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A Typology of Consumer Utility Subsidies

Consumer utility subsidies, as defined in this book, are subsidies that result in some or all residential consumers paying less than the cost of the electricity, water, or sanitation services that they receive. Consumer utility subsidies can be distinguished from subsidies to utilities (fiscal transfers, guarantees, concessional credit), which are treated here as a potential mechanism for funding consumer subsidies. Although it is convenient to refer to consumer utility subsidies as a general label, in practice there is an enormous variety in the forms that such subsidies can take. Such differences matter, because the details of the subsidy design ultimately determine the targeting performance of the subsidy. With a view to establishing an adequate terminology for distinguishing between different variants of subsidies, this chapter lays out a general taxonomy of consumer utility subsidies and discusses their prevalence.

What Types of Consumer Utility Subsidies Exist?

Table 2.1 presents a general typology of consumer utility subsidies. Few subsidy programs fit perfectly into any one category in this typology. Most existing subsidy mechanisms combine a number of the elements in the table. Nonetheless, the typology helps illustrate two important ways in which subsidy models differ from one another, each of which is the result of a policy decision made in the process of designing the subsidy. The two dimensions of subsidy design are consumption versus connection subsidies, and targeted versus untargeted subsidies.

Subsidies May Facilitate Connection or Consumption

A distinguishing feature of subsidies is whether they seek to reduce the cost of consumption or the cost of connecting to the network. Consumption subsidies help make service less expensive to existing utility customers on a continuing basis. Consumption subsidies may be provided to all those with private household connections. Some consumption subsidy models,

Table 2.1 Typology of Consumer Utility Subsidies

		Targeted subsidies			
			Explicit targeting		
	Untargeted subsidies	*Implicit targeting*	*Self-selection: quantity targeting (See chapter 5)*	*Self-selection: service-level targeting (See chapter 6)*	*Administrative selection (See chapter 6)*
Consumption subsidies	*Across-the-board price subsidies* ⇒ all consumers *Charging for variable but not fixed costs* ⇒ all consumers	*Low collection rate with no disconnection policy* ⇒ all consumers who do not pay their bills *Illegal connections* ⇒ those with illegal connections *Flat fees for unmetered connections* ⇒ high-volume consumers with unmetered connections *Combined water and sewer tariffs* ⇒ households with water and sewer connections *Single volumetric charge* (when costs vary by customer or time of use) ⇒ high-cost customers	*Increasing block tariffs* ⇒ low-volume consumers with meters *Volume-differentiated tariffs* ⇒ households with metered private connections who consume less than x units per month	*Free water at public water taps* ⇒ households using public taps *Low rates for low-voltage electricity service* ⇒ households with connections to low-voltage electricity services	*Geographically differentiated tariff* ⇒ customers who live in certain areas *"Social tariffs"* ⇒ customers classified as poor *Merit discounts and discounts for pensioners* ⇒ qualifying customers *Burden limit cash transfers* ⇒ households whose utility bills and housing expenditure exceed a defined burden limit
Connection subsidies (*See chapter 7*)	*No connection fee* ⇒ all new customers *Subsidized interest rate for financing connections* ⇒ all new customers	*Flat connection fee* ⇒ new customers who are more costly than average to connect		*Reduced connection fee for households providing labor or materials* ⇒ households that choose to provide labor *Reduced connection fee for lower service level* ⇒ households that chose this service level	*"Social connections"* ⇒ households classified as poor

Source: Authors' elaboration.

however, deliver subsidies only to metered customers or only to users of a communal form or lower level of service (for example, public water taps or low-voltage electricity). Consumption subsidies may operate through the tariff structure (as a reduction in the price faced by all or some households), may appear as a percentage discount applied to customer bills, or may take the form of a cash transfer to reimburse households for utility expenditures. The defining feature of consumption subsidies is that they are available only to current utility customers.

Connection subsidies, by contrast, are available only to unconnected households, which are households that are not currently utility customers. Connection subsidies are one-time subsidies that reduce or eliminate the price that customers pay to connect to the system.

Subsidies May Be Targeted or Untargeted

Connection and consumption subsidies may be targeted or untargeted. Untargeted subsidies occur when there is general underpricing of utility services, such as when certain costs are not passed on to customers. By contrast, targeted subsidies benefit only a subgroup of utility customers. In practice, targeted and untargeted subsidies are often combined: there may be an across-the-board price subsidy for all customers, but some customers may be targeted to receive greater discounts than others.

Within the category of targeted subsidies, a distinction can be made between those that rely on implicit targeting and those that rely on explicit targeting. Explicit targeting represents a conscious attempt to reduce the cost of service or the cost of connection for customers with a particular characteristic (for example, poor households, households in informal settlements, or households that use little electricity). By contrast, implicit targeting is the unintentional result of common pricing practices of utilities.

The most basic form of implicit targeting arises from charging one flat connection fee or one flat monthly service fee to all households for water supply or electricity service. Some households are inevitably more expensive to connect because they are farther from the network, or they are more expensive to serve because they consume more electricity or water than other households. Flat fees subsidize those expensive-to-serve customers, relative to those who are inexpensive to serve. When water and electricity connections are not metered, this form of implicit targeting is unavoidable. It is difficult to know the exact cost that a particular unmetered customer imposes on the system, so it is not possible to charge full cost to each customer. In the case of connection fees, it is possible to avoid implicit targeting of subsidies—each customer could be charged the exact cost of his or her connection—but making this calculation for each new customer imposes a significant administrative burden on the utility. In practice, many utilities prefer to use a flat connection fee, which will overcharge some new customers and undercharge others.

Implicit targeting does not arise only from flat fees. Even when connections are metered and all customers pay the same unit prices, some customers may be paying more than the cost they impose on the system, and others may have their service subsidized. In the case of electricity service, for example, failure to differentiate between peak and off-peak demand in the tariff subsidizes those consumers with heavy peak-period demand. A common example of implicit targeting in the water supply and sanitation sector is the practice of charging one combined tariff for water supply and sewer service. Where not all households have both water and sewer connections (which is usually the case in developing countries), those combined tariffs lead to subsidies for households with sewer connections. Low collection rates (with no disconnection for nonpayment) and tolerance of illegal connections are two other practices that lead to implicit targeting of subsidies, because, in practice, customers who pay for the service they receive subsidize those who do not pay.

The value of the subsidies that arise through implicit targeting can be quite substantial, making them worthy of inclusion in a study of the distributional incidence of utility subsidies. One might expect, for example, that the subsidy provided to those with illegal connections would be a well-targeted subsidy because illegal connections are very common in informal settlements. Likewise, the subsidies to sewer users, which arise from the practice of charging one combined price for water and sewer service, would probably be regressive in most cases: wealthy households are more likely than poor households to have sewer connections. Unfortunately, it is very difficult, in practice, to measure the distributional incidence of implicit subsidies precisely because the costs that different consumers impose on the system are not known. For example, the most common forms of implicit targeting arise in situations where the quantity of water or electricity used by subsidy beneficiaries is not known (for example, unmetered or illegal connections). Because of this practical limitation in available data, it was generally not possible to study implicit subsidies in detail in this book.

