
The Economics of Universal Service: Theory

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Abstract

The universal service obligation (USO) is a cornerstone of industrial and regulatory policies in the major network industries of most industrialized and developing countries. It is probably the major building block of the concept of public service which is central to regulatory policies in many European countries. Historically, universal service has typically been provided by a monopolistic public or regulated operator and its financing mechanism has been designed accordingly. The ongoing liberalization process raises new questions, and regulating authorities face the problem of organizing the provision and financing of universal service in a competitive environment. In this paper, we address some of these questions, by providing a systematic economic study of the USO. We analyze its rationale, its costs and benefits and the different options available for its practical implementation, both in a monopolistic and in a liberalized environment. We start by assessing the underlying economic issues pertaining to its definition and its rationale. This sets the grounds for the remaining, more policy-oriented discussion. Next, we deal with the costs (and benefits) of the USO, an issue which has drawn most of the attention in the recent literature on the USO. We point out the problems raised by its definition and measurement and suggest possible solutions. Finally, we study the financing of the USO. We consider and compare several alternative arrangements in various types of environments and analyze their respective advantages and disadvantages.

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The Economics of Universal Service: Theory

The universal service obligation (USO) is a cornerstone of industrial and regulatory policies in the major network industries of most industrialized and developing countries. In particular, it occupies a prominent place in the policy debate within the EU and the United States. It is probably the major building block of the concept of “public service” which is central to regulatory policies in many European countries. In many instances, universal service was historically provided by a monopolistic public or regulated operator and its financing mechanism was designed accordingly. The ongoing liberalization process has, to a large degree, made these traditional arrangements obsolete. While the need for monopoly protection has been questioned, the very idea of universal service remains relatively unchallenged. Most regulators express a strong commitment to universal service, which often motivates a large fraction of the remaining regulatory intervention in otherwise liberalized industries.¹ Consequently, new questions arise and regulating authorities face the problem of organizing the provision and financing of universal service in a competitive environment.

In this paper, we address some of these questions by providing a systematic economic study of the USO. We analyze its rationale, its costs and benefits and the different options available for its

practical implementation, both in a monopolistic and in a liberalized environment. We start by assessing the underlying economic issues pertaining to its definition and its rationale (Section 1). This discussion sets the grounds for the remaining, more policy-oriented sections. Next, we deal with the costs (and benefits) of the USO (Section 2), an issue which has drawn most of the attention in the recent literature on the USO. We point out the problems raised by its definition and measurement and suggest possible solutions.

Finally, we study the financing of the USO (Section 3). We consider and compare several alternative arrangements in various types of environments and analyze their respective advantages and disadvantages.

At this stage, it is important to point out that while the various network industries have a number of common features, they also differ in many significant respects. In most of our arguments we try to abstract from these differences by considering some generic form of a network industry. This approach allows us to focus on the main issues and to provide an integrated study of the various sectors. It has, however, the drawback that our arguments may fail to address some crucial specificities of particular sectors. Consequently, some fine-tuning may be necessary to apply the arguments presented in our study to a specific sector.

1. Fundamentals

This section addresses the underlying economic issues. It analyzes the economic content of the definition of the USO and attempts to cast this policy within a more general regulatory framework. What type of constraints does the USO effectively impose on an operator? How is it related to other regulatory policies? What are its possible justifications, both on normative and on positive grounds?

1.1 Definition and Economic Content

An examination of the major network industries shows that the precise definition of the USO is, to a large extent, country and sector specific. Some crucial features are, however, omnipresent and lead to a generic definition of the USO. From this perspective, the USO can essentially be viewed as the obligation of an operator to offer either a full range or a basic package of services,

- of “good quality”
- to all users
- at “affordable” rates.

The precise definition of the goods and services which are subject to the USO is, of course, sector specific. It also varies across countries, but a number of directives of the European Commission has opened the door for an harmonization within the EU. Let us provide a few illustrative examples. According to the 1996 Telecommunications act, the Universal Service basket in the US includes “voice grade access to the Public Switched Network with the ability to place and receive calls, touch-tone signaling, single-party service, access to emergency services, access to operator services, access to interexchange² services and access to directory assistance.” In the UK these service include “basic telephony, message forwarding, directory and operator assistance, emergency services, phone book provision and the availability of public phones.” In the context of postal services, on the other hand, a recent directive of the European Commission stipulates that universal service should

at least incorporate the following facilities: the clearance, transport sorting and distribution of postal items up to 2 kg, the clearance, transport, sorting and distribution of postal packages up to 10 kg and the services for registered and insured items.

In many instances, uniform pricing is imposed as *additional* requirement. The operator is then not allowed to differentiate its prices (or pricing policies) geographically and/or between consumer types (like households and firms). Whatever its precise definition, the USO is, in essence, a set of restrictions on the operator(s) pricing policy. The requirement to offer service to all individuals imposes a binding constraint only because of the simultaneously imposed restrictions on the pricing policy. If the operator were free to set its prices, the USO would be an empty condition. The operator could then charge any consumer group a sufficiently high price to either cover costs or to ensure that their demand drops to zero. This is no longer true if prices are restricted to be « affordable » and/or uniform (across consumer types). In this case, prices are likely to be below cost for some consumer types, and the USO constitutes a binding constraint. Put differently, the USO can be seen as a specific form of price regulation; that is, a mechanism through which a public authority imposes prices or pricing restrictions. From this perspective the “universality” of the service simply means that the pricing restrictions apply to all consumers.

