

Urban Water Reform: What We Know, What We Need to Know

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ABSTRACT

Conventional wisdom among economists often disregards local political and institutional realities. The experience with urban water reform illustrates some of the consequences of ignoring confounding circumstances. Most economists agree that urban water supply should be treated as a private good and priced to cover costs, including investment and externalities. Most economists also believe that water utilities should be operated under state regulation to assure access and quality, and poor consumers should be subsidized through means-targeted subsidies. Many believe that water systems will be more efficient under private operation, and some believe that competition could further spur efficiency. But four facts about water explain why few countries with weak institutions have successfully followed this advice. Water is essential, local, mysterious, and dull. More concretely, water is essential to life, local in supply, mysterious in information, and dull in innovation. These four characteristics have important political and institutional implications for urban sector water reform. The Buenos Aires water concession is an example of what happens when an economically sound reform is not adjusted to political sensitivities and institutional failings. We need more research to understand how successful reforms overcame adverse political and institutional circumstances.

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I. Water Reform Is Hard

Water, a cause of war and a source power for centuries, has always been a critical good. Access to clean water and adequate sanitation are essential to preventing disease and premature death. Yet large numbers of poor people, most of them children, are made sick and die every year from lack of adequate access to safe water and better sanitation. The UN estimates that as many as 1 billion people lack access to safe drinking water, 1.2 billion lack access to adequate sanitation, and 12.2 million people, most of them children, die yearly from water borne diseases such as cholera or diarrhea.

Despite – or perhaps because of – water’s importance, urban water systems in developing countries are plagued by waste, inefficiency, and underinvestment. A wave of reforms in the 1990’s improved matters in some countries, but many countries have not improved. And some reforms have ended with notable failures and popular backlash. Why has water reform been so troublesome?

Conventional wisdom among economists often disregards local political and institutional realities, and the experience with urban water reform illustrates some of the consequences of ignoring confounding circumstances. In section II, the paper reviews what economists know, or think they know, about water reform. Among other things, economists generally agree that urban water supply should be treated as a private good and priced to cover costs, including investment and any negative externalities, and that

targeted subsidies and government regulation are also necessary to assure access and quality.

Four facts about water explain why few countries with weak institutions have successfully followed economists' advice: water is essential, local, dull, and mysterious. More concretely, water is essential to life, local in supply, dull in innovation, and mysterious in information. In Section III I discuss the political and institutional implications of these facts. In section IV, I analyze the Buenos Aires water concession as an example of what happens when the design of an economically sound reform is not adjusted to local political sensitivities and institutional failings. Finally, I consider what we need to know if we are to understand how successful reforms overcame adverse political and institutional circumstances.

II. What We Know, or What We Think We Know

Most economists agree that urban water supply should be treated as a private good. Water supplied for domestic, industrial, or irrigation uses does not meet Samuelson's tests for a pure public good, i.e. non-rival and non-excludible. Water supplied by a utility is a rival good -- your consumption of clean water reduces the amount available to me -- and piped water is excludable -- a water utility can in theory cut off service to consumers who do not pay. It is more costly but also certainly possible to monitor and exclude users who bore wells into shared aquifers or divert water from rivers.¹ Economists recognize that water supply has some public good characteristics that occasion government involvement. Water is essential to life so governments may

¹ While water in the environment, such as rainwater or large lakes and oceans, may be a public good, urban water supply is usually viewed by economists as an economic good with "economic value in all its competing uses" (Dublin Statement from the International Conference on Water and the Environment, 1992, quoted in Boland 2004, p.530).

need to assure that all citizens have access to some minimal amount of water. The amount of drinking water required to sustain human life is very small, however, only about two liters a day in temperate climates and four liters daily in hot climates. Additional water is needed for hygiene and this has positive externalities: it reduces the incidence of communicable diseases such as cholera. But hygiene too requires only relative small amounts; poor people without washing machines or gardens are estimated to need only 20 to 50 liters of water per day for all domestic purposes (Rijsberman 2004, p.499). Economists generally agree that government regulation is also required to monitor water quality, to control monopoly providers, and to reduce negative externalities for other users from the diminution and pollution of water sources. A large literature on optimal regulatory design calls for a politically independent public body to set rates and monitor performance based on objective and verifiable information, with a neutral and independent appeals process (for a good sense of this literature see Armstrong, et al. 1994, Joskow 2000).

Notwithstanding these public good characteristics, private markets for water can function effectively. Surveys show that people are willing to pay for water, and most economists agree that water rates should be set to cover the marginal cost of efficient operation, maintenance, pollution, and a return on investment (Noll, et al. 2000). Proper pricing has many advantages: it gives consumers the incentive to conserve water, it gives water utilities the funds to maintain and expand the system and to compensate users for unabated pollution, and it gives governments the information to judge the economic value of competing uses. There is some disagreement among economists on how to calculate the costs of water supply and how best to set tariffs to maximize information and

minimize costs, but less disagreement about the principal of cost recovery pricing for consumers who can afford to pay (see the discussions in Munasinghe 1992, Noll 2002).² Metering is recommended when the benefits of conservation exceed the transaction costs of installing and reading meters, which is likely to be the case only where water supply is scarce relative to the projected rate of consumption (Munasinghe 1992).

There is also strong evidence that if subsidies are needed to make water affordable for poor consumers, these should be targeted, means-tested subsidies rather than low rates for all consumption or for lower volumes of consumption. Lower water rates rob the utility of resources needed to maintain and expand the system. Increasing block tariffs, which provide lower rates for lower volumes of consumption, have several disadvantages. They are set below marginal costs and so motivate inefficient use. They also provide confusing signals to consumers (Boland and Whittington 2000), they rob the utility of resources need to expand the system, and they provide subsidies to wealthier customers while not necessarily providing sufficient subsidy to poorer users. Poorer consumers tend to share connections and to sell water to their unconnected neighbors, so they are often higher volume users and capture less of the cross subsidy than richer consumers (Munasinghe 1992). And politicians have an incentive to set the initial block too high, so that most consumption is priced below costs instead of just basic needs (Boland and Whittington 2000).

The rampant inefficiencies, waste, and underinvestment common among water systems in many developing countries led most economists to conclude that water

² Noll (2002) notes that because a water system has a high ratio of fixed to variable costs, the private marginal costs of supply may be below the average costs. He suggests an optimal, two-part tariff where one part is a usage price based on private marginal cost and the other is a capacity charge that recovers any costs not covered in the usage charge.

utilities should be managed as enterprises with incentives to operate efficiently at 100% coverage of the population. Many economists also argue that regulated private operation or ownership could increase a utility's incentives to demand a return on assets, to expand coverage, and to operate efficiently.

