

Chisari, Omar O.; Estache, Antonio; Waddams Price, Catherine

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Discussion Paper No. 2001/75

Access by the Poor in Latin America's Utility Reform

Subsidies and Service Obligations

Omar O. Chisari¹, Antonio Estache², and
Catherine Waddams Price³

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Abstract

Any infrastructure reformers concerned with social issues in a developing country need to address two problems. The first is increasing access by the poor, and the second is ensuring consumption affordability, i.e. the ability of the poor to pay for both consumption and the amortization of the access charges. The two are related. The main concern of both policy makers and academics has been to identify options to cut costs so that coverage can be accelerated, focusing on cheaper technologies or on various financing/lending schemes. Latin America has been a pioneer in many aspects of such reform. Nevertheless, the Latin American experience shows that *the poor* are often the last to benefit from increased access due to reform. While in most countries, the rural poor tend to be omitted from reforms altogether, treatment of urban users varies considerably. Residential users have often been more exposed to increasing connection costs resulting from reform than commercial users,

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¹Centro de Estudios Económicos de la Regulación, Universidad Argentina de la Empresa, Buenos Aires, Argentina, ²World Bank, ³Centre for Competition and Regulation, University of East Anglia, UK. Catherine Waddams Price's work for this paper was supported by the Public-Private Infrastructure Advice Facility and the World Bank and presented at the conference on Infrastructure Reform and the Poor in London, June 2000.

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particularly where this element had previously been subsidized; therefore a more careful consideration of the key policy instruments to increase access by the poor may have strong social payoffs. This has led to various subsidy schemes of which Universal Service Obligation and Obligatory Service discussed in this study are 'standard' tools used to increase access.

The main focus of this study is to use both theory and practice to see how subsidies and service obligations can be designed, imposed and financed to increase coverage for a specific service (e.g. access to safe water, to electricity or to at least a public phone) as much and as fast as possible. The poor are particularly vulnerable to deterioration in macro-economic conditions. Design of access charges and penalties for arrears and delinquency need to take account of potential shocks. Argentina's experience shows that it is important not only to design the infrastructure appropriately, but also to maximize ongoing voluntary connection to services, particularly when the product is considered to be a 'merit good'.

1. Introduction

Any infrastructure reformers concerned with social issues in a developing country need to address two problems. The first is increasing access by the poor, and the second is ensuring consumption affordability, i.e. the ability of the poor to pay for both consumption and the amortization of the access charges.¹ The two are related. The main concern of both policy makers and academics has been to identify options to cut costs so that coverage can be accelerated, focusing on cheaper technologies or on various financing/lending schemes. Latin America has been a pioneer in many aspects of such reform.

What regulatory reform experience has demonstrated is that many operators perceive poor financial returns from supplying the poor and postpone such supply as long as possible, unless specific policy requirements force them to do otherwise. Hence governments often impose some type of service obligation or connection targets on operators as part of a multiple obligation public-private partnership. In Latin America, the inclusion of service obligations in 'privatization' transactions has been a recurring feature during the 1990s and is likely to continue in the foreseeable future to meet the needs of the rural population and the urban poor, particularly in telecommunications, water and sanitation. By 1996 only about 10 percent of the population in Latin America had access to telecoms services, 75 percent to safe water and 90 percent to electricity, and these rates have not improved significantly since then. While access to electricity is close to full coverage (even if quality is variable), and telecommunications is catching up through major technological changes, access to water and to sanitation is still a long way from a socially desirable level.

A recent study by Estache, Foster and Wodon (2001) suggests that it may take an additional 20 years to raise access to safe water in the region beyond 90 percent under the policy environment prevailing at the end of the 1990s, current growth and urbanization trends. In the same time span, extrapolating current trends, telephone penetration would reach 40 main lines per 100 inhabitants, but technological progress may speed this process further. What these bare numbers do not reveal is how fast these reforms will help the poor rather than other users.

Though the need and scope for reforms leading to changes in access rates are different between countries and sectors, the Latin American experience shows that *the poor* are often the last to benefit from increased access due to reform. While in most countries, the rural poor tend to be omitted from reforms altogether, treatment of urban users varies considerably. Residential users have often been more exposed to increasing connection costs resulting from reform than commercial users, particularly where this element had previously been subsidised; therefore a more careful consideration of the key policy instruments to increase access by the poor may have strong social payoffs. This has led to various subsidy schemes of which Universal Service Obligation and Obligatory Service discussed in this study are 'standard' tools used to increase access.

¹ A large literature is available on affordability, with a strong emphasis on the design of subsidies and will hence not be covered here. See C. Waddams (2000), Estache, Gomez-Lobo, Leipziger (2001), Estache, Foster, Wodon (2001) for recent surveys.

However regulators are also concerned with the financial viability of the regulated firm and with efficient pricing. The first aspect entails ensuring a reasonable return on capital. Accelerating service coverage may impose financial obligations on the firm (in the form of debt) that could jeopardise these objectives. The examples of Aguas Argentinas in Buenos Aires, and Aguas del Aconquija in Tucuman, where there was a direct conflict between financial viability and extended coverage, show that policy makers must balance these demands. The imposition of over-ambitious targets could entail a complex renegotiation process with the firm, where the regulator is handicapped by asymmetries of information with respect to costs, especially access to the capital market.

The main focus of this study is to use both theory and practice to see how subsidies and service obligations can be designed, imposed and financed to increase coverage for a specific service (e.g. access to safe water, to electricity or to at least a public phone) as much and as fast as possible. The poor are particularly vulnerable to deterioration in macro-economic conditions. Design of access charges and penalties for arrears and delinquency need to take account of potential shocks. Argentina's experience shows that it is important not only to design the infrastructure appropriately, but also to maximise ongoing voluntary connection to services, particularly when the product is considered to be a 'merit good'.

The rest of the study is organized as follows. Section 2 discusses the objectives of regulators, the concept and practice of cross subsidy and criteria for assessing subsidy schemes. Section 3 distinguishes obligatory and compulsory service and universal service obligations, reviewing why operators are reluctant to serve low income clients and suggesting criteria by which to judge them. Section 4 discusses the interactions between social concerns at the sectoral level and macroeconomic conditions, including USOs, unemployment and income distribution, and financing options for universal service obligations. Section 5 presents a brief overview of the Latin American experience with USO, and concludes.

