may, however, overestimate the compensation concessionaires can reasonably expect. First, not all concession contracts include the payment of compensation to shareholders for the value created at the end of the concession's operation. Second, it cannot be excluded that a future government negotiates a change to or is not in the capacity to pay such compensation. Third, compensations are often based on the nonamortized value of assets, which may be very different from the value of estimated future flows. In addition, concessionaires generally expect to earn a sufficient return over a reasonable period of time and do not rely on the TV to get a sufficient return. They will tend to rely on returns including the future value (FV) of flows until the last year of the concession, but excluding the value of flows beyond the concession operation period.

Adjustments to financial returns

As explained earlier, financial returns were adjusted recognizing that the financial accounts of a company may not always be fully representative of its economic situation. Two adjustments were made, related to management fees and investments. Other possible adjustments were run as sensitivities.

Management fees

For many of the concessions, a management contract was signed between the concession company and its shareholders (see table 12, page 27). These contracts typically called for various services to be provided to the concession by its shareholders, including the transfer of technology, development of general policies, preparation of detailed strategic plans, design of formal organizational structures, hiring of qualified staff, and formulation of annual operating budgets. These services are generally remunerated with a fee payable to the concessionaire by the concession, normally defined as a percentage of sales or operating profits.

In the concession's accounts, these fees are usually treated as tax-deductible operating costs. Therefore, they reduce the concession's operating and net incomes. However, it is often argued they do not remunerate real services or that their value is frequently inflated, so that all or part of them should be considered as dividends. In this case, the concession's operating and net income should be corrected (that is, increased), and the fees paid should be added to dividends in the computation of the internal rate of return. All returns would thus be higher.

To be as conservative as possible, returns have been corrected, assuming that all the explicit management fees paid by concessions were in fact dividends to their strategic shareholders. It is important to understand that this assumption implies that none of the services or know-how the management fees were supposed to remunerate are considered real. If the concession really needed to use those services or to buy that know-how, and had to acquire them from an outside party, their costs would be real costs to the concession and no correction would be made to its RoE and RoCE, while the Shareholder IRR should only be increased by the margin earned by shareholders on those services. Hence, by including them entirely as dividends, it is assumed the concession could have reached the same operating and net incomes without any of these services or know-how transfer. This is clearly a strong assumption.

It must also be noted that some concessions may not recognize the management fees paid to their concessionaires as such. The latter might be disguised under other cost categories, such as technical assistance costs.

Investments (transfer pricing)

When concessions invest in new machinery and equipment or build new facilities, they tend to use related parties to execute the works. Some argue that related parties are likely to charge higher prices for these services and works than if competitive bidding was organized, due to the monopolistic nature of the transaction. As a result, the *transfer price* is inflated and the concession's income reduced.

It is obviously very difficult to assess the fairness of such transactions since there is precisely no competitive bid with which to compare them. In fact, most countries include transfer pricing audits in the audits required from concessions. These require full disclosure of intragroup transactions, and compare their prices with those of similar transactions internationally. Therefore, significant inflation of transfer prices should not go unnoticed by auditors. Also, not all concessions' investments are made by related parties.

Therefore, the value of the total investments made by each concession were reduced by only 10 percent, and, likewise, the annual depreciation charges, assuming that about 30 percent of all investments were made by group companies with a price inflated on average by 33 percent.

With such adjustment, the operating and net incomes are higher (as depreciation charges are lower), which leads to higher return on equity and on capital employed. Concession returns are also higher because investments are smaller. The shareholder IRR is also higher since it was assumed these investment cost markups were direct benefits for the strategic shareholders' companies, which could then distribute them to themselves as dividends (after tax).

Other possible adjustments

In addition to the two adjustments made, several other adjustments could have been made. However, these further adjustments would have been very difficult to estimate and quite uncertain. They have, therefore, not been considered in this analysis.

Acquisition value

When bidding for a concession, concessionaires often pay an acquisition premium over the fair value of the target firm, known as *goodwill*. This acquisition premium is triggered by the competition created by the bidding process. The buyer is willing to pay such premiums if the asset provides a competitive advantage, such as an entry point in a new market, or a stronger brand name.

Normally, the goodwill appears on the balance sheet of the acquirer in the amount by which the purchase price exceeds the net tangible assets of the acquired company, and the goodwill is amortized over a few years, creating a recurrent cost in the company's accounts. For all the concessions analyzed, however, the goodwill was not recognized. Rather, the value of the assets of the acquired companies was increased so the net asset value of the acquired company was made equal to the purchase price. This implies the entire purchase price was incorporated in the capital base of the concession, which reduces returns (in particular the Project IRR). However, the acquisition premium should be left in the concession's capital base only if it represents real market value. If it represents a premium the acquirer was willing to pay for strategic reasons, for instance, then it represents additional value for the current buyer, but probably not for a future purchaser. In this case, it needs to be progressively eliminated by amortizing the goodwill.

In addition, overvalued assets lead to higher depreciation charges, which lower concessions' returns on equity or capital employed further (by reducing operating and net incomes). These charges are usually larger than the goodwill amortization charges (spread over a longer period of time), so that the net effect on returns is negative. One could adjust returns for the difference between the goodwill amortization charges and the depreciation charges on the overvalued assets.

From the point of view of shareholders, however, what matters is the amount they effectively paid for the assets and on the basis of which they hope to gain a sufficient return. From that angle, no adjustment is needed.

Pre-acquisition asset value

Companies often revalue their assets shortly after their privatization. A revaluation increases the concession's asset base but also depreciation charges, and reduces rates of return. Frequently, little information is provided on the basis of these revaluations, and doubts arise on their economic foundations. However, the lack of information makes any reasonable adjustment impossible to make.

Transfer pricing (other than for investments)

In the same way investments are often carried out by related parties to a concession, many other services can be provided to the concession by group companies. The most common suspicious accounts are repairs and maintenance, consulting services, technical assistance, rent, and general services. Again, the prices of the related services are likely to be inflated as a result of the monopolistic nature of the transactions. However, companies tend to disclose little information on transfer prices other than for large transactions, so that it is not possible to make any reasonable assumption on their true extent. In addition, all intragroup transactions are supposed to be audited for transfer prices so that there should be limited room for overpricing. In any event, regulators are encouraged to require concessions to document and disclose their transfer pricing policies as much as possible.

Depreciation

Depreciation periods for infrastructure assets can sometimes be shorter than the actual life of the assets (accelerated depreciation). This increases depreciation charges in the short term and reduces returns. Even though accelerated depreciation is normally allowed by most countries' tax and accounting rules, from an economic point of view depreciation should be made over the actual life of the assets. However, adjusting for this would only be possible if a detailed depreciation schedule was available for each concession's assets.

5.

COMPUTATION OF THE HURDLE RATES: COST OF CAPITAL

Computation of the cost of equity

As explained above, the cost of equity has been calculated on the basis of CAPM. The required parameters have been estimated as described in Appendix 2. Figure 2 shows the resulting current costs of equity for each country.

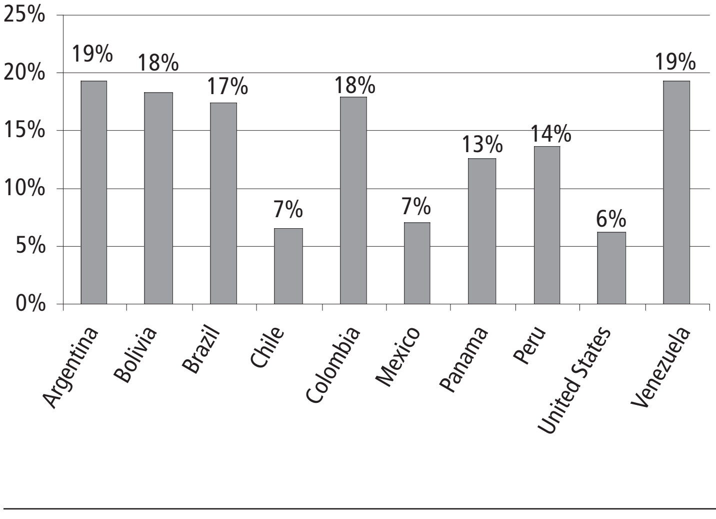
The figure indicates, for instance, that an investor looking to invest today in a concession in Argentina would need to earn an internal rate of return of at least 19 percent on the investment. If the concession's financial projections show the internal rate of return on the investment is likely to be less than 19 percent, the investment would not be worth it, as the investor should be able to find alternative investments with a similar level of risk but a higher expected return. The same investor would only need to earn an internal rate of return of 6 percent to invest in an American concession and 7 percent in a Chilean concession.

Since the main discriminating factor is the country risk premium (see Appendix 2), the cost of equity tends to vary significantly across countries, but less so across sectors within a country (see Figure 3).

Computation of the weighted average cost of capital

The weighted average cost of capital has also been derived from CAPM. The required parameters have been estimated as described in Appendix 2. Note the cost of debt used in the calculation is nominal and does not include the cost of potential debt renegotiations. It

Figure 2: Estimated cost of equity by country, May 2004



Source: Authors' calculations.

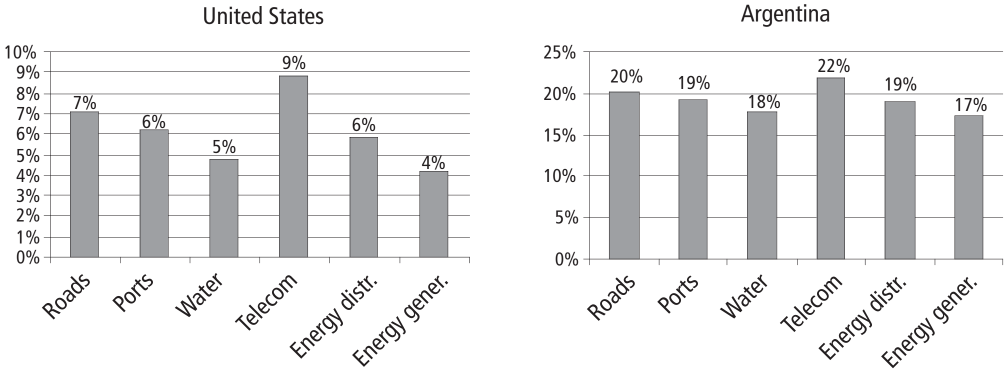
may understate the effective cost of debt and the resulting WACC. Figure 4 shows the resulting estimates of the weighted average cost of capital per country.

Figure 4 indicates, for instance, that an investor looking to invest today in a concession in Argentina would need to earn a project internal rate of return of at least 14 percent on the investment. If the concession's financial projections show the project internal rate of return is likely to be less than 14 percent, the investment is not worth it, as the investor should be able to find alternative investments with a similar level of risk but a higher expected return. The same investor would only need to earn a project internal rate of return of 3 percent to invest in an American or Chilean concession.

As for the cost of equity, the WACC varies more across countries than across sectors (see Figure 5).

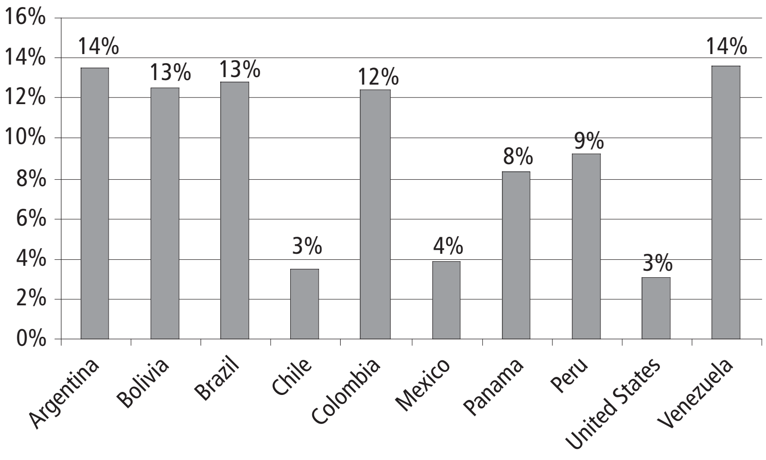
Since the estimated cost of debt is lower than the cost of equity, the resulting WACCs are lower than the costs

Figure 3: Estimated cost of equity by sector; United States and Argentina, May 2004



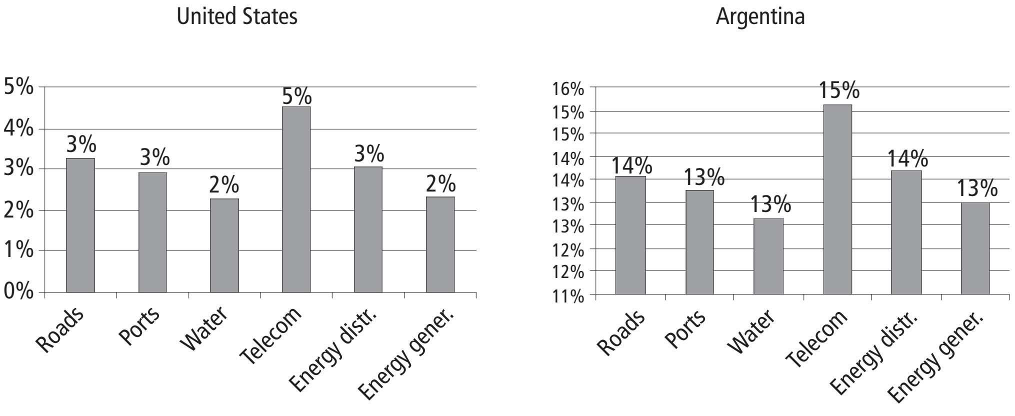
Source: Authors' calculations.

Figure 4: Estimated weighted average cost of capital by country, May 2004



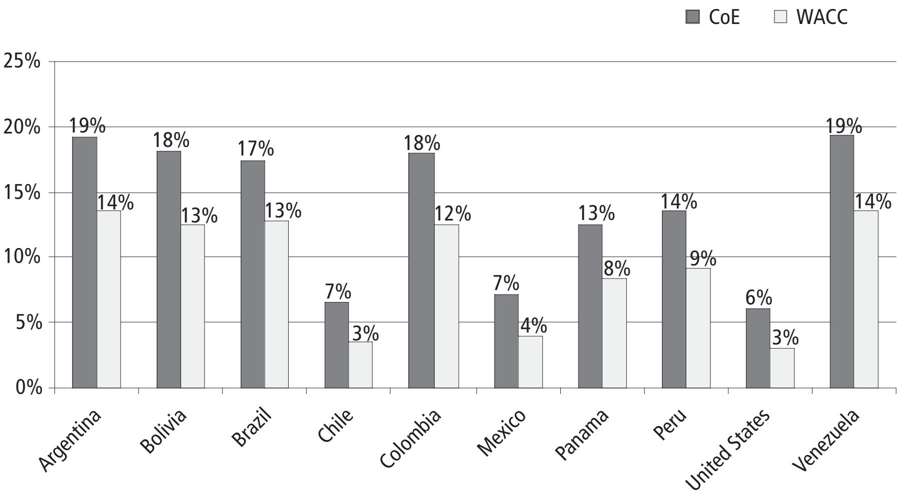
Source: Authors' calculations.

Figure 5: Estimated WACC by sector; United States and Argentina, May 2004



Source: Authors' calculations.

Figure 6: Comparison of the estimated cost of equity and the estimated WACC



Source: Authors' calculations.

of equity (see Figure 6). This means equity investors expect higher returns than debt holders, a logical consequence of their taking on more risk.