Although most have assumed that water must be run as a monopoly, competition in urban water systems has been proposed by some economists. Competition in urban water supply is possible in principle. Water vendors already co-exist with piped water systems in many poorer cities. But water vendors usually operate only in neighborhoods without access to piped water, rather than in competition with the utility. Noll (2002, pp.46-47) points out that water systems with multiple reservoirs could be made competitive by treating each reservoir as akin to an electricity generator. A decentralized competitive wholesale water market could direct the delivery of water to the network of pipes, the equivalent of a centralized grid. A few urban systems do rely on multiple independent sources (Roth 1987, cited in Noll 2002). Noll further suggests that water systems with multiple wells pumping groundwater could have different, competing well owners and centralized management of the aquifer, as is widely done with petroleum and natural gas fields (Noll 2002, p.47). To my knowledge this has not been tried.

In most of the developing world and even much of the developed world, real urban water systems bear little resemblance to what economists advise. Despite the last two decades of reforms, water rates do not cover the costs of operation and maintenance, much less expansion of the water system in most developing countries. Indeed, few cities in developed countries set prices to cover a return on investment. Although there have been some improvements, urban water is still supplied free to many consumers in poor

countries. This is because of policies, such as free water to religious orders and schools, because of failures to bill or collect, and because theft of water is seldom detected or punished. In some cases the government is the worst of the water thieves. In Guinea, for example, the government has sometimes paid as little as 10% of its billed obligations (Menard and Clarke 2002).

Economists' preference for means-tested subsidies is seldom shared by governments in developing countries. Targeted subsidies are hard for weak or corrupt bureaucracies to administer well, and the political payoffs from helping only the poorest are often low. So governments in many poor countries prefer to charge lower rates for low volume users on the assumption, or pretext, that poorer consumers will benefit. As economists have predicted, this assumption is usually wrong. The very poorest consumers are not connected to the water system in poorer cities, and must rely on water vendors or public fountains. In Lima for example, 25% of the city's residents are not connected to piped water. As a result, water subsidies in developing countries tend overwhelmingly to benefit middle and upper income consumers.

Some countries, especially wealthier ones, did follow some of the advice of economists. These countries introduced cost recovery pricing, professionalized the management of water utilities in the 1990's by turning public departments into public enterprises, and attracted private operators through management contracts, leases, concessions, and, more rarely, outright sales. In most cases pricing and regulatory reforms were combined with private participation, usually in response to past failures in reforming public utilities and the need for additional funds to meet deferred maintenance and investment. By 2004, 80% of developed countries and 35% of developing countries

out of a sample of 147 had some private participation in water and sanitation (Estache and Goicoechea 2005, p.7).³

This may seem like a flurry of reform activity, but in fact private participation in water and sanitation has lagged behind other infrastructure. Total private investment in water and sanitation from 1990 to 2004 was about \$41 billion, which is only about 5% of total private investment in all infrastructure projects in developing countries (Izaguirre and Hunt 2005). Past investments are dwarfed by the estimated \$101 billion required to meet the UN Millennium Development Goal to halve by 2015 the percentage of people, both rural and urban, without access to safe drinking water and basic sanitation (UN Millennium Project 2005). The UN assumes that governments will provide most of the necessary financing for the poorest countries (Ibid.).

The effects of water reforms to date are hard to judge. Studies are few and their results are ambiguous, reflecting information problems in the sector and large exogenous differences between water systems that I describe in detail later. Some cross-city comparisons are comparative statics, and do not measure whether a reformed system has improved over its pre-reform trends. Such a reformed system may have a high -- but falling -- rate of leakage and large -- but shrinking -- expenses for repair compared to other cities, because the pre-reformed utility failed to invest in maintenance.

One survey reported only 8 statistical analyses of the effects of water reforms, two on Africa, one on Asia, and the rest on three individual countries in Latin America (Estache, et al. 2005, p.11). Two of the three cross-country studies surveyed found no significant difference between the cost efficiency or productivity of public and private

³ Private participation among developing countries varied by income: almost half of the 72 middle-income developing countries in the sample had some private involvement compared to only 18% of the 55 low income developing countries (Estache and Goicoechea 2005).

water utilities in Africa and Asia. The third, using earlier data, found that productivity improved with private operation in Africa, although corruption mattered more than ownership. Only two of the country studies compared public and private utilities. One found significant improvements in total factor productivity in privately operated water utilities in four Argentine provinces, while the other found no difference between public and private productivity overall in Brazil. Besides these studies, another cross country study found no difference in the rates of expansion in connections between privately managed and publicly managed water utilities in 18 cities in three Latin American countries (Clarke, et al. 2004).

In contrast, one statistical analysis found faster declines in child mortality rates in Argentine cities with privately operated water systems than those with public systems, especially in poorer areas (Galiani, et al. 2002). A comparison of private and public utilities in Chile found that private firms invested more and kept prices lower, although rates of unaccounted for water were higher (Bitran and Valenzeula 2003, cited in Clarke, et al. 2004).

Case studies are better able to account for pre-reform conditions and local factors that affect outcomes. Case studies found substantial welfare gains in three privately managed systems compared to a counterfactual based on the same systems under continued public management (Shirley 2002).

Economists' conventional wisdom about water has sometimes had adverse political effects. As we have seen, there are good economic arguments about why cities with ample supplies of low cost raw water should not meter. Indeed, some large cities in developed countries, such as London, have not installed residential meters. Conventional

wisdom about metering ignored the political consequences of treating water and sanitation services as private goods, especially in institutional settings where consumers are suspicious of the government's ability and incentive to control a utility's monopoly powers. As a result of reforms, consumers suddenly faced higher water bills, more stringent billing and collection, and private, perhaps foreign, management of the utility. Without metering, they lacked the information necessary to understand and challenge their bill and also had no way of reducing their bill by using less water. Although economists assumed that consumers would not object to reforms if marginal water rates stayed low, consumers have objected to nominal rate increases even when real rates were below historic levels and even when average rates were well below those of comparable cities (see my description of the Buenos Aires water and sanitation concession below).