The focus of the book is instead on explicit targeted subsidies. Explicit targeting involves an intentional policy to charge some consumers more and other consumers less for the same service. When policy makers debate the benefits and costs of consumer utility subsidies, they are usually talking about explicit targeted subsidies.

There Are Several Approaches to Explicit Targeting

Various forms of explicit targeting exist, as table 2.1 shows. One approach is administrative selection: the government or the utility decides which consumers will receive the subsidy. The administrative decision could be to subsidize all customers in a particularly deserving group, such as pensioners or veterans (categorical targeting), all residential customers living in a certain region or neighborhood (geographic targeting), or all households that are determined to be or thought to be poor (targeting through means testing or proxy means testing).

Self-targeting can be an alternative or a complement to administrative selection. On one level, all consumer utility subsidies are self-targeted: to the extent that households choose whether or not to be utility customers, they play an important role in determining whether they are eligible for consumer utility subsidies. In the subsidy models identified as self-targeted in table 2.1, however, households play an even larger role in determining whether they receive a subsidy and how large that subsidy is. In such cases, subsidies are allocated to some households on the basis of how much water or electricity they consume (quantity targeting—see box 2.1) or of what level or type of utility service they use (service-level targeting). Quantity-targeted subsidies, such as increasing block tariffs, are the most widely used type of consumer utility subsidy.

Why Target Subsidies?

Targeting subsidies to the poor has three potential benefits. First, targeting has the potential to lower the subsidy budget or the cost of providing the subsidy. If only some households receive the subsidy, the amount of revenue the utility needs to obtain through cross-subsidies or from some external source to fund the subsidies it provides is reduced. Second, targeting means a greater potential impact on poor households for a given subsidy budget, because such targeting should allow a larger proportion of the total subsidy budget to benefit the poor. Third, subsidies that are targeted to fewer households have the potential to cause fewer distortions in consumption decisions than untargeted or poorly targeted subsidies (but are still more distorting than no subsidies at all).

Targeting does have its costs, however. Four generic costs are often cited (Sen 1995; Subbarao and others 1997). First, targeting programs may receive little political support and thus may run the risk of being eliminated. In the case of utility subsidies, there would likely be more support for a broad-based subsidy that protected all customers from potential tariff increases than for a narrowly targeted subsidy that provided such protection only to low-income households. Second, when benefits are targeted only to the poor, poor households may choose not to take advantage of the benefits because of the stigma associated with being categorized as needy. Third, administrative costs are associated with targeting, both for the agencies in charge of the targeted program and for the households receiving the targeted benefit. It is administratively more difficult to limit who receives a benefit than to provide the benefit to all. If households have to apply for or be

Box 2.1 Quantity-Targeted Subsidies in Tariff Structures

There are two basic types of tariffs that incorporate quantity targeting. One is a block tariff and may be either an increasing block tariff (IBT) or a decreasing block tariff (DBT). The second is a volume-differentiated tariff (VDT).

A block tariff is a stepped tariff in which a different price per unit is charged for different blocks of consumption. In the case of an IBT, the price charged rises with each successive consumption block, while in the case of a DBT, the price charged falls with each successive consumption block. A specific example of an IBT would be a tariff under which households were charged US$0.10 per cubic meter for the first 10 cubic meters of water consumed, then US$0.20 per cubic meter for any additional units of water used during the billing period. If US$0.20 represents the average cost of water service, then this IBT provides a subsidy to all customers for the first 10 cubic meters of water they use each month.

A VDT uses quantity targeting in a different way. It could take the form of two different tariffs, for example, a flat rate of US$0.10 per cubic meter and a flat rate of US$0.20 per cubic meter. Customers consuming less than 10 cubic meters would have their bills calculated on the basis of the first price. For customers consuming more than 10 cubic meters, the second tariff would be applied. The higher-volume customers would be charged US$0.20 for all units of water consumed, including the first 10. Unlike the IBT, the VDT does not provide any subsidy to the households that consume more than 10 cubic meters a month. This tariff is sometimes referred to as a tariff with a "disappearing first block."

A common misconception about quantity-targeted tariff structures is that they somehow seek to represent the underlying cost structure for the relevant services, which is generally not, in fact, the case. For the water sector, the marginal cost is determined by the total consumption in the system, not the amount consumed by each customer. A water user does not impose an increasingly high cost on the system with each unit of water consumed. For the electricity sector, it is a customer's load profile rather than the total volume of consumption that primarily affects his or her contribution to system costs. In this sense, quantity-based tariff structures merely represent alternative ways of allocating system costs across customers to meet cost recovery or social objectives. They cannot be justified in terms of reflecting underlying economic costs. The exception would be a case in which quantity consumed was correlated with another factor that drives the cost a user imposes on the system, such as a correlation between quantity consumed and the load profile of a customer (that is, time of day or seasonal usage patterns).

screened for subsidies, they incur real private costs (time, transport, etc.) in doing so. Finally, incentive costs arise if households change their behavior—or even falsify their status—in order to qualify for the subsidy.

How Are Subsidies Funded?

How to fund subsidies is another decision that must be made in the process of designing a subsidy program. Subsidies may come directly from the government, may be funded by other customers, or may not be funded at all.

Government-funded subsidies can be delivered in a variety of ways. Governments may transfer the subsidies directly as a cash payment to the beneficiary household, as is the case with the burden limit subsidies common in the countries of the former Soviet Union. Alternatively, the government may make a cash payment to the utility against proof that a subsidy was provided to a specific consumer, as is the case in the Chilean water supply sector. Such payments are the cleanest approaches to funding subsidies with government transfers, because the money flows directly to the intended beneficiary.

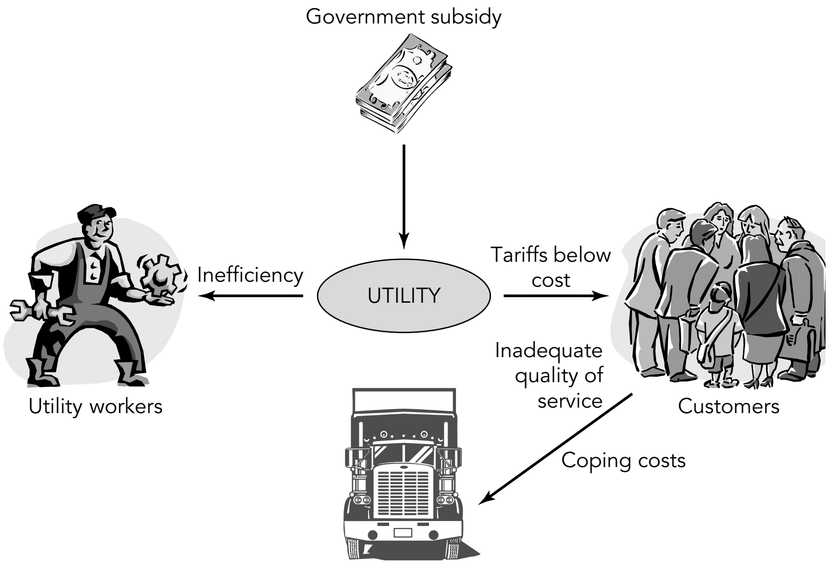
A more common approach to channeling government funding for utility subsidies is for the utility to receive general financial support (grants, tax exemptions, guaranteed low prices for inputs, loan guarantees, support for research and development, etc.) and then to make subsidy allocation decisions. The government provides the financial support to the utility, and the utility is expected to pass this benefit on in the form of lower prices to customers in general or to some particular privileged customer group. An alternative approach is for utilities to incur losses by providing subsidies to consumers and then to be reimbursed by the government. This arrangement is often unplanned, as when governments assume the debt obligations of utilities that are in bad financial shape.