2. Regulation, efficiency and equity

In industries which retain a degree of monopoly power as most infrastructure industries do, at least in the short term, some regulation is required to prevent exploitation of monopoly profit. Regulators have the main objective of curbing monopoly power. They also seek an efficient pattern of prices, reflecting marginal costs where possible. In parts of the network which are intrinsically monopolistic because of economies of scale or scope, the competitive outcome is undefined, and it may not be feasible to constrain prices to reflect marginal costs, because of the need to cover (higher) average costs and the regulator's duty to ensure financial viability of providers. Nevertheless regulators will wish to achieve the most efficient feasible pricing pattern. Where prices must be marked up above marginal costs, the most efficient pattern is for mark ups to be higher for consumers and services whose demand is least price responsive, so-called Ramsey prices. But this may directly contradict another objective of regulation, more equal distribution of income, if such efficient pricing involves higher mark ups for those with low incomes. (While equity may not be an explicit objective of regulators governments are generally unhappy about allowing the regulatory process to impose regressive effects on income distribution.) Moreover prices which depend on consumers' demand as well as cost characteristics may be regarded as discriminatory and disallowed in the courts.

Theory suggests that privately owned companies are likely to lower costs compared to their nationalised predecessors because they retain residual profits, and this is supported by some empirical evidence. A revenue cap form of regulation may reinforce these cost cutting incentives, while more traditional cost of service regulation tends to weaken them.

The *pattern* of prices, as well as their level, is affected by private ownership. Companies will focus supply on consumers with the highest margins; if uniform prices are imposed, companies will seek to serve low cost customers. Such incentives can be reversed through contract conditions, but it is often difficult to write complete contracts in such circumstances, especially when there is little knowledge about the potential consumer base and costs. Regulation, too, affects relative prices. Cost of service regulation is usually associated with individual constraints on each tariff, while revenue caps generally apply to some average of prices, leaving the company discretion to rebalance between different prices within the cap. Proponents argue that such discretion is in the interests of efficiency, and is better than traditional detailed interference from governments (Beesley and Littlechild, 1989). A private monopoly which is maximising profits has incentives to raise prices above marginal costs in a pattern similar, but not identical, to the most efficient pattern detailed above. However in the UK, where such revenue caps have been in force for over fifteen years (and are known as price caps), many infrastructure firms have not taken advantage of the additional profit opportunities from such incentives (Giulietti and Waddams Price, 2000). There are several possible explanations for such behaviour. One is that the companies are ignorant both of the exact costs of serving different consumers, and of consumer demand characteristics; another is that suppliers may want to protect their monopoly by arguing for the maintenance of cross-subsides which will be eroded by competition (see below). Thirdly they may be responding to informal pressure from regulators where such changes, though efficient, are considered discriminatory or distributionally regressive, perhaps reflecting an implicit higher weighting of welfare for low income households (Iozzi *et al.*, 1999). Such government pressure may be less effective when exerted on firms owned by overseas shareholders. Moreover it is clear that there is an important distinction between maintaining existing subsidies, in order not to worsen distribution, and introducing new ones, which would arouse considerably more opposition.

The traditional alternative to price cap is cost of service regulation, where the company is allowed a rate of return above its cost of capital. This also has difficulties (Green and Pardina, 1999); it provides weaker incentives to cost cutting, because costs which can be justified are passed on to consumers, but this in turn may lead to unnecessarily high quality (gold plating), particularly if allowed prices are based on return on capital. Moreover the regulatory costs are generally much higher with cost of service regulation (though we have noted above that the simplicity of revenue caps can be illusory, in the sense that other aspects such as quality may need to be defined separately).

The method of regulation affects incentives for expansion of supply, and ultimately the cost of providing the subsidies themselves. With revenue cap, so long as prices for services exceed their marginal costs (even if below the average costs) expansion will incur fewer costs than the extra revenue raised, and increase company profitability. This may coincide with social objectives, but may be at odds with environmental concerns to curb consumption levels. Moreover if the prices for some elements are below marginal costs, such expansion will increase the net loss which requires subsidy. In contrast, cost of

service regulation encourages capital intensive expansion such as new grid connections and peak demand which expand the capital base.

Moreover different regulatory systems provide different incentives for various forms of technology. Rate of return regulation encourages network providers to use capital intensive solutions, such as grid connection, rather than off-grid solutions. Grid owners generally have an interest in maximising the value of their own operations; in Argentina there is concern that incentives for gas pipeline operators to reduce costs are removed by their requirement to pass these on to users. In any case the incumbent will generally try to protect his own technology; in Latin America initial penetration of mobile telephony was hampered by those with fixed line monopolies, even where the former technology was clearly the most appropriate for communications in remote areas.

When infrastructure reform is introduced, many cross-subsidies are likely to be inherited from the previous régime. The distributional effect of abolishing past subsidies depends on how well these were targeted. Much of the evidence suggests poor targeting in the past. Newbery (1995) argues that the distributive effects of reform in Hungary and the UK were not regressive, suggesting that previous subsidies may have been badly targeted.

Cross subsidies, i.e. prices which are not determined by the pattern of (marginal) costs may arise from the market itself, or may be imposed by the regulator. Cross-subsidies generally result from the regulator's incapability or unwillingness to set different tariffs according to production costs (Varian, 1989). Such tariff differentiation may be rejected for three reasons. The first is linked to how information is distributed between the regulator and the regulated company. If the latter argues that the supply costs are different for one group or another, information regarding the real supply costs and a method to fix prices correctly may be beyond the regulator's reach. If estimates of these costs are uncertain, it may be preferable, as far as regulation is concerned, to fix a single price. One of the current problems in fixing telephone tariffs for the rural areas in Argentina is to define exactly where the urban service ends and the (more expensive) rural service starts. The second and third reasons for the regulator not to set prices which reflect costs arise from the regulator's political and/or distributional objectives. One of these occurs if the regulator seeks to impose equality of prices and supply of the service in general, regardless of cost differences, perhaps for arguments of equity. Or the regulator may *impose* cross subsidies because of specific social objectives. Prices may be lowered in rural areas to encourage the settlement of people in these districts, and achieve other social objectives such as defence or national security.²

Cross-subsidies may help the poor, at least amongst subscribers since low income groups living in marginal locations often have higher costs than others, and are likely to be helped by a tradition of uniform tariffs (Waddams Price and Hancock, 1998). But infrastructure reform is likely to be part of a general reform programme rather than an isolated event; there may be a cumulative effect on real incomes in the short to medium term from a reform programme which reduces employment levels, lowers social security nets and raises prices across the board.