In sum, developing countries failed to introduce many of the reforms recommended by economists. In most cases reforms were introduced coupled with private management, which has proved controversial. Public acceptance of private participation in infrastructure in general and water in particular has shrunk. Private investment in water and sanitation has fallen from its peak in the mid-1990's. Although only 20 private projects in water and sanitation were cancelled or "became distressed" between 1990 and 2004, these included some of the largest concessions, and amounted to 37% of private investment in the sector (Izaguirre and Hunt 2005). Why has reform in water and sanitation been so difficult?

III. Institutional Considerations

Economic advice, however sound, has been confounded by adverse conditions arising out of the interaction between local institutions and politics and four basic facts about

water. Four characteristics of water have huge implications for the institutions and the politics of supply: water is essential; water is local; water is dull; and water is mysterious.

- **Water is essential** to sustain life, both of humans and of the plants and animals they consume. This gives water a special cachet, even though most water is consumed in non-essential uses, such as washing cars or watering flower gardens, or wasted, though evaporation of irrigation water, leakage of water from pipes, or flows through improperly closed taps and malfunctioning toilets.⁴

Because water is essential – and it falls from the sky -- many non-economists object to treating water services as a private good. Many believe that water, even urban water services, should be provided at very low cost or free. Because water is essential, it also has a long history of well established and fiercely protected property rights, and has long been subject to government controls. In many Latin American countries, for example, ground water is owned by the state, not the property owner. Few countries have privatized the ownership of their water systems and some observers are opposed to any form of privatization of water. A representative attitude is reflected in this quote:

In our view water privatization represents a troubling shift away from the conception of water as a good requiring common social management, and towards the conception of water and water management services as commodities that individuals can purchase as they can afford. Water is essential for life....The nature of water as a scarce, essential, monopolistic resource makes it particularly important that the government guarantee access to it. Privatization of public resources, such as water, may diminish the ability of governments to ensure that the needs of all their citizens are met, because governments are no longer directly in charge of their services. (Mulreamy, et al. 2006, p.30)

⁴ Sanitation has never had the cachet of water, even though it too is crucial to preventing disease. Connecting household to clean, piped water does not make children healthier unless sanitation is also improved, from no facilities to pit latrines or from pit latrines to flush toilets. Based on an epidemiological study of diarrhea prevalence, height for age, weight for age, and weight for height scores of 5000 urban and 12,000 rural children aged 3-36 months in eight developing countries (Esry 1996).

This belief contrasts with the view of economists, who argue that when consumers pay for a scarce and essential good they will make better use of it and demand better service.

The essential nature of water has also led some economists to assume that improvements will always be welcomed. But poor people have found ways of providing for their basic water and sanitation needs and may not fully value improved alternatives (see water is mysterious below). Surveys have shown that poor people sometimes place a higher value on connecting to the electrical grid than to the water system. Cities such as Lima have coped with rationing and large numbers of unconnected consumers for decades. Most of Lima's citizens have invested in some form of water storage and have a lower willingness to pay for a reliable 24 hour, year-round supply than economists may expect.

- **Water is local.** It is costly to transport water because it is heavy to pump and much water can be lost in evaporation and leaks. So most water systems are at the mercy of geography and weather. Raw water supply can vary greatly from locale to locale, even over short distances, and these differences in raw water translate into different extraction costs, treatment costs, and rates of sustainable use. Compare, for example, Lima and Santiago. Lima is located in an arid coastal region. Deep wells are depleting Lima's aquifer and becoming contaminated by salt water. Water from Lima's river, the Rimac, is polluted by heavy metals and is insufficient to meet demand during the dry months. Only 75% of the population is connected and close to half of these connections receive water less than 12 hours a day during the dry season. In contrast, Santiago has an ample

supply of relatively clean water from snow melt from the nearby Andes.

Santiago's water supply flows into its river, the Maipo, where it is diverted into a low cost, gravity fed system. During the relatively rare droughts, Santiago can draw on a large natural reservoir and deep wells.

The local nature of water makes reform more politically charged than reforms orchestrated purely at the national level, since local politicians will be responsive to local interests while national politicians may be responding to other interests. Many local interests have a large and competing stake in their water system, including consumers who are connected to the system and want quality service at reasonable prices, consumers who are not connected to the system and want access, developers and construction companies who want to expand the city's building stock, environmentalists who want to control development, industrialists who want adequate supplies for their needs, and neighboring farmers who want to assure continued access at low prices. Water is also an important source of pork for local governments, which adds to its local political salience. Yet even though water is local, in centralized polities many different jurisdictions are involved in governing water systems. For example, Buenos Aires' concession contract and Conakry's lease were largely negotiated with their federal governments.

- **Water is dull.** There has been far less technological progress or organizational experimentation in urban water systems than in telecommunications or electricity, where large gains have come from innovation (See Menard 2006). There are some new developments in water – notably the average cost of desalination has

fallen about 90% over the last 40 years.⁵ But the cost of desalination is still too high to make a big difference for poorer countries, and there are not immediate prospects for innovations in water that are as transforming as fiber optic cable or mobile telephony.

Urban water and sanitation systems are notoriously capital intensive, with large fixed costs sunk in assets that have long useful lives. The high ratio of fixed to variable costs means that water's marginal costs may be below average costs, making it institutionally demanding to set prices that allow a small return on investment over long periods (Noll 2002). As a result water and sanitation have lower and riskier private returns on investments. Guasch finds that from 1990 to 2002 the internal rate of return including management fees for a sample of water and sanitation concessions and sales in Latin America was 11% compared to a cost of equity at the time of the transaction estimated at 15.5% (Guasch 2006, p.135). This is the most disadvantageous of any infrastructure sector as we can see in Table One.

⁵ The cost of desalination depends upon the type of technology used and whether the raw water is brackish or seawater. The average cost of desalinating seawater by the so-called MSF process fell from \$9.00 per cubic meter in 1960 to about \$0.90 in 2000 (Zhou and Tol 2003, p.3).

Table One: Profitability & Cost of Equity in Privatized & Concessioned Firms in Latin America and the Caribbean, 1990-2002

| Sector | IRR (inc. management fees)* | Cost of Equity at time of transact.* |
|--------------------|------------------------------------|---|
| Water & Sanitation | 11.0 | 15.5 |
| Transport | 11.5 | 13.5 |
| Energy | 14.5 | 14.0 |
| Telecommunications | 21.0 | 14.0 |

Source: (Guasch 2006, p.135)

*The project IRR is the return earned by investors in the project from flows of dividends minus flows of capital injections into the project over the life of the project. The cost of equity is based on the usual capital:equity pricing model which augments the risk free rate (long term return on US Treasuries) by adding a general market risk premium, an market risk premium for non-diversifiable investments in that industry, a country risk premium, and a sector and regulatory risk premium (Guasch 2004).