Each approach carries the risk that the government will fail to deliver the promised resources. This risk is borne directly by the customer in the case of burden limit subsidies and directly by the utility in the other options considered, and the risk is particularly high in the case of unplanned subsidies to the utility. Where governments fail to deliver subsidies, utilities may end up in an unfunded subsidy situation. Unusually, the Chilean water subsidy program addresses this problem by allowing utilities to stop providing subsidies to consumers if the utilities are not adequately reimbursed by the government. Because such a move would be politically unpopular, this requirement provides strong incentives for government officials to ensure that it does not happen.

In the case of government financial support for utilities, consumers face an additional risk that resources transferred by the government to the utility will be absorbed in the form of inefficiency and will fail to filter through in the form of lower prices. Where utilities rely on state transfers, utility managers experience a soft budget constraint that undermines incentives to manage resources efficiently, because higher costs may be accommodated by larger state transfers. Utility managers may have significant power in budget negotiations because of the potential threat of service interruptions if adequate financing is not forthcoming. In such situations, subsidies may effectively be captured by utility employees and contractors in the form of excess costs, rather than being transferred to customers in the form of lower prices.

For example, in the case of the Hyderabad Municipal Water Supply and Sewerage Board, it was estimated that about 40 percent of the annual subsidy transfer from the state government in 2001 was absorbed by utility employees in the form of excess labor costs (Foster and Homman 2001). The remaining 60 percent of the subsidy benefited consumers in the form of utility tariffs that were below the true costs of efficient service provision. Nevertheless, the unreliability of government funds led to underfinancing of maintenance and capital programs, so that the utility was able to provide water for only a couple of hours every other day. Consumers spent a sum equivalent to about half of the subsidy they received on storage systems and tanker water so they could cope with intermittent service (figure 2.1).

Figure 2.1 Who Ultimately Captures Government-Funded Subsidies to Utilities?



Source: Foster and Homman 2001.

Subsidies for capital projects are another common form of government support for utility operations. Like the fiscal transfers and other financial support for utilities, capital subsidies have the potential to lower the utility's costs (and thus lower prices) or to avoid burdening customers with the cost increases associated with improved service levels. Capital subsidies are unique among government-funded subsidies, however, in that the choice of the capital project (not just the utility's decision about how to allocate the cost savings across customers) has an effect on the distributional incidence of the subsidy. For example, capital projects that lead to service expansions will benefit unconnected customers, whereas capital projects aimed at improving the reliability of service will benefit only existing customers.

It is sometimes argued that financing subsidies from government funds is desirable because it avoids distortions in utility price structures. While this is true, it overlooks the fact that raising taxation revenue can also introduce important distortions into the economy as a whole—for example, by diluting incentives to work or to save, or by reducing consumer spending. Empirical studies suggest that this cost of public funds can actually be quite high. It has been estimated that in the United States each dollar of public funds that is raised has an opportunity cost of US$1.30 of private consumption (Ballard and others 1985), while more recent estimates for 38 African countries find an average opportunity cost of US$1.17 for each dollar of tax revenue raised (Warlters and Auriol 2005).

A politically attractive alternative to funding subsidies with government funds is to rely on *cross-subsidies* generated within the utility. Revenue earned in excess of costs from some customers or in one part of the utility's business is used to offset losses created by the subsidy programs. Cross-subsidization may take many forms. The two most common forms of this practice are for industrial customers to pay prices in excess of costs to subsidize residential consumption, and for high-volume consumers within the residential customer class to subsidize low-volume users. There are other types of cross-subsidies. Existing customers may subsidize the expansion of the water supply network into unserved areas. Depending on how the fixed costs of electricity service are allocated, high-density areas might subsidize low-density areas. In multiservice utilities, surcharges on one service can be used to keep prices low for another service. In Ecuador, for example, a surcharge on telecommunications is used to fund investments for water utilities. In Gabon, the national water and electric utility uses profits from urban electricity supply to subsidize water and electricity service in small towns and rural areas. Thus, even though the water business generates only 15 percent of the utility's total revenues, it accounts for 60 percent of the overall investment plan (ERM 2002; Tremolet 2002).

Cross-subsidies are popular because they appear to permit utilities to achieve cost recovery without relying on central government transfers. Cross-subsidies are not without their own risks, however. Achieving cost recovery by using cross-subsidies requires having the right balance between subsidy recipients and cross-subsidizers; otherwise, the utility will not be able to recoup the revenue lost through subsidy provision. Because consumers react to the price distortions entailed by establishing a cross-subsidy mechanism, this balance is hard to predict and sustain over time.

In some situations, reaching a balance is simply not possible because of the socioeconomic composition of the customer base. For example, this is the case where there are simply not enough industrial consumers or enough high-income, high-consumption residential consumers to compensate for the mass of low-income consumers who are thought to be deserving of subsidization. In general, industrial customers account for 10 to 15 percent of water utility revenues and 40 to 60 percent of electric utility revenues. For example, in Colombia, only 15 percent of water customers are net contributors to the national cross-subsidy scheme, compared with 55 percent of electricity customers, because of greater industrial demand for power than for water supply (World Bank 2004a).

This more favorable balance between industrial and residential customers makes electricity appear to be a more promising sector for applying this type of cross-subsidy. However, growing liberalization of electricity markets for larger industrial customers has at the same time made such cross-subsidization increasingly difficult to sustain. By contrast, in the water supply sector, which remains a monopoly, industrial customers are more exposed to this type of policy. Nevertheless, even in the water supply sector, industrial customers still have the option of reacting to cross-subsidization by disconnecting themselves from the public network and by arranging their own private supply of water, or perhaps by relocating to a different service area.

This option can lead to a vicious circle in which the shrinking base of subsidizing customers leads to even more punitive prices on the remaining cross-subsidizers, which further accelerates the contraction of the customer base. This situation arose in Côte d'Ivoire during the 1980s, when a policy of free water connections for urban and rural customers was funded by imposing hefty surcharges on a few hundred industrial customers. Although the scheme was initially successful in expanding access, it ultimately collapsed as industrial customers exited from the public network (Lauria and Hopkins 2004). For this reason, having a sense of the price elasticity of demand of both the subsidized customers and the cross-subsidizers is a critical step in designing any tariff that relies on cross-subsidies.