Variability during the concessions' lifetime

As explained in Appendix 2, both the cost of equity and the weighted average cost of capital vary constantly, as new information is incorporated into betas and country ratings (on the company's risk level, the sector, the country, the regulatory environment, and so forth), and as the risk-free rate moves. Therefore, three hurdle rates for each concession have been computed: at their start, on average over their operation, and at the end of 2001.

It can be seen from Table 5 that, despite small variations, on average the cost of equity was relatively stable until 2001. The average weighted cost of capital of the sample concessions, by contrast, has been falling over the life of the concessions (by up to 2 percentage points on average). This fall results from concessions' higher overall indebtedness level in the telecommunications and energy sectors. In the analysis, returns to average hurdle rates over each concession's historical years of operation are compared. One has to keep in mind that hurdle rates are higher today.

Table 5: Variation in the cost of equity and WACC over the concessions' lifetime

	At the start of each concession	On average during each concession's life time	2001
Cost of equity			
Water concession average	15%	16%	15%
Transport concession average	15%	17%	16%
Telecommunications concession average	20%	20%	20%
Energy concession average	18%	19%	18%
Overall	**17%**	**18%**	**17%**
WACC			
Water concession average	10%	11%	11%
Transport concession average	11%	11%	10%
Telecommunications concession average	16%	15%	13%
Energy concession average	16%	15%	13%
Overall	**14%**	**13%**	**12%**

Source: Authors'calculations.

6.

CONCESSION AND SHAREHOLDER RETURNS

As explained in the methodology, two sets of returns have been computed. First, *concession returns,* those measuring the overall attractiveness of the concessions as business entities, were computed. Second, *shareholders returns,* those effectively earned by project shareholders from the distribution of dividends or other sources of funds generated by the concession, were computed.

For each sets of returns, *financial returns* derived directly from the financial statements of the concessions were first computed. Then, to account for some potential economic distortions, with the objective of estimating *adjusted returns* representative of the economic situation of each concession, these returns were adjusted.

Finally, three values were provided when returns based on an internal rate of return calculation (Shareholder IRR and Project IRR) were measured. First these returns were computed only over historical years to account for the returns already generated by the concessions or earned by their concessionaires to date. Second, it was estimated what they might generate or earn over the concessions' remaining years of operation by projecting flows until each concession's last year of operation. Third, to estimate the returns they would generate or earn if they were adequately compensated for the value created at the end of each concession, a terminal value was added. In this section, the results of the analysis, focusing on each of these measures of return, are presented.

Concessions' returns

Overall concession returns

Starting with the most aggregated level first, the average returns earned by our sample of 34 concessions were computed. Obviously, these overall returns must be interpreted with caution given the variety of countries and sectors included in the sample and the wide discrepancy of results across them.

Figure 7 shows that without including the future value to be created by the concessions (future and terminal values)—that is, including historical years only—our concessions reach a financial return of negative 24 percent, well below their average WACC of 13 percent.

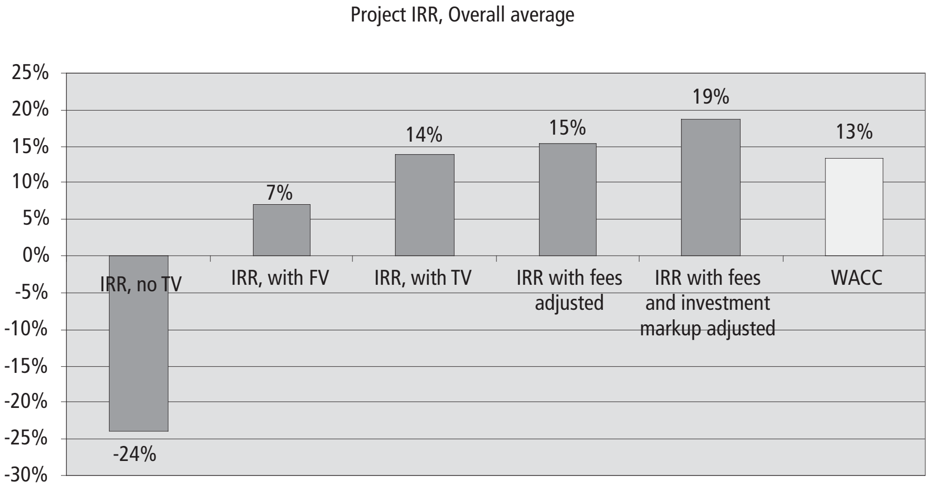
This results in part from our sample concessions' low operating profitability compared to their average WACC. Figure 8 shows the average annual return on capital employed generated by our sample concessions so far was 7 percent (oscillating between 4 and 9 percent from year to year), well below the average WACC of 13 percent. (The impact of adding up management fees and excess depreciation is minimal, the overall average annual ROCE rising to 9 percent). Investments, which averaged 27 percent of our concessions' annual revenues, have also had their toll on net profitability.

Despite this low historical profitability, Figure 7 shows the sample concessions should on average be able to generate an internal rate of return (Project IRR with TV) above their average WACC (14 percent) if their future growth is at least equal to each country's average historical economic growth and the residual value added is taken into account. In this sense, infrastructure concessions are interesting business proposals for potential investors, providing them with an adequate long-term return compared to the risk taken.

In fact, based on this study's adjusted measures of returns, they even seem able to generate some excess returns. If no management fees were paid to the concessions' operators, the concessions' average long-term Project IRR would reach 15 percent; and if, in addition, the cost of investments was not possibly inflated by 10 percent, their internal rate of return would reach 19 percent.

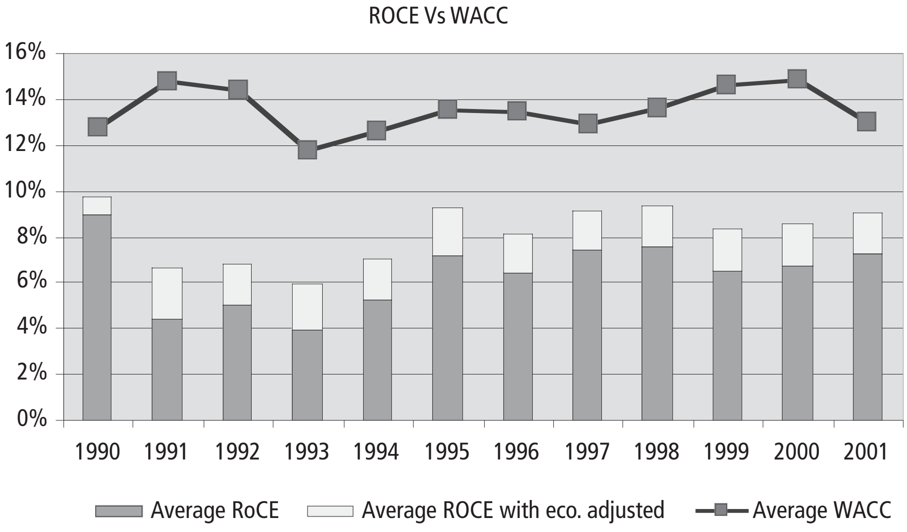
It must be noted, however, that these adjustments may not always be feasible or desirable for the concessions' shareholders. Management fees may be

Figure 7: Overall concession return



Source: Authors' calculations, based on concessions' historical financial statements and the authors' growth assumptions.

Figure 8: Average annual profitability of sample concessions



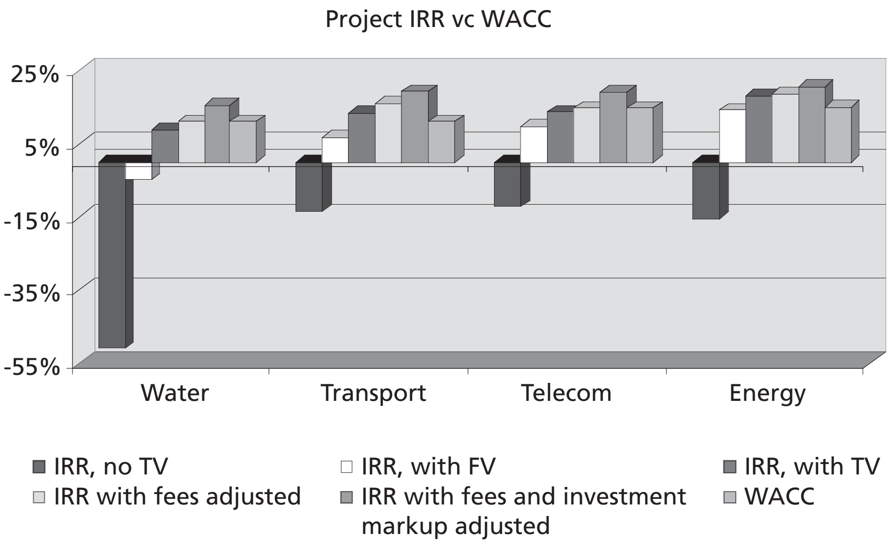
Source: Authors' calculations, based on concessions' historical financial statements.

unavoidable if the services they pay for are necessary for the concession company, and the cost of investment may not be reducible. In addition, reducing management fees and possible investment markups would reduce shareholders' returns, while this analysis will show later that these are below the required cost of equity.

Concession returns by sector

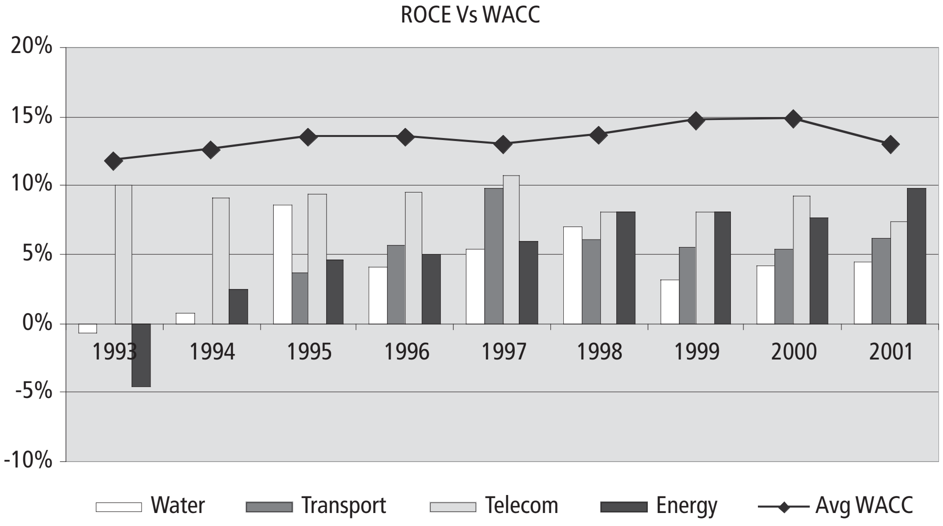
Returns seem to vary somewhat across sectors, although the general conclusions presented above apply to all sectors. As Figure 9 shows, historical returns are negative in all sectors. The water sector stands out, with an average historical return significantly lower than those in other sectors.

Figure 9: Long-term concession returns by sectors



Source: Authors' calculations, based on concessions' historical financial statements and the authors' growth assumptions.

Figure 10: Average operational profitability by sector



Source: Authors' calculations, based on concessions' historical financial statements.

This results because in all sectors the net average annual operating profitability of concessions has not been high enough compared to their respective levels of risk (see Figure 10). Table 6 confirms the average operating profitability of concessions in the water sector has been the lowest. It has also been the most volatile. Telecommunications is the sector with the highest average operational profitability.

Large investments have also reduced the net profitability of concessions, as illustrated in Table 7.

As Figure 9 shows, water is the only sector where the long-term financial return of concessions is expected to remain below the sector's corresponding WACC (9 percent Project IRR with TV, versus 11 percent WACC). However, if management fees are added back to the concessions' net income, the average return of water concessions equals their average WACC. This means that if water concessions could reach our projected profitability without paying any management fees, they would be interesting business proposals.[6] If they could also reduce the cost of their investment by at least 10 percent, their average long-term return would exceed the corresponding WACC.

In all the other sectors, the estimated long-term returns all equal or exceed the corresponding sector WACC, even without adjustment. When return adjustments are introduced, the long-term returns of concessions in all three sectors exceed their corresponding WACC.

Concession returns by country

Mexico, Panama, and Venezuela were excluded from the by-country analysis because there is only one concession for each of the countries in the sample.

Figure 11 shows concession returns vary significantly across countries. Historical returns (IRR with no TV) have been negative in all countries, except in Colombia, where they are marginally positive.

Looking at long-term returns, Colombian concessions really stand out as the only ones capable of generating a long-term return well above their corresponding WACC, even without any adjustment. Adjustments would bring their expected return above 40 percent.

Brazil follows, with concessions estimated to generate long-term financial returns equal to their WACC. In Argentina and Chile, long-term returns become equal to the corresponding country WACC only with adjustments.

Peru and even more so Bolivia stand out as the only countries where our sample concessions are expected to earn a long-term return below the country WACC, even when adjustments are taken into account. In Bolivia, the long-term adjusted return of concessions is projected to be negative.

Table 6: Volatility of profitability by sector

	Average RoCE	Standard deviation of RoCE
Water	4.3%	4.3%
Transport	5.2%	2.9%
Telecom	8.2%	3.8%
Energy	7.2%	3.5%
Global average	6.3%	3.7%

Source: Authors' calculations, based on concessions' historical financial statements.

Table 7: Investment levels by sector

	Average annual level of investments in % of revenues
Water	32
Transport	35
Telecom	26
Energy	21
Overall	27

Source: Authors' calculations, based on concessions' historical financial statements.

Colombia stands out with above average expected returns partly because the average historical profitability of Colombian concessions has been the highest in the sample (see Figure 12). The lower level of investments in percentage of revenues also contributes to these concessions' higher profitability (see Table 8).

In Bolivia, the country where concessions have recorded the lowest return, investments have been the highest compared to revenues, while the operational profitability of concessions has been the lowest (excepting Argentina).

Concession returns by concession maturity

Returns vary also as a function of each concession's *maturity,* that is, its years of operation. As the concession matures, profitability usually increases (heavy investments and operating restructuring often penalize the early years). Table 9 shows that concessions with more than 10 years of operation have returned an adjusted Project IRR higher than the overall average WACC (16 percent compared to 14 percent). This confirms that concessions are economically profitable businesses in the long term, possibly after as few as 10 years of operation.

The concessions' Project IRR increases systematically as the sample concessions' number of years of operation

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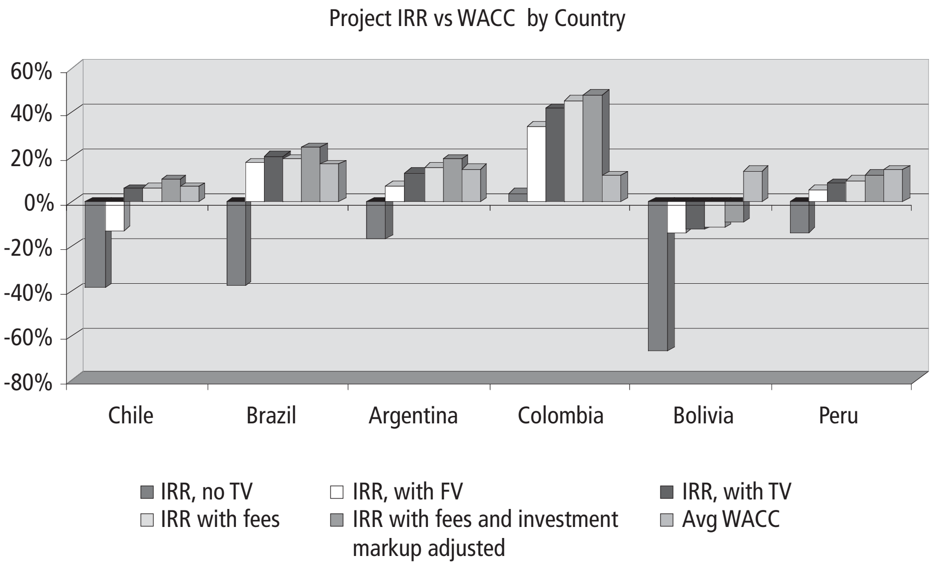
[6] Because management fees are supposed to remunerate some transfer of knowledge and other services, suppressing them could lower the concessions' profitability.