- Water is mysterious. Water has all the usual information asymmetry problems described at length in the principal-agent literature (see, for example, Laffont and Tirole 1993), but beyond that much information about water is hidden or partial. Consumers cannot tell by taste or smell whether the water they drink is contaminated by microorganisms or heavy metals. Utilities cannot cheaply determine where leaks in underground pipes are located, and poorly managed firms may not even know where all their pipes are located. Nor can investors cheaply see how well underground pipes have been maintained.

Because water is mysterious, consumers may not fully value improvements in water quality, as I mentioned above. Also, users will not see health improvements from improved water alone, sanitation must also be improved, as must hygiene, which demands that people change their habits. And even those with good hygiene and access to improved water and sanitation will still be sickened if foodstuffs are contaminated by contact with untreated sewage in irrigation waters or if they swim in contaminated

waters.⁶ For all these reasons consumers may misjudge the water utility's performance in improving water quality.

Information problems confronting investors may partly explain the frequent renegotiation of water and sanitation concessions. Between 1985 and 2000 almost 75% of water concessions were renegotiated out of a sample of 1000 infrastructure concessions in Latin America, compared to only 10% of electricity concessions (Guasch 2004, p.13 Table 1.7). Water system concessions were renegotiated on average only 1.6 years after signing (Guasch 2004, p.14 Table 1.8), usually at the instigation of the private investor. Guasch attributes the more frequent renegotiations in water and sanitation to the sector's lower profitability described above. He also finds that renegotiation in all sectors was largely instigated by the operators, and was strongly correlated with the way the concession was bid (e.g. contracts bid competitively were renegotiated more frequently than those awarded through bilateral negotiations, contracts awarded on the basis of the lowest proposed tariff were renegotiated more frequently than those awarded on the basis of the highest transfer fee) and regulated (e.g. contracts with price caps were negotiated more frequently than those setting tariffs based on rate of return, contracts where the regulatory body did not exist prior to the concession were renegotiated more frequently than those where a pre-reform regulatory body existed) (Guasch 2004, 2006). He suggests that investors may be acting opportunistically, making generous offers to win an initial bid in the expectation of future renegotiations. Guasch does not explicitly consider water's information costs. The low rates of return in water and sanitation compared to the initial cost of equity and compared to returns in other sectors include

⁶ Cholera transmission in Lima in the mid-1990s has been attributed to undercooked fish from ocean waters contaminated by the city's sewage, as well as contaminated water from tanker trucks and contaminated food sold by street vendors (US Government 1995).

returns after renegotiations. These low IRRs suggest that water's information problems may have led even opportunistic investors to overestimate the potential for gains in water and sanitation concessions.

The essential, local, dull, and mysterious nature of water have important implications for what politicians and voters believe about water, and hence for how water reforms are designed and whether they are sustained. This may explain why the consensus view among economists about how urban water supply should be managed has turned out to be very different from how it is managed in most countries.

Water's local and mysterious nature makes it hard for scholars to judge reforms. Comparative statistical studies, even those with panel data, fail to control adequately for the many local factors that affect water. For example, water systems facing capacity constraints, water systems relying on pumping water from wells, and water systems treating water from contaminated sources, will all be more costly than systems drawing ample supplies of relatively clean river water. Less densely populated, more extensive service areas will be more costly than densely populated, more compact service areas. Trends in costs and returns can be affected by such factors as a local drought, an increase in pollution or turbidity of raw water, or an increase or decrease in the locale's population size or density. Important institutional factors can also vary with location, such as local water regulation, municipal rules on zoning or construction, or local enforcement of laws against water theft.

Another problem for scholars is determining whether water tariffs in unmetered systems went up after privatization. The average water tariff in an unmetered system is calculated by dividing the utility's total sales revenues by a volume figure. Volume of

water delivered is calculated by subtracting an estimate of unaccounted-for-water (water lost to leaks, theft, and delivery to unbilled customers) from the amount of water pumped into the pipes by the treatment plant. Researchers doing cross country comparisons often don't know whether average prices are higher because water tariffs were increased, because the volume pumped declined thanks to fewer leaks, or because revenues were raised by better billing and collection and a crackdown on theft. They also may not know whether price increases were appropriate to cover the costs of operating and maintaining the system and to allow a return on investment, or alternatively, whether those costs were inflated by the inefficient operation of the system and prices should have been reduced, not increased. This is the sort of local detail that can be uncovered by a careful case study.

What sorts of institutions might mitigate the adverse effects of water systems' four characteristics? New Institutional Economics bridges the gap between institutional reality and economics wisdom, analyzing feasible remedies that may not be optimal, but are superior to any other feasible alternative (Williamson 1985). Consider each water characteristic in turn:

- **Water is essential.** Political sensitivities could be assuaged by an electoral system that allows voters to hold politicians accountable for assuring an affordable supply, contractual rules that protect consumers from abuses of monopoly power, and a regulatory framework that enforces contractual rules.
- **Water is local.** Conflicting local and national political interests could be mediated through a contract that allocates costs and benefits reasonably across

interest groups and a regulatory framework that is not subject to capture by any one party and is reasonably independent of short term political pressures.

- **Water is dull.** Despite the low dynamic gains in water and sanitation, investors could still be motivated to sink capital if the state can credibly commit to assure a low but reasonable return over a long period. This requires institutions that bind the hands of the political powers (on commitment see Levy and Spiller 1994, Weingast 1993). Also necessary is a contract that provides incentives, such as profits, for the operator to operate efficiently and expand to meet demand. It would also be helpful to have a regulatory framework that enforces at least some of the major contractual obligations but also allows some flexibility over time, but this can be tough in weaker institutional settings. Ideally there would also be the possibility of appeal to a politically neutral and independent legal system.
- **Water is mysterious.** The information problems in water could be reduced by investing in information prior to signing the contract, by metering water, and by setting rates through a transparent process.

To see how this might work in practice I turn to a case study of the Buenos Aires water and sanitation concession.

