

COMMENTS WELCOME

# Is Debt Replacing Equity in Regulated Privatized Infrastructure in Developing Countries?

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## Abstract

The main purpose of this paper is to describe the evolution of the financing structure of regulated privatized utilities and transport companies. To do so, we rely on a sample of 121 utilities distributed over 16 countries, and 23 transport infrastructure operators and 23 transport services operators distributed over 23 countries. The paper shows that leverage rates vary significantly across sectors, with the highest rates observed in transport and the lowest in water. Moreover, the paper also shows that the 1997 Asia crisis led operators to adjust their financial structure differently in different regions. Overall, the evidence presented here shows that debt is replacing equity in financing the investment needs of utilities and transport services in developing countries. These results raise some questions as to whether the regulator's mandate should be expanded to monitor the financial structure of companies and as to whether the international community should make a stronger commitment to more transparent regulatory accounting systems.

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## 1. Introduction

One of the main motivations of the infrastructure privatization wave of the 1990s was to obtain a significant contribution from the private sector to the financing of the major investment needs of the poorest countries. Reforms, restructuring and guarantees were generally aimed at maximizing the access to private investment. More specifically, this meant reorganizing the sector to achieve a significant equity contribution in financing new projects. Initially, the private sector responded very positively, as illustrated by the major acceleration in private sector investment commitments during the first half of the 1990s. Average annual investment commitments totalled approximately US\$62 billion between 1990 and 2002. This was significant, in that it represented 20 to 25% of the actual investment expenditures in the sector (DFID, 2003).

More recent evidence provides a much less positive story (World Bank, 2003). Investment commitments peaked in 1997 and have since continued to drop. With a commitment level of US\$47 billion, 2002 figures represented the lowest level of investment commitments in projects with private sector participation since 1994. This represents a decline of 30% compared with 2001, matched by a significant reduction in the number of projects reaching financial closure.

This story adds a potentially serious element to the many issues associated with the reversal trend. Indeed, in addition to the fact that the drop in commitments is likely to slow down the ability of the poorest countries to meet their needs, a change in the nature of these commitments may further add to the burden of these countries. This is because, in many countries, there is a growing concern that the financing structure adopted by the operators may be increasingly switching from equity to private, mostly foreign, debt financing.<sup>1</sup>

A progressive switch from private equity to private debt is likely to be difficult for two reasons. First, contrary to what is suggested by finance theory, in developing countries debt finance can be more expensive than equity finance when the effective short-term nature of the bonds markets is accounted for and the transaction costs associated are accounted for. This implies that sectors moving toward higher debt financing would be facing higher financing costs for future investment (Alexander et al., 2001).<sup>2</sup> Second, every dollar that enters a country would be matched by a much larger proportion of debt contracted by the private operators. The public debt needed to finance the operations in the past would then be replaced by private debt rather than by private equity.

Besides the obvious balance of payments consequences, this evolution in the financing structure of the sector raises significant issues from the strict viewpoint of regulation. Indeed, more expensive debt and operators more leveraged in foreign currency imply higher risks,

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<sup>1</sup> See also Alexander and Shin (2003) on evidence of the increased role of bond financing in regulated industries

<sup>2</sup> This stems from a couple of reasons. First, most of the debt is generally foreign debt since domestic capital markets are seldom developed enough to generate the required financing and in uncertain environments, risk premia tend to be quite high. Second and more importantly, debt financing in developing countries tends to be of short maturity. This implies that debt needs to be reissued or refinanced quite frequently by the operators and fairly high transaction costs. Indeed, interest rates are only a minor part of the cost of debt in developing countries. A large share of the cost is associated with complex fee structures charged by banks which in view of the short term nature of the associated financing instruments tend to be paid almost as frequently as interest payments.

higher cost of capital and hence higher tariffs. Ultimately, if there is indeed a marked trend toward increased debt financing, the typical hands-off position of regulators with respect to the financial structure of the regulated infrastructure industries may no longer be sustainable in developing countries, because in an increasing number of experiences debt ratios have been at the core of regulatory conflicts.

Several recent experiences suggest that the concern seems to be justified. Both the experience of the 1997 multi-country Asian crisis and, more recently, the 2002 Argentinean crisis have resulted in the direct involvement of regulators in discussions of the financial structure of privatized infrastructure companies as a way of mitigating the social consequences of brutal changes in leveraging associated with foreign exchange crises (e.g. Estache (2004)). For companies that are highly leveraged in dollars, these devaluations resulted in major increases in debt service requirements which necessitated a choice between considerable average tariff increases, or a major scaling down of investment programs at existing local currency tariff levels. In both Asia and Latin America, the de facto erosion of real tariffs has been such that many operators are no longer compliant with the previously agreed conditions for obtaining more funds or refinancing debt with banks, and have hence also slowed down or stopped their investment commitments.

But it is not only in developing countries that regulators have become aware, in recent years, of the relative importance of debt financing for regulated industries. The major telecommunications debt bubble of 1999-2000 resulted in a credibility crisis and a depression in equity values that have since diminished the operators' access to capital. In order to participate in the telecoms boom of the second half of the 1990s, major incumbent telephone companies had issued stock and took on excess debt to finance spending and acquisitions. Since the crisis, the companies have seen their market capitalization fall more than half since 2000. As credit rating agencies downgraded companies, the cost of borrowing increased and this in turn eroded the price benefits of the technological progress in the sector.<sup>3</sup>

With this background in mind, the main purpose of this paper is to document more systematically the evolution of the financial structure of the regulated companies in developing countries and some of the related policy consequences. The paper focuses on some of the basic indicators available on the evolution of the capital structures for a large sample of regulated utility and transport companies in developing countries. The paper will not, however, seek to address the micro-level implications of these developments. When looking at the capital structures of regulated companies, obvious questions arise with regard to the impact of regulation in the companies' financing choices, and the tools the regulators have at their disposal to influence these choices. These issues have recently been analyzed in depth in the context of utility sectors in developed countries (by OXERA (2003)). However, the set of issues in LDCs is more complex, and would warrant more extensive analysis to address them in sufficient depth.