Figure 11: Average concession returns by country



Source: Authors' calculations, based on concessions' historical financial statements and the authors' growth assumptions.

rises. The average RoCE increases, too, with concession maturity, although less so. This seems to suggest that concession returns are driven up in later years by lower investments. It may also be that for many concessions returns are depressed in early years by inadequate prices that are then corrected after the first price control period.

Individual concession returns

The intention here is not to provide an analysis of each concession's returns, but to draw some general conclusions.

Individual concession returns are highly volatile. Figure 13 shows that while all our concessions but one have generated a positive net operating profitability, the majority of them have so far generated a return below their WACC or even negative.

Table 8: Investment levels by country

	Average annual level of investments in % of revenues
Chile	30
Brazil	27
Argentina	22
Colombia	15
Bolivia	32
Peru	28
Overall	26

Source: Authors' calculations, based on concessions' historical financial statements; the calculation includes all years of operation of each concession.

Table 10 confirms that, while the majority of our sample concessions have so far generated a negative return, about 60 percent of them should generate an adjusted return above their WACC in the long term. This means that about two-thirds of our sample concessions have the potential to become interesting business proposals.

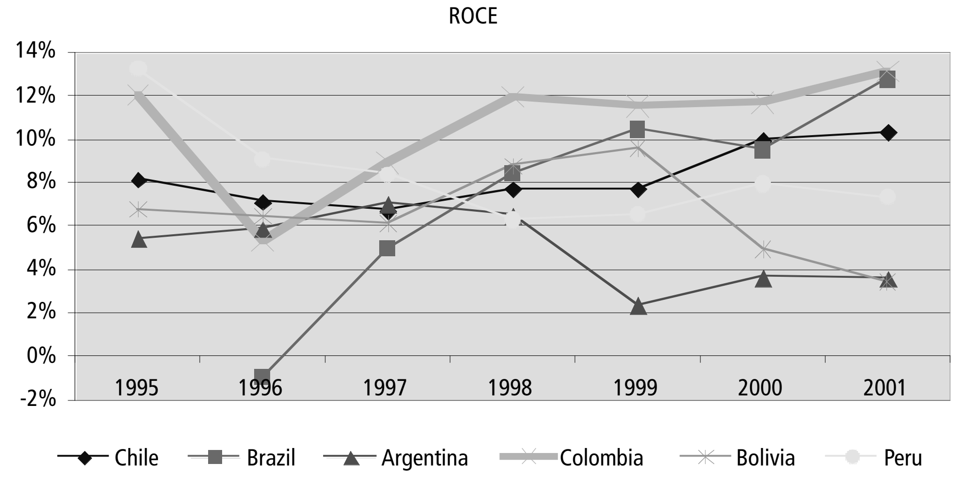
However, it also means that about 40 percent of our sample concessions do not seem to have the potential to generate adequate long-term returns under our growth assumptions. These unattractive concessions are spread in all sectors, but with a lower concentration in the telecommunications sector (where 25 percent of our concessions fall into that category).

Concession return, a conclusion

The analysis above shows that if concessions continue to grow at least as fast as the economies around them, their average long-term financial profitability will be equal to their average WACC. Under these assumptions, they are on average interesting business proposals.

Returns are highly volatile, however. They vary across sectors, countries, and concessions. Concessions in the water sector appear less attractive than in others, as do concessions in Peru and Bolivia. Concessions in the telecommunications sector and concessions in Colombia appear overall more profitable than in other sectors and countries in the sample. The largest differences are

Figure 12: Average annual concession profitability by country



	Chile	Brazil	Argentina	Colombia	Bolivia	Peru	Global
Avg RoCE	7.5%	9.7%	3.0%	10.7%	7.1%	7.3%	6.3%
St dev	7.6%	3.6%	3.9%	4.4%	3.5%	2.6%	1.5%

Source: Authors' calculations, based on concessions' historical financial statements.

observed by concession maturity: Concessions with over 10 years of operation appear clearly more profitable than younger ones. This may result from the way investments were forecast (future investment flows were based on historical investment amounts, penalizing young concessions that usually suffer from heavy early investments). As mentioned earlier, it may also be that returns are often depressed in early years by inadequate prices that are then corrected after the first price control period or by favorable renegotiation. Whatever the reason, it means that returns are built over many years.

Returns also vary widely across concessions. Therefore, even if, overall, about 60 percent of our sample concessions have the potential to generate attractive returns in the long term, 40 percent do not seem to have the potential to ever generate attractive returns. Therefore, concessions seem, in general, to be an attractive but highly risky business. This is especially true in the energy and transport sectors, where as many as half of our sample concessions do not seem able to generate adequate returns in the long term (under our base case assumptions).

Shareholders' returns

Overall shareholder returns

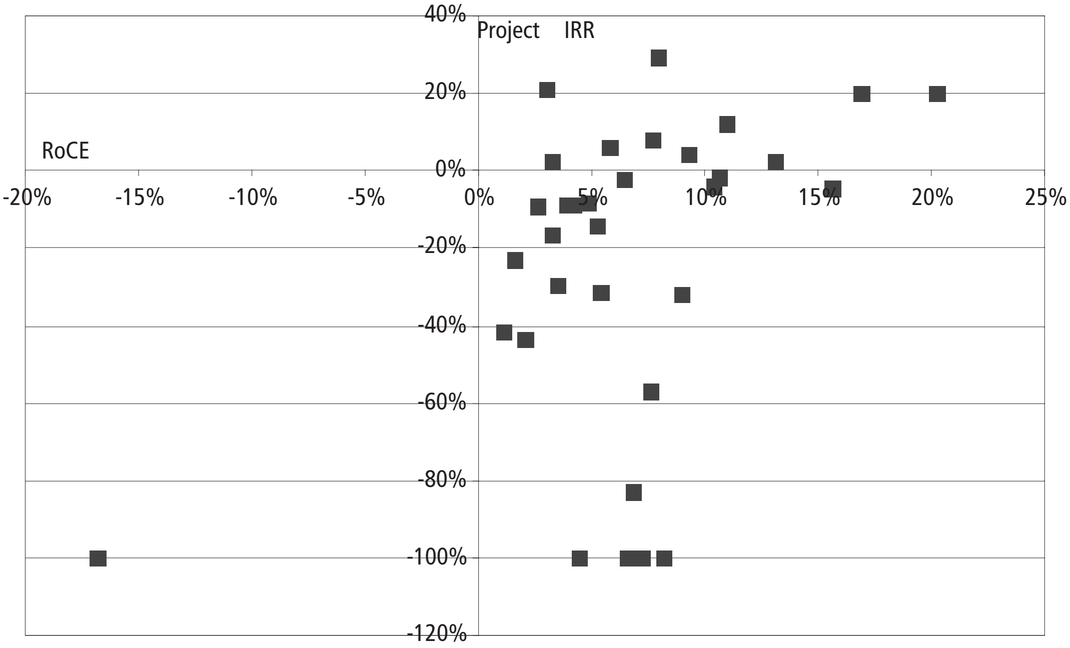
Figure 14 shows that with a growth rate equal to historical economic growth, the shareholders of our sample concessions would on average earn a long-term financial return well below the average required cost of equity (negative 27 percent compared to 18 percent). When management fees and investment cost markups

Table 9: Historical concession returns by concession maturity

Number of years of operation (as of Dec. 2001)	Avg ratio of investment to revenue	Adjusted RoCE	Economic Project IRR (no TV)
< 2	46%	7%	-91%
2 to 4	18%	5%	-45%
5 to 7	29%	8%	-30%
8 to 10	29%	9%	2%
> 10	24%	11%	16%
Overall	27%	8%	-19%

Source: Authors' calculations, based on concessions' historical financial statements.

Figure 13: Financial RoCE and Project IRR by concession



Source: Authors' calculations, based on concessions' historical financial statements.

are added to dividends, the average Shareholder IRR increases substantially but remains below the average cost of equity (at 14 percent). Figure 14 also shows that historical returns earned so far by concession shareholders from dividends only have been highly negative, at –49 percent on average.[7]

With our assumptions, investment markups make up a large share of the prospective returns concession shareholders might hope to earn. This is the result of the large investments made so far by all our concessions (see Table 7), on the basis of which future investments were projected. In reality, future investments are likely to be high for most of our concessions, but shareholders may not earn any markup on these (for instance, if they are implemented by companies outside the group or at market prices). Therefore, in such cases shareholders will have to rely on dividends and management fees only.

This suggests that to earn a sufficient return shareholders will have to achieve concession growth rates superior to those of the economies around them.

It must also be noted that the prospective average return of 14 percent with management fees and investment markups includes a terminal value. This means that it would only be earned by concession shareholders if they are compensated fairly at the end of their concession's operation period for the value added they created by reinvesting part of the concession's earnings into the concession. Most concession contracts include some form of compensation to their shareholders for the value created. Such compensation often takes the form of a payment equal to the nondepreciated value of assets or to the market value of the concession company at that time.

Such payments are not free of risk, however. Since they are made by the government, they are exposed to the same credit risks as any other government liabilities. The history of concessions is, unfortunately, too short to assess how fairly concessionaires tend to be treated at the end of their concession. Without such payment, however, the returns shareholders can expect are well below the required cost of equity. Again, this does not include the potential impact that retained earnings might have had on their own share price during the life of their concession, although this value added is subject

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[7] Note that this does not include the potential increase in their own share price as a result of the earnings accumulated in their concession subsidiaries.

Table 10: Dispersion of returns across concessions (number)

Sector	With Adjusted Project IRR (no TV) Negative	Below WACC	Above WACC	With Adjusted Project IRR (with TV) Negative	Below WACC	Above WACC	% unattractive concessions
Water	7	1	2	2	2	6	40
Transport	2	2	0	0	2	2	50
Telecom	2	3	3	1	1	6	25
Energy	8	2	2	2	4	6	50
Globally	19	8	7	5	9	20	41

Source: Authors' calculations.

to the same political risk as the overall concession (as it could be captured by an expropriating government).

As Figure 15 shows, the low return earned so far by concessionaires results largely from the low average annual return on equity earned by our sample concessions. Over the last 10 years, the latter has been significantly below the average cost of equity. (Management fees and investment markups have a marginal impact on the average RoE.) In fact, their average return on equity (5.8 percent) has been just below the cost of equity in the United States (6.1 percent).

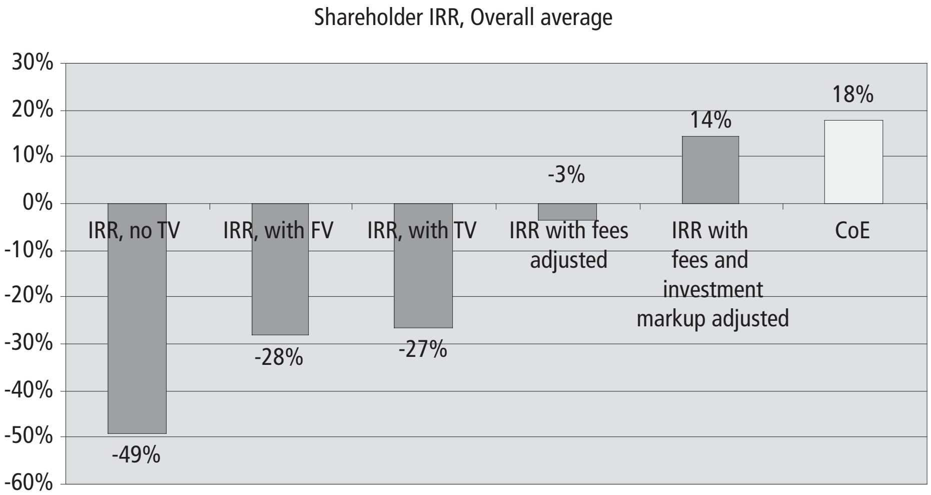
The large difference between the average RoE and the average historical Shareholder IRR suggests that on average a significant portion of net income has been reinvested in each concession every year. This is confirmed in Table 11, which shows the average dividend payout ratio of our sample concessions is 30 percent. This means that on average 70 percent of net income has been reinvested every year in the concessions.

The large differences between Project and Shareholder IRRs confirm that shareholders have so far not extracted much of the value they created in their concessions by way of dividend distributions.

Shareholder returns by sector

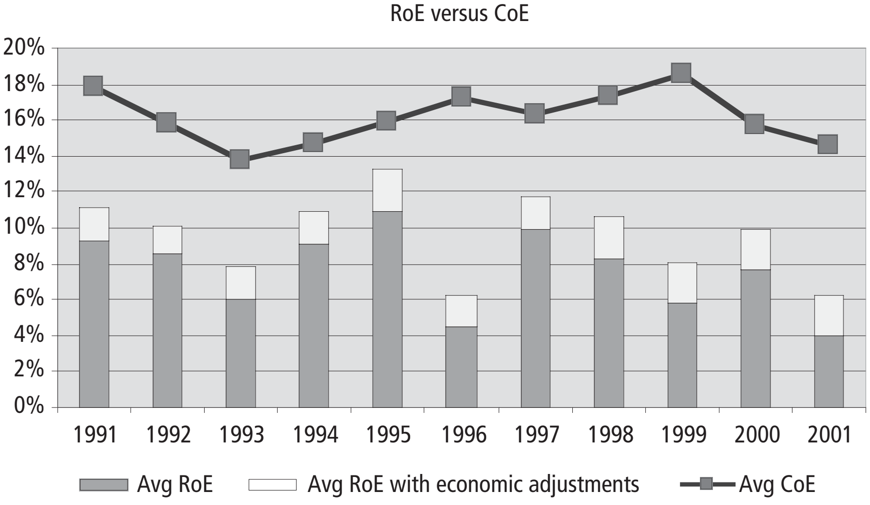
As Figure 16 shows, shareholders' returns vary widely across sectors. As for our overall results, without adjustments, the long-term returns concession shareholders can expect to earn are below the required cost of equity in all sectors. In fact, such return is negative in all sectors, except in telecommunications, where it is

Figure 14: Overall long-term shareholder returns



Source: Authors' calculations, based on concessions' historical financial statements and the authors' growth assumptions.

Figure 15: Average annual return on equity of sample concessions



Source: Authors' calculations, based on concessions' historical financial statements.

marginally positive. Management fees bring shareholder returns above the required cost of equity in the telecommunications sector, while in water, management fees and potential investment markups are needed to bring shareholder returns to the required level. In the other sectors, energy and transport, even with such adjustments, shareholder returns remain below the required cost of equity. In the transport sector, they even remain negative. This is the result, to a large extent, of the lower dividend payout concessionaires have benefited from in the transport sector (see Table 11). As Table 12 shows, the relatively high management fees that transport concessions have paid their strategic shareholders on average have not been sufficient to compensate for the low dividends.