IV. The Buenos Aires Water Concession: Snatching Failure from the Jaws of Success

A 30-year concession for the Buenos Aires water and sanitation system was signed in December 1992 with a private consortium led by Lyonnaise des Eaux-Dumez (now Suez). Three groups bid on the concession and it was awarded to the group that offered the largest decrease in water tariffs. The winning bid from the Lyonnaise

consortium reduced tariffs by 26.9%. The contract required the winner, over the course of 30 years, to connect all of the population to water and 90% to sewerage; to treat 93% of all sewerage; to renovate the 45% of the water network; and to reduce unaccounted for water to 25% of water production.

The concession produced substantial benefits in its first five years as we can see in Table Two.

Table Two: Performance of the Buenos Aires Water and Sewerage Concession, 1992 to 1998

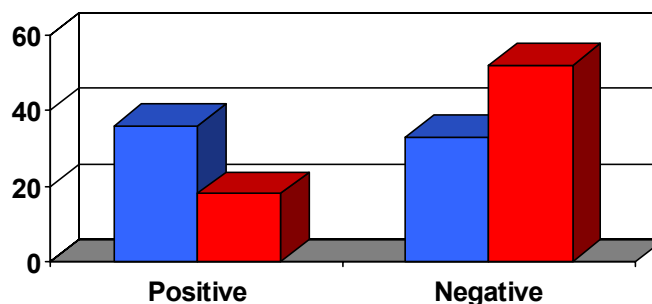
| | |
|-------------------------|--|
| Tariffs declined | By 26.9% in Dec. 1992 and stayed below pre-reform levels in real terms until 1998. |
| Access increased | To water by 1.5 million people, i.e. from 70% to 83% connected. To sewerage by 583, 000 people. |
| Welfare increased | By \$1.7 billion NPV in 1992 \$*. 80% of welfare gains went to consumers, about \$500 per connection (NPV in 1992 \$). |
| Worker welfare improved | Voluntary severance package with one years pay, no involuntary layoffs. Workers who remained with the company received shares and their welfare went up by an estimated \$11,000 per employee NPV in 1992 \$*. |
| Productivity improved | Workers per thousand connections dropped from 3.4 to 1.7. UFW dropped from 44% of production to 34%. |
| Service improved | Response time to water complaints dropped from 144 hours to 48 hours (by 1995); customers with acceptable levels of water pressure went from 17% to 54% (by 1996). |

*All welfare numbers calculated by comparing the net present value of gains from post reform trends to pre-reform trends projected over a ten year period.

Source: (Alcázar, et al. 2002).

Despite these gains the concession became increasingly unpopular, see Graph 1:

Public Opinion of the Buenos Aires Water & Sanitation Concession



Source: (Alcázar, et al. 2002).

The drastic devaluation of the Argentine peso in 2002 led to acrimonious disputes between the privately operated utility, Aguas Argentinas, and the government about tariffs and the terms of the concession, culminating in the cancellation of the concession in 2006. There is no way of knowing whether any reform could have survived such a wrenching change in circumstances or overcome a deep seated sense of injustice among lower income groups (see Shirley 2005). Nonetheless, it is plausible that the seeds of this outcome were sown in the initial design of the reform, which produced good economic outcomes but conformed poorly to the institutional and political circumstances in Argentina.

We can compare the institutions involved in the Buenos Aires concession with the kinds of institutions required to mitigate the adverse consequences of water's four characteristics. To summarize, these are the electoral system, the concession contract, the regulatory framework, and the legal system. Since the currency board also played a role in conferring credibility to government's commitment not to renege on commitments to foreign investors – at least in the medium term – I include it as well.

The Electoral System

The electoral system in Argentina provided little assurance to concerned water consumers that politicians could be held accountable and were representing their interests. For many years Argentina's politics had been so polarized between two parties, the Radicals and the Peronists, that structural reforms were impossible. That changed in 1989 when the severity of the hyperinflation and economic crisis, plus the fear of military intervention, led moderates in both parties to agree to compromise. The legislature

passed laws that allowed Carlos Menem to take office five months ahead of schedule, and to enact sweeping reforms by executive decree. Whereas his predecessor had issued only 10 decrees in his term, Menem issued 308 decrees from 1989 to 1993 alone (De Michele and Manzetti 1996). Menem's free market reforms came as a surprise to much of the electorate. Menem was the candidate of the successor to the populist Peronist Party (titled Justicialista), and he had run on a populist platform. He won the support of most of the unions and the poor, taking office with 47% of the votes. The suspension of political checks and balances, the special powers granted the president, the extensive use of executive decrees, and the differences between Menem's platform and his actions, meant that the reforms were the product of a powerful presidency and not the result of an institutionalized process to produce political compromise among competing interests. This threatened the perceived legitimacy and hence the sustainability of reforms like the water concession, especially when economic performance began to deteriorate and accusations of corruption arose.

The Concession Contract

The concession contract provided disproportionate benefits to one group of consumers versus another, fueling rather than mediating between conflicting local interests. Consumers already connected to the system, who were generally wealthier than those not connected, benefited from an almost 27% reduction in tariffs. Poorer consumers who were not connected benefited from getting connected, but they may not have valued the connection fully since many had wells and cesspools or some less expensive form of sanitation. Groundwater in unconnected areas was contaminated by the cesspools, and residents in these areas had higher rates of waterborne diseases, but

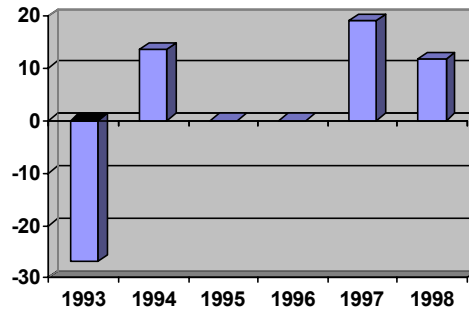
they were not well informed about their risks. They were required to connect and pay a connection charge, as well as an infrastructure charge to cover the cost of the expansion of the secondary network. The total amount was large, ranging from \$1,107 to \$1,528, which made it unaffordable to some poorer consumers (Alcázar, et al. 2002, p.85).

Aguas Argentinas gave customers only two years to pay these charges, which could be as much as 18% of household income in poorest sections of the city (Ibid.).

Many consumers refused to pay the charges. Local politicians representing the poorer areas of Buenos Aires mobilized opposition, arguing that the charges were unfair. The wealthier consumers who were already connected had not had to pay an infrastructure charge; those costs had been incorporated into the rate base for all consumers. Aguas Argentinas built up large arrears because of the non-payments, and partly because of this, the concession had to be renegotiated in 1997. The renegotiation replaced the infrastructure charge with a fee charged to all users, alienating those consumers who were already connected to the water system without winning allies among those new users who had lobbied for this outcome.