The paper is organized as follows. Section 2 explains the collected dataset and methodology used for estimations. Section 3 presents the results for the full set of data.

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<sup>3</sup> For more details see the various consultation papers of UK communications regulator, Ofcom, available on its website [www.ofcom.gov.uk](http://www.ofcom.gov.uk). For a discussion in the context of the water sector, see Correia da Silva et al. (2003) or Palmer (2003)

Section 4 discusses the evolution of leverage of the sector since the 1997 Asia crisis. Section 5 summarizes the main results and raises the policy issues that seem to emerge from the simple analysis of the data presented in the paper.

## **2. Data and methodology**

The paper focuses on stock market listed companies operating in developing countries.<sup>4</sup> Distinction is made between utilities and transport companies. This is due to historical differences in the types of regulation and levels of competition between the two sectors, which have also influenced the financing structures in these companies. The utilities sample is further broken down into electricity, gas and water sectors, and the transport sample into infrastructure and services providers. However, the scope for detailed monitoring of the evolution of the financing structure for any company in developing countries is limited, since few regulators in these countries tend to collect this data systematically. Also, in many countries an increasing number of small local companies are taking over the public management and provision of services in sectors such as water and sanitation and transport services. Unless these smaller companies are listed, they will not be covered here. There is, however, a large enough set of companies that report their financial structure in their home countries to ensure the statistical representativeness of the sample collected here.

The sample data were collected from the companies listed in the Thompson Financial Datastream database. Datastream holds accounting and financial market data for publicly traded companies in a large number of countries, collected from companies' group financial accounts and regional data providers. The data were collected for a period of 12 years from 1991 to 2002. The total number of observations in each year is presented in Table 1. A more detailed data description is provided in the Appendix.

For utilities, the data are for 121 companies from 16 countries. These include 90 electricity companies<sup>5</sup>, 23 gas distribution companies and 8 water distribution companies. For transport, the data limitations were more constraining and required a more complex screening and aggregation process. Only companies that are at least partly subject to government regulation are considered. Attention is restricted to the following transport sub-sectors: rail and road passenger transportation companies, airlines and airports, and shipping ports. In order to have representative sample sizes, companies had to be aggregated into two categories, depending on whether they were transport service or transport infrastructure providers. The final dataset comprises 23 transport infrastructure and 23 transport service companies in 15 developing countries.

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<sup>4</sup> This is clearly a biased sample but it is the only one for which this kind of data is available.

<sup>5</sup> For the purposes of this study, both electricity transmission and distribution companies are included under the electricity sector.

**Table 1: Data description**

Year	Utility sample				Transport sample		
	Electricity	Gas	Water	Total	Infrastructure	Services	Total
1991	16	2	0	18	3	3	6
1992	19	3	0	22	5	4	9
1993	25	4	1	30	5	6	11
1994	28	6	2	36	5	8	13
1995	30	8	3	41	7	9	16
1996	46	12	4	62	9	10	19
1997	50	15	7	72	11	14	25
1998	51	16	7	74	10	14	24
1999	73	21	8	102	18	19	37
2000	80	21	7	108	20	22	42
2001	84	20	8	112	22	23	45
2002	82	20	8	110	19	23	42

Source: Datastream.

As was to be expected in the case of developing countries, the quality of the data is an issue. All necessary data were not available for all companies for all years, and there may therefore be gaps of one or more years in the time series of leverage ratios. This makes the aggregate sample somewhat unbalanced. As a result, although the number of companies in the sample increases steadily over time, there can sometimes be substantial changes in the identity of companies in the sample in each year. Although this does not affect the longer-term trend, it might increase the volatility of average sectoral levels of leverage from year to year.

When analyzing the impact of the 1997 Asian crisis, this volatility needs to be controlled, and therefore a balanced sample was constructed. This balanced sample covers the period from 1997 to 2002, and only considers companies that have a full time series of data for those years. For utilities, 54 companies fulfill this criterion, including 37 electricity companies, 14 gas distribution companies and 3 water companies. For the transport sector, the balanced sample contains 20 companies: 8 transport infrastructure and 12 transport services providers.

The countries covered in the sample include Argentina, Brazil, Chile, Mexico, Peru and Venezuela for Latin America; China, India, Indonesia, Malaysia, Pakistan, the Philippines, South Korea and Thailand for Asia; and a residual group of important countries in the international investment world for infrastructure, including the Czech Republic, Russia, South Africa and Turkey. All data were collected in domestic currency.

Table 2 describes the data types collected for these countries, and their definitions for the purposes of the calculations of the leverage ratios. While leverage can simply be defined as the ratio of the value of a firm's debt to the combined value of the firm's debt and equity, practical estimations can be more complicated, as several definitions of debt and equity can be used.

**Table 2: Data types collected**

<b>Data type</b>	<b>Definition</b>
Market value of equity	Share price multiplied by the number of ordinary shares in issue
Net debt	The total of all long- and short-term borrowings, less total cash and equivalent
Total share capital and reserves	The total share capital and reserves, including preference shares

The equity capital of a firm can be measured in terms of either market or book value. From a theoretical perspective, the market value should be used, as it reflects all available information, and represents the present discounted value of the firm's equity. Using market values, however, may expose the measured leverage to higher short-term volatility. Moreover, if the market value of equity is readily available for publicly traded firms, the market value of a company's debt is often unobservable. Therefore, in many cases, leverage is estimated with the book value of debt. Also, in estimating a firm's leverage, the debt maturities that are to be considered must be decided. This choice can be somewhat dependent on the purpose for which the leverage measure is estimated. In the academic literature, firms' leverage measures have normally been based either on the total amount of debt, or on long-term debt only.