² This debate arose when the issue of telephone tariffs was discussed, regarding differences between consumers living in the interior and those in the more densely populated Buenos Aires Metropolitan Area (see Instituto de Economía UADE, 1996).

One special case of determining the relation between different prices arises in determining the balance between a connection charge, the fixed charge for staying connected and usage-related charge. Following this reasoning, it is possible to identify two different types of demand, each with possibly very different sensitivity to prices and income. Demand for access is normally less price responsive than demand for use. This suggests that imposing the universal service obligation would have a less distortive effect if it were enforced on connection rather than on use charges.³

Whatever their justification, cross-subsidies entail costs. These are mainly ‘inefficiency’ since relative prices move away from relative (marginal) costs. To minimize such inefficiency costs, the regulator must decide how to define these subsidies: either among consumers or among services. However, this last possibility varies between industries. If reducing access barriers is the objective, for instance, the fixed charge may be brought down by adding a surcharge for use. Or the price of basic telephony could be reduced if it were financed with contributions from other services not considered basic. This latter possibility is not available for industries lacking multifaceted supply. In water, the cross-subsidy could be implemented among consumers, or at the most, between the connection and consumption charges. Since water supply is indispensable, it would be difficult to finance access from consumption charges while still achieving increased access and use. This issue might be addressed through an increasing bloc tariff.

Conversely, industries such as telephony, where several services are provided, invoke problems in defining the exact scope of the universal service criterion. For example, it could be decided that oral transmission, emergency calls, telephone directories and telephones for the disabled are considered a basket of products constituting universal service. This would omit other special services (fax, internet, point to point communications, and many others), the supply of which would be subject to different market rules or regulations. And the definition of ‘basic’ might change over time, as concern shifts, for example, from basic communication to financial inclusion which involves access to more sophisticated services.

In markets such as telephony, where competition is developing, cross-subsidies will also affect the dynamic development of the market. Such technical progress offers greater opportunities for cross-subsidies through falling overall costs, but also risks greater costs through inefficient bypass and the long term bias of the market. Subsidies will be most profoundly affected by the introduction of competition. Incentives for any kind of cross-subsidies are replaced by the incumbent’s need to protect profitable markets from cherry picking and equalise mark-ups in all markets. Any remaining subsidies need to be delivered either through the monopoly element of the industry (the network) or through an alternative mechanism for which suppliers compete (Wellenius, 2000). Otherwise there may be severe distortions in the way the market develops, with long term costs for consumers and the economy if monopoly power and collusion result. There may be a particular problem in administering some subsidy schemes across different companies who are competing in the same market, since this can encourage tacit collusion, through

³ This is still evident in conditions in which variable costs represent a lower share of total costs than do fixed costs. The network industries are generally included within this definition. Therefore, the ‘affordability’ problem is very sensitive to connection charges.

information exchange. There is a real three way conflict between the needs of consumers for clear information, of the administrative authorities for transparency, particularly in administering subsidies, and the danger of potential collusion among producers. The balance between these is likely to change as markets develop, and needs regular review.

Introducing competition and the way in which inherited cross subsidies are regulated will have a particularly strong effect on the way in which Universal Service can be delivered. In particular, constrained prices deter new investment to particular groups or areas. In the UK, the reaction of the competitive market to the maintenance of subsidies for prepayment meter energy users has delayed competition in this market (Otero and Waddams Price, 2001a and b). In the longer term such consumers will lose out on the potential benefits of a competitive market through the depression of their current price levels. It is a difficult regulatory decision to balance current protection for such consumers with longer term benefits; the best compromise might be a clear (and credible) timetable for the removal of special protection, so that there is time to adjust to the removal of current protection, and the market appears attractive to entrants in the longer term. Alternatively such consumers might be subsidised through a Universal Service Fund, funded through a general levy on consumers (see section 4 for further discussion of this option).

Lovei *et al.* (2000) suggest seven criteria for assessing subsidy mechanisms; these are based on experience in transition economies where the issue is *maintaining* connections in straightened economic circumstances, rather than extending the network. The first four criteria are:

- coverage, how well the scheme reaches those in need and avoids errors of exclusion;
- effective targeting, i.e. reaching a high proportion of those for whom the subsidy is designed, and avoiding errors of inclusion;
- predictability, important both at the macro planning level for the industry and for individual households;
- minimizing distortions, which requires monitoring the long term relation between cost and prices, the effect of the distortions on demand and competition, and developing a credible programme for their removal, so that long term investment is as close as possible to its efficient level.

Predictability and controllability of expenditure are particularly important for low income households, making prepayment schemes especially attractive for this group, whose income is likely to be both low and unpredictable, because of the lack of secure employment (Melo, 2000).

The last three criteria are all related to minimizing costs. The authors distinguish:

- costs for the utility (presumably met through cross-subsidies, with consequent internal distortions in prices);
- fiscal costs, which are met from outside the organization, with distributional and efficiency costs elsewhere in the economy; and
- administrative cost, which is dead-weight loss to the economy, whoever picks up the initial bill, and likely to be particularly high for schemes which try to target particular groups.

Administrative burdens can be reduced through schemes which offer preferential rates to targeted households, via discounts for privileged consumers or 'floating-block' lifeline rates.

Wodon (1997) suggests a quantitative approach to rank the impact on the poor of sector specific subsidies. He defines Consumption Dominance (CD) curves to test how far subsidizing various sectors reduces poverty. The impact of subsidies on income distribution can be deduced by decomposing indices of inequality (e.g. Gini indices) by consumption sources. Analysis of CD Curves for Bolivia, Honduras and Mexico suggests that governments should subsidize those goods which are consumed in larger proportion by the poor. For instance subsidies for water and urban transport tend to have greater poverty reduction potential than those for electricity and telephone services, simply because the poor's share of total expenditures for water and urban transportation is larger than for electricity and telephone.

2.1 Subsidies, costs and quality

The various regulatory mechanisms invite some game playing by the regulated companies, and in the context of subsidies this is particularly evident in cost reporting. Once the company knows what mark up or subsidy rules the regulator is likely to apply, he will report cost structures which support the profit maximising outcome with the regulatory scheme. Such games are inevitable given the asymmetry of information between regulators and companies. If some service obligation is imposed, the operator may claim a very high marginal cost of capital to increase the rewards for meeting it. Moreover the nature of the game will be influenced by the regulator's status. If elected, the regulator wants to expand supply in areas where it will receive more votes and not necessarily where cost recovery is the fastest. Moreover there may be a risk of collusion between operators and government.