Buenos Aires consumers were already suspicious of any rate increases, since the concession had been bid on the basis of a rate reduction. Provisions in Argentina's constitution did not allow any prices to be indexed to the CPI, so instead the concession allowed Aguas Argentinas to petition for a rate increase whenever a composite cost index rose by more than 7 percent.⁷ As Graph 2 shows, this led to infrequent and lumpy price increases that were controversial with the regulator and the affected consumers.

⁷ The water rates are changed by taking the tariff paid by an individual consumer and multiplying it by a K factor. When the concession was won with a bid to reduce water rates by 26.9%, the K factor was 0.731.



Graph 2. Change in Buenos Aires Water and Sanitation Tariff Rates, %

Source: Alcázar et al. (2002). The 1997 increase includes the effects of the incorporation of the infrastructure charge into the rate base as a result of the renegotiation of the contract.

The concession contract also failed to provide incentives for Aguas Argentinas to deal equitably with different groups of unconnected customers. The tariff structure provided large cross subsidies between customers. A customer with a newer, more luxurious home could pay up to seven times more for water than a customer with an older, less luxurious home on a property of similar size (Alcázar, et al. 2002, p.81). The utility had an incentive to provide service first to customers who would pay more.

Information revelation was another weak point of the concession. The information available to bidders was so poor that the winning bidder used the first four pages of the bid document to describe the serious lack of reliable information (Alcázar, et al. 2002, p.77). The information deficiencies throw considerable doubt on the validity of the bids and the sustainability of the initial contractual obligations. Some in Argentina later argued that the company had accepted patently unreliable information in the expectation that it could renegotiate the tariff and its obligations later (Ibid., p.89). Regardless of the merits of this claim, the lack of reliable information increased the likelihood of renegotiation, with all its adverse consequences for public trust. The

concession contract was renegotiated after four years of operation, and, although this is better than the average time for water and sanitation concessions in Latin America, it still raised considerable public suspicion about the legitimacy of the concession.⁸

The tariff structure created information problems that hurt consumer confidence that their interests were protected. Aguas Argentinas was not required to meter residential connections and by 1998 only 14% of connections were metered. Non-metered, residential tariffs were set on the basis of five factors: where the property is located in the city, the total area of the property, the square meters of construction, the age of the construction, and the type of construction (six categories from low budget to luxury) (Alcázar, et al. 2002, p.78). The company could propose adjustments in all these factors. It could also propose to reclassify a customer from residential to non-residential: non-residential consumers paid about twice as much. This complex and obscure tariff structure left consumers with minimal information about their bills, and made it difficult for them to discover and protest changes by the utility. The lack of metering made it impossible for consumers to reduce their bill by reducing consumption. The tariff structure also made it difficult for the regulator to assess the utility's actions on tariffs. In one case the regulator arbitrarily disallowed the utility's reclassification of 80,000 users from residential to non-residential. Despite this denial, Aguas Argentinas was able to reclassify about 11% of residential customers as nonresidential and to recalculate the size of built areas for some 425,000 consumers during the first five years of the concession.

The Regulatory Framework

⁸ In 1994, one year after the contract was signed, there was an adjustment to the contract at the instigation of the directors representing the municipality of Buenos Aires as I describe later.

The regulatory framework for the Buenos Aires concession was poorly designed to overcome water's inherent institutional challenges. The regulatory agency was politicized by design. It had a six member board with two members each representing the presidency, the province of Buenos Aires, and the municipality; the presidency of the board rotated between them. Instead of mediating between local and national interests involved in decisions about water and sewerage, the board was often paralyzed by partisan disputes.⁹ The executive branch frequently intervened and bypassed the regulator or overturned its decisions, usually finding in favor of Aguas Argentinas. Regardless of the merits of these individual decisions, the net effect was to make consumers feel unprotected by the regulator and to reduce the credibility of the concession.

The concession was also ill designed for motivating investors to sink money into a capital-intensive system with relatively low returns spread over long periods. The politicization of the regulator's board threatened the credibility of the contract because directors could pressure the regulator to take politically motivated decisions. For example the municipality's representatives pressured Aguas Argentinas to provide water and sewerage to a new town so as to allow the Mayor to keep his promise to resettle a shantytown dislocated by a highway. The municipal directors asked Aguas Argentinas to connect a new town and the regulator provided Aguas Argentinas with a price increase to cover the additional costs (Alcázar, et al. 2002). The ability of Aguas Argentinas to bypass the regulator and appeal to the executive was also bad for the credibility of the concession in the longer term. It meant that government's adherence to its part of the

⁹ The Mayor of Buenos Aires was from the opposition party to Menem and the governor of the province was his chief rival in his own party.

bargain was not a matter of law, but depended on the shifting incentives of different presidents to defend the agreement.

The Legal System

The concession allowed the utility to appeal to the judiciary in the event of a conflict with the regulator. In principle, an appeals process strengthens a contract's credibility by allowing flexibility and by checking politically-motivated decisions by the regulator that violate the contract. In Argentina, however, the judicial institutions are themselves subject to partisan politics. Since 1946, when Peron impeached and replaced the four of the five supreme court justices, Argentine's courts have not acted as an effective check on the executive branch (Alston and Gallo 2005). Judges in Argentina oppose the executive only when they are political opponents of the current regime (Iaryczower, et al. 2000). Since Peron Argentina's president has used his power to remove opponents in the judiciary and replace them with allies (Ibid.). Menem followed this tradition by increasing the size of the Supreme Court in order to appoint his allies, and by appointing a large number of federal judges and state prosecutors. The partisan affiliation of the judiciary may have reassured investors in the short term, but left long term contracts such as the water concession vulnerable to the next legal reshuffling.

The Currency Board

Given such weak credibility one might wonder why any investor would be attracted to a long term contract in Argentina's water and sanitation sector. The Menem administration did create one powerful commitment device to reassure investors – a currency board that pegged the peso to the dollar and made inflation and devaluation very difficult. The increasing dollarization and openness of the economy following the

currency board made it more and more costly for any Argentine government to devalue the currency or to renege on its obligations to foreign investors. Costly, but not impossible. The credibility of the currency board as a commitment device was reduced by Argentina's political institutions, which were not compatible with a fixed exchange rate. As Spiller and Tomassi describe, the Argentine constitution gives the provinces' strong claims on the treasury and no incentive towards fiscal responsibility (Spiller and Tommasi 2000). Moreover, Argentina's electoral institutions give provincial party bosses considerable power over whether federal legislators are re-nominated and reelected. Most legislators serve single, four-year terms, giving them little incentive to care about the long term implications of policy decisions (Jones, et al. 2000). Although the credibility of the currency board was not in question during the first five years, its longer term sustainability was not secure.