Table 11: Payout ratios by sectors

	% net income distributed in dividends
Water	18
Transport	2
Telecom	44
Energy	41
Overall	30

Source: Authors' calculations, based on concessions' historical financial statements.

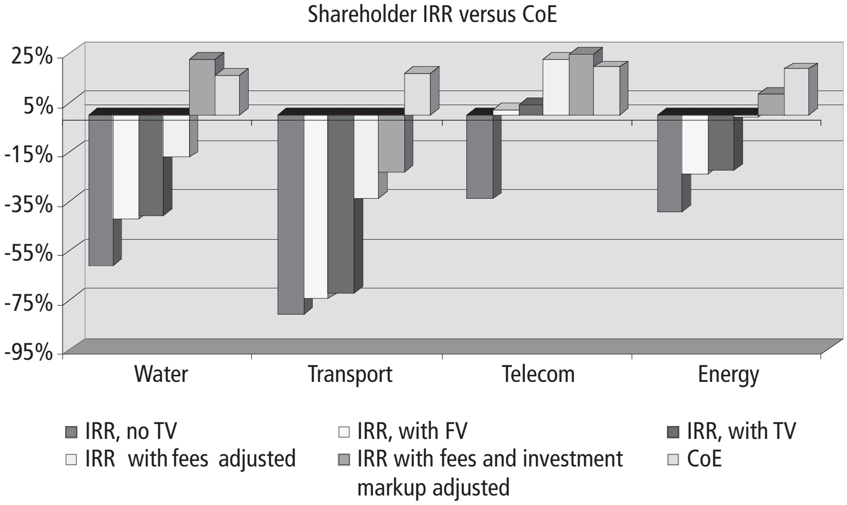
Shareholder returns by country

Figure 17 shows that shareholders' financial returns vary quite widely across countries. In financial terms (with dividends only) they are positive only in Colombia (with TV). Colombia also stands out as the only country where, under our assumptions, concession shareholders would earn a long-term return above their required cost of equity just from dividends. If management fees and potential investment markups are added to dividends, their returns would be above 40 percent.

In Bolivia, some concessions have paid large management fees to their shareholders, so that if they were to be maintained in the future, shareholders would earn returns in line with their required cost of equity. In Brazil, potential investment markups could possibly bring returns very close to the required cost of equity (as investments have been high in the past and are projected to remain so), but again, there may not be any investment markups in these concessions.

Chile stands out as a country where shareholder returns would remain negative if things were to continue on a steady state path, even including management fees and potential investment markups. This is one of the countries with the lowest payout ratios (after Argentina). Shareholders in Chile, Argentina, and Peru would only earn an adequate return in the long term if the future rate of growth of income is higher than

Figure 16: Overall shareholder returns by sector



Source: Authors' calculations, based on concessions' historical financial statements and the authors' growth assumptions.

in our projections. It is interesting to note that shareholders in the Argentinean concessions in the sample, who are most frequently accused of having extracted resources from Argentina via large dividend flows, have paradoxically the lowest average historical payout (see Table 13).

Figure 17 shows also that historical returns have been much lower. Looking at dividends only, shareholders in all countries have earned negative returns so far. If management fees are included, only Colombian concessions have paid their shareholders a positive return, just one percent below the required cost of equity. Given the large investments Colombian concessions have made in general, if their shareholders have been remunerated through possible investment markups, they might in fact have already earned a return higher than their cost of equity. In all the other countries, concession shareholders have earned negative returns so far, even if management fees and potential investment markups are included (but excluding the potential increase in their own companies' share price or value).

Table 12: Management fees by sector

	% concessions with management contracts	Avg management fee in % of total sales
Water	60	2
Transport	100	7
Telecom	75	2
Energy	42	1
Overall	62	2

Source: Authors' own calculations.

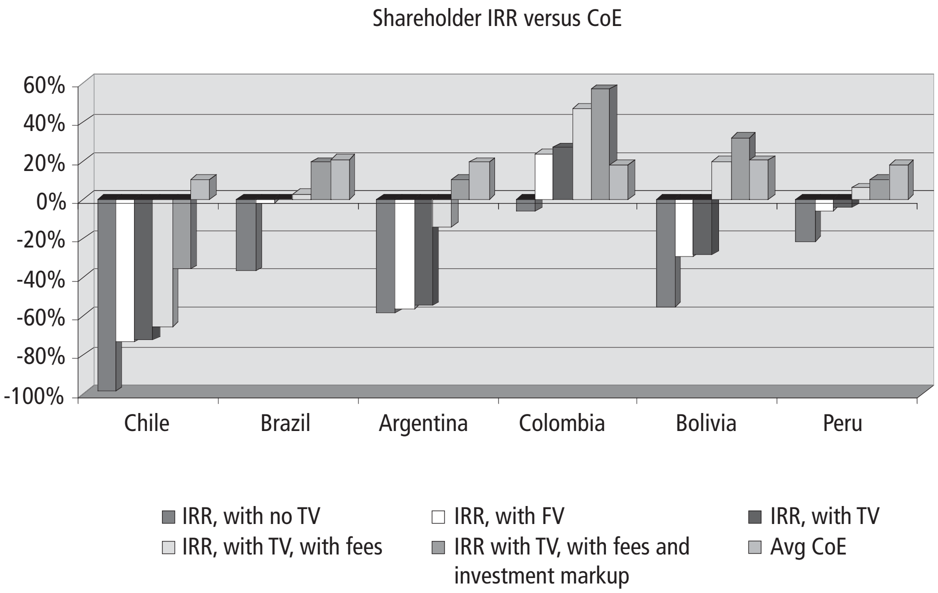
Note: The low level of management fees (as a percent of total sales) is confirmed by an analysis of electric utilities in Latin America by Deutsche Bank Securities Inc, which shows that only 14 percent of all electric utilities in Latin America have established management fees in their contracts.

Shareholder returns by concession maturity

Shareholder returns vary also as a function of each concession's maturity, or the number of years in operation. This is because shareholders simply benefit from more years of dividend distribution. Table 14 shows that it is only for concessions with more than 10 years of operation that average shareholder returns from dividends become positive (but they remain much lower than the average cost of equity). The average annual return on equity of our concessions increases systematically with their maturity, becoming positive after five years and close to (but below) the average cost of equity after 10 years.

Given that, on average, concessions with more than 10 years of operation returned a Project IRR above the required WACC, the discrepancy with shareholder returns (which are below the required cost of equity) confirms that concessionaires have reinvested most earnings in their concessions. It also suggests that the overall economic profitability of concessions has not

Figure 17: Shareholder returns by country



Source: own calculations, based on concessions' historical financial statements and the authors' growth assumptions.

been shared yet between equity and debt holders proportionally to their investments, even for those concessions that have been in operation for more than 10 years (unless shareholders have been able to cash in the value added accumulated in the concessions by way of share price increases in their own companies).

There is another argument that suggests old concessions should be more profitable than young ones. As reported in Guasch (2004), there has been a tendency of aggressive bidding by potential operators to secure the rights to the concession. That aggression, or overbidding, led to contractual terms that were not financially sustainable from the start, with rates of return not covering the cost of capital. The rational for that overbidding has been the expectation—quite often well founded—that the concession or its contractual terms could be renegotiated shortly after. The evidence supports that hypothesis, since on average the incidence of renegotiation of infrastructure concessions in Latin America was 42 percent, (but much higher in the water and sanitation sector, 75 percent, and in the transport sector, 55 percent), the average time interval between the granting of the concession and renegotiation was less than three years, and the outcome of the renegotiations usually favored the operator (Guasch 2004). This would provide a profile consistent with low or negative returns early on and larger returns later on (after renegotiation).

Table 13: Payout ratios by country, average over concession life

	Payout ratio
Chile	24%
Brazil	37%
Argentina	10%
Colombia	27%
Bolivia	68%
Peru	54%
Overall	30%

Source: Authors' calculations.

Individual shareholder returns

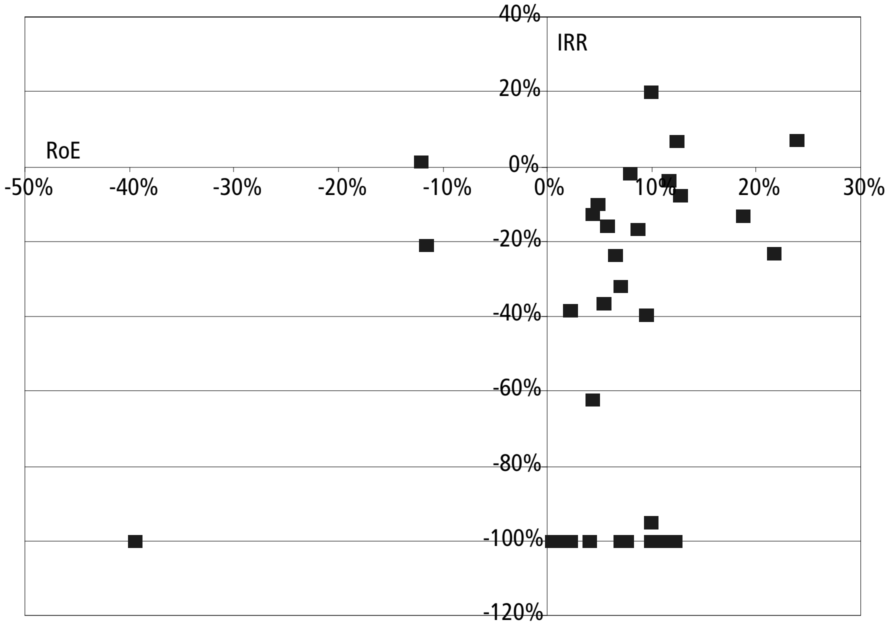
The main characteristic of shareholder returns by concession is their high volatility, not only across concessions, but also from year to year.

Volatility of returns across concessions

Looking at the volatility of returns across concessions first, Figure 18 shows no two concessions are alike in terms of their RoE and Shareholder IRR. Nevertheless, some concentration can be found, in particular in the corner, with highly negative financial Shareholder IRR (without FV or TV) and a small positive RoE.

Table 15 confirms that with adjusted returns the majority of our sample concessions have a Shareholder IRR below the required cost of equity, even with terminal value, and that for more than half our sample,

Figure 18: Financial RoE and Shareholder IRR by concession



Source: Authors' calculations.

concession shareholders would only be adequately remunerated with higher growth rates.

Transport and energy stand out as sectors where 75 percent of all concessions do not have the potential to generate adequate returns in the long term to their shareholders without higher growth.

Volatility of returns from year to year

Looking at the volatility of returns from year to year, Figure 19 shows that RoEs have varied substantially over the period covered, especially in the water sector. Surprisingly, telecommunications, where sales are supposed to be more volatile than for truly basic services, has had one of the most stable RoEs. The standard deviation of RoE over the last 10 years was 15 percent in water, 6 percent in transport, 7 percent in telecommunicaitons, and 8 percent in energy.

Figure 20 shows that returns have been volatile in each country.

Shareholder returns, a conclusion

The returns earned so far by our sample concession shareholders from dividends and other financial flows (excluding potential appreciations in their own share price) have been negative in all sectors and countries. This results from the low average profitability of concessions to date and from low dividend distribution policies (for which limited management fees do not compensate).

If concessions were to grow in the future at the same rate as the economies around them (all other things being equal), in the long term shareholders could hope to earn an overall positive return only if they continued to earn management fees and potential investment markups. Their return would, however, remain below the required cost of equity. This means that on average shareholders can only hope to earn returns commensurate with the risks taken if there is superior concession growth in the future.

Table 14: Relation between return and concession maturity

Number of years of operation (as of Dec. 2001)	Adjusted RoE	Adjusted Shareholder IRR (no TV)
< 2	10%	-78%
2 to 4	-1%	-70%
5 to 7	6%	-34%
8 to 10	13%	-6%
> 10	15%	1%
Overall	8%	-30%

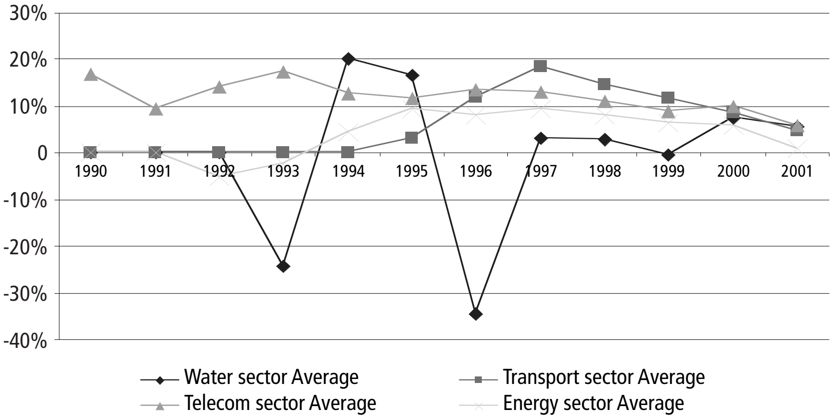
Source: Authors' calculations.

Table 15: Dispersion of adjusted RoE and Shareholder IRR across concessions

	Number of concessions with: Adjusted Shareholder IRR			Adjusted Shareholder IRR (with TV)			
Sector	**Negative**	**Below CoE**	**Above CoE**	**Negative**	**Below CoE**	**Above CoE**	**% unattractive concessions**
Water	6	0	4	2	2	6	40
Transport	3	0	1	2	1	1	75
Telecom	2	1	5	1	1	6	25
Energy	10	2	0	4	5	3	75
Globally	**21**	**3**	**10**	**9**	**9**	**16**	**53**

Source: Authors' calculations.

Figure 19: Evolution of annual RoE by sector



Source: Authors' calculations.

Figure 20: Evolution of the annual RoE by country

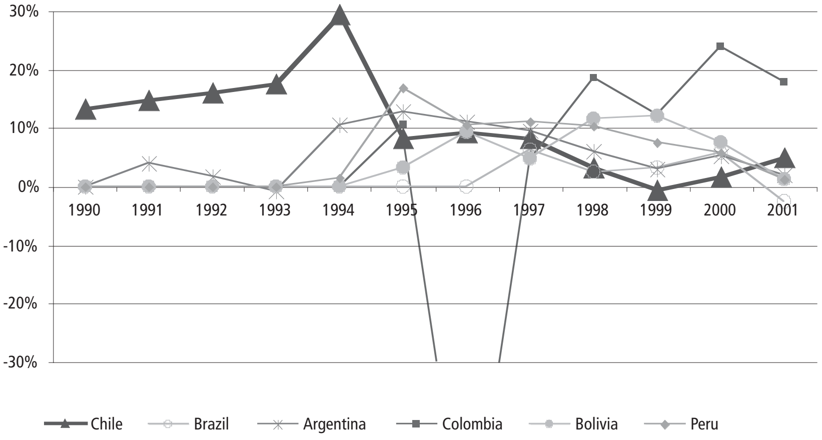
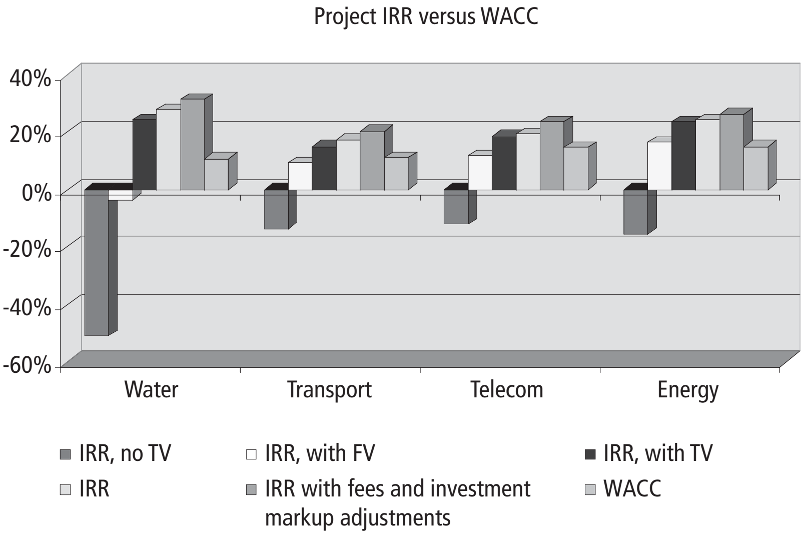


Figure 21: Project IRR sensitivity to concession growth rates



Source: Authors' calculations.