One way for providers to reduce costs is to degrade the quality, either in the short run through lower reliability, or in the long run by reducing investment (see Tremolet and Baker, 2000). It may be appropriate to offer differential quality dimensions, even where connection to infrastructure is the best method of supply. For example voltage variations acceptable for heat and light are very different from those which are tolerable for electronic and computer uses. A single public telephone may be more suitable than individual access to a fixed line or cell phone in each building. Clean water supplies may be more appropriately provided through yard stand pipes than via piping to individual dwellings. Here quality may vary both in terms of the access (how many telephones or water outlets) and in terms of the quality of the service itself (whether the water is potable, probability of brown outs in electricity). An example of differential quality occurs in self targeting schemes, where some cost barrier is introduced in access or consumption which is lower for the targeted group (for example increasing personal waiting times, which is less costly for those with lower valuation of time, usually the poor and the unemployed).

However there are both political and practical difficulties in differentiating quality. Politically it may be difficult to provide an explicitly different standard for different groups, even where the reliability for all could be improved by such differentiation (the random ex post unreliability of the whole system is seen as more equitable than a deliberate ex ante decision allocating different reliability levels to different groups). In

some cases the technical possibility for differentiation of quality is limited. For example all those served by a particular electricity distribution line, water pipe or telecoms transmitter will experience the same reliability, so some decisions on quality need to be communal. Nevertheless where differentiation is politically and technically possible, it is likely to improve the allocation of resources by recognising where high quality is most valued, and allowing discounts for those who prefer lower quality and lower cost services.

3. Obligatory service (OS) and universal service obligation (USO)

Two particular forms of cross-subsidy are commonly imposed, Obligatory and Universal Service, and this section identifies and distinguishes between them. Incentives for expansion of utilities service during privatization are curtailed by two principal factors. The first relates to lack of reward for the company supplying a market at the prevailing price. The poor are often the main victims of such supply rationing, because they consume relatively small quantities of the service, so that the fixed costs of service provision are spread over a relatively small number of units of demand; or they may be located in topographically difficult sites which incur costs well above the ongoing 'politically sustainable' prices. In a nutshell, supply rationing is the reverse of cream-skimming.

The second source of potential under-expansion arises from low demand. This may either be because of externalities, for example when demand for sanitation services, and hence the willingness to pay for the service, fails to take account of the health risks of poor sanitary conditions. Until an outbreak of cholera, like that in the 1990s, increases awareness of service benefits, the private level of consumption may be 'too low', failing to reach a desirable level from a social viewpoint. But the demand problem is not only related to externalities. Estache, Foster and Wodon (2001) report that in Guatemala, two thirds of households in the first quintile live in communities where the electricity grid is available. However, fewer than half of these households apparently choose to connect to the service when it is available. Here the prior need to invest in appropriate appliances and the lack of a 'demonstration effect' of potential benefits inhibit demand among low income consumers.

While apparently somewhat artificial, this distinction between supply rationing and under demand is useful in designing and targeting policy tools. Stimulating consumption (through tariff subsidies to customers) is inappropriate when the problem is the unwillingness of the operator to take risks on the supply side, unless there is a guarantee that the subsidies will flow into its revenue stream. Similarly, when effective demand is the main problem, service obligations will do little to address the problem since availability of connections or service does not guarantee consumption. The main focus of the discussion here is on the supply side, to reflect most of the experience in the Latin America region. It will show however that part of the supply side problem stems from the fact that reluctance to supply is often driven by demand uncertainty, and particularly by weak ability to pay.

Regulators in Latin America address scarce supply or demand by imposing two types of conditions: the Obligatory Compulsory Service (OS) and the Universal Service Obligation (USO).⁴ The differences are subtle but important.

⁴ Part of the international experience is summarized in ITU (1994), Wellenius, *et al.* (1994) and OECD, (1995).

Obligatory service (OS) is appropriate when:

- supply costs are higher in some locations so that the operator may ‘undersupply’ some markets, for example in rural areas;
- some consumers present ‘accessibility’ problems, particularly those with physical or motor disabilities; or
- availability of certain privately supplied services is lower than the socially desired level (public telephones, special numbers, among others).

Under OS, operators are asked to allow access to their services to all users who wish to join the supply system at the prevailing tariff. Although this duty normally lies with the supplier, it can also have implications for consumers because there are two types of obligatory service: the unidirectional service (obligation to serve), in which the supply-side is prevented from using rationing mechanisms and differentiating prices; and the bi-directional service, in which the demand-side cannot self-exclude from consumption due to price or substitute availability (i.e. an obligation to take service from the designated supplier, or at least not to take it from elsewhere). Telephone, gas and electricity services are generally associated with an obligation to serve. Water and sanitation are more typically associated with a combined obligation to serve and to use for health and environmental reasons.⁵

In practice, OS means that any user who expresses interest in the service can gain access to service provisions with no conditions other than the payment of the on-going tariff, even if this incurs a loss for the supplier. Many companies prefer to work with tariff caps in this type of situation, since these give a margin for relatively easy adjustment in tariff levels and some opportunity for rebalancing without the public political debate that surrounds frequent tariff revisions under cost plus regulatory models.

Universal Service Obligation (USO) contains an additional dimension of affordability and arises when:

- the product is essential;
- there are groups of consumers who cannot gain access to a product or service unless tariffs are adjusted to meet their ability to pay;
- failure to gain access also entails the exclusion of consumers from other markets (e.g. labor market), typically in communications.

USO (or Universality)⁶ is a more pro-active instrument than OS. Like OS, it reflects the ambition to give all community members access to product consumption, but in addition controls tariffs so that an ‘acceptable’ consumption level is achieved. USO requires tariff adjustment until the voluntary service consumption reaches a socially desirable level. Of course, this consumption is reachable only with investment plans compatible with the

⁵ In many cases, obligatory connection is also related to financing the extension of the network; this is most obvious when the obligation to connect is applied even in cases where there is no dwelling, for example on empty plots of land.