A More Sustainable Design?

Could the Buenos Aires water and sanitation concession been designed to fit better with the Argentina's political and institutional framework for water? This analysis suggests several possible ways to adjust the concession design.¹⁰ To summarize:

1. Award the concession on the basis of some criteria other than water rates.
2. Acquire better information before bidding the concession.
3. Require metering and introduce transparent simple tariffs, replacing cross subsidies with some form of direct assistance.
4. Increase tariffs only gradually and enough to cover the costs of a hypothetical efficient operator.

¹⁰ I discuss some of these options in another paper (Shirley 2005).

5. Spread the costs of the secondary network across all users or require the utility to provide longer financing terms for poorer consumers.
6. Appoint a prominent, highly regarded, and politically neutral individual to head the regulatory body and chair the board; allow only one representative of each political jurisdiction; and add industry and consumer representatives to the board.
7. Create an independent, politically neutral appeals process, perhaps an arbitration panel agreed by the utility and the regulator in advance of any disputes.

These recommendations could be seen as the product of 20:20 hindsight, but many of the problems and possible solutions were known to those who designed the concession (according to field interviews cited in Alcázar, et al. 2002). Reformers did not incorporate these changes into the contract because they felt they had a very short political window in which to implement the concession, and because they believed that an economically sound design would lead to benefits that would secure the sustainability of the concession despite its flaws. As we have seen, that assumption, which is not uncommon among economists, was proved to be wrong.

V. What We Need to Know

One important unanswered question is: what has been the outcome of reform efforts to date? As we have seen, the statistical studies of this are few, contradictory, and suffer from a lack of information on the local determinants of outcomes. Most have examined cost or productivity; there is only one study comparing access to supply; and only one study comparing health effects. Very few serious studies have examined prices, affordability, profitability. A number of flawed and polemical studies have emerged instead. These studies make a number of errors: they compare performance across

systems without any controls for differences in initial conditions or local circumstances; they measure price increases in nominal terms and make no reference to costs; they compare performance to initial targets and ignore renegotiations of the targets; and they make unsubstantiated claims about affordability, scarcity, and profits. One priority is case studies that carefully measure performance of reformed systems against a realistic counterfactual.

Cross city or cross country statistical analyses could be very informative if they properly control for local determinants and endogeneity. For example, the cross-municipality study of the effects of water privatizations on child mortality from water borne diseases by Galiani et al. has a dependent variable – child mortality – that is less affected by local, non-ownership factors than the cost or productivity variables used in other studies. In addition the study uses several measurement techniques to allow for heterogeneity across municipalities and to control for endogeneity. The study uses a matching method to pair privatized municipalities with non-privatized municipalities with similar attributes; it uses panel data to control for the trends in child mortality independent of water system privatization; it analyzes the determinants of whether and why a municipality privatized its water and sanitation system to rule out reverse causality; and it checks that privatization's effect on child mortality is from a reduction in water born diseases and is uncorrelated with deaths from causes unrelated to water supply, such as accidents.

Once outcomes are measured, the next important question is: what determined the outcomes? An advantage of case studies is that they can capture the role of institutional and political factors in reform outcomes. Cases can measure the performance of a

reformed system against a realistic counterfactual that controls for the local factors that matter so much in water supply. Case studies could also compare reforms with previous efforts and their outcomes.

There are other unanswered questions that require new analytical approaches. One question is, what are the possibilities for competition? Economists could map locales with different raw water sources where competition might be feasible, and experiments could be tried with cooperating investors and local governments. Another question is, are there possibilities for technological developments to have more impact on the organization of water supply? Further declines in desalination costs may open the way for competition in locales where that was not previously feasible. Reductions in the cost of meters and systems to allow remote meter reading may make widespread metering more affordable.

An earlier analysis of cases concluded that reforms were more politically feasible where raw water costs were low and rates of exploitation were sustainable (Shirley and Menard 2002). A map of locales where such conditions prevail would help determine where initial reform efforts might be concentrated.

References

- Alcázar, Lorena, Manuel A. Abdala, and Mary M. Shirley. 2002. "The Buenos Aires Water Concession," in *Thirsting for Efficiency: The Economics and Politics of Urban Water System Reform*. Mary M. Shirley ed. Oxford: Elsevier Science Ltd., pp. 64-102.
- Alston, Lee and Andres A. Gallo. 2005. "The Erosion of Checks and Balances in Argentina and the Rise of Populism in Argentina: An Explanation for Argentina'S Economic Slide from the Top Ten." Institute for Behavioral Science, Research Program on Political and Economic Change, University of Colorado at Boulder, Working Paper PEC2005-0001. <http://www.colorado.edu/ibs/pubs/pec/pec2005-0001.pdf>; Boulder, CO.
- Armstrong, Mark, Simon Cowan, and John Vickers. 1994. *Regulatory Reform : Economic Analysis and British Experience*. Cambridge, Mass.: MIT Press.
- Bitran, Gabriel A. and Eduardo O. Valenzeula. 2003. "Water Services in Chile: Comparing Private and Public Performance." Public Policy for the Private Sector: Washington, D.C.
- Boland, John J. 2004. "Perspective Paper 9.1," in *Global Curses, Global Solutions*. Bjorn Lomborg ed. Cambridge, UK: Cambridge University Press, pp. 528-34.
- Boland, John J. and Dale Whittington. 2000. "The Political Economy of Water Tariff Design in Developing Countries: Increasing Block Tariffs Versus Uniform Price with Rebate," in *The Political Economy of Water Pricing Reforms*. Ariel Dinar ed. London: Oxford University Press.
- Clarke, George R.G., Katrina Kosec, and Scott Wallsten. 2004. "Has Private Participation in Water and Sewerage Improved Coverage? Empirical Evidence from Latin America." World Bank Policy Research Working Paper 3445: Washington, D.C.
- De Michele, Roberto and Luigi Manzetti. 1996. "Legal Security and Market Reforms: The Case of Argentina." University of Maryland at College Park: Judicial Security and Markets Working Paper.
- Esry, Steven A. 1996. "Water, Waste, and Well-Being: A Multicountry Study." *American Journal of Epidemiology*, 143, pp. 608-23.
- Estache, Antonio and Ana Goicoechea. 2005. "How Widespread Were Private Investment and Regulatory Reform in Infrastructure Utilities During the 1990's?" The World Bank Policy Research Working Paper 3595: Washington, D.C.