Much of the empirical evidence regarding price elasticity of demand in different cases indicates that industrial customers may be more price sensitive on average than residential customers (table 2.2). Where this is so, high markups on industrial customers may ultimately be counterproductive, so that cross-subsidy schemes predicated on cross-subsidies from industrial customers

Table 2.2 Summary of Evidence on Price and Income Elasticity

	Price elasticity			*Income elasticity*		
Sector and customer class	*Median (number of observations)*	*Mean*	*Standard deviation*	*Median (number of observations)*	*Mean*	*Standard deviation*
Electricity						
Residential	−0.32 (57)	−0.39	0.25	0.28 (38)	0.47	0.45
Industrial	−0.42 (10)	−0.42	0.20	n.a.	n.a.	n.a.
Water						
Residential	−0.38 (155)	−0.38	0.22	0.35 (69)	0.36	0.22
Industrial	−0.54 (17)	−0.54	0.32	n.a.	n.a.	n.a.

Source: Authors' elaboration based on a survey of published studies.

Note: Residential values for electricity are based on data from 31 countries and 57 separate estimates of elasticities. Residential values for water are based on data from 18 countries and 155 separate estimates of elasticities.
n.a. = not applicable.

may be on shaky financial ground. The burden placed on cross-subsidizers can be minimized (and the financial stability of cross-subsidy mechanisms thus improved) by funding cross-subsidies across a relatively broad customer base and by keeping the associated surcharge as low as possible.

When transfers or cross-subsidies fail to fully cover the financial losses associated with subsidizing consumers, consumer utility subsidies are termed *unfunded subsidies*. Loss-making utilities are forced to reduce expenditures on system expansion, maintenance, or asset renewal when their budgets run short. Such cutbacks have serious long-run effects on the quality of service and on the ability of the utility to meet demand growth. The lower the quality and reliability of service, the less valuable the service is to households and the higher are the coping costs they face. Households are forced to turn to alternative fuels or to alternative water sources in times of outages, to filter or boil water, to buy water storage containers, and to find ways to protect appliances against power surges.

The Funding Mechanism Affects the Net Distributional Incidence of Subsidies

It is important to note that only a subgroup of the general public ultimately pays for utility subsidies, whether in the form of higher taxes, higher utility prices, or deteriorating utility service. The distribution of costs across society may differ substantially according to how taxes are raised, how cross-subsidies are structured, and how service restrictions are allocated across the population. Thus, funding mechanisms can play important roles in determining the distribution of the net benefits of the subsidy.

For example, if all nonpoor households were cross-subsidizers and if all poor households received the subsidy, then a cross-subsidy structure would increase the progressivity of the subsidy. If, however, some poor households become cross-subsidizers, the cross-subsidy structure could work against the objective of targeting benefits to the poor. The same is true for subsidies funded from general tax revenue or from property taxes. If the tax system is progressive, then the funding mechanism will improve targeting of the poor. A regressive tax system, however, can have the opposite impact—any benefits that poor households receive from their utility subsidy may be lost through general taxation. Unfunded subsidies transfer the subsidy burden to future generations of utility consumers or taxpayers who will be responsible for repairing run-down systems.

Measuring the net benefit of a subsidy to a particular household (the subsidy received minus the contribution to the subsidy pool) is very difficult, in practice, because information on contributions to the subsidy pool is rarely available. In most of this book, the focus is on the distribution of the utility subsidies themselves, but where possible the impact of the funding mechanism on the distribution of subsidy benefits is also examined.

How Prevalent Are Different Types of Subsidies?

Little systematic information is available about the prevalence of untargeted subsidies, implicit targeted subsidies, and explicit targeted subsidies in water supply and electricity sectors around the world. This is due in part to the lack of comparable data across cases and in part to the lack of careful analysis of subsidies in the literature. To analyze prevalence, data were collated from a variety of regional databases and country case studies to obtain a global overview of subsidy practice based on evidence for some 80 large cities in the case of water and some 50 countries in the case of electricity. The analysis of increasing block tariffs presented below is based on evidence on tariff structures for 50 water utilities and 66 electric utilities from around the world (presented in appendix H).

Underpricing and Increasing Block Tariffs Are Common for Water Sector

A recent survey by Global Water Intelligence (GWI) covering water utilities in 132 major cities worldwide revealed that underpricing of water supply services is widespread, even in high-income and upper middle-income

Box 2.2 Indicative Cost-Recovery Ranges for Water Services

GWI (2004) developed the following ranges for identifying the probable degree of cost recovery in developing and industrialized countries. The box table differentiates between tariffs that are in most cases insufficient to reach even basic operation and maintenance (O&M) costs, tariffs that are probably high enough to be covering operation and some maintenance costs, and tariffs that may be high enough to be covering O&M plus some capital costs. Cost estimates for developing countries are somewhat lower, reflecting lower labor costs.

	Developing countries	*Industrialized countries*
<US$0.20/m^3	Tariff *insufficient* to cover basic operation and maintenance (O&M) costs	Tariff *insufficient* to cover basic O&M costs
US$0.20–0.40/m^3	Tariff *sufficient* to cover operation and some maintenance costs	Tariff *insufficient* to cover basic O&M costs
US$0.40–1.00/m^3	Tariff *sufficient* to cover operation, maintenance, and most investment needs	Tariff *sufficient* to cover O&M costs
>US$1.00/m^3	Tariff *sufficient* to cover operation, maintenance, and most investment needs in the face of extreme supply shortages	Tariff *sufficient* to cover full cost of modern water systems in most high-income cities

Source: GWI 2004.

countries (GWI 2004). According to survey data and estimates of tariff levels that would be needed to achieve varying degrees of cost recovery (box 2.2), it appears that 39 percent of water utilities have average tariffs that are set too low to cover basic operation and maintenance (O&M) costs. A further 30 percent have tariffs that are set below the level required to make any contribution toward the recovery of capital costs (table 2.3). The average tariff rises substantially across country income levels, from US$0.11 per cubic meter in low-income countries to about US$0.30 in middle-income countries, reaching US$1.00 in high-income countries. Nevertheless, even in high-income countries, only 50 percent of water utilities charge tariffs

Table 2.3 Overview of Average Water Tariffs and Probable Degree of Cost Recovery

Grouping of water utilities	*Average water tariffs (US$/m³)*						*Percentage of utilities whose average tariffs appear to be . . .*[a]		
	Mean	*Median*	*Min.*	*Max.*	*25th percentile*	*75th percentile*	*Too low to cover basic O&M*	*Enough to cover most O&M*	*Enough for O&M and partial capital*
Global	0.53	0.35	0.00	1.97	0.13	0.85	39	30	30
By country income level									
HIC	1.00	0.96	0.00	1.97	0.60	1.37	8	42	50
UMIC	0.34	0.35	0.03	0.81	0.15	0.57	39	22	39
LMIC	0.31	0.22	0.04	0.85	0.19	0.39	37	41	22
LIC	0.11	0.09	0.01	0.45	0.05	0.16	89	9	3
By region									
OECD	1.04	1.00	0.00	1.97	0.70	1.37	6	43	51
LAC	0.41	0.39	0.12	0.81	0.22	0.54	13	39	48
MENA	0.37	0.15	0.03	1.17	0.03	0.60	58	25	17
EAP	0.25	0.20	0.04	0.53	0.18	0.30	53	32	16
ECA	0.13	0.16	0.01	0.20	0.08	0.17	100	0	0
SAS	0.09	0.06	0.02	0.22	0.05	0.12	100	0	0

Sources: ADB 2004; ADERASA 2005; GWI 2004; NIUA 1999.