⁶ OFTEL (1995) (1997); Analysys (1995); Muller (1997); Graham, (1995).

concomitant growth in demand. Therefore, USO includes OS and it must incorporate incentives to users to share the formal network.

Table 1
Policy instruments and service obligations types

Policy variables	Obligatory/ Compulsory Service (OS)	USO
Tariffs	Current tariffs	Endogenous. Adjusted to the objective of maximizing number of consumers.
Investment (network extension)	Endogenous. Expanded according to demand	Endogenous. Adjusted to the envisaged coverage level

Source: Chisari and Estache (1999).

The move from OS to USO depends on the social valuation of the product or services and whether or not any substitutes exist. The supply of water and sewers, for instance, is highly desirable and service obligation will be effective only if tariffs are endogenous and driven by ability to pay.⁷ On the other hand, in telecommunications, the importance of service use varies according to service types and service users and over time. The need to separate the essential from the non-essential is a crucial decision for reformers and sometimes regulators.

Obligatory service may become a universal service by imposing a specific tariff reduction for all or some users. Openly admitting the possibility of reduced tariffs for some users paves the way for free-riding, even in cases of certain, clearly identifiable, users (such as retirees). A risk with bringing down tariffs, particularly access tariffs, is that it either harms public finances, if the government provides support, or it threatens the viability of the suppliers if there is no government support.

Policymakers' different definitions of what is desirable from the social viewpoint explains inter country variation in the content of what is commonly known as 'USO' in the practitioners' world. For instance, the obligation to connect schools to internet services will have a different impact on demand if it is designed as an OS or a USO because the tariff may be quite different. There is a risk of arbitrage across tariff types and of resale of subsidized services at higher prices, e.g. subsidized water from urban fountains sold at huge mark-ups in rural areas, which makes design of USO especially challenging. This simply highlights one of the dilemmas of regulation. Promoting access must simultaneously encourage consumption and restrain free-riding and misuse. A summary of USO and OS in Latin America is shown at table 2.

Self-exclusion becomes a concern for service universality if it is harmful for society. Self-exclusion from sanitation services has an impact on the economy's productivity and on hospital costs, apart from other ethical aspects and externality arguments. Self-exclusion from telephone services reduces the value of the network to other users. Self-exclusion from the electricity network, and to a lesser extent from the gas network, may increase

⁷ This statement relates to particular levels of consumption because consumers may utilize water for uses that are not of high social importance (for example, swimming pools and recreational gardens).

dangers from accidental fires from candles or off network heat sources. In many instances, the charge for access is likely to be the main cause of self-exclusion.

In most countries the supply of services to shantytowns and poor neighbourhoods, and the upgrade, rehabilitation or construction of networks have become a problem for poor people. Even if real connection charges go down, the effective connection cost may increase for those who are now forced to pay for the infrastructure if they had previously avoided such payments. For poor users, fixed charges mean the precommitted purchase of products, which exerts different pressures on them. Their available budget for other products is reduced. The alternative is to work longer hours, with attendant costs of increasing their labour-supply.

In some cases, a high percentage of neighbours may adhere voluntarily to the network, reducing available substitutes and seriously affecting those who cannot pay. The only alternative the non-user has is to 'escape' from the network by relocating to non-serviced areas. Such moves occurred in Argentina. Moreover, the provision of services is often accompanied by legalising the occupation of fiscal lands, and thus increasing taxes payable (mainly municipal). Legal demands to join the network (for example, if it runs in front of the door of a dwelling), or the social demands to do so (because others have done so and there are no longer any substitutes) may favour a progressive process of 'dualization'. The poor 'flee' from efficiently provided services. The geographical pattern of demand may thus be considered both stochastic and well-determined as a result of the poor user's optimization plan. This random characteristic increases suppliers' costs because they are pursuing a mobile target.

3.1 USOs, unemployment and income distribution

The risk of self exclusion, and hence the importance of universal service obligations, is particularly significant in situations of high long term unemployment levels. In Argentina, the economy has been experiencing unusually high levels of unemployment compared to the averages in the seventies and eighties. While the 'normal rate' had been around 6 percent, by 1993 unemployment had reached 9.3 percent and rose to around 18 percent after the 'Tequila' effect in 1994-5.

At first, unemployment was largely explained by increased participation rates, arising from improvement of real wages derived from the stabilization plan⁸, and by frictional reasons (substitution of public by private employment after the privatizations). Thereafter, unemployment rates responded more to financial shocks on firms and on labour supply, and to the substitution of capital for labour. On the other hand, the progressive extension of the networks, following the established expansion plans set forth in the privatization tender specifications, extended the services to areas typified by higher supply costs, poorer users, and relatively high unemployment rates. In fact, the unemployment rate has jumped to a persistently high level, which affected low-income, low-skilled workers more harshly. These workers have both low and cyclically variable incomes.

⁸ Known as the Convertibility Plan since it set a 1:1 peso/dollar ratio.

Table 2: Universal Service/Obligatory Service approach in selected countries

AREA/ COUNTRY	US/OS definition		US/OS coverage		US/OSOBLIGATIONS				RETAIL SCHEME				FUNDING MECHANISM					
													US/OS FUND					
LATIN AMERICA	Y	N	Rural	General	Incumbent	Cellular	Regional	Special rural license	Special payphone operators	Phone shops & private PCOs	Telecentres	Innovative initiatives	Cross-subsidies	Interconnect fees	N	Y	Plan	Funded through
Argentina	X			X	X				X	X	X		X		X			Pay or play
Bolivia	X		X		X		X ⁹									X ¹⁰		Gvt?
Brazil	X		X		X ¹¹							X ¹²			X			
Chile		X						X	X		X			X ¹³		X		Central gvt
Colombia	X			X				X								X ¹⁴		Operator levy
Ecuador					X						X						X	WB: TA for fund
El Salvador											X							
Dominican Rep.	X				_15						X					X		2% tax on subsc. bills, int'l settlements
Guatemala								X	X	X			X			X		Spectrum auctions
Honduras					_16					X							X	-
Peru	X		X		X			X	X		X					X		Operator levy
Mexico		X	X		X						X			X	X			Virtual fund considered
Nicaragua											X		X				X	WB TA for fund
Venezuela	X		X		X	_17		X	X	X	X							

Source: Regulators websites, World Bank contract database and Juan Navas-Sabater, USO in Latin America, World Bank (mimeos).

⁹ Co-operatives with rural obligations.