The specific financial ratios calculated in this paper are shown in Table 3. Two leverage measures are produced: one based on the market value of equity and the other on the book value.<sup>6</sup> For both leverage measures, the debt is measured as the company's net debt, which includes all long- and short-term liabilities but deducts the cash reserves. This is done because a firm may have considerable outstanding debt, but at the same time also hold a significant amount of cash. Therefore, using net debt in the leverage calculations can provide a more accurate indication of the firm's true liabilities.<sup>7</sup>

**Table 3: Financial ratios**

<b>Ratio</b>	<b>Definition</b>
Leverage(1)	Net debt/(net debt + market value of equity)
Leverage(2)	Net debt/(net debt + total share capital and reserves)

It may be useful to point out that despite the major differences in accounting rules that make international comparisons difficult, the data provided here may provide useful benchmarks for companies not covered by the sample. Whenever possible, we will compare the lessons to be learned from these two approaches. The former is potentially subject to significant levels of volatility, but is the most appropriate from a theoretical standpoint. The

<sup>6</sup> In general, comparing company financial information across countries can be problematic due to different accounting practices. Although the majority of countries in the sample use accounting principles comparable to the North American GAAP, this is not consistently the case. For example, South Korea and Thailand's models are closer to the model used in Germany and Japan. These differences may have an impact on leverage measures based on book values.

<sup>7</sup> It is notable that using a company's net debt presents the possibility of negative leverage. If the amount of cash reserves exceeds the amount of debt (ie, net debt for the firm is negative), the observed leverage will also be negative.

latter, based on standardized accounting valuations, is much closer to what is readily available for operators in developing countries

### **3. Evolution of the financial structure during the 1990s**

This section reports the evolution of the two leverage indicators for developing country utilities in section 3.1, and for transport companies in section 3.2. Whenever the sample sizes are statistically representative, we also report the results for specific geographical areas.

#### **3.1 Results for the full sample of utilities**

Table 4 shows the results of the leverage analysis based on market and book equity valuation,s respectively. The figures are averages across all identified companies for the three utility sectors, and key results can be summarized as follows.<sup>8</sup>

- *Electricity*—when measured using market value of equity, electricity shows the highest leverage; moreover, there is evidence of a clear increase in the average leverage levels over time. Leverage(1) has increased from a low of 15% in 1994 to over 40% in 2002. However, this trend is not observed when the leverage ratios are based on book values of equity. Leverage(2) has fluctuated steadily at around 30%, with no apparent long-term trend.
- *Gas distribution*—according to the market valuation of equity, the average leverage for this sector has increased steadily over the period from below zero in 1991 to close to 40% in 2002. According to the book valuation of the leverage ratio, leverage (2), the trend looks slightly different. After a substantial jump at the beginning of the period, the average leverage has remained stable at between 20% and 30%, increasing to slightly above 30% in 2002.
- *Water*—the average leverage for water companies is generally lower than for companies in the other two sectors, and does not display any clear upward or downward trend. The time-series is also more volatile, and experiences some considerable fluctuations from year to year. Both leverage(1) and leverage(2) have very similar patterns over time, and have largely stayed close to 10–20% in recent years.

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<sup>8</sup> All results are unweighted averages across the relevant samples. Furthermore, the use of the median rather than the mean was preferred due to some data outliers.

**Table 4: Average leverage by sector, based on all identified data (%)**

Year	Leverage 1 - Market based			Leverage 2 - Accounting based		
	Electricity	Gas	Water	Electricity	Gas	Water
1991	28.6	-2.5	n.a.	28.7	-14.2	n.a.
1992	26.7	0.4	n.a.	32.7	0.9	n.a.
1993	17.8	5.0	-21.6	25.9	21.3	-107.2
1994	14.2	9.2	-10.5	18.8	24.6	-16.4
1995	21.7	14.5	7.9	33.1	29.3	5.8
1996	18.7	10.1	5.8	20.1	25.7	4.9
1997	22.7	18.3	7.5	20.0	25.8	32.7
1998	36.4	23.8	24.4	24.6	28.8	36.4
1999	36.1	29.3	10.2	23.2	35.1	18.4
2000	35.1	36.7	1.8	25.3	29.6	6.2
2001	39.5	39.2	17.4	26.0	33.6	13.0
2002	44.0	39.2	26.3	31.6	38.2	7.9

Source: Datastream and authors' calculations.

The sample covers companies from different geographical areas and institutional backgrounds. Therefore, apart from considering sectoral differences, it is of interest to compare leverage ratios across geographical areas. Table 5 presents the average results for leverage(1) and leverage(2), calculated across countries in three geographical areas. The results are again unweighted averages and are based on all identified data. Overall, the figures show some regional differences in the way the utilities are financed. The most important results can be summarized as follows.

- *South America*—measured by leverage(1), South American utility companies have increased their leverage levels considerably over the last 10 years. The average level of leverage has been rising throughout the period, reaching almost 60% in 2002. However, the same trend is not observed with regard to leverage(2). When book value of equity is used, the leverage has remained practically constant, at close to 30%. A slight jump can be observed from 2001 to 2002.
- *Asia*—the average leverage for Asian utilities follows a very similar pattern to the South American utilities. The average increase in leverage(1) has not been as large over the last five years, but the trend has been very similar. *The average leverage(2) has fluctuated between 20 and 40%.*
- *Other*—the third group of countries consists of mainly Eastern European countries. The capital structures of utility companies in these countries have typically been characterized by low levels of debt. Both market and accounting based measures of leverage have remained low over the period, fluctuating around 0%.
- *Overall:* the Asian and South American utility sectors appear to be characterized by very similar levels of leverage. In Eastern European countries, the utility companies seem to be significantly less debt-financed.