To make the USO operational, it is not sufficient to define the bundle of goods and services it covers. It is also necessary to make the requirement of *affordable* rates somewhat more precise. Unfortunately, the translation of this legal (and somewhat philosophical) principle into economically meaningful policy guidelines and from there into precise regulatory measures is a rather intricate problem. In the telecommunications sector, for instance, the penetration rate can be used as an indicator of affordability.³ However, it certainly falls short of providing a comprehensive assess-

ment. While a declining penetration rate in a given area may well point to unaffordable rates, a constant or even increasing penetration rate does not necessarily mean that rates are affordable. Phone service may well be perceived by households as a necessity, and some (even low income) households may remain connected, even though this imposes a significant burden on their budget. This argument is even more compelling in other sectors like electricity for instance. Consequently, it is necessary to assess the burden that the particular service imposes on the budget of specific consumer groups and to determine whether that burden is deemed acceptable by public authorities.

Our theoretical analysis below will shed some further light on the economic implications of the notion of affordability. By analyzing the USO as a regulatory pricing policy, we will point to the fact that this problem has to be dealt with in an integrated way. Put differently, the appropriate design of the USO policy cannot rely on a sequential discussion of the different problems involved. Content, price levels and financing mechanisms have to be decided upon simultaneously, and the different decisions are largely interdependent. The crucial question is then to know what is the basic objective of the policy and how can this objective be pursued in the most effective way through the appropriate design of the various components of the Universal Service policy.

Finally, it has to be pointed out that quality introduces an additional dimension of complexity: pricing restrictions are in general complemented by requirements on the operator's quality of service (ranging from "minimum quality standards" to a precise definition of a range of *basic* services). Such restrictions can, on the one hand, be an expression of the regulator's concern for quality. Put differently, a high quality may, in itself, be one of the regulator's objectives. On the other hand, they

can simply be imposed to avoid the possibility that the operator « cheats » on the price constraints through low quality. For example, without such restrictions, an operator could effectively bypass a uniform pricing constraint by offering a service of low quality to some consumer groups. This in turn would make the USO an essentially meaningless policy. In the remainder of this paper, we shall focus on pricing policies keeping, however, quality issues in mind.

1.2 Rationale

We shall now study the possible justifications for a USO. Two different but complementary questions arise. The first one is to know if and how the USO can be justified on welfare grounds, taking into account the various constraints that the policy makers (or regulators) may face. In particular, one wants to know if the USO can be considered as an effective policy tool, which ought to be included in the public authorities' optimal policy mix. Alternatively, one can adopt a positive approach and attempt to explain why the USO is effectively imposed in most network industries. Acknowledging the fact that social welfare may not be the only relevant consideration for policy makers and regulators, one may explore alternative justifications for the observed prevalence of a USO in network industries.

We review and discuss the major arguments which arise from both of these approaches. We show that it is indeed possible, under plausible conditions, to make a case for a USO based on welfare considerations. While some of the justifications which are often quoted in the literature appear to be either flawed or of limited relevance, we point towards some important aspects which are often neglected. We also show how the political process in itself can lead to the imposition of a USO, irrespective of its implications for overall welfare. Here are the main arguments that have been suggested.⁴

1.2.1 NETWORK EXTERNALITIES

Network externalities arise when the benefits from using a network depend on the number of individuals who are connected to the network.⁵ For instance, in the case of telecommunications, the number of subscribers determines the number of individuals any particular user can communicate with. Consequently, any individual's decision to subscribe or not to subscribe directly affects the utility of other individuals. However, when deciding upon participation, any particular consumer will only take his own (private) benefits into account.

It is often argued that such externalities may lead to an inefficient outcome in an unregulated market. Specifically, one expects that participation will be "too low," or from a dynamic perspective, that the development of the network will be adversely affected. These inefficiencies may be eliminated, or at least reduced, through regulatory measures aimed at providing access to the network at subsidized rates—and this is precisely what a USO can accomplish.

This points to an often quoted justification of the USO, namely, as a device to correct market inefficiencies in the presence of network externalities. This argument has some appeal for communications networks (telecommunications, postal services etc.) especially in less industrialized countries, where the networks are their early stage of development. However, it also has a number of limitations:

- First, it does not apply to all the industries where a USO is imposed. For instance, network externalities can hardly be used to justify a USO in the electricity, gas or water sectors. Put differently, the argument applies only to communications networks and in particular to telecommunications.
- Second, even in those sectors where network externalities do arise, a number of regulatory measures, which are usually associated with

the USO, do not appear to have a direct link to this phenomenon. Examples include the uniform pricing requirement imposed on postal operators or their obligation to maintain post offices in rural areas.

- Third, under closer scrutiny, it may not be self-evident that network externalities result in an inefficiently low degree of network participation. For instance, an operator may well find it profitable to "coordinate" consumers even in the absence of a regulatory obligation. This is because the firm also benefits from the network externalities (they increase