Note: Average tariffs are based on residential consumption of 15 cubic meters. Data are drawn from utilities serving 132 major cities worldwide, broken down geographically as follows: OECD, 47; South Asia (SAS), 24; Latin America and Caribbean (LAC), 23; East Asia and Pacific (EAP); 19; Middle East and North Africa (MENA), 12; Europe and Central Asia (ECA), 6. The same group of countries is broken down by income group as follows: high-income (HIC), 52; upper-middle-income (UMIC), 18; lower-middle-income (LMIC), 27; lower-income (LIC), 35.
O&M = operation and maintenance.
a. Based on GWI 2004 (box 2.4).

high enough to cover more than O&M costs. In low-income countries, barely 3 percent of water utilities were able to achieve this level. Some degree of general subsidy is thus the norm.

These findings are confirmed by additional data collected for this study. Those data show that many countries, including Organisation for Economic Co-operation and Development (OECD) countries, still provide grant subsidies for constructing water infrastructure. The subsidies involved are quite substantial and even reach 100 percent in some cases. There is also further evidence that many water utilities are not recovering even O&M costs from customers. Evidence compiled on Asian water utilities in the late 1990s showed that the operating ratio (annual O&M costs relative to annual billing) was less than 1 for 35 of 49 utilities (McIntosh and Yñiquez 1997). Canada has an estimated $1.2 billion per annum shortfall in tariff revenues in water utilities (OECD 1999).

Implicit subsidies are also omnipresent in the water supply and sanitation sectors. Implicit subsidies associated with unmetered service are very common, producing widespread subsidies for high-volume unmetered customers. Of 50 water utilities reviewed for this study for which information on metering was available, about a quarter had meter coverage below 50 percent. Metering coverage varies widely, from 0 percent in Calcutta and Ireland, to 100 percent in Chile. A recent survey of 22 major urban water utilities in Latin America found an average meter coverage of 78 percent, with an interquartile range from 65 percent to 95 percent (ADERASA 2005). A similar survey of metropolitan water utilities in India found that only a handful of cities had come close to achieving universal metering, and elsewhere average meter coverage was about 62 percent in larger cities and 50 percent in smaller cities (Ragupathi and Foster 2002). The practice of combining water and sewer tariffs—another source of implicit subsidies—is quite common in both Latin America and Asia, but in Latin America, at least, many utilities have taken steps to avoid charging households without sewer connections for sewer service. Finally, many water utilities have low collection rates and many illegal connections, which means that nonpaying households are subsidized by those that do pay.

As regards explicit subsidies, it is quite common to find higher average prices for industrial than residential customers across all geographic regions, possibly indicating the presence of cross-subsidies between customer classes. This price differential exists in 90 percent of the utilities in our sample for which information is available. A recent survey in Latin America found that in 17 major urban water utilities, industrial customers were charged 2.24 times as much as residential customers for an equivalent volume of water (ADERASA 2005). A similar study of 23 metropolitan cities in India found that the ratio was 5.42 times as much (Ragupathi and Foster 2002).

Most water tariff structures are block tariffs, which means that quantity targeting is used to allocate subsidies within the residential customer base.

The majority of utilities surveyed in Latin America and Asia use increasing block tariff structures with two to four consumption blocks (table 2.4). In Latin America, and to a lesser extent in South Asia, increasing block tariff structures also often include fixed charges that are relatively high compared with the average consumer bill. In most Latin American cases, the tariff for the last consumption block begins to be high enough to cover a significant proportion of capital costs, while in Asia the tariff for the last block is commensurate only with O&M costs. However, in both cases, the last tariff block begins to apply only at consumption levels of about 70 cubic meters per month, which is about three times as high as typical residential consumption. In OECD countries, linear tariff structures are more common, although increasing block tariff structures are still found in a significant percentage of utilities. North America is the only region of the world where decreasing block tariff structures are found, albeit in a minority of cases.

In Latin America, the majority of utilities surveyed offer a separate social tariff structure for disadvantaged customers. Eligibility for this tariff is often determined on the basis of proxy means tests of various kinds. Social tariffs are also known to be widely practiced in Europe and Central Asia.

There is only limited information available about service-level targeting for water supply services. Such targeting seems to be most common in Africa and Asia, where it is common for water supplied through public standpipes to be provided free of charge.

Electricity Sector Achieves Better Cost Recovery and Targeting

Generalized underpricing is less prevalent in the electricity sector than in the water supply sector. A global survey of cost recovery using a methodology similar to the GWI study for water (see box 2.3) found that 15 percent of electricity utilities had average tariffs below the level likely required to cover O&M costs, and a further 44 percent had tariffs below the level required to make any contribution toward the recovery of capital costs (table 2.5). The average tariff rises substantially across country income levels, from US$0.05 per kilowatt-hour in low-income countries to about US$0.07 in middle-income countries, reaching US$0.12 in high-income countries. In high-income countries, more than 80 percent of electric utilities charge tariffs high enough to more than cover O&M costs, while in low-income countries, only 25 percent of electric utilities achieve this level.

However, it should be noted that many industrialized countries that charge cost recovery prices for electricity have—in parallel—developed substantial social safety nets to help cover electricity and heating fuel charges. Those programs are funded directly by fiscal transfers. Examples include the U.S. Low-Income Home Energy Assistance Program (amounting to US$1.7 billion per year), the French energy funds for low-income households (amounting to US$175 million per year), and the British fuel poverty

Table 2.4 Overview of IBT Tariff Structures for Residential Water Customers

	Fixed charges, with or without minimum consumption		*Block structure*				
	Minimum consumption (m^3/month)	*Fixed charge (% of 15m^3/month)*	*Number of blocks*	*Size of first block (m^3/month)*	*Size of last block (m^3/month)*	*Price of first block (US\$/m^3)*	*Price of last block (US\$/m^3)*
Latin America	5	36	4	24	72	0.32	0.82
Bolivia	4	43	7	23	195	0.22	0.75
Brazil	10	26	5	20	70	0.40	1.59
Colombia	0	34	2	20	40	0.38	0.44
Costa Rica	15	100	4	25	60	0.31	0.70
Nicaragua	0	6	2	20	20	0.24	0.54
Peru	4	31	4	18	80	0.22	0.73
South Asia	3	73	2	13	79	0.08	0.32
Bangladesh	0	0	1	n.a.	n.a.	0.08	n.a.
India	3	100	2	17	134	0.06	0.15
Nepal	10	45	1	n.a.	n.a.	0.16	n.a.
Sri Lanka	0	0	5	10	25	0.01	0.48
East Asia	1	44	4	17	74	0.13	0.35
Cambodia	0	0	4	7	50	0.14	0.33
China	0	0	2	12	62	0.08	0.47
Indonesia	0	0	3	10	20	0.13	0.20
Korea, Rep. of	0	28	4	30	100	0.24	0.60
Malaysia	0	44	3	20	35	0.15	0.45
Mongolia	0	0	1	n.a.	n.a.	0.12	n.a.
Philippines	10	59	8	20	200	0.04	0.12
Vietnam	0	0	4	20	50	0.11	0.27

Source: Adapted from appendix H.