**Table 5: Average leverage by geographical area, based on all identified data (%)**

Year	Leverage 1 - Market based			Leverage 2 - Accounting based		
	South America	Asia	Other	South America	Asia	Other
1991	25.4	27.9	-3.6	28.2	31.1	-25.7
1992	27.0	26.2	-24.2	29.5	48.4	-79.4
1993	19.6	6.9	3.8	21.5	27.0	12.0
1994	13.3	9.8	7.9	17.3	25.4	1.7
1995	21.0	18.4	5.4	27.9	32.5	-15.1
1996	21.7	13.6	0.2	26.2	26.1	0.2
1997	23.1	31.4	0.5	21.1	33.5	0.5
1998	41.8	28.2	-0.1	31.4	28.9	-0.1
1999	38.7	33.0	8.8	31.2	33.1	8.6
2000	42.8	35.0	2.0	28.7	29.6	6.3
2001	52.1	36.1	4.7	30.4	33.0	1.4
2002	59.3	39.2	-10.0	37.7	37.0	-5.4

Source: Datastream and authors' calculations.

### 3.2 Results from the full sample of transport companies

Table 6 reports the estimated levels of leverage across the two types of transport company in developing countries. The numbers clearly show that the average leverage levels in the transport services sector appear to have been increasing over the period. The increase seems more pronounced when the market value of equity is used in the calculations. In the transport infrastructure sector, the development has been slightly different. The leverage levels seemed to have reached their peak around 1999, after which there has been a rapid decline. A similar pattern is observed for both market and book value based measures.

**Table 6: Average leverage by sector, based on all identified data (%)**

Year	Leverage 1 – Market based		Leverage 2 – Accounting based	
	Infrastructure	Services	Infrastructure	Services
1991	26.2	37.7	21.6	53.5
1992	3.6	44.2	16.9	59.7
1993	19.3	31.2	37.2	48.1
1994	15.3	20.7	50.9	40.8
1995	25.4	33.4	41.6	47.8
1996	23.2	22.4	36.6	38.7
1997	38.1	62.7	36.5	53.0
1998	41.1	60.6	45.5	62.0
1999	41.1	54.7	31.4	67.6
2000	46.8	47.4	23.9	55.1
2001	36.5	57.3	18.9	46.5
2002	13.8	58.2	10.9	50.5

Source: Datastream and authors' calculations.

The key results for each sector can be summarized as follows.

- *Transport services*—transport service providers in developing countries appear to be characterized by relatively high levels of leverage. When the market value of equity is used in the calculations, there is evidence of a gradual upward trend over the past decade. The average leverage(1) has increased from below 40% in 1991 to 58% in 2002. When leverage is measured by the book value of equity, the average leverage appears to fluctuate at around 50%, without any clear upward or downward trend. However, a dip is observed in this measure of leverage after 1999. This is not only high when compared to other sectors, it is also high compared to similar sectors in developed, countries where leverage rates, as defined, here tend to be around 30%.
- *Transport infrastructure*—the increase in average leverage up to 2001 was more pronounced in this sector. When measured with leverage(1) in Figure 3.1, the average leverage has increased from close to 0% in 1992 to close to 40% in 2001. However, a significant decrease is observed from 2001 to 2002. However leverage(2) does not exhibit a similar upward trend in the mid-1990s. Although the average leverage(2) seemed to have increased from 20% to 50% between 1991 and 1994, this has been followed by a steady decline to 10% in 2002.

The geographical disaggregation for transport companies is less meaningful because of the smaller sample size. The main distinction that can be made is between Asian companies and companies from other parts of the world. This is reported in Table 7 below. For Asian companies, the trend in leverage has been broadly similar, regardless of whether market or book values of equity are used, although, pre-1996, the level of leverage(2) remained higher than that of leverage(1). Both leverage measures experience a substantial jump after 1996 and peak in 1998, but have been decreasing steadily since then.

For companies in other countries the trends of the two measures behave differently over time. Leverage(1) remained at relatively low levels until 1997, after which there was a considerable increase; the average leverage(1) reached close to 60% in 2001. Leverage(2), by contrast, exhibits a reasonably stable trend over the period. Apart from the peak in 1998 the measure has been fluctuating between 20% and 40%. However, the trends over time can be somewhat sample-specific. In the years prior to 1998 there are only a few companies in the ‘other countries’ sample, suggesting that the average leverage presented here is not likely to be a fully representative indicator of transport companies’ capital structure choices across these countries. Overall, it appears that the trends in transport companies’ leverage have been similar across this geographical distinction. The levels of leverage have also been converging towards the end of the period.

**Table 7: Average leverage by geographical area, based on all identified data (%)**

Year	Leverage 1 – Market based		Leverage 2 – Accounting based	
	Asia	Other	Asia	Other
1991	52.3	21.2	48.1	21.6
1992	33.2	11.4	43.0	30.6
1993	26.7	26.2	40.7	38.3
1994	18.9	34.6	46.1	38.4
1995	29.4	23.9	48.8	25.0
1996	23.2	24.8	38.7	19.6
1997	52.3	6.8	53.8	16.4
1998	59.6	59.2	60.6	63.9
1999	52.8	54.8	53.7	43.9
2000	46.3	47.6	39.3	24.8
2001	37.6	57.8	34.2	38.5
2002	37.1	52.1	30.7	30.0

Source: Datastream and authors’ calculations.

#### **4. A more precise look at the evolution since the 1997 Asian crisis**

In developing countries, the concern with the financing structure of regulated companies started approximately with the slowdown in the interest in project finance resulting from the 1997 Asian crisis. Since this crisis also corresponds to the beginning of the overall slowdown in the commitments made by the private sector to infrastructure investment in developing countries, it is important to make a more precise assessment of the evolution of the situation. Having a high-quality sample of data is essential for this purpose. Indeed, while the relatively high volatility of average leverage levels observed due to the unbalanced full sample does not have much impact on the overall long-term trend, which was presented in section 3, it may interfere with the analysis of the impact. To control for this, results were also produced for the balanced sample which covers a much lower number of countries and companies, but which includes the same companies for each year between 1997 and 2002. The utilities sector is covered in section 4.1 while transport is covered in section 4.2.

#### 4.1 Impact of the Asian crisis on the financial structure of utilities

Table 8 presents the results for the balanced sample with regard to the average leverage levels in the three utility sectors for the 5-year period following the Asian crisis.