- Estache, Antonio and Ana Goicoechea. 2005. "How Widespread Were Private Investment and Regulatory Reform in Infrastructure Utilities During the 1990s?" The World Bank, Policy Research Working Paper 3595: Washington, D.C.
- Estache, Antonio, Sergio Perelman, and Lourdes Trujillo. 2005. "Infrastructure Performance and Reform in Developing and Transitional Countries: Evidence from a Survey of Productivity Measures." World Bank Policy Research Working Paper 3514: Washington, D.C.
- Galiani, Sebastian, Paul Gertler, and Ernesto Schargrotsky. 2002. "Water for Life: The Impact of the Privatization of Water Services on Child Mortality."
- Guasch, J. Luis. 2004. *Granting and Renegotiating Infrastructure Concessions. Doing It Right*. Washington, D.C.: The World Bank Institute.
- _____. 2006. "The Infrastructure Challenge: Increasing Investments and Better Performance: Contracting out and Concessions." <http://www.ub.es/graap/concession-fundacion%20del%20pino-6-06%20WORKSHOP.ppt>: Microsoft Power Point Presentation to Fundacion del Pino Workshop on Government Restructuring: Privatization, Regulation and Competition, June 29, 2006.
- Iaryczower, Matias, Pablo T. Spiller, and Mariano Tommasi. 2000. "Judicial Decision Making in Unstable Environments, Argentina, 1935-1998." Presented at the annual meetings of the International Society for New Institutional Economics, Tübingen, Germany, September 2000.
- Izaguirre, Ada and Catherine Hunt. 2005. "Private Water Projects." The World Bank, Private Sector Development Viewpoint Note 297, <http://rru.worldbank.org/pubpolicyjournal>: Washington, D.C.
- Jones, Mark P., Sebastian Saiegh, Pablo T. Spiller, and Mariano Tommasi. 2000. "Professional Politicians-Amateur Legislators: The Argentine Congress in the 20th Century." Presented at the annual meetings of the International Society for New Institutional Economics, Tübingen, Germany, September 22-24, 2000.
- Joskow, Paul L. 2000. *Economic Regulation*. Cheltenham, UK and Northampton, MA, US: Edward Elgar Publishing.
- Laffont, Jean-Jacques and Jean Tirole. 1993. *A Theory of Incentives in Procurement and Regulation*. Cambridge, Mass.: MIT Press.
- Levy, Brian and Pablo T. Spiller. 1994. *Regulations, Institutions, and Commitment : Comparative Studies of Telecommunications*. Cambridge ; New York: Cambridge University Press.

- Menard, Claude. 2006. "Redesigning Public Utilities: The Key Role of Microinstitutions." draft working paper.
- Menard, Claude and George R.G. Clarke. 2002. "A Transitory Regime: Water Supply in Conakry, Guinea," in *Thirsting for Efficiency: The Economics and Politics of Urban Water Sector Reform*. Shirley Mary M. ed. Oxford: Elsevier Science.
- Mulreamy, John P., Sule Calikoglu, Sonia Ruiz, and Jason W. Sapsin. 2006. "Water Privatization and Public Health in Latin America." *Pan American Journal of Public Health*. <http://journal.paho.org/>, 19:1, pp. 23-32.
- Munasinghe, Mohan. 1992. *Water Supply and Environmental Management. Developing World Applications*. Boulder, CO: Westview Press.
- Noll, Roger. 2002. "The Economics of Urban Water Systems," in *Thirsting for Efficiency: The Economics and Politics of Urban Water System Reform*. Shirley Mary M. ed. Oxford, UK: Elsevier Science B.V., pp. 43-63.
- Noll, Roger, Mary M. Shirley, and Simon Cowan. 2000. "Reforming Urban Water Systems in Developing Countries," in *Economic Policy Reform: The Second Stage*. Anne O. Krueger ed.
- Rijsberman, Frank. 2004. "Sanitation and Access to Clean Water," in *Global Curses, Global Solutions*. Bjorn Lomborg ed. Cambridge, UK: Cambridge University Press, pp. 498-527.
- Roth, Gabriel. 1987. *The Private Provision of Public Services in Developing Countries*. New York: Oxford University Press.
- Shirley, Mary M. ed. 2002. *Thirsting for Efficiency: The Economics and Politics of Urban Water System Reform*. Oxford: Elsevier Science.
- _____. 2005. "Why Is Sector Reform So Unpopular in Latin America?" *The Independent Review*, 10:5, pp. 195-207.
- Shirley, Mary M. and Claude Menard. 2002. "Cities Awash: A Synthesis of the Country Cases," in *Thirsting for Efficiency: The Economics and Politics of Urban Water System Reform*. Shirley Mary M. ed. Oxford, UK: Elsevier Science B.V.
- Spiller, Pablo T. and Mariano Tommasi. 2000. "The Institutional Foundations of Public Policy: A Transactions Approach with Application to Argentina." Presented at the annual meetings of the International Society for New Institutional Economics, Tübingen, Germany, September 22-24, 2000.
- UN Millennium Project. 2005. *Health, Dignity, and Development: What Will It Take?* New York: United Nations Millennium Project.

US Government, Centers for Disease Control. 1995. "Epidemic Cholera in the New World: Translating Field Epidemiology into New Prevention Strategies." EID Volume 1, #4, October - December 1995, <http://www.cdc.gov/ncidod/eid/vol1no4/tauxe.htm>.

Weingast, Barry R. 1993. "Constitutions as Governance Structures: The Political Foundations of Secure Markets." *Journal of Institutional and Theoretical Economics (JITE)*, 149:1, pp. 286-311.

Williamson, Oliver E. 1985. *The Economic Institutions of Capitalism*. New York: The Free Press.

Zhou, Yuan and Richard S. J. Tol. 2003. "Implications of Desalination to Water Resources in China - an Economic Perspective." Research Unit Sustainability and Global Change, Center for Marine and Climate Research, Center for Marine and Climate Research, Hamburg University Working Paper FNU-22: Hamburg, Germany.