Note: n.a. = not applicable.

Box 2.3 Indicative Cost-Recovery Ranges for Electricity

Following the Global Water Intelligence methodology for the water sector described in the text, Foster and Yepes (2005) developed indicative ranges for cost recovery in the electricity sector. Their analysis, presented in the box table below, was based on discussions with international experts on electricity tariffs. Different thresholds are provided for residential and industrial customers to reflect the lower cost of service provision to the latter group.

Tariff	*Residential customers*	*Industrial customers*
< US$0.04/kWh	Tariff insufficient to cover basic O&M costs	Tariff insufficient to cover basic O&M costs
> US$0.05/kWh		Tariffs likely to be making a significant contribution toward capital costs, in most types of systems
> US$0.08/kWh	Tariffs likely to be making a significant contribution toward capital costs, in most types of systems	

Source: Foster and Yepes 2005.

payments. The special welfare assistance programs for energy reflect the fact that this service has a relatively high weight in the household budget, particularly in cold countries where heating requirements are substantial.

The magnitude of implicit subsidies is also lower in the electricity sector than in the water supply sector. Metering levels are typically much higher—and close to universal—thereby avoiding implicit cross-subsidies between metered and unmetered customers. Moreover, the issues presented by joint charging of water and sewerage services do not arise. Nevertheless, collection rates and theft through illegal connections remain a problem for many electrical utilities, generating significant implicit subsidies for nonpaying households and for those with illegal connections.

As regards explicit subsidies, differential pricing between industrial and residential customers is less common in the electricity sector than it is in the water supply sector. Of the electricity utilities in Europe and

Table 2.5 Overview of Average Electricity Tariffs and Probable Degree of Cost Recovery

Grouping of electricity utilities	*Average electricity tariffs in US$/m³*						*Percentage of utilities whose average tariffs appear to be…*[a]		
	Mean	*Median*	*Min.*	*Max.*	*25th percentile*	*75th percentile*	*Too low to cover basic O&M*	*Enough to cover most O&M*	*Enough for O&M and partial capital*
Global	0.08	0.07	0.01	0.21	0.05	0.10	15	44	41
By income									
HIC	0.12	0.11	0.06	0.21	0.09	0.13	0	17	83
UMIC	0.07	0.06	0.04	0.14	0.05	0.09	0	71	29
LMIC	0.06	0.05	0.03	0.14	0.04	0.08	27	50	23
LIC	0.05	0.05	0.01	0.13	0.04	0.06	31	44	25
By region									
OECD	0.12	0.11	0.06	0.21	0.09	0.13	0	17	83
LAC	0.09	0.09	0.05	0.14	0.06	0.10	0	47	53
ECA	0.06	0.04	0.02	0.14	0.04	0.08	31	38	31
EAP	0.05	0.05	0.01	0.08	0.04	0.06	29	65	6
SSA	0.05	0.06	0.03	0.08	0.04	0.06	29	71	0
SAS	0.04	0.04	0.04	0.05	0.04	0.05	33	67	0

Sources: ERRA 2004; Estache and Gassner 2004; OECD 2004; OLADE 2004; UN-ESCAP 2004.

Note: Data drawn from 84 countries worldwide, broken down as follows by region: OECD, 23; Latin America and Caribbean (LAC), 19; Europe and Central Asia (ECA), 18; Sub-Saharan Africa (SSA), 13; East Asia and Pacific (EAP), 8; South Asia (SAS), 3. The same group of countries is broken down by income group as follows: high-income (HIC), 23; upper-middle-income (UMIC), 18; lower-middle-income (LMIC), 26; lower-income (LIC), 17.

O&M = operation and maintenance.

a. Based on Foster and Yepes 2005 (box 2.3).

Central Asia, the Middle East, Sub-Saharan Africa, and South and East Asia for which information is available, 30 percent charge different tariffs to residential and industrial customers, possibly resulting in cross-subsidies to residential consumers. In Latin America, only 1 of 14 utilities charges higher average prices to industrial customers than to residential ones. In all the others, residential customers pay higher rates than industrial clients.

The use of special social tariffs in electricity for low-income households is relatively common in Latin America and in Europe and Central Asia. In Latin America, the most common criterion used to determine eligibility for social tariffs is the volume of consumption. However, in Eastern Europe, there is greater use of proxy means tests, categorical targeting, and administrative selection in general. Information on the prevalence of social tariffs in Africa and in South and East Asia is not available.

The use of quantity targeting to distribute the benefits of explicit subsidies is quite common in electricity services—though not omnipresent, as in water services. About 70 percent of countries surveyed applied increasing block tariff structures for electricity. Analysis of the tariff structures in place show that such structures typically comprise three to four blocks (table 2.6). The first block tends to vary between 50 and 100 kilowatt-hours per month, with a tariff of about US$0.05 to US$0.06 per kilowatt-hour. The size of the last block varies enormously, from about 200 to 2,000 kilowatt-hours per month. A handful of countries, including the United Kingdom and several countries in Asia, apply decreasing block tariff structures. Most regions present isolated cases of volume-differentiated tariff structures (multiple tariffs applied to customers in different consumption ranges).

There is little information on service level targeting, but available information suggests that it is comparatively rare. Only one or two of the countries surveyed reported that they differentiated domestic tariffs according to load, or according to whether single-phase or triple-phase service was provided.

The Majority of Subsidies for Water and Electricity Apply Quantity Targeting

To summarize, available evidence suggests that quantity-targeted subsidies are by far the most common form of explicit subsidy in both the water supply and the electricity sectors. Because general underpricing is still present in many utilities, quantity targeting and other alternative measures are often combined with a general subsidy so that all households are subsidized and the targeting mechanism is used to distribute the subsidy between households.

Table 2.6 Overview of IBT Tariff Structures for Residential Electricity Customers

	Fixed charges, with or without minimum consumption		*Block structure*				
	Minimum consumption (kWh/m)	*Fixed charge (% of 100kWh)*	*Number of blocks*	*Size of first block (kWh/m)*	*Size of last block (kWh/m)*	*Price of first block (US$/kWh)*	*Price of last block (US$/kWh)*
Latin America	13	22	4	93	308	0.06	0.11
Brazil	0	0	3	30	125	0.03	0.07
Colombia	0	0	2	200	200	0.05	0.07
Ecuador	0	20	6	50	300	0.08	0.11
Honduras	20	50	3	100	300	0.05	0.08
Mexico	0	18	3	50	100	0.11	0.15
Nicaragua	0	0	6	25	1,000	0.04	0.26
Paraguay	0	0	3	50	150	0.05	0.06
Peru	0	6	3	30	100	0.07	0.10
Venezuela, R. B. de	100	100	3	300	500	0.06	0.07
Asia	1	n.a.	4	54	255	0.06	0.11
Cambodia	0	0	3	40	105	0.16	0.17
Indonesia	0	n.a.	3	23	60	0.03	0.04
Lao PDR	0	0	3	50	151	0.02	0.11
Malaysia	0	14	3	103	533	0.07	0.08
Philippines	10	9	3	10	300	0.07	0.13
Sri Lanka	0	n.a.	5	30	180	0.03	0.16
Thailand	0	5	6	78	400	0.04	0.07
Vietnam	0	0	5	100	310	0.04	0.10
Africa	0	n.a.	3	95	2,250	0.05	0.12
Cape Verde	0	0	2	40	n.a.	0.15	0.19
Kenya	0	7	4	50	7,000	0.02	0.19
Uganda	0	n.a.	2	30	n.a	0.03	0.10
São Tomé and Principe	0	0	3	100	300	0.07	0.17
Zambia	0	n.a.	3	300	700	0.01	0.03
Zimbabwe	0	n.a.	4	50	1,000	0.02	0.05

Source: Adapted from appendix H.