¹⁰ Telecom law of 1997 has provisions for using El Fondo Nacional de Desarrollo Regional for funding rural telecoms, no evidence of actual implementation.

¹¹ The incumbent operators, no obligations for the mirror license holders.

¹² Virtual telephony.

¹³ To ensure the viability, payphone operators are planning to charge higher interconnection fees.

¹⁴ Social Telephony Fund.

¹⁵ DGT, Directorate-General of Telecommunications has operated rural telegraph system, but its to be discontinued.

¹⁶ Rural Master plan defines target, but is there any license obligations?

¹⁷ Cellular operators are permitted to serve rural areas, and have service expansion requirements.

Table 3
Estimate of users' expenses in services (income deciles) January 1998

Decile	Inc. per capita (US\$)	H'hold average persons	H'hold total income (US\$)	Rate of unemployment (%)	Monthly fixed charges (US\$)	Monthly variable charges (US\$)	Total	Total expenses as % of total income
1	56.8	5.25	298.06	40.7	29.04	19.37	48.41	16.2
2	107.7	4.31	464.11	28.8	29.04	27.85	56.88	12.3
3	148.4	3.31	491.33	21.3	29.04	29.48	58.51	11.9
4	186.1	3.6	669.95	22.6	29.16	33.50	62.66	9.4
5	233.6	3.28	766.25	16.6	30.58	34.48	65.06	8.5
6	296.0	2.94	870.32	15.4	32.52	34.81	67.33	7.7
7	372.0	3.07	1142.16	12.2	34.80	39.98	74.78	6.5
8	486.0	2.78	1351.06	8.3	37.06	40.53	77.59	5.7
9	684.5	2.69	1841.27	6.2	42.04	46.03	88.07	4.8
10	1 383.7	2.25	3113.37	6.1	49.76	62.27	112.03	3.6

Source: adaptation from Chisari and Estache (1999).

Note: As of January 1998. The figure do not take into account subdeclaration, which would reduce expenses as a proportion of decile incomes.

Table 4
Expenses in services including amortised connection charges January 1998

Decile	Household total income (US\$)	Fixed and variable charges (US\$)	Amortised connection charges (US\$)	Total expenses (US\$)	Total expenses as a % of total income
1	298.06	48.41	57.33	105.74	35.48
2	464.11	56.88	57.33	114.21	24.61
3	491.33	58.51	57.33	115.85	23.58
4	669.95	62.66	57.33	119.99	17.91

Source: adaptation from Chisari and Estache (1999).

Note: As of January 1998. The figure do not take into account subdeclaration, which would reduce expenses as a proportion of decile incomes

Tables 3 and 4 show the results of 'first order' estimates of 'tariff pressure.' Table 2 shows the tariff reflecting only ongoing costs of connection and usage, while table 3 also includes the fixed cost to cover (amortized) initial connection to the system. Average tariffs were considered by decile. Notice the high level of unemployment for the poorest deciles, and the significant proportion of total income when all services are provided simultaneously. When only usage (monthly variable charges) are considered, the financial commitment falls to about 6 percent of the total average income of a family belonging to the poorest decile, though this average will hide wide variations. The high burden for low income groups of including both ongoing and initial fixed costs is evident and supports an argument for some sort of USO.

One important corollary arising from the discussion above is that tariffs must be designed not only for ‘normal’ times, but also for periods when the poor are suffering from macro economic shocks. Thus the expected value and variance of the tariff should ideally be computed if connection to the formal network is to be maintained. If heavy penalties for late payment and delinquency are not avoided, the poor are likely to abandon the network.

4. Financing USO

As the discussion above shows, Universal Service Obligation generally entails providing service at a lower price than the company would choose freely. USO is essentially an ad hoc mechanism, driving prices away from their strict allocative efficiency, with an economic impact that may be divided into two parts: a distributive one (between consumers) and an allocative one: each of these affects both access and usage. We have seen that allocative inefficiencies and costs from divergences between prices and costs are lower in markets with low demand responsiveness. In this context, further questions emerge. Should the universal service obligation be applied to access (provision of the network), to its use by consumers, or to both markets? Where is the social cost lower in regard to USO implementation? These questions are essential to determining the economic impact of USO, as well as potential financing methods.

In principle, there are four financing systems for the Universal Service Obligation:

- Cross-subsidies among consumers and/or among products.
- Direct transfers either to consumers or through company disbursements.
- Setting-up a specific fund, financed from suppliers or government.
- Extension of the concession.

Section 2 has discussed cross-subsidies, and the rest of this study considers alternative financing mechanisms.

4.1 Direct transfers

In terms of economic efficiency, direct transfers to consumers are, in principle, the best option since relative prices are not altered. Each user pays the cost reflective price. However, this system has two impracticalities. First, it is difficult for the regulator to know the exact payment capacity of each agent or the real production cost of the company for each location, so it is difficult to make an efficient transfer calculation. This is an ‘adverse selection’ problem. The regulator must also ensure that those who receive a transfer spend it on the service for which it was designed, i.e. a moral hazard problem. The second impracticality is in implementation. Since public opinion may not accept price differentiation, cost reflective prices are unacceptable if costs differ between consumers.

A dual solution to this problem has been proposed. Consumers should be charged a uniform price and transfers should be received by the company. Although this system solves the moral hazard problems, since consumers do not receive any extra income that can be used for other purposes, it does not eliminate adverse selection, because the problem of identifying the people who need the transfers remains. Nevertheless, this method has been used in different regulated sectors in Argentina (electricity, gas and

water) for retirees and in the Patagonia region, and in Chile where subsidies have been administered through municipalities.

Of course, any financing must come from global public resources, so other publicly supplied products and services must be sacrificed; or taxes (which distort) or the financial exposure (indebtedness) of the public sector must be increased. Indeed the Argentine public sector started to accumulate a heavy debt burden with operators through the social security system.

Consumption subsidies are often more politically popular than production subsidies because so many more consumers than producers have votes. The risk with public sector consumption subsidies is free-riding. In the case of some subsidized services, for instance telephony and gas, many retirees paying a subsidised tariff showed very high levels of consumption, indicating that relatives or friends used these services in the retirees homes to gain access to lower tariffs. The effect was to increase total subsidies and pressure on public finances.