**Table 8: Average leverage by sector, balanced data (%)**

Year	Leverage 1 – Market based			Leverage 2 – Accounting based		
	Electricity	Gas	Water	Electricity	Gas	Water
1997	22.2	13.4	7.5	19.2	25.0	41.9
1998	41.3	20.8	24.4	24.6	28.5	36.4
1999	35.6	26.5	21.6	23.2	32.5	40.0
2000	42.7	31.6	19.2	25.9	27.3	27.6
2001	39.6	30.2	26.0	28.4	32.9	17.8
2002	42.9	27.4	48.6	34.5	29.1	8.7

Source: Datastream and authors' calculations.

According to the market valuation of assets, there appears to be a clear upward trend in leverage ratios in all sectors. As expected, the acceleration started right after the 1997 crisis as companies saw the real market value of their equity drop. Moreover, for many of the companies, the debt level did not change, or actually increased, in local currency terms, because, for many of the operators, the debt is often contracted in foreign currency. After a 2-year slowdown in the acceleration, the debt/equity ratio has again started increasing following the stock market bust in 2000. The highest leverages are still observed in the electricity sector, and the lowest for the water sector, suggesting that lenders perceive risk to be lower in the energy sector than in the water sector in developing countries. For the electricity sector the results from the balanced sample closely resemble those based on all identified data reported earlier. The average leverage(1) has increased significantly from just above 20% in 1997 to above 40 % in 2002.

The book valuation tells a slightly different story. For electricity and gas, leverage(2) does not exhibit an increase similar to that revealed by the market valuation leverage. It stays virtually constant between 20% and 30% after the 1997 Asian crisis, with only a slight upward trend. For water companies, however, there is a marked difference between the two leverage ratios. Leverage(1) starts from an average level of below 10% and gradually increases over the period to almost 50% in 2002. In contrast, the average level of leverage(2) for water companies was close to 50% in the beginning of the period, and has declined substantially over the period to about 10% in 2002. For this sector, however, it is important to remember that the companies' local equity valuation may have been driven up by a series of strategic changes in the size and management of the global parent companies with which they were associated. The sector is now controlled by four major players that have acquired many of their smaller competitors during this period—i.e. many of the smaller Spanish water companies that were key players in Latin America in the earlier years of privatization have been acquired by the two largest French companies. Also, the equity appreciation of these

companies enjoyed through their diversification in other business lines is likely to have had some local spillover effects.

It is also worth highlighting an interesting regional finding arising from the results. Both leverage indicators suggest that the financing policy of operators in Latin America was much more dramatically influenced by the Asian crisis. Indeed, while there was a small increase in Asia from 25% to 40% in the leverage rate based on market values, the major increase was observed in Latin America, which has seen its leverage rate more than double as a result from the Asian crisis. These developments are shown in Table 9.

**Table 9: Average leverage by geographical area, balanced data (%)**

Year	Leverage 1 – Market based			Leverage 2 – Accounting based		
	South America	Asia	Other	South America	Asia	Other
1997	20.9	25.6	-2.6	21.1	30.6	-2.7
1998	42.3	28.2	0.1	30.2	28.9	0.1
1999	37.7	34.3	5.5	33.7	36.4	3.6
2000	50.0	33.3	2.0	38.2	29.6	0.8
2001	51.8	36.3	4.7	42.5	32.5	1.4
2002	52.9	42.9	-12.8	51.4	29.2	-6.0

Source: Datastream and authors' calculations.

#### **4.2 Impact of the Asian crisis on the financial structure of transport operators**

Table 10 presents the results for the balanced sample with regard to the average leverage levels in the two transport sub-sectors. The results from the balanced sample analysis are somewhat different to those based on all identified data. Namely, the leverage ratios from the balanced sample show significantly higher stability than the unbalanced sample ratios over the same time period. The availability of data for transport companies has increased considerably during the past five years and, as a result, the number of companies in the full sample almost doubled between 1997 and 2002. Therefore, the trends observed in the full sample over this period may reflect new data becoming available, rather than companies choosing to alter their capital structures. The results from the balanced sample suggest that this might indeed be the case. However, evidence from both samples suggests important information about the transport companies' capital structure choices.

**Table 10: Average leverage by sector, balanced data (%)**

Year	Leverage 1 – Market based		Leverage 2 – Accounting based	
	Infrastructure	Services	Infrastructure	Services
1997	45.1	52.8	46.9	51.6
1998	41.1	60.6	46.4	62.3
1999	41.1	54.7	39.5	64.9
2000	49.9	47.4	30.6	64.3
2001	47.4	53.9	31.3	56.0
2002	29.7	56.1	17.2	59.4

Source: Datastream and authors' calculations.

The main messages arising from Table 10 can be summarized as follows. First, both the Asian crisis, and, to a lesser extent, the 2000 stock market bust did have an initial impact on the leverage of these companies. However, it appears that this impact was short-lived, and, at least in terms of the market-valued leverage rate, has returned to its initial level. Second, up to 2001 there seems to have been a negative correlation between leverage in infrastructure and service transport companies. Indeed, they seem to have reacted with opposite signs to the Asia crisis. The transport service companies have seen their leverage increase, while the leverage of transport infrastructure operators has declined significantly since 1997. While there is no simple explanation to this fact, it may be reasonable to assume that the infrastructure sector is likely to be slower to react to shocks since their investments tend to be heavier and start from stronger initial equity commitments. These commitments tend to be more effective at reflecting risks and hence require fewer adjustments. Also, large investment commitments and hence borrowing requirements in the sector are easier to spread out over time than they may be for services.

Overall, the transport services sector continues to be characterized by a relatively high level of leverage, measured by both leverage(1) and leverage(2). Both measures point toward an average leverage of 55–60%. Also, the trends of the two measures appear to be very similar over this period. As for transport infrastructure, the two measures of leverage appear to behave quite differently over time. Leverage(1), based on the market value of equity, has increased over the period and remained above 40% up until 2001. A significant drop to 30% is observed in 2002. While the book-valued average leverage(2) starts at a similar level as the market-valued leverage(1) in 1997, it has decreased more quickly, standing at 17% in 2002.