Returns vary widely, however, across sectors, countries, and concessions. In the telecommunications sector, shareholders can hope to earn adequate returns if the present conditions are perpetuated, provided management fees and investment markups are included. In Colombia, shareholders might hope to earn adequate returns even without management fees and investment markups. As the overall profitability of concessions increases with their maturity, so do shareholder returns. However, even for concessions with more than 10 years of operation, shareholder returns remain below the average cost of equity.

Concession and shareholder returns, a conclusion

Overall, the returns earned so far by our sample concession shareholders from dividends have been significantly lower than the overall returns generated by their concessions. This results from low distribution policies. It may be partially compensated by increases in the shareholders' company share price, however.[8]

If things continue on a steady path, concessions should overall generate long-term returns in line with their average WACC, which means they do constitute potentially interesting business proposals (with wide variation). By contrast, their shareholders should not be able to earn long-term returns in line with their average cost of equity, even when management fees and investment markups are included. The discrepancy between shareholder and concession returns in the long term (including a terminal value)[9] suggests that equity holders will not receive a share of profits proportional to their participation and risk taking in the concessions' funding without more generous dividend policies.

The conservative dividend distribution policies of concessionaires suggest that they tend to have a long-term perspective when investing in concessions: They tend to reinvest a significant part of earnings in the concessions in the first years of operation in the hope these investments will increase their overall return, even if it is at the cost of reducing their immediate financial returns.

It also means that to earn a return commensurate to the risks they took, concessionaires probably intend either to distribute more generous dividends in the later years of their concessions (to cash in part of the accumulated value) or to reach concession growth rates superior to those of the economies around them.

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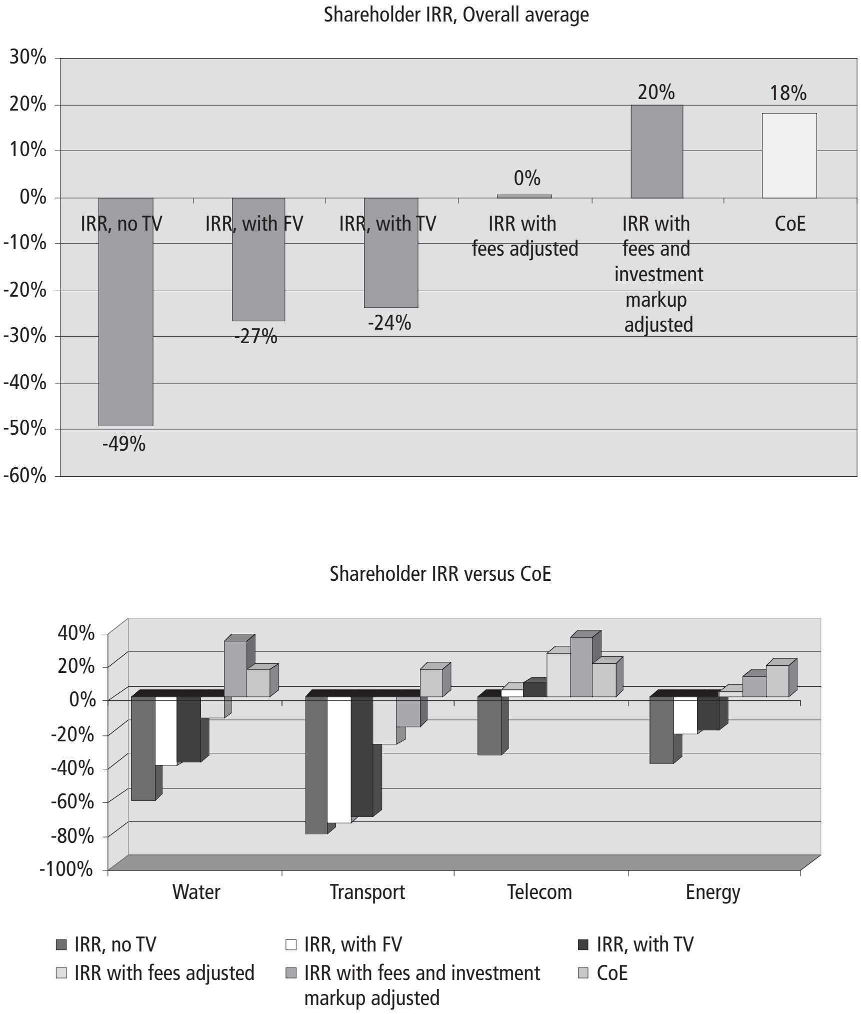
[8] However, concessions' retained earnings are usually not fully reflected in their mother companies' share price because of the associated political risk. An analysis of the relationship between earnings retained in subsidiary concessions and a mother company's share prices would indicate to what extent retaining earnings creates immediate value for concession shareholders.

[9] The latter captures potential increases in shareholder prices—but slightly underestimates it, given that US$1 is worth more today than tomorrow.

Figure 22: Shareholder IRR sensitivity to concession growth rates



Source: Authors' calculations.

The analysis highlights also that returns, in particular shareholder returns, are highly volatile. While the standard deviation of the average return on capital employed in our sample concessions over each concession's years of operation is relatively low at 1.5 percent, the standard deviation of the return on equity is significantly higher at 10 percent. In addition, the analysis shows that as many as 40 percent of our sample concessions are unlikely to generate adequate returns unless they outperform the economies around them. The combination of a high volatility of returns and a high probability for returns to be lower than required confirms that infrastructure concessions in Latin America are a high risk investment proposal. This in turn explains why investors in such concessions demand high expected returns.

Sensitivity analysis is presented in the next section.

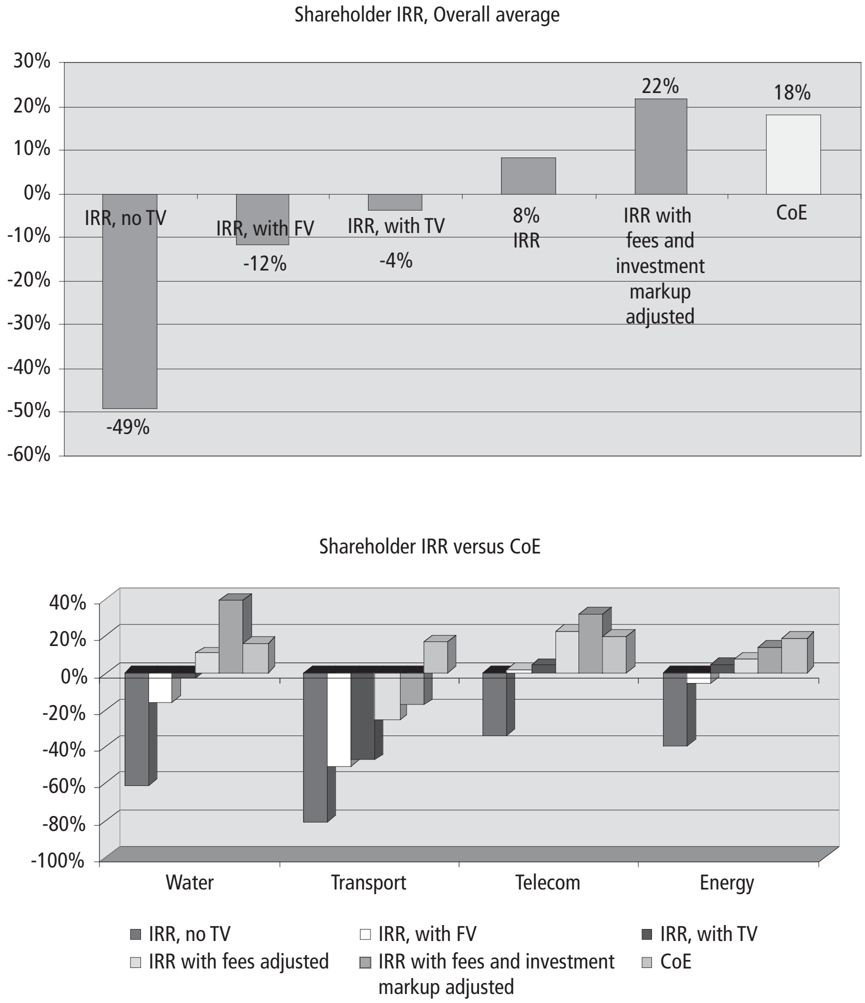
Sensitivity analysis

Future concession growth

The analysis above has shown that most concessions would not be able to remunerate their shareholders adequately compared to the risks they take, unless the concessions grow faster than the underlying economy.

The analysis above assumed that concessions would grow in the future at the same rate as the underlying economy and that the economies would grow at their

Figure 23: Shareholder IRR sensitivity to dividend payout



Source: Authors' calculations.

average historical growth rate, calculated to vary between 2.7 to 4.7 percent per annum, depending on the country. In reality, the sample concessions have so far been growing at a much faster rate (17 percent on average for their operating income).[10] This may be the result of their young age (seven years on average) and includes wide discrepancies across concessions (the standard deviation is 41 percent).

A sensitivity analysis was conducted, increasing the future growth rate of each concession to 7 percent per annum. Maintaining their historical average growth rate of 17 percent did not seem reasonable, since this was achieved when most concessions were just starting to operate (which usually leads to growth rates much higher than those in the later years of the concession's life, as the new private management reduces costs and increases efficiency mostly in the first years). In addition, conditions and growth prospects in the region appear to have worsened for most concessions, since when they were awarded. Seven percent per annum seemed a reasonably optimistic proposal.

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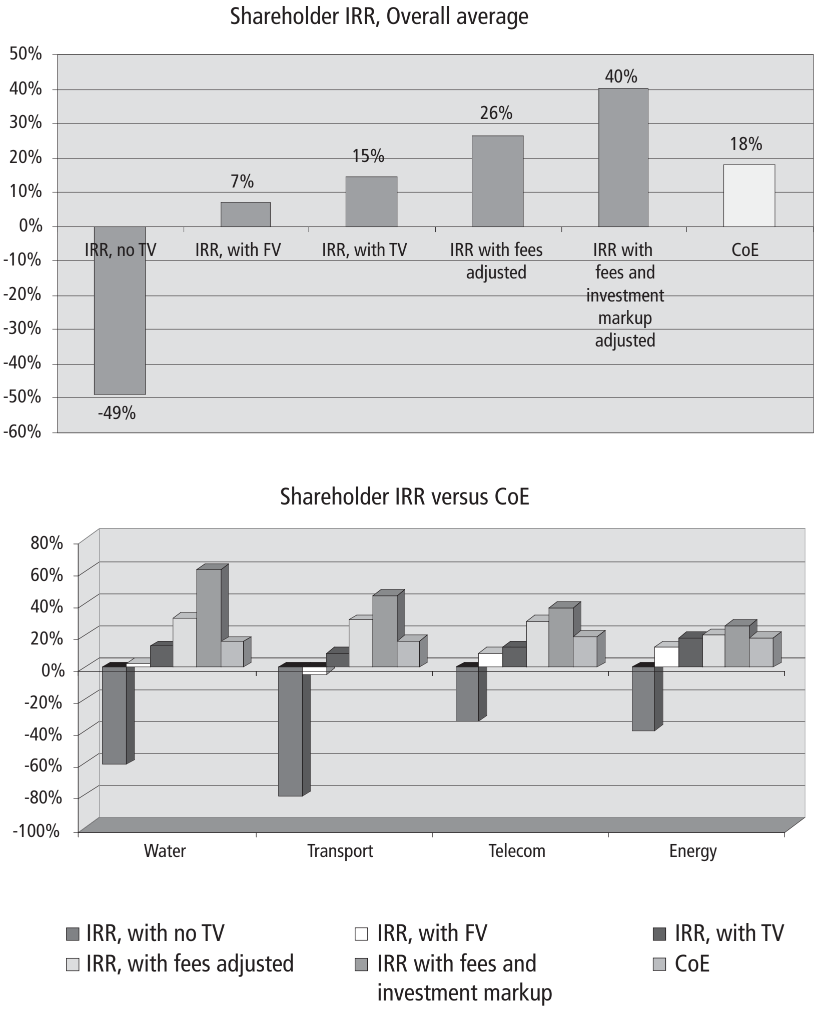
[10] Based on the sample concessions, energy has been the fastest growing sector, with an average growth rate of operating income of 23 percent, followed by water at 18 percent, transport at 12 percent, and telecommunications at 7 percent. The calculation excludes years of exceptionally high or low growth for each concession.

Figure 24: Shareholder IRR sensitivity to concession growth rates and dividend payout



Source: Authors' calculations.

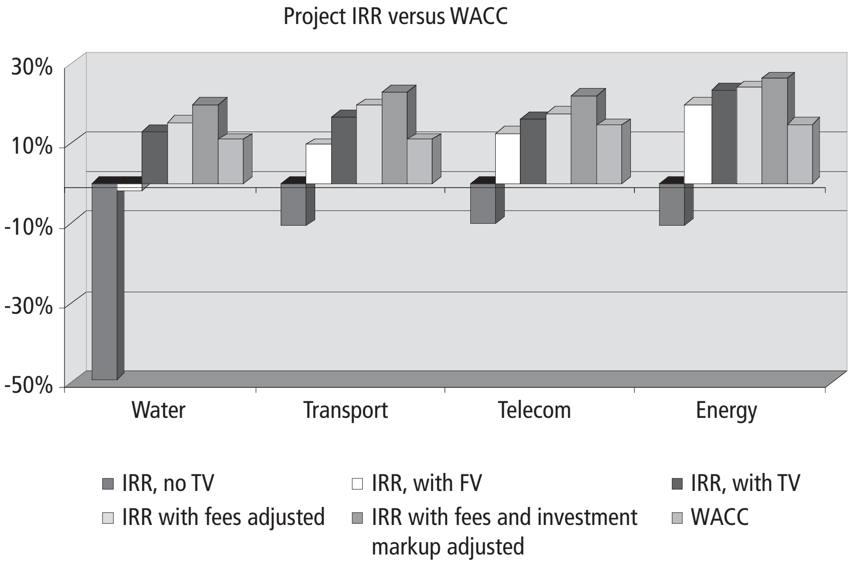
Figures 21 and 22 show that concession returns are quite sensitive to the future rate of growth of operating cash flows. In fact, shareholder returns remain largely negative and below their corresponding cost of equity, but concession returns all rise to levels above their corresponding WACC without adjustments (the average Project IRR without adjustments reaches 21 percent). Shareholder returns remain insufficient, however, which means that an accelerated growth would not be enough to ensure them of adequate remuneration. They would also need to capture more of the value accumulated into their concessions, either via a more generous dividend distribution policy or by cashing in capital gains.