In Argentina, this problem was addressed by providing a fixed money amount to all retirees (earning a minimum pension) regardless of whether or not they were connected to the network. This mechanism solves the dilemma of profit distribution among homogeneous retirees, but does not ensure use of the services at ‘the socially acceptable minimum consumption level’ (nor ensure connection to the network). Although this change is recent, there are already recorded cases of retirees using the amount they received for expenses other than paying for public utility services, and delaying payment of their bills. Another difficulty with tariff reduction or subsidies is that those who are officially eligible are not necessarily low-income consumers. For example, if a tariff reduction or subsidy is directed at minimum pension earners, no account is taken of other sources of income. Finally, the whole scheme had an obvious degree of unfairness, since encouraging the use of certain products or services is not possible for those without access to the service networks. The lower tariffs for the retirees connected to the system are partly financed (through taxes) by retirees of similar or lower income levels who are not served by the network.

These trade-offs arise because identifying the target group through a proxy characteristic is often the only way of implementing the program. We have already noted that the definition of ‘socially acceptable minimum consumption standard’ is liable to evolution and change. Moreover, there is a potential danger of a misallocation of funds if there are no well-defined prizes and penalties governing the destination of the subsidies and private benefits are lower than social gains, as for example with connection to drinking water and sewerage networks.

4.2 Financing fund

A financing fund is a means of financing transfers such as those discussed above. The fund consists of a contribution from all the market operators toward those who carry the USO. It is a mechanism applicable to situations where entry to the industry is allowed, but in which USO is compulsory for only one operator. Different options have been proposed for collecting funds, although the main source is to levy taxes on those supplying the service, either through charges for granting licenses, which may be competitive, or through inter-

connection charges if the operator responsible for USO is the owner of a network that all others must use. Such a fund also has drawbacks. An inadequate collection mechanism may affect the competition process through payment conditions which hinder long-term incentives. For instance, if the fund absorbs a significant proportion of revenue and entrants have large fixed costs, this will reduce the incentive to enter the market.

4.3 Extension of the concession and coverage

Other financing mechanisms have been used to finance USOs. One is the extension of the concession through granting the company exclusivity. This mechanism allows the company to continue financing the essential investments needed for complying with the USO from its own resources. Effectively the company is allowed to generate monopoly profits for longer, or from a broader base, and so use a cross-subsidy from these monopoly supplied consumers to benefit those to whom the system is extended. Questions of transfer of income arise, except in the special case where the exclusivity is granted only for the new part of the network. In this particular case the beneficiaries themselves finance the extension through paying higher (monopoly) prices to the supplier. But if these are low income households it raises the problem of ability to pay, resulting in inadequate effective demand. Such a franchise mechanism was proposed in Argentina in order to cover the collection deficit in infrastructure charges, which occurred when the extension works reached poorer neighbourhoods farther and farther away from densely populated districts. Another variation is coverage extension. If the company is obliged to provide services to non-profitable community sectors, the regulator offers to extend coverage so as to include consumers to which prices incorporating cross-subsidies may be charged.

In other words, the extension of the area is the mechanism through which the population base for the collection of subsidies that finance the universal service obligation is expanded. If the extension is not feasible because of geographical limitations, there is an alternative that entails the 'reserving' of certain parts of the market for the operator in charge of providing USO. In all these cases of extended franchise, however, the cost is that consumers located in the reserved area will not benefit from competition as quickly as they otherwise would.

4.4 Regulation of the obligatory service and alternative technologies

When there are supply alternatives, it is easier to overcome supply shortages because such technologies generate different cost structures. This is true in the telecommunications industry. An example is wireless telephony, which uses a technology increasingly common in rural areas or low-density districts that are unattractive to companies operating with fixed networks. The advantage of wireless technologies is to save infrastructure costs, so that entry is profitable. While such technologies have lower costs than those of the fixed network telephony at low densities, costs grow rapidly if the served population in an area increases because of congestion and interference. Where such technologies are appropriate, competition is possible because the capital is divisible, reducing the minimum efficient scale. Likewise, a company that has already installed a fixed network may be forced to adopt this technology through an additional clause in the universal service obligation (OfTel, 1997). Here the choice may be between diverting demand from lower resource cost fixed networks already provided by the networks, and encouraging new entrants by handicapping the incumbent, even if this is 'wasteful' in static terms.

Finally, the possibility of competition presents an interesting perspective from the regulatory viewpoint since it diminishes the pressure on the regulator to fix prices. A continuous competitive process is expected to result in lower prices. However, the entry of new suppliers may lead to duplicating costs which are amortized once the company invests capital in the area under consideration. If such capital is 'specific' for that activity, capital cannot be freely reassigned if a company exits the market. The capacity is under- or unused, and society faces 'stranded' costs, the recovery of which is an issue for the regulator.^{18 19)}

If the regulator has no alternative regarding supply, and service is obligatory, the debate reduces to finding a mechanism to finance the activity when conditions do not allow self-financing. Experience shows that pricing with cross-subsidies is the most common tool, as discussed in section 2.

Increasingly, governments are involving the private sector in implementing their social goals. For example in 1997, the Bolivian Government issued a 30 year concession to the Suez Lyonnaise des Eaux consortium, Aguas del Illimani, for private provision of water and sanitation services in the cities of La Paz and El Alto in Bolivia.²⁰ A major objective of the concession was to increase coverage of these services rapidly, particularly in El Alto, a city adjacent to La Paz formed in the last few decades as a result of migration from mining centres and agricultural areas. At the time of the concession award, coverage was 87 percent for water and 48 percent for sewerage. The concept of the compulsory service obligation was built into the design of the auction for the right to deliver the service by awarding the contract to the bidder offering the largest number of new connections in return for a predetermined water tariff.²¹ The winning bidder promised to achieve coverage close to 100 percent for water and 90 percent for sewerage in El Alto by 2001.

To make connection more affordable for low income households, the concessionaire chose to expand the network in low income areas by means of the condominial system, reducing the cost of network expansion by 10 to 20 percent for the water service and by 30 to 60 percent for the sewerage service. Households are also allowed to choose between backyard, sidewalk or indoor connections, in increasing order of charges. When households contribute some of their own labour time, the cost of a sewerage connection can fall as low as \$100. Following connection to water and sewerage networks, about 70 percent of households went on to build their own bathroom installations, about half with the assistance of microcredit facilities. The total cost of such an investment is typically

¹⁸ The importance of capital specificity in decision-making for entering and exiting the market is highlighted in Klein, *et al.* (1978).