## **5. Summary and policy implications**

The evidence presented in this paper seems to confirm the anecdotal evidence: debt is replacing equity in the financing of the investment needs of utilities and transport services in developing countries. Even if this observation is not obvious from the leverage calculated from book values of equity, it is quite strong when considering the market valuation of equity over the past 10 years. Moreover, the results presented here point toward an acceleration of

this trend, which is particularly strong during the periods of global shocks that followed the 1997 Asian crisis. Similar increases have been observed in developed countries.

The data collected suggest differences across sub-sectors. With a market valuation of equity, since the 1997 crisis, the average leverage levels in electricity have been growing above 40% while the rates for water and gas have reached the 25-30% range. The companies in the transport services sector appear to hold higher levels of debt, regardless of whether market or book valuations are used. In general, the data point to leverage levels of around 10-20% for infrastructure and close to 50-60% for services, depending on whether the market or book valuation is adopted.

Finally, the data suggest significant regional variations in both levels of leverage and in trends over time. South American companies appear relatively highly leveraged when using market valuations of equity, and increasingly so, driving the overall trend. Leverage rates have in fact been well over 50% in recent years.<sup>9</sup> Asian operators are also showing an upward trend in their leverage but at a much lower rate. The level has been in the 30-35% range for utilities and somewhat higher for transport companies. However, there appears to have been a decrease in leverage of Asian transport companies over the last five years, which is not observed elsewhere. Other regions, and in particular Eastern Europe, have been characterized by significantly lower levels of leverage than Asia and Latin America, and no obvious change in trend.

From a policy viewpoint, this analysis points to a number of emerging issues that may deserve consideration. The first is the choice of the correct asset base in the context of regulatory decisions. This paper has shown that the stockmarket valuations and the book values of the operators' equity have tended to vary significantly, since the observed increases in the market value-based leverage ratios were at least partly driven by depressed equity valuations.<sup>10</sup> Figure 1 underlines the importance of this point. The average book-to-market values for companies operating in privatized infrastructure sectors have increased significantly over the past 10 years. This suggests that, while for most standard regulatory decisions, the book value provides an easier and less volatile asset base, it can be misleading in that it does not allow the regulators to get a sense of the real concerns the operators have to address in their management of infrastructure services. An increase in the relative importance of debt in the financing of public services can be, and has in the past been, an issue that only appeared too late on the radar screen of the regulators. The evidence reviewed here would suggest that it is important for regulators to monitor both book and market valuations of the assets.

The second policy issue is the extent to which regulation can mitigate the equity flight from the sector documented in this paper. Experience suggests that there are three main ways in which regulation can help. The first is the specific design of regulation. There is evidence suggesting that the cost of equity is lower under rate of return regulation or hybrid regimes than under price cap regulation (Estache et al., 2003; Foster et al., 2003; Rodriguez-Pardina and Sember, 2003). Increasing the willingness to contribute equity can thus be facilitated by

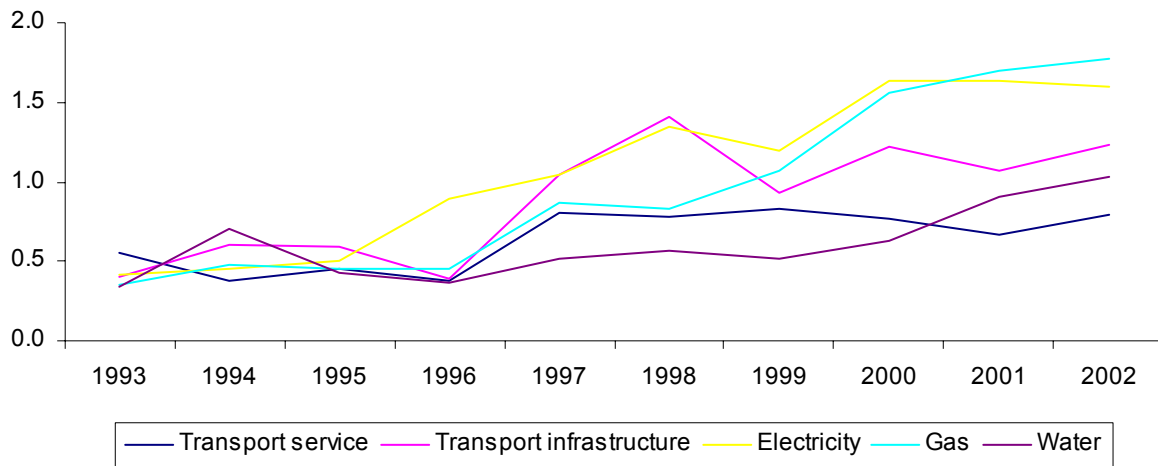
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<sup>9</sup> See Foster et al. (2003) for a similar conclusion.

<sup>10</sup> Note the wedge between book and market valuation of assets can also come from a bubble in the valuation of equity, not just from a depression in this valuation.

the adoption of less-efficiency-oriented regulatory regimes. Second, guarantees and various types of insurance can reduce the overall risks of projects, and hence reduce the risk of equity flight from the sector (Erhardt and Irwin, 2003). Third, the level of debt can be limited by other instruments, such as leasing agreements and allowing specific arrangements with infrastructure vendors. In some business lines, creative business development will allow improvements, but in most regulated industries facing low-income wage earners as their main client, cost control of some type is likely to be the solution. The main question that remains to be solved is then the extent to which cost cutting and creative business development appear the best ways to improve the operators' capability to finance their investments and debts.

**Figure 1: Average book-to-market ratio for the companies in privatised infrastructure sectors**



Source: Datastream, authors' calculations.