Note: n.a. = not applicable; m = month; IBT = increasing block tariff.

Table 2.7 Summary of Prevalence of Different Types of Subsidies in Water and Electricity

	Water	*Electricity*
Untargeted subsidies	39% of utilities fail to cover O&M; 69% fail to cover full capital costs	15% of utilities fail to cover O&M; 59% fail to cover full capital costs
Implicit subsidies	Widespread as a result of low meter coverage, lack of separate accounts for sewerage, low revenue collection, and illegal connections	Less widespread as a result of higher metering, but low revenue collection and illegal connections remain problematic
Explicit subsidies with quantity targeting	Widespread IBTs, used by 80% of utilities, suffer from high fixed charges and shallow price gradients	Widespread IBTs, used by 70% of utilities; lesser prevalence of high fixed charges and steeper price gradients
Explicit subsidies with service-level targeting	Significant use of public standpipes	Occasional use that is based on load profile
Funding	Combination of government transfers, cross-subsidies, and unfunded subsidies	Combination of government transfers, cross-subsidies and unfunded subsidies

Source: Authors' elaboration.

Note: IBTs = increasing block tariffs; O&M = operation and maintenance.

When one compares the water supply and the electricity sectors, it is evident that consumer utility subsidies are much more prevalent in the former than in the latter (table 2.7). The water supply sector has a much lower degree of cost recovery and metering coverage than the electricity sector, leading to more untargeted and implicit subsidies in the water sector. It is also more common in the water sector to charge different prices to industrial and residential customers and to apply increasing block tariff structures that subsidize all but the very highest levels of residential consumption. The lower prevalence of industrial to residential cross-subsidies for electricity reflects the increasing liberalization of power markets, as well as the greater sensitivity of industries to electricity pricing.

Why Are Subsidies So Prevalent?

Why are consumer utility subsidies so prevalent, and why are they more prevalent for water than for electricity? The idea of subsidizing water and electricity services (the latter particularly in cold climates) has widespread support among politicians, policy makers, utility managers, and the public at large. Subsidies for basic services—particularly subsidy mechanisms such as increasing block tariffs—are considered fair and even necessary for ensuring that poor households enjoy the use of those services. They are also seen as an alternative instrument of social policy, as a way to increase the purchasing power of the poor. The next chapter considers policy rationales for subsidizing the poor in more detail. However, irrespective of the policy motivation, it is important to understand how the cost structure of water and electricity services makes them tempting candidates for subsidization, especially when there is political interest in subsidization.

Three characteristics of the cost structure are considered here. The first is the relatively high proportion of fixed costs to total costs, which means that the economically efficient pricing solution (marginal cost pricing) will, in many situations, not lead to full cost recovery. The second is the relatively high percentage of nonattributable or common costs, which are difficult to allocate precisely to different customers. The third is the high capital intensity of water and electric industries, combined with long asset lives, which collectively make it feasible to get away with underpricing services in the short or medium term. Each of those characteristics of the water and electricity sectors is considered in more detail below.

High Fixed Costs Complicate the Determination of Prices

The theoretical ideal for utility pricing is marginal cost pricing. The most efficient consumption level and allocation of consumption across customers are obtained when all customers face the marginal cost of using an additional unit of water or electricity as they decide how much to consume. Under marginal cost pricing, each customer will consume up to the point that the marginal cost of using another unit of water or electricity is greater than the value he or she places on that additional unit of consumption.

In practice, marginal cost pricing is rarely implemented, however, because it is not always compatible with other objectives of tariff design. For example, marginal cost pricing will not necessarily lead to full cost recovery. The high proportion of fixed costs in the total cost structure of utilities means that marginal costs decline with the scale of production, thus making the marginal cost lower than the average cost. As a consequence, marginal cost pricing would not allow firms to break even financially. Strict implementation of marginal cost pricing in this situation would result in an untargeted, across-the-board price subsidy. In the longer run, of course, marginal costs tend to rise as the capacity limits of current infrastructure are reached and as the need to develop new (often more costly) facilities becomes apparent. When the marginal cost exceeds the average cost, marginal cost pricing is consistent with recovering all costs.

The potential incompatibility between marginal cost pricing and cost recovery gives rise to much discussion and controversy about how to recover the costs of service without deviating too far from the ideal rule for marginal cost pricing. Two possible solutions to this problem have been identified in the economics literature. The first is to cover the deficit arising from marginal cost pricing by using a budget transfer from the state. This school of thought gives rise to the tendency toward government-funded subsidies that was documented above. The second possible solution is to allow some markup of prices over marginal costs to allow the firm to break even. This school of thought opens the door for cross-subsidization between different customer categories, as was also documented earlier.

In principle, there are many different ways in which prices could be marked up over marginal costs to ensure full cost recovery. The economics literature has focused on developing pricing rules that minimize the distortions caused by raising prices above marginal costs. Building on the work of Boiteux (1971), Ramsey (1927) showed that the best way to close the gap was to apply markups over marginal cost pricing that were inversely proportional to the price elasticity of demand of each customer, thereby minimizing the deviations from what each customer would have consumed under marginal cost pricing. This markup effectively entails charging higher prices to those customers with the most inflexible demands on the system, which in practice are often domestic customers. Coase (1946) later showed that it was possible to improve on Ramsey-Boiteux pricing by using two-part tariffs when the elasticity of connection is zero. In this way, all consumers continue to face marginal cost prices on each unit consumed, and fixed costs are recovered through a flat entry fee, which is akin to a lump-sum tax. However, a potential disadvantage of two-part tariffs is that small consumers may be discouraged from using the network because it may not be worth their while to pay the flat entry fee.

In practice, the wide range of potential solutions for recovering fixed costs means that more often than not those degrees of freedom are used to advance social and political objectives, rather than to promote economic efficiency. This means that fixed costs are recovered primarily from those customer groups with the perceived highest ability to pay for the service, generally industrial customers. From the policy maker's perspective, one of the attractions of determining utility prices in this way is that it often gives the impression that social policy objectives can be achieved at zero fiscal cost. However, there is clearly an economic cost associated with this approach, which leads to distortions in economic behavior. The reason is that determining prices in this way typically involves charging the highest prices to the largest consumers (commerce, industry, and high-volume domestic consumers). If those are the customers whose consumption decisions are most sensitive to price (that is, those who have the highest price elasticity, as table 2.2 suggests might be the case), they should—according to Ramsey-Boiteux principles—face the lowest marginal prices, not the highest ones.