Future concession dividend policy

Figure 23 shows shareholder returns using a higher dividend payout (85 percent per annum)—but keeping everything else unchanged. This scenario approximates the returns shareholders would earn if they could capture every year most of the value added created in their concessions (while keeping its profitability unchanged), rather than having to wait until the concession is re-bid, as our previous analysis assumes.

The figure shows the long-term financial return shareholders would earn remains largely below the required cost of equity in all sectors. It becomes higher than the required cost of equity in the telecommunications sector

Figure 25: Project IRR sensitivity to concession acquisition price



Source: Authors' calculations.

if management fees are included and in the water sector if potential investment markups are also included. Overall the return becomes sufficient only when possible investment markups are included, but the existence of the latter is clearly uncertain.

This suggests that, with historical growth assumptions, capturing annually most of the value added created by concessions would not be enough to ensure shareholders of an adequate return, except in telecommunications concessions (assuming that management fees can be considered as dividends rather than operating costs). This suggests that telecommunications concessions might be the only ones where concessionaires should be able to reap adequate returns without significantly outperforming the market, provided they can capture annually accumulated capital gains.

Future concession growth and dividend policy

Figure 24 shows concession and shareholder returns using both a higher growth rate (7 percent per annum) and a higher dividend pay out (85 percent per annum). This scenario measures the returns that shareholders would earn if they could capture every year most of the value added created in their concessions and if the overall growth of their concessions was superior to the historical growth of each concession's country of location.

The figure shows that, under those circumstances, concessions in all sectors have the potential to generate (on average) adjusted shareholder returns superior to their corresponding cost of equity (including management fees only). With investment markups, returns would even become quite higher than the required cost of equity. Average financial returns become positive but remain lower than the cost of equity in all sectors.

This suggests that shareholders in concessions expect to earn sufficient returns on their investment by maintaining growth rates superior to those of the economies in which they operate. It also shows they rely on both dividends and capital gains, and on management fees. Without any one of these sources their returns would remain insufficient even with a higher rate of growth.

Acquisition price

Figure 25 shows the returns that would have been earned had concessionaires paid 20 percent less for their concession and invested 20 percent less equity in its capital (assuming debt would not have changed).[11] The figure shows the average Project IRR becomes equal to the average WACC in all sectors, without adjustments. In

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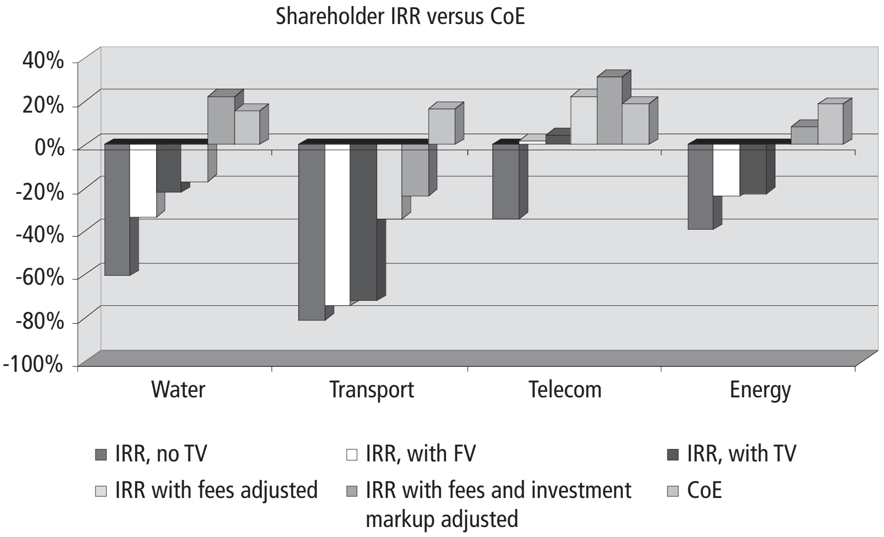
[11] This would, however, lead to an increase in leverage, which might not have been acceptable to the project's financiers.

Figure 26: Shareholder IRR sensitivity to concession acquisition price



Source: Authors' calculations

the energy sector, the average concession return becomes significantly higher than the average WACC.

However, it has a marginal impact only on shareholders' returns. It becomes superior to the required cost of equity in the telecommunications sector with management fees (and in water with uncertain investment markups). Bringing them in line with the average cost of equity in all sectors without adjustments would still require increasing the payout ratio or future concession growth rate as previously illustrated.

7.

THE IMPACT OF REGULATION ON PROFITABILITY

The results reported above indicate that concessions have the potential to be profitable businesses over the full life of their contracts. However, they are risky businesses with only 60 percent of concessions in the sample having the potential to generate attractive returns, and these returns, moreover, are premised on management fees and other additional sources of revenue, as well as (in some cases) outperforming historic market trends.

Unlike normal competitive business sectors, the profitability of concessions is not simply a reflection of market conditions and managerial competence, but is to a considerable extent determined—or at least circumscribed—by regulatory decisions. The companies analyzed in this study operate mostly under a monopoly regime and are subject to regulation of tariffs and other aspects of enterprise performance. Thus, the observed profitability of these concessions in part reflects the performance of the regulators that oversee them.

Conceptual framework

Regulation is needed both to protect consumers from abuse of monopoly power and to protect investors from opportunistic behavior by the government, given the politically sensitive nature of infrastructure tariffs and the large sunk-cost characteristics of the companies' investments. In consequence, regulatory decisions have a substantial impact on the profitability of companies. Ideally, the regulator's objective should be to maintain alignment between a company's rate of return and its cost of capital. This is because a rate of return in excess of the cost of capital inappropriately penalizes consumers, while a rate of return beneath the cost of capital inappropriately discourages further investment. The closeness of that alignment will depend, among other things, on the quality of regulation.

Nevertheless, the closeness with which the rate of return tracks the cost of capital will not only depend on the quality of regulation, but also on the chosen regulatory regime, including elements of the concession design. Under rate of return regulation, the regulator has the possibility of making frequent price adjustments to keep realigning the company's rate of return with its cost of capital. Under price cap regulation, the regulator sets tariffs so that expected returns match the cost of capital ex ante, but allows these returns to diverge ex post during the periods between regulatory reviews.

In practice in Latin America, the distinction between price cap and rate of return regulation is somewhat blurred. Although most regulatory regimes provide for periodic tariff reviews (typically at five-year intervals), suggesting a multi-annual price cap framework, contracts are often renegotiated between reviews (Guasch 2004). The short interval between the granting of a concession and its renegotiation, about two years, and the outcome of the renegotiation process, makes the resulting regime a hybrid of price caps and rate of return.[12] Moreover, review methodologies sometimes take into account historic divergences between the rate of return and the cost of capital in adjusting future prices, which goes against the forward-looking principles of price cap regulation. Thus, in practice both types of regulatory regime tend to converge to a hybrid, suggesting that rate of return should track the cost of capital more closely than under a pure price cap, but less closely than under pure rate of return.

Accordingly, instead of focusing on the dichotomy between price cap and rate of return regulation, the

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[12] Guasch (2004) shows the incidence of renegotiation is about 42 percent of all concessions and about 55 percent and 75 percent for concessions in the transport and water sectors, respectively. And the incidence is even much higher for concessions regulated under a price cap regime. Even more striking is how fast those renegotiations take place. The time interval between the granting of the concessions and renegotiation is about 2.1 years, and for water concessions it is even quicker, about 1.6 years.

Table 16: Construction of regulatory quality indices

	Weight	Scoring
Legal solidity	0.33	1 if regulatory framework established by law, 0 otherwise
Financial capacity	0.33	Sum of scores on factors below
• Financial independence	0.17	• 1 if funded from regulatory levy, 0 if funded from public budget
• Financial strength	0.17	• Regulatory budget as percentage of sectoral GDP normalized on [0,1] scale
Decision-making autonomy	0.33	Sum of scores on factors below
• Independence of appointment	0.11	• 0 if appointed directly by executive, 1 if screened by legislature
• Duration of appointment	0.11	• 1 for a single fixed term, 0 for indefinite appointment
• Collegiality of decisions	0.11	• 1 if headed by regulatory commission, 0 if by individual regulator

Note: Scores between 0 and 1 are given for intermediate cases.

approach taken is to develop a measure of the overall quality of the regulator that oversees each of the companies in the sample.

The purpose of this section, then, is to empirically evaluate the impact of the quality of regulation on the profitability of the firms. The hypothesis is that the better the quality of regulation, the closer the correspondence between the firm's rate of return and the firm's cost of capital.

Measuring regulatory quality

To test this hypothesis a quantitative measure of regulatory quality is needed. Good regulation is defined by clear, stable, and predictable rules, a purely professional and technical interpretation of the law and contract, and the ability to withstand influences and pressures from the stakeholders, such as government and operators. And for it to be effective regulation, it needs to be supported by a predictable and sufficient allocation of resources. In consequence, the Regulatory Quality Index developed here considers three key aspects of regulatory quality: legal solidity, financial strength, and decision-making autonomy.

Legal solidity refers to the stability, and thus predictability, of the regulatory regime. The stronger the legal foundation of regulation, the more stable the regime is, and thus the better the quality of regulation. The strongest legal foundation is when the regulatory framework is embedded into a law, as opposed to a decree, contract, or other lesser legal instruments.

Financial strength refers to the resources the regulatory agency has to undertake its functions. In principle and within limits, the more resources the agency has the better it can perform its function and the better the quality of regulation. A second element of financial strength is the stability of the funding for the regulatory agency. The principle is that stability and predictability of resources—and thus better quality of regulation—comes when the funding is linked to the sales of the regulated sector, rather than a yearly appropriation from the general government budget that can be changed at the discretion of the executive.

Decision-making autonomy is key to securing good regulatory quality. This variable tries to measure the likelihood that the regulatory decisions are based on technical and professional assessment of the contract, law, and existing evidence as opposed to decisions based on—or influenced by—a government's political agenda or investors' influence or capture. This can be captured by three aspects: independence of appointment, which measures the extent to which the appointment process avoids a purely political appointee without adequate technical knowledge of the sector; duration of the appointment, which indicates whether a regulator can be reappointed and hence might be less likely to act independently and issue professionally and technically based decisions; and collegiality of decisions, which measures the relative difficulty of regulatory capture, thought to be lower when multiple regulators act jointly within a board structure.

The construction of each of these indices and the associated scoring method are detailed in Table 16. The factors can either be considered individually or aggregated into three broader regulatory quality indices using the indicated weighting scheme, each of which may be summed together to obtain an overall regulatory quality indicator. For the sample of companies covered in this study, the average score on the index of

Table 17: Summary of regression results

Dependent variable	IRR-WACC simple differential without terminal value	IRR-WACC simple differential with terminal value	IRR-WACC simple differential with terminal value and adjustment for management fee	IRR-WACC simple differential with terminal value and management fee and adjustment for transfer pricing
Financial independence	–0.340	–0.174	–0.151	–0.135
Financial strength	–0.372	–0.332**	–0.355**	–0.370**
Legal solidity	–0.026	0.077	0.070	0.080
Independence of appointment	–0.109	–0.068	–0.101	–0.109
Duration of appointment	–0.125	–0.011	–0.038	–0.030
Collegiality of decisions	0.455**	0.256**	0.271**	0.267**
Constant	–0.341	–0.047	–0.022	0.002
P-value	0.156	0.072*	0.052**	0.045**
Adjusted R-squared	0.124	0.208	0.237	0.248
No. of observations	32	30	30	30

Notes: Regressions based on 30 observations; *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

overall regulatory quality is 0.51, suggesting that the quality of regulation is not very high overall. However, there is significant variation in quality across countries and sectors, with scores ranging widely between 0.12 and 0.85. The highest average score is obtained on legal solidity, 0.65, as against decision-making autonomy, 0.56, and financial strength, 0.34.

Pair-wise correlations between each of the regulatory quality measures are typically low, at around 0.20, and in no case greater than 0.57. In some cases, pair-wise correlations even take negative values, suggesting that high regulatory quality along one dimension is correlated with low regulatory quality along another dimension. This result illustrates that few countries have consistently applied all of the design principles needed to ensure good quality regulation.

These indices of regulatory quality are used to try to explain differences in the divergence between rate of return and cost of capital across the different companies in the sample. This is done by regressing the Project IRR-WACC differential against this set of explanatory variables. The hypothesis is that the greater the quality of regulation, as measured by the described index, the smaller the differential should be, suggesting that the regulatory quality subindexes would enter the regression with negative signs.

Two separate measures of the IRR-WACC differential are considered. The first measure is the simple IRR-WACC differential. This captures the quality of regulation purely from a short-term, consumer's perspective, since the smaller the IRR-WACC differential (including negative values), the lower the resulting tariffs for consumers. However, this constitutes a myopic view, since a negative IRR-WACC undermines investment incentives and ultimately penalizes consumers through declining service quality, decelerating service expansion, and potential flight of investors. Therefore, the absolute IRR-WACC differential is taken as a second relevant measure. According to this indicator, what matters is minimizing the distance between IRR and WACC, with positive and negative differentials regarded as equally reflective of poor regulatory decisions.

Simple differential (myopic consumer-protection perspective)

The results for the first set of regressions are reported in Table 17, using each of the four measures of IRR-WACC differential developed in the study. Despite small sample sizes, three out of the four models show the regulatory quality variables are significant in overall terms, and are on their own capable of explaining 20 to 25 percent of the IRR-WACC differential. Moreover, some of the regulatory quality variables are also individually significant. Thus, the financial strength variable is significant at the 5 percent level in most of the regressions, with the expected negative sign indicating that regulators with larger budgets tend to have greater success in minimizing the IRR-WACC differential. In addition, the

Table 18: Summary of regression results

Dependent variable	IRR-WACC simple differential without terminal value	IRR-WACC simple differential with terminal value	IRR-WACC simple differential with terminal value and adjustment for management fee	IRR-WACC simple differential with terminal value and management fee and adjustment for transfer pricing
First principal factor	0.064	0.041	0.029	0.024
Second principal factor	-0.114	-0.017	-0.026	-0.019
Third principal factor	-0.219**	-0.115**	-0.130**	-0.127**
Collegiality of decisions	0.400**	0.202**	0.216**	0.210**
Constant	-0.649	-0.136	-0.133	-0.095
P-value	0.065*	0.057*	0.040**	0.043**
Adjusted R-squared	0.164	0.186	0.212	0.207
No. of observations	32	30	30	30

Notes: Regressions based on 30 observations; *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

collegiality of the decision variable is also significant at the 5 percent level, but takes a positive sign. This suggests that, arguably contrary to expectations, regulatory entities headed by a single superintendent do a better job at reducing the IRR-WACC differential than broader based regulatory commissions.[13]

To learn if there is a statistically more efficient way of combining the information embodied in the six indicators of regulatory quality, factor analysis is performed. Factor analysis helps to ensure adequate orthogonality between explanatory variables and also allows statistical information to be condensed into a smaller number of variables, thereby economizing on degrees of freedom. Table 18 summarizes the results of the best specification found for factor analysis. This preserves the *collegiality of decisions* variable, but combines the other five variables into three principal factors. This leads to a slight improvement in the overall significance of the regressions, while the pattern of significance hardly changes, except that the negative and significant coefficient of the *financial strength* variable is picked up by the third principal factor.

Absolute differential (protecting both consumers and investors)

The results of the second set of regressions are reported in Table 19. Given that taking the absolute value of the IRR-WACC differential reduces the spread across observations in an already small sample, a log-linear specification is used to ensure that there is adequate variation for the purposes of the regression. Overall, this second set of regressions does not perform as well as the first. Nevertheless, two of the models show overall significance at the 5 to10 percent level and are able to explain about 20 percent of the variation in the IRR-WACC differential. As before, the financial strength variable proves to be significant in some specifications, although not always with the expected sign. On the other hand, the collegiality of decisions is no longer statistically significant.