Overall, these suggestions do not eliminate the fundamental problem that these sectors still need to find the necessary levels of finance to deliver on their investment commitments. Ineffectiveness in reducing the equity flight from the sector is likely to reduce the speed at which countries will be able to rely as much as they had hoped for on the private sector to help them finance their investment needs. But there is also a macroeconomic reason for concern. It is not unreasonable to expect that for some countries foreign participation is highly concentrated in these sectors, and increased international debt levels resulting from a switch from equity in public services may have balance of payment effects.

These concerns do not imply that regulators should regulate the financial structure of the company, but it certainly implies that it may be important for regulators to better monitor the leverage rates and their evolution to minimize the risks of unexpected shocks. It will also require a much serious commitment by all stakeholders to deliver the regulatory accounting systems needed to increase the transparency of the monitoring of the financial viability of companies that ultimately are responsible for delivering basic services in the poorest countries of the world.



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## Appendix: Description of the main sample for utilities

Name	Country	Sector	No. of observations for Leverage(1)	No. of observations for Leverage(2)	Included in balanced sample
Central Costanera	Argentina	Electricity	9	9	YES
Capex S.A.	Argentina	Electricity	7	7	YES
CELESC - Sta Catarina	Brazil	Electricity	8	9	YES
CERJ	Brazil	Electricity	3	3	
CESP	Brazil	Electricity	12	12	YES
Energetica Mato Gros	Brazil	Electricity	4	4	
Elec Paulista Ctep	Brazil	Electricity	4	4	
AES Tiete SA	Brazil	Electricity	4	4	
Duke Energy Int'l	Brazil	Electricity	4	4	
Sao Carlos Empreend	Brazil	Electricity	4	4	
CIA De Minas Gerais	Brazil	Electricity	9	11	YES
CIA Paulista - Cpfl	Brazil	Electricity	12	12	YES
Light De Eletricidad	Brazil	Electricity	12	12	YES
Centrais Eletricas	Brazil	Electricity	12	12	YES
Bandeirante Energia	Brazil	Electricity	4	4	
Emae-Aguas Energia	Brazil	Electricity	4	4	
Tractebel Energia SA	Brazil	Electricity	5	5	
Caiua Eletricidade	Brazil	Electricity	4	4	
Elektro - Eletrica	Brazil	Electricity	4	4	
Light Participacoes	Brazil	Electricity	7	7	YES
Electropaulo Metropo	Brazil	Electricity	7	7	YES
Centrais Elet Matogr	Brazil	Electricity	4	4	
CIA Eletrec. Bahia	Brazil	Electricity	7	8	YES
CIA Energetica De Br	Brazil	Electricity	4	4	
CIA Do Ceara-Coelce	Brazil	Electricity	4	4	
Espirito Santo Centr	Brazil	Electricity	4	4	
General De Electric	Chile	Electricity	12	12	YES
Empresa Electrica – EMELARI	Chile	Electricity	5	5	
Electrica De Iquique	Chile	Electricity	5	5	
Colbun SA	Chile	Electricity	12	12	YES
Empresa Electrica – EDELMAQ	Chile	Electricity	5	5	
Empresa Elect – PEHUENCE	Chile	Electricity	12	12	YES
Emp Elect Pilmaiquen	Chile	Electricity	12	12	YES
Empresa Electrica – EMELAT	Chile	Electricity	5	5	
Empresa Electrica - ELECDA	Chile	Electricity	5	5	
Empresas Emel S.A.	Chile	Electricity	3	3	
Almendral S.A.	Chile	Electricity	4	4	
Electrica Rio Maipo	Chile	Electricity	12	12	YES
Emp Nac Electricidad	Chile	Electricity	7	7	
Enersis S.A.	Chile	Electricity	10	10	

CIA Electrica	Chile	Electricity	4	4	
Chilectra S.A.	Chile	Electricity	12	12	YES
Gener S.A.	Chile	Electricity	10	10	
Shenergy Company Ltd	China	Electricity	9	9	YES
Inner Mongolia	China	Electricity	3	3	
HC Elec Pow Develop	China	Electricity	2	2	
Shandong Intl.Power	China	Electricity	2	2	
Huaneng Pwr.Intl.	China	Electricity	3	5	
Beijing	China	Electricity	6	7	YES
SP Power Development	China	Electricity	4	4	
SZ Electric Power Co	China	Electricity	2	2	
Zhejiang Southeast	China	Electricity	6	6	YES
Prazska Energetika	Czech Republic	Electricity	7	7	YES
Stredoceska Energeti	Czech Republic	Electricity	4	4	
Jihomoravska Energet	Czech Republic	Electricity	7	7	YES
Severomor Energetika	Czech Republic	Electricity	7	7	YES
Vychodoc. Energetika	Czech Republic	Electricity	7	7	YES
Jihoceska Energetika	Czech Republic	Electricity	7	7	YES
Zapadoces Energetika	Czech Republic	Electricity	7	7	YES
Severoces Energetika	Czech Republic	Electricity	6	6	
Ahmedabad	India	Electricity	10	10	YES
Gujarat Industries	India	Electricity	8	8	YES
Bses Limited	India	Electricity	12	12	YES
Tata Power Co	India	Electricity	10	10	YES
Tata Hydro-Electric	India	Electricity	7	7	
CESC Limited	India	Electricity	2	2	
Sarawak Enterprise	Malaysia	Electricity	11	11	YES
Tenaga Nasional Bhd.	Malaysia	Electricity	10	10	YES
Powertek	Malaysia	Electricity	6	5	
Malakoff	Malaysia	Electricity	10	10	YES
Hub Power Company	Pakistan	Electricity	6	6	YES
Kohinoor Energy Ltd	Pakistan	Electricity	4	4	
Duke Energy	Peru	Electricity	3	3	
Luz Del Sur Servicio	Peru	Electricity	3	3	
Manila Electric (Meralco)	Philippines	Electricity	11	11	YES
First Phil. Holdings	Philippines	Electricity	10	10	YES
Krasnoyarskenergo	Russia	Electricity	6	6	YES
AO Lenenergo	Russia	Electricity	3	3	
AO Mosenergo	Russia	Electricity	4	4	
AO Sverdlovenergo	Russia	Electricity	3	3	
Unified Energy	Russia	Electricity	5	5	
Electrosila	Russia	Electricity	2	2	
AO Bashkirenergo	Russia	Electricity	2	5	
Korea Electric Power	South Korea	Electricity	12	12	YES
Electricity Generating	Thailand	Electricity	8	8	YES