Nonattributable Costs Lead to Discretion in Cost Allocation

The costs of providing utility services are difficult to attribute uniquely to different customers or even customer groups. The reason is that water and electricity can flow freely across networks that are shared by large numbers of customers; thus, it is not feasible or meaningful to say which water molecules or electrons go to specific customers or exactly which parts of the network were used to reach those customers. Moreover, strictly speaking, the cost of serving each individual customer is different, because the cost will be affected both by the precise geographic location and by the time profile of consumption.

This situation creates a considerable degree of discretion in allocating costs across customer groups, and it is always tempting to use this discretion to further social and political objectives. There are, however, economic limits on the extent to which costs can be arbitrarily assigned to politically convenient customer categories.

Faulhaber and Levinson (1981) use a game-theoretic bargaining framework to shed light on this issue. This framework is based on the concepts of stand-alone cost and incremental cost. *Stand-alone cost* is defined as what it would cost a particular customer or group of customers to abandon the network and to provide its own utility services on an independent basis. *Incremental cost* refers to the additional costs placed on the system to attend to the needs of a new customer or group of customers who decide to connect to the system. As a result of the cost structure of utility services, stand-alone costs are often quite high, while incremental costs are often quite low.

Faulhaber and Levinson (1981) show that any set of prices that will ensure that no group of consumers will pay more than its stand-alone cost and that each group of consumers will pay at least its incremental costs would be acceptable to all parties involved as the outcome of a bargaining process. The reason is that it is no longer in the interest of any group of consumers to break away from the utility's client base because, by definition, those customers are being offered a price that is lower than their stand-alone cost. At the same time, it is not in the interest of any group of consumers to try to exclude any other group from the utility's customer base because, by definition, all are paying more than their incremental cost. Hence, all groups are making some contribution toward common costs, thereby reducing the burden to be shared among other customers.

Given the high fixed costs of utilities as noted above, the range defined by incremental and stand-alone costs can be a very wide one, meaning that a wide range of potential prices could emerge and be justifiable in principle. This range varies considerably according to the local context. Cities with good-quality, shallow groundwater—such as many in Asia—have a very low stand-alone cost for urban water supply. As a result, network connections may be very sensitive to the design of tariff structures. More generally, commercial and industrial customers may face a lower stand-alone cost than the cost to residential customers, owing to the larger volume of consumption within commercial and industrial areas. They are thus more likely to abandon network services as utility prices increase.

Long Asset Lives Make It Tempting to Underfinance

Utility services are characterized by a high degree of capital intensity and by long asset lives (table 2.8). The table shows that—in the network components of the electricity and water services—70 percent to 90 percent of costs can be capital costs. Such assets typically last for much longer than 20 years.

High capital intensity and long asset lives make it possible to get away without covering the full capital costs of service provision—at least for some period of time. This opens the door to unfunded subsidies of the type described above. The problem is more severe in the case of water utilities than electric utilities because water networks and their associated services deteriorate quite gradually, without necessarily threatening the continuity of provision. Power systems, however, are more sensitive. Inadequate maintenance can lead relatively quickly to outright failure and prolonged blackouts—which are, moreover, politically unpopular. For this reason, it is easier for politicians to underfinance water and sewerage services than electricity services.

Table 2.8 Capital Intensity and Asset Lives for Utility Services

	Capital intensity (% of total costs)	*Typical asset lives (years)*
Electricity		25–30
Generation	35–75	
Transmission	90	
Distribution	70	
Water	65	20–40
Sewerage	80	40–60
Telecommunications	25–45	10–15

Source: Authors' elaboration that is based on consultations with World Bank specialists.

As a point of contrast, it is interesting to examine the equivalent parameters for the telecommunications sector, which has a much lower level of capital intensity and substantially shorter asset life (table 2.8). This explanation is one of several potential reasons those services have been less vulnerable to underpricing than water or electricity services. Because capital represents a lower proportion of total costs, there is less scope for reducing prices by squeezing capital maintenance. Moreover, because asset lives are shorter, equipment needs to be replaced more frequently in order to ensure service continuity.

In summary, the cost structure of utility services means that there is no unique, widely accepted formula for utility pricing that will achieve cost recovery. Therefore, there is considerable scope for modifying the way that costs are recovered. Furthermore, the long-lived nature of network assets makes it possible to defer the recovery of capital costs for some time before service quality begins to decline. As a result, it can be politically tempting to sustain general price subsidies for water and electricity services or to use utility prices as a vehicle for income redistribution.

Summary

This chapter presented a general typology of utility subsidies. Utility subsidies can be used to reduce the cost of either consuming or connecting to utility services. Subsidies may be untargeted, involving generalized underpricing of the service, or may be targeted to benefit specific groups. Although many common utility practices lead to implicit subsidization, the focus of this book is on explicit targeted subsidies, which represent a deliberate attempt to benefit certain groups of customers. Explicit subsidies can be targeted on the basis of categorical variables, geographic zones, or individual means testing, or may be designed to allow beneficiaries to self-select the subsidy through their choice of the quantity or type of service that they consume.

Three different vehicles of subsidy finance were defined and distinguished, involving direct transfer of government funds, cross-subsidy among customer groups, and unfunded subsidies that entail running down the capital stock. Each has its drawbacks. Government transfers are often unreliable and may undermine managerial incentives, so that subsidies are ultimately absorbed by inefficiencies within the utility rather than passed on to customers. Cross-subsidies create distortions in pricing that affect consumer behavior and that may ultimately undermine financial sustainability of the utility by creating incentives for customers to turn to self-provision. Unfunded subsidies ultimately impose a heavy nonfinancial burden on consumers in the form of deteriorating service quality and reduced service expansion.

Utility subsidies were found to be quite prevalent across most regions of the world—particularly in developing and transitional countries. Quantity targeting, built around the increasing block tariff structure, is by far the most common approach to subsidization. However, it is typically combined with general underpricing, so that all customers benefit from subsidies to varying degrees. Subsidies tend to be more prevalent in the water supply sector than in the electricity sector. Electric utilities tend to recover a higher proportion of costs, to make much greater use of metering, to be less reliant on quantity targeting, and to be much less likely to charge different prices to industrial and residential customers.

One of the reasons utility services are so prone to subsidization lies in the very cost structure of such network industries, in particular the preponderance of fixed and nonattributable costs, as well as the high capital intensity and long asset lives. A high share of fixed costs means that marginal cost pricing does not necessarily allow full cost recovery in the short run, thus providing a justification for government transfers or price markups to close the financial gap. At the same time, a high share of common or nonattributable costs introduces substantial discretion in the allocation of such costs across different customer groups, making it politically tempting to use utility tariffs as an off-budget vehicle for financing social objectives. Finally, high capital intensity and long asset lives mean that expenditures can often be quite easily deferred by underfunding ongoing operations and postponing capital maintenance activities, the negative effect of which becomes apparent only gradually as service levels decline.

For all those reasons, the central policy question with regard to utility subsidies is typically not whether to introduce them but how to deal with those that are already in place. In particular, can and should utility subsidies be scaled back or radically overhauled in their design? The answer depends on how well the subsidies perform in meeting the sectoral and social objectives that are typically used to justify their existence. The nature of those motivations is the topic of the next chapter.