The lower level of significance and explanatory power associated with this second set of regressions may simply be reflecting that regulatory efforts are more strongly motivated by the short-term considerations of keeping prices as low as possible for current consumers than by the long-term considerations of keeping returns as close as possible to hurdle rates for investors.

The conclusion of this analysis is that regulation matters in aligning cost of capital and rate of return. Overall, the existing regulatory frameworks are not rated very highly by the regulatory quality index, with an average score of 0.51. Nevertheless, variations in quality across regulatory regimes are significant and material in determining the size of the IRR-WACC differential. However, regulatory efforts seem to be more closely associated with minimizing the simple IRR-WACC differential (and thereby keeping tariffs as low as possible for current consumers), than with minimizing the absolute IRR-WACC differential (and thereby keeping profitability well aligned with hurdle rates of return).

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[13] One weakness of regulatory commissions, perhaps captured here on the estimates, is the higher political intervention, since often each relevant political party gets to designate its own commissioner.

Table 19: Summary of second regression results

Dependent variable	IRR-WACC simple differential without terminal value	IRR-WACC simple differential with terminal value	IRR-WACC simple differential with terminal value and adjustment for management fee	IRR-WACC simple differential with terminal value and management fee and adjustment for transfer pricing
Financial independence	1.071	-0.653	-0.001	0.071
Financial strength	2.619**	-2.478	-2.488**	-2.140**
Legal solidity	-0.697	0.928	0.412	0.844**
Independence of appointment	1.147	0.974	0.577	-0.050
Duration of appointment	-0.478	1.412	1.053	0.767
Collegiality of decisions	-1.771	-0.810	-0.456	-0.243
Constant	-1.104	-2.618**	-2.365**	-2.487**
P-value	0.094*	0.273	0.125	0.049**
R-squared	0.171	0.069	0.156	0.242
No. of observations	32	30	30	30

Notes: Regressions based on 30 observations; *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

Another striking feature of the results is that regulatory quality variables seem to have overall significance, more than individual significance, in determining IRR-WACC differentials. This is consistent with the point that performance along different dimensions of regulatory quality is not highly correlated and that the benefits of high regulatory quality along one dimension can be completely offset by low regulatory quality along another dimension. For example, a regulatory framework that rests on a solid legal basis for regulatory decisions but does not provide the regulator with any financial resources is unlikely to be very effective. So for regulation to be effective, one needs the whole package of regulatory characteristics. If some of the key ingredients are missing the effectiveness of regulation is highly diminished.

8.

CONCLUSIONS AND POLICY IMPLICATIONS

The analysis has shown that concessions are profitable (although risky) businesses overall, capable of generating adequate returns in the long term. Concessions in the water sector appear relatively less attractive than others, while concessions in the telecommunications sector appear to be the most profitable in relative terms. On average, concessions seem to become profitable after about 10 years of operation. However, about 40 percent of our sample concessions do not seem to have the potential to generate attractive returns, with this number climbing to 50 percent in the energy and transport sectors. Concessions are thus risky businesses.

The profitability results imputed here are likely to understate the true profitability of the firms, since, as opposed to firms in nonregulated sectors, the incentives of the regulated firms is to underreport true earnings through creative accounting, so as not to trigger reductions in tariffs at the corresponding tariff reviews.

Low dividend distribution ratios, however, have not to date translated this overall profitability into adequate returns for shareholders. In fact, on average, concession shareholders have so far earned negative returns on their investments, even including management fees, estimated accumulated capital gains, and potential investment markups.

With historical growth maintained into the future, only telecom concessions would seem to have an inherent profitability high enough to generate adequate returns to their shareholders in the long term, provided they can capture annually the capital gains accumulated in their concessions over all years of operation and that the full value of their management fees corresponds to dividends. In all other sectors, shareholders can hope to earn long-term returns commensurate to the risk taken only if the sectors consistently and significantly outperform historical market growth. This conclusion would not change if concessionaires had paid up to 20 percent less for their concessions. The implication is that to build an adequate return, shareholders must rely both on various sources of remuneration (including dividends, management fees, and capital gains), and on outperforming historical market growth consistently, over the entire length of their concession.

The fact that concessionaires have maintained low dividend payouts so far, despite knowing that such a choice would have a significant impact on short-term returns, indicates they have given priority in the allocation of earnings to investments. This suggests that concessions had no other economic way to finance their investment obligations, probably because of their size and because of constraints on availability of funding from other sources.

Furthermore, these results suggest that concessionaires operate with long-term perspectives, giving priority to growth-enhancing investments in the early years (at the cost of depressing returns in the short term), and relying on the entire concession period to build an adequate return. This may be driven by their contractual obligations, which usually require high investments in the early years. It implies that early breaks of concession contracts may have a highly negative impact on expected returns.

The results also highlight that management fees, although not widespread, may be needed to build adequate returns. In addition, allowing concession shareholders to be fairly compensated at the end of the period for the capital gains accumulated during the life of the concession is an important component of their return.

That old concessions are on average more profitable than young ones suggests that returns may be depressed in early concession years by inadequate prices or overly aggressive bidding, corrected after the first price control period (high investments in the first years of operation may also take a toll on young concession returns) or through renegotiations. The high incidence of renegotiation in infrastructure contracts, about 42 percent, within three years of the award date, as reported in Guasch (2004), renders support to the hypothesis that operators have tended to submit overly aggressive bids—which are not financially viable—so as to secure the concessions, with the belief or expectation of renegotiating the contract shortly afterward and securing better terms. The evidence reported also in Guasch (2004) shows the outcome of the renegotiations tended to benefit the operator with better terms than those contracted or bid at the time of the award.

The analysis also highlights that returns (in particular shareholder returns) are highly volatile across sectors, concessions, and from year to year. Thus, infrastructure concessions in Latin America are a high risk investment proposal, explaining why the required rates of return on such investments are high.

Finally, this report shows that regulation matters in aligning cost of capital and rate of return. Given that virtually all of the concessions included in this study are regulated monopolies, their profitability is not only a consequence of market conditions and managerial skills but also partly a reflection of regulatory decisions on service tariffs. A good regulator should aim to maintain alignment between a company's rate of return and its cost of capital in the medium term. This is because a rate of return in excess of the cost of capital inappropriately penalizes consumers, while a rate of return beneath the cost of capital inappropriately discourages further investment.

An evaluation of the quality of the regulatory regimes faced by concessionaires in the study sample finds that the regimes do not score very highly on average and that there is a high variance in the quality of regulatory frameworks across concessions. Yet, the quality of regulation is found to be a significant determinant of the divergence between the overall profitability of the concession and its corresponding hurdle rate, explaining about 20 percent of the variation. However, regulatory efforts seem to be more closely associated with minimizing the simple IRR-WACC differential (and thereby keeping tariffs as low as possible for current consumers), than with minimizing the absolute IRR-WACC differential (and thereby keeping profitability well aligned with hurdle rates of return). Then the policy implications are clear. Securing effective regulation to protect both consumers and investors should be a key priority. For regulation to be effective the regulatory framework and institutional structure of a regulatory agency should have (a) legal solidity—embedded in a law; (b) adequate financial capacity—capacity and strength; and (c) decision-making autonomy. Moreover, it is imperative that all three regulatory elements be in place. The absence of any of them significantly decreases the effectiveness of regulation.

APPENDIX 1

MEASURES OF SHAREHOLDERS' EFFECTIVE RETURNS

The Shareholder Internal Rate of Return

The Shareholder Internal Rate of Return (IRR) is a measure of the profits that shareholders have distributed to remunerate their equity investment in the project. It is the return that makes the net present value (NPV) of the flow of dividends distributed (usually annually) by the concession to its shareholders, less the flow of capital injections made by them into the concession, equal to zero (see Box 4). It is the Shareholder IRR of the net flows received by the concession's shareholders from their investment to date.[14]

For young concessions especially, the Shareholder IRR represents the return earned so far by shareholders, but it underestimates the total return they can expect to earn over the entire life of their investment, since it ignores the flow of future dividends.

To capture the value of these future expected dividends, the Shareholder IRR was also computed, adding a terminal value (TV) to the stream of net cash flows. The TV has been estimated assuming that future dividends grow at a constant rate and that there would be no new capital injection. The formula is included in Box 5.

The formula assumes concessionaires will not be compensated at the end of the concession for its value at that time. In most concession contracts this is the case. In fact, in most concessions the concessionaires do not own the

BOX 4

Definition of the shareholder internal rate of return

Shareholder IRR is the rate which ensures $\sum_{t=0}^{y} CF_t / (1 + IRR)^t = 0$

Where: CF = net cash flow to shareholders, that is, dividend – capital injection

t = 0 is the first year of operations

y = last year of historical data available (2001)

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[14] Note the IRR computed represents the average IRR earned by all shareholders in the concession. It does not attempt to differentiate the returns of shareholders who might have purchased their shares at a later stage than when the concession was initially awarded, nor of those who might have sold their shares already.

BOX 5

Definition of the shareholders' internal rate of return with a terminal value

Shareholder IRR is the rate which ensures $\sum_{t=0}^{y} (CF_t) + TV / (1 + IRR)^t = 0$

With:[15]

$$TV = D\left[\frac{1}{r-g} - \frac{1}{r-g}\left(\frac{1+g}{1+r}\right)^n\right]$$

Where: D = last historical dividend

g = growth rate of future dividends

r = cost of equity (see below for calculation details)

n = concession's last year of operation

concession's assets, which remain the government's property. However, some concession contracts state that at the end of the concession the government will pay compensation to the concessionaire, usually based on the concession's asset value at that time, which is intended to capture the value of nonamortized investments accumulated by the concessionaire. It was decided to ignore these compensations because of their uncertainty (their value will likely be subject to intense discussion). This may understate some results, although slightly, since uncertain and distant cash flows have a highly discounted value.[16]

The Return on Equity

The Return on Equity (RoE) is a measure of the profits a company is able to generate given the resources provided by its shareholders. It is the ratio of the concession's net income divided by the shareholders' equity investment in the concession (see Box 6).

Although in theory the concession's net income is available for distribution to equity holders, a portion of it is typically reinvested every year in the concession. This portion of net income is only really earned by shareholders in future years, at the latest at the concession's end, when it is sold or transferred back to the government, provided the transaction is at market prices and concessionaires are compensated for the value they created by reinvesting the money in the concession. To the extent that part of the concession's net income is not earned immediately by the concessionaires and that they might not be compensated at the end of the concession for its extra value, the RoE tends to overestimate their effective returns. The RoE might be seen as a ceiling capping shareholders' potential returns.

Compared to the RoE, the Shareholder IRR presents two advantages as a measure of shareholder returns. First, it summarizes in one single number the

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[15] Formula for a growing annuity.

[16] Doing so better corresponds to the investors' viewpoint, for whom uncertain distant cash flows do not have much value.

BOX 6

Definition of the return on equity

RoE = Net income/Shareholders' equity

Where: Shareholders' equity (also called **net worth**) = total assets minus total liabilities = book value of common and preferred stocks

Net income = after-tax profit

return earned by shareholders up to now (without terminal value) or over the entire life of the project (with terminal value), while the RoE is an annual measure. Second, it takes into account the exact net financial flows received by shareholders every year. The Shareholder IRR is, therefore, a superior measure of the concessionaires' financial returns, the RoE being more of a general measure of the company's efficiency. However, the information needed to calculate a Shareholder IRR is not always available. In such cases, computing an average RoE over the concession's life is a reasonable alternative measure of returns.

The Project Internal Rate of Return

The Project Internal Rate of Return (Project IRR) is a measure of how effectively a company uses the funds invested in its operation, independent of the nature of these funds (see Box 7). It is the rate that makes the net present value of the net financial flows generated by the concession before financing equal to zero. The net financial flows generated by a concession are calculated as its earnings before interest, taxes, depreciation, and amortization (EBITDA)—a measure of the financial flows generated by the concession's operation, independent of its financial structure—minus the investments, increases in working capital, and taxes financed by these flows, and minus the price initially paid for the concession.

As for the Shareholder Internal Rate of Return (Shareholder IRR) earned by concession shareholders, the project IRR/including a TV equal to the estimated future value of the net flows generated by the concession was computed (see Box 8). It was assumed the net flows would grow at a constant rate.

BOX 7

Definition of the project internal rate of return

Project IRR is the rate which ensures $\sum_{t=0}^{y} CF_t/(1 + IRR)^t = 0$

Where: CF = net cash flow generated by the concession, that is, EBITDA – (the investments – working capital – bid price)

t = 0 is the first year of operation

y = last year of historical data available (2001)

BOX 8

Definition of the project internal rate of return with a terminal value

Project IRR is the rate that ensures $\sum_{t=0}^{y} (CF_t) + TV / (1 + IRR)^t = 0$

With:

$$TV = CF \left[\frac{1}{r-g} - \frac{1}{r-g} \left(\frac{1+g}{1+r} \right)^n \right]$$

Where: CF = last historical net cash flow generated by concession (EBITDA – Inv. – WC

g = growth rate of future cash flows

r = weighted average cost of capital (see below for definition)

n = concession’s last year of operation

The Return on Capital Employed

The Return on Capital Employed (RoCE) is a measure of the returns a company is getting from its capital at large (see Box 9). It is calculated as the ratio of profits before interest divided by the difference between total assets and current liabilities. The denominator is, in fact, a measure of the long-term financing structure of the company (that is, its capital and long-term liabilities). The numerator is a measure of the income generated by the company independent of its financing structure. The resulting ratio represents the efficiency with which long-term financing is being utilized to generate net operating revenues.

Compared to the RoE, the RoCE is not strictly limited to the return earned on shareholders’ invested funds. It is based on a broader notion of capital than equity capital, to incorporate all the long-term funds that were invested in the concession. In addition, it is based on the company’s net operating income (before financial charges and revenues), rather than its net income to exclude the impact of the choice of financial structure. Therefore, it is a measure of the concession’s ability to generate sufficient operating income (after tax) to cover its financial obligations of all kinds. As with the RoE, the RoCE is an annual measure.

BOX 9

Definition of the return on capital employed

RoCE = EBIT * (1 – T) / Capital Employed

Where: EBIT = Earnings before interest and taxes

T = nominal corporate income tax rate

Capital Employed = Fixed assets + current assets – current liabilities

= Shareholders’ funds + long-term liabilities

The Project IRR, compared to the RoCE, has the same two advantages as the Shareholder IRR, compared to the RoE. First, it summarizes in one single number the return earned by a concession over its entire life (while the RoCE is an annual measure of profits). Second, it takes into account the exact net financial flows generated by the concession every year. For instance, it deducts from earnings the entire cost of the investments financed in any given year, while the RoCE is only affected by the smaller related depreciation charges. The Project IRR is a superior measure of the concession's financial return, the RoCE being more of an economic measure of the company's efficiency. However, the information needed to calculate the Project IRR is not always available. In such cases, computing an average RoCE over the concession's life is a reasonable alternative measure of returns.

The Return on Investment (ROI) is sometimes used as an alternative to the RoCE. It is the ratio of net income divided by the company's capital employed. Compared to the RoCE, it deducts financial charges from operating income. The pre-financial charges RoCE were preferred to measure the profitability of the concession independent of its financial structure.

APPENDIX 2

COMPUTATION OF THE COST OF EQUITY AND THE WEIGHTED AVERAGE COST OF CAPITAL

Computation of the cost of equity

As explained earlier, the cost of equity is calculated with the following formula in Box 10.