Aksu Enerji VE	Turkey	Electricity	3	4	
Zorlu Enerji	Turkey	Electricity	3	4	
Ayen Enerji	Turkey	Electricity	3	4	
Ak Enerji Elektrik	Turkey	Electricity	3	4	
Cukurova Elektrik	Turkey	Electricity	5	5	
Metrogas S.A.	Argentina	Gas Distribution	9	9	YES
Transpra Gas Del Sur	Argentina	Gas Distribution	4	6	
Distrib. De Gas	Argentina	Gas Distribution	4	4	
Gas Natural Ban	Argentina	Gas Distribution	4	4	
Cia De Gas De Sao Paulo	Brazil	Gas Distribution	4	4	
GASCO S.A.	Chile	Gas Distribution	12	12	YES
CEM SA	Chile	Gas Distribution	9	9	
Gujarat Gas Co Ltd	India	Gas Distribution	7	7	YES
EOX Group Bhd	Malaysia	Gas Distribution	7	7	YES
Gail (India) Ltd	India	Gas Distribution	6	6	YES
Petronas Gas	Malaysia	Gas Distribution	7	7	YES
Sui Southern Gas Co.	Pakistan	Gas Distribution	1	1	
Sui Northern Gas	Pakistan	Gas Distribution	2	2	
Kyungnam Energy	South Korea	Gas Distribution	9	9	YES
Korea Gas Corp.	South Korea	Gas Distribution	4	4	
Daegu City Gas	South Korea	Gas Distribution	4	4	
Seoul City Gas	South Korea	Gas Distribution	8	8	YES
Daehan City Gas	South Korea	Gas Distribution	8	8	YES
Kyung Dong City Gas	South Korea	Gas Distribution	6	6	YES
Kukdong City Gas	South Korea	Gas Distribution	7	7	YES
Pusan City Gas	South Korea	Gas Distribution	6	6	YES
LG GAS	South Korea	Gas Distribution	6	6	YES
Aygaz A.S.	Turkey	Gas Distribution	12	12	YES
Saneamento Sao Paulo	Brazil	Water	5	5	
Aguas Andinas S.A	Chile	Water	6	6	
Shanghai Raw Water	China	Water	10	10	YES
Ades Alfindo Putrasetia	Indonesia	Water	9	9	YES
Intan Utilities	Malaysia	Water	5	5	
Puncak Niaga Hdgs. Bhd	Malaysia	Water	6	6	YES
Ionics Inc.	Philippines	Water	8	8	YES
Eastern Water Resources	Thailand	Water	6	6	YES

## Appendix 2: Description of the main sample for transport

Name	Country	Sector	No. of observations for Leverage(1)	No. of observations for Leverage(2)	Included in balanced sample
Gpo.Concio.Del Oeste	Argentina	Infrastructure	3	3	
Doc Imbituba PN	Brazil	Infrastructure	4	4	
Agunsa	Chile	Infrastructure	4	4	
Froward	Chile	Infrastructure	4	4	
Puerto	Chile	Infrastructure	4	4	
Ventanas	Chile	Infrastructure	12	12	YES
Shai.Intl.Airport	China	Infrastructure	2	2	
Shai.Shentong Metro	China	Infrastructure	4	4	
Zhejiang Expressway	China	Infrastructure	5	6	
Citra Marga Nusaphala	Indonesia	Infrastructure	8	8	YES
Bintulu Port Holdings	Malaysia	Infrastructure	2	2	
Johor Port	Malaysia	Infrastructure	7	7	YES
Malaysia Airports Hdg.	Malaysia	Infrastructure	4	4	
Ncb Hdg.Bhd	Malaysia	Infrastructure	11	11	YES
Plus Expressways Bhd	Malaysia	Infrastructure	1	1	
TMM	Mexico	Infrastructure	11	11	
Asian Terminals	Philippines	Infrastructure	7	7	YES
Intl.Ctnr.Term.Svs.	Philippines	Infrastructure	11	11	YES
KCTC	South Korea	Infrastructure	12	12	YES
Bangkok Expressway	Thailand	Infrastructure	8	8	YES
Celebi Hava Servisi	Turkey	Infrastructure	3	3	
Turk Hava Yollari	Turkey	Infrastructure	5	5	
Terminales Maracaibo	Venezuela	Infrastructure	2	2	
Varig Pn	Brazil	Services	4	7	
LAN	Chile	Services	6	6	YES
China Eastern Airline	China	Services	6	7	YES
Hainan Airlines	China	Services	6	6	YES
Shai.Qiangsheng Hldg	China	Services	3	3	
SHANDONG Airlines	China	Services	3	3	
Shn.Hong Kai Group	China	Services	2	2	
Steady Safe	Indonesia	Services	8	8	
Zebra Nusantara	Indonesia	Services	8	8	YES
Malaysian Airline Sy.	Malaysia	Services	10	10	YES
Nationwide Express	Malaysia	Services	7	7	YES
Park May	Malaysia	Services	10	10	YES
See Hup Consolidated	Malaysia	Services	5	5	
Tiong Nam Transport Holdings	Malaysia	Services	9	9	YES

Holdings						
Transmile Gp.	Malaysia	Services	6	6	YES	
PIAC	Pakistan	Services	4	4		
Aeroflot	Russia	Services	4	4		
Putco	South Africa	Services	4	4		
Value Group	South Africa	Services	4	4		
Chunil Express	South Korea	Services	12	12	YES	
Korea Express	South Korea	Services	12	12	YES	
Korean Airlines	South Korea	Services	11	11		
Thai Airways Intl.	Thailand	Services	11	11	YES	