¹⁹ The impact of technological change in defining the universal service obligation is highlighted in ITU - (1994). The 1997 Telecommunications Act in the USA. accepts that the definition of USO is dominated by technological changes and recommends imposing a 'dynamic' definition.

²⁰ For more details, see Komives and Brook-Cowen (1999); Carbonnel (2000).

²¹ Specifically, the residential tariff was fixed at \$0.22/m³ following a 35 percent increase immediately prior to privatization. This tariff, which covers both water and sewerage services, represents about half of the true cost of provision. The difference is covered by industrial customers who pay between \$0.66/m³ and \$1.18/m³. The concession contract set connection charges at \$155 for water and \$188 for sewerage, well below the full economic cost of \$300 and \$400, suggesting that a significant proportion of the costs of network expansion are being recovered via cross-subsidies from the use of service charge.

around \$500. Micro credit is provided at interest rates of around 14 percent for a 5 year period. Overall, the delegation of this social role to the private sector seems to have been effective. Revenue recovery by the concessionaire has been as high as 98 percent, even in the low income areas of El Alto.

5. Practical application of obligatory service and universal service criteria

Interesting lessons can be learned from the application of OS and USO criteria in Argentina, many arising from the rapid and far-reaching nature of the privatization process. Although there was some experience in dealing with OS and USO criteria in public companies, the private operators and regulators encountered a new series of problems. These were exacerbated by the changing economy and persistently high unemployment rate. We analyse the failures detected in the market, as well as setting forth the successes and mistakes observed, classifying the most important ones from an economic viewpoint. While the network was extended to areas where the poor had lived, many were forced to move away and were adversely affected by attempts to help them.

5.1 Inter-jurisdictional externalities

This phenomenon arose from the migration of the inhabitants of the poor neighbourhoods toward jurisdictions where real estate ownership was not formalized. The disincentive effects of fixed charges were exacerbated by persistent unemployment and low, unstable incomes.

5.2 Elusive demand

As part of imposed geographical expansion of the network, the companies encountered low-income neighbourhoods with high and uncertain access costs, as well as uncertain revenues. This led to more difficulties in achieving the USO objective, and more hesitation in implementing OS. The Agreement of guidelines (Acuerdo Marco) blended the efforts of the companies and the national and provincial governments, overlapping with other social assistance plans and seems to have been effective. The simultaneity with which the new services were provided is significant. This could indicate that a gradual policy can sometimes work better than a 'shock' procedure.

5.3 Expected tariffs, unemployment and delinquency

Consumers may self-exclude themselves due to the tariff, depending on their payment capacity, the expected unemployment rate, their expected salaries and the re-connection and delinquency charges. Within the framework of a static economy without unemployment, the optimum tariff structure depends on the elasticity of the fixed charge and of the usage charge. In an economy with persistent unemployment and a skewed income distribution, these elasticities and their dynamic equivalents are even more important.

5.4 Access to credit and fixed charges as implicit contracts

Most of the financial assistance programmes in Argentina did not take the unemployed into account who normally have no access to credit. Moreover, the expansion of services was

implemented alongside elimination of leakages, misuse and clandestine connections. In other words, (informal) availability of the services free of charge was reduced.

Although 'normal' tariffs are usually lower than the cost of any substitutes, such substitutes can often be bought on the spot, when needed, with no long term commitment, while access to the network and a fixed charge entail an implicit contract and some commitment and inflexibility. Consequently plans that included credit for the payment of infrastructure charges were not very successful.

5.5 Regulatory policy, employment policy and social policy

Regulatory policy was implemented faster and with clearer objectives than unemployment policy, which may account for some of the difficulties encountered. Tariff structure is not the optimum mechanism to solve unemployment problems, and cross-subsidy structure is unsustainable in competitive markets. In some sectors, 'cross-subsidy' policy is explicit (such as in water), in others it is implicit. It includes both use (on-going) and expansion (one-off connection to the system). Should the system be designed assuming that full employment exists, or should it recognise the low income and informal participation of the targeted users and permit cross-subsidies? Should poverty be addressed at a different and more comprehensive level? Of course the ideal is to improve both aspects simultaneously, and there has been particular success with schemes employing workers from poor families for infrastructure extension works.

5.6 Latent opportunism of users who benefit from special programmes

The special tariffs in telephony, which favour retirees collecting a minimum pension, show that special treatment of a consumer sector may induce free-riding. In the telephony sector, this problem was corrected by establishing a maximum number of calls which each beneficiary could claim at the reduced rate.

5.7 Fixed allocations for payment of services do not ensure USO

To avoid burdening pensioners with excessive bills for public services, a fixed monthly allocation for gas, electricity and water was included in pensions. But it has already been noted that many pensioners do not pay their bills. If services are cut off, the desired externalities will not have been achieved; if defaults are paid from central funds, the above objective will be fulfilled only at the expense of public finances.

5.8 Increasing bloc tariffs to identify payment capacity

Increasing bloc tariffs were applied in all sectors. However, the methods differed. In some cases, the discontinuity of prices between blocs was very sharp, and these mechanisms brought about costly claims challenging whether consumption had been measured accurately.

5.9 Information asymmetry between the regulator and the operator.

There is little knowledge on the costs of reaching agents located in remote regions. This may raise a 'moral hazard issue,' with companies exaggerating supply costs in these districts. If alternative technologies are available, their use in competition with currently

used technologies limits the above effect, for example in satellite technologies for rural areas.

5.10 'Tailored' programmes

The policy to be implemented may be of a general nature, setting fixed, homogeneous rules among consumers. Consumers vary widely in their circumstances and costs. A 'tailored' programme is more expensive, but is probably the only method to implement USO effectively.

Regulatory reform can bring long term benefits to consumers through lower costs and prices. But low income consumers will not necessarily benefit most or fastest from the changes. In particular the introduction of competition may erode traditional cross-subsidies with adverse distributional effects. USOs, OS or new subsidies may be needed to protect the interest of the most vulnerable and ensure that they receive a 'fair share' of the benefits of reform in the short term. An ideal scheme maximises the benefits for the target group, while minimising the efficiency losses through distortion which any such mechanism inevitably involves. This study has demonstrated the different principles and practical considerations involved, drawing particularly on the Latin American experience.

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UNU World Institute for Development Economics Research (UNU/WIDER)
Katajanokanlaituri 6 B, 00160 Helsinki, Finland

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