BOX 10

Definition of the cost of equity

$C_E = r_F + ß * (r_m - r_f) + Crp$

Where: r_f = risk-free rate

ß = beta of the project

r_m = expected stock market return

Crp = country risk premium

The required parameters have been estimated as follows.

Risk-free rate

The risk-free rate is a theoretical interest rate that would be returned on an investment completely free of risk.

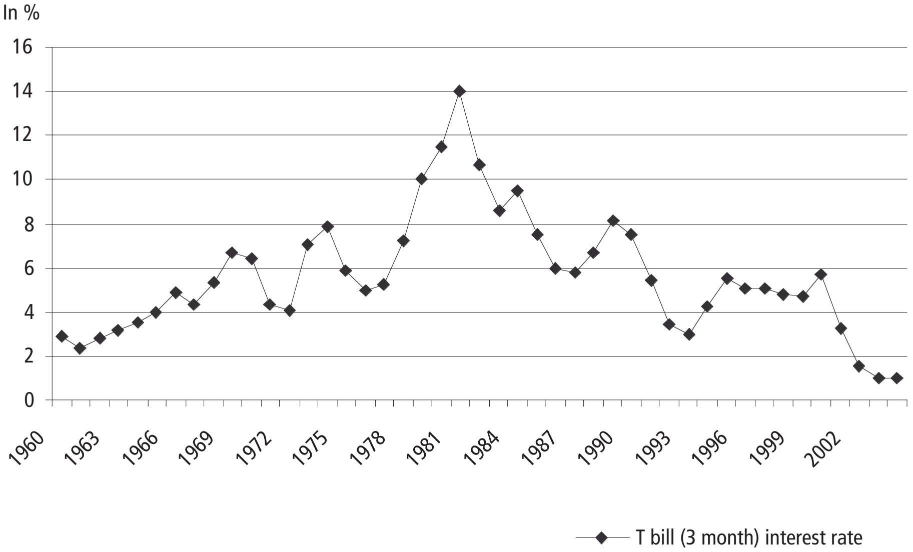
Interest rates on government bonds are often used as proxies for the risk-free rate. This implicitly assumes that governments are default-free entities. However, in some emerging markets, governments have sometimes failed to meet their financial obligations. Many governments are clearly not risk-free. Because of its default-free track record, the United States government is usually used as a proxy for risk-free entity, and the interest rate on the U.S. three-month treasury bill is usually considered the best approximation of a virtually risk-free interest rate.

At the end of May 2004, the risk-free rate was 0.98 percent. Figure 27 shows the evolution of the risk-free rate since 1960.

Beta

Beta is a quantitative measure of the volatility of a given stock relative to the overall market. The S&P 500 index is usually used as reference for the overall stock market. Beta is defined using an index of 1:1, that is, a beta above 1 means that the stock is more volatile than the market, and a beta below 1 means it is less volatile than the market. Volatility is defined here as the rate at

Figure 27: Evolution of the risk-free rate, 1960–04



Source: Federal Reserve Board of the United States.

which the price of a security moves up and down and is usually measured as the annualized standard deviation of daily changes in price. The relative volatility of a stock is measured as the ratio of the covariance between the stock's and the market's return divided by the variance of the market's return.

Betas are regularly estimated and updated by a number of specialized private companies. Some companies use the simple covariance method described above, based on historical stock prices to get a historical beta. While some studies have shown betas appear reasonably stable,[17] historical betas are only imperfect guides to the future since the market risk of a company can genuinely change. Some other companies, such as Barra,[18] therefore, use more forward-looking methodologies, where historical betas are adjusted to take into account some forward-looking quantitative and qualitative information about the company and its environment (including the regulatory framework). The resulting betas are called predicted or fundamental betas. These are deemed superior to historical betas since they incorporate new information that may influence the future volatility of the stock. There are, therefore, better predictors of an asset's future response to market movements.

However, companies such as Barra do not calculate betas for nontraded companies nor for small companies with limited liquidity, especially in emerging markets. Therefore, one has to use proxies. The betas of the sample concessions were proxied using the average predicted betas estimated by Barra for American companies in the same sectors.[19] The resulting betas are summarized in Table 20.

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[17] See for instance, Sharpe and Cooper, 1972.

[18] Barra, an American company founded in 1975, became famous for its multi-factor model for measuring the risk of stock portfolios. Its estimates of betas are used by many investment banks and stock brokers.

Table 20: Unleveraged betas by sector

	Unleveraged fundamental beta	Number of companies in Barra sample
Transportation — roads	0.57	16
Transportation — ports	0.49	44
Water	0.34	17
Telecom services	0.85	195
Energy distribution	0.51	6
Energy generation	0.34	2

Source: Barra, end 2003

The table shows the average betas of all the infrastructure sectors considered in this analysis are below 1. This means that stocks of companies in those sectors are usually less volatile than the market,[20] so that investments in those sectors are less risky than in other sectors with higher betas. This reflects the fact that these sectors enjoy more stable economics, in particular a more stable demand, than other sectors. One of the lowest betas is that of water companies (0.34). This reflects to a large extent the fairly stable demand for water, which tends to immunize water companies from large market shocks. The highest beta in the sample is that of telecommunications companies (0.85), which reflects the higher variability of the demand for telecommunications services and, therefore, their higher sensitivity to market shocks. The other sectors fall between these two extremes.

Leveraging betas

To isolate risks resulting from the financing structure of a company from its fundamental business risk, betas are usually calculated assuming the company has a hypothetical unleveraged financial structure (they are then called

BOX 11

Leveraged and unleveraged betas

$\beta_L = \beta_U * (1 + D / E * (1- T))$

Where: β_L = Leveraged beta

β_U = Unleveraged beta

D = Outstanding long-term debt

E = Total shareholders' funds

T = Corporate income tax rate

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[19] European companies were used when Barra's sample of American companies was not available. For instance, Barra does not separate energy distributors and generators for U.S. companies. In that case, Barra's samples of European energy companies were used. Note that Alexander, Mayer, and Weeds (1996) show that asset beta values are higher the more incentive–based the regulatory regime. Therefore, U.S. beta values reflect the regulatory regime in place in the U.S. in each sector. The adjustments to account for other regimes would, however, be small.

[20] Assuming the market has a beta of 1; some argue that the market itself has a beta below 1, in which case, these assets' volatility could be in line with the market.

Table 21: Typical leverage by sector

	Typical leverage (D/E)	Corresponding D/Assets
Transportation	162%	62%
Water	156%	61%
Telecom services	119%	54%
Energy	127%	56%

Source: Authors' calculation based on sample, December 2001.
Note: Leverage is defined as the ratio of total liabilities to total shareholders' funds. Differences across countries appeared insignificant in our sample and were ignored.

Table 22: Nominal corporate income tax rates by country

2002	Nominal income tax rate
Argentina	35%
Bolivia	37.5%
Brazil	20%
Chile	35%
Colombia	35%
Mexico	25%
Panama	30%
Peru	30%
Venezuela	34%

Source: PriceWaterHouse; Latin Business Chronicle.
Note: When the country's nominal corporate income tax rate varies depending on business sizes or income levels, an arithmetic average of all nominal levels has been computed. This is the case of Brazil (two slabs at 15 and 25 percent), Bolivia (25 or 50 percent, depending on nature of business), and Mexico (six slabs from 15 to 35 percent).

unleveraged or unlevered betas). The betas presented in Table 20 were all unleveraged betas. They then need to be re-leveraged to account for the extra risk embedded in the company's leveraged capital structure (leveraged or levered betas), using the formula in box 11.

As explained earlier, unleveraged betas were transformed into leveraged betas using a capital structure typical of each sector (rather than the specific capital structure of each concession). For each sector, the average leverage of sample companies was used.

Table 21 shows these sectors are usually highly leveraged. This again is a reflection of their relative stability, but also of the usually high investments to be financed.

The tax rates used are each country's nominal corporate income tax rates (Table 22).

The resulting leveraged betas are summarized in Table 23.

The table shows that once leverage is taken into account the expected volatility of each sector increases as expected, but the impact is larger in the telecommunications and transport sectors. The average betas in these sectors tend to become higher than 1. In the water and energy sectors, by contrast, leveraged betas tend to remain lower than 1.

Market risk premium

The market risk premium represents the additional return that investors will require to hold a risky investment (shares) rather than a risk-free asset. It is generally measured as the historical average annual excess return on the U.S. stock

Table 23: Leveraged betas by sector and by country

As of Oct. 28, 2003	Transportation				Energy	
	Roads	Ports	Water	Telecom	Distribution	Generation
Argentina	1.17	1.00	0.68	1.51	0.94	0.61
Bolivia	1.14	0.98	0.67	1.48	0.92	0.60
Brazil	1.31	1.12	0.76	1.66	1.03	0.68
Chile	1.17	1.00	0.68	1.51	0.94	0.61
Colombia	1.17	1.00	0.68	1.51	0.94	0.61
Mexico	1.26	1.08	0.74	1.61	1.00	0.66
Panama	1.21	1.04	0.71	1.56	0.97	0.64
Peru	1.21	1.04	0.71	1.56	0.97	0.64
Venezuela	1.18	1.01	0.69	1.52	0.94	0.62

Source: Authors' calculations.

Table 24: Returns on stocks compared to government bonds

	Average total annual return:		Average excess return on stocks
	Stocks (S&P 500)	Treasury bonds (USA)	
1960–2004	10.7%	5.8%	5.0%

Sources: Global Financial Data Inc, Federal Reserve Board, the United States.

market (using returns on the S&P 500) above the risk-free rate (Table 24). The geometric average of these excess returns over the period 1960–2004 were used. A market risk premium of 5.0 percent was used.

Country risk premium

The country risk premium corresponds to the extra return investors require to invest in stocks of companies in a country deemed riskier than a less risky country used as benchmark (often the United States). The country risk premium reflects the potential volatility of investments in a given country due to defaults associated with political or other events in that country.

Country risk premiums are usually estimated as the average spread over the U.S. treasury bond (assumed to be risk-free) of U.S. corporate bonds with a credit rating equivalent to that of the country under consideration (called the default spread). To estimate these spreads default spreads estimated by Reuters for a large number of utilities worldwide were used.

Some argue that the country risk premium is likely to be higher than the country's default spread. Therefore, they multiply the latter by the ratio of the volatility of the equity market to that of the bond market in the country under consideration (sometimes proxied by the same ratio globally of 1.5). Such adjustment has not been made, to be as conservative as possible.

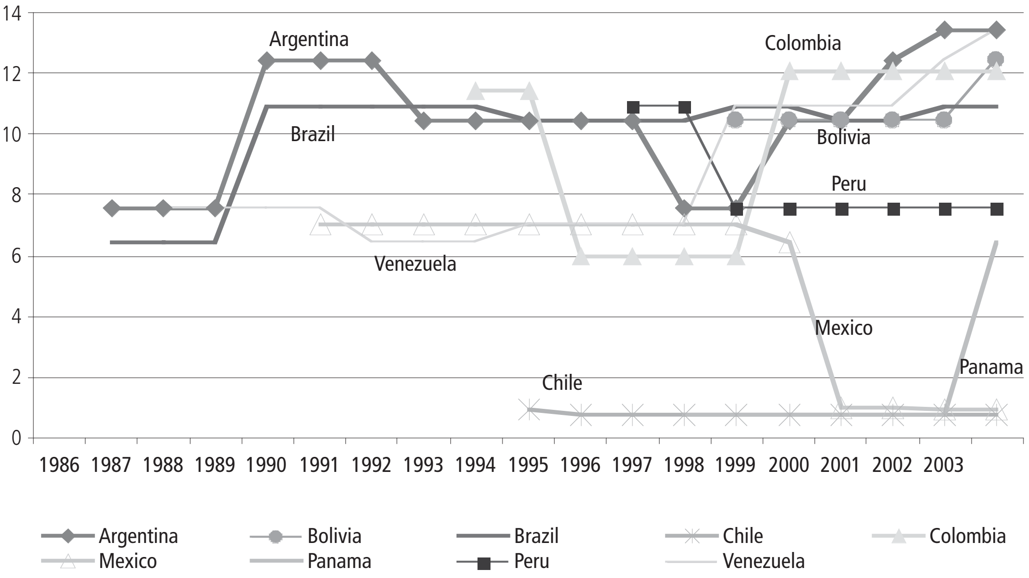
Table 25 shows the country risk premium is the most discriminating factor among countries, varying from less than 1 percent in Chile to 13 percent in Argentina and Venezuela. It is also highly volatile, as Table 26 shows, varying, for example, from 7 percent in 1990 to 13 percent in Argentina in 2003. This is because it is influenced by many factors and subject to frequent shocks and variations, including exchange rate risk, political risk, regulation risk, and so forth. It is for this reason that one needs to compare expected returns at any given time with the cost of equity at the same time.

Table 25: Country risk premiums

As of Oct 28, 2003	Moody's Long-Term Rating (foreign currency bonds)	Default spread (in basis points)	Country risk premium
Argentina	Caa1	1420	13.4%
Bolivia	B3	1320	12.4%
Brazil	B2	1170	10.9%
Chile	Baa1	146	0.7%
Colombia	Ba2	780	7.0%
Mexico	Baa2	163	0.9%
Panama	Ba1	720	6.4%
Peru	Ba3	830	7.5%
United States	Aaa	71	0.0%
Venezuela	Caa1	1420	13.4%

Sources: Moody's, bondsonline

Figure 28: Evolution of country risk premiums over time (percent)



Source: Authors' calculation based on data from Moody's and Bondsonline.

Table 26: Cost of debt by country

Cost of debt	Pre tax	Post tax
Argentina	20.6%	13.4%
Bolivia	19.6%	12.2%
Brazil	18.1%	14.5%
Chile	7.9%	5.1%
Colombia	19.2%	12.5%
México	8.1%	6.1%
Panama	13.6%	9.5%
Peru	14.7%	10.3%
United States	7.2%	5.2%
Venezuela	20.6%	13.6%

Source: Authors' calculations.

Computation of the weighted average cost of capital

As explained above, the weighted average cost of capital is derived from the formula in Box 12.

BOX 12

Definition of the weighted average cost of capital

$$WACC = E / (D + E) * C_E + D / (D + E) * (1 - T) * C_D$$

Where: E = book value of equity

D = long-term debt

C_E = cost of equity (as measured in Box 10)

C_D = cost of debt

T = nominal corporate income tax rate

The required parameters have been estimated as described below.

Book value of equity and long-term debt

As explained in chapter 6, a typical capital structure for each sector was used, rather than concession-specific leverages. The typical leverage levels used are presented in Table 21.

Cost of equity

The estimated cost of equity was used and is presented in Box 2.

Corporate income tax rate

The nominal corporate tax rates of each country were used, as presented in Table 22.

Cost of debt

A typical cost of debt for each country was used, estimated on the basis of the cost at which a hypothetical corporate issuer could issue local currency bonds in each country, given that country's rating. This cost was estimated to be equal to the sum of the risk-free rate, the country risk premium, and a 20 basis point premium for corporate issues over sovereign issues.[21] Note also there was no attempt to try to estimate the cost of potential debt renegotiation or restructuring. Table 27 shows the resulting estimates.

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[21] Note that the same country risk premium (a historical country risk premium) to compute the cost of equity was used. The country risk premium relevant to compute the cost of debt may, however, be different because the relevant horizon is usually shorter (it would be higher if the risk of investing in a given country is perceived as higher in the short term than in the long term, and vice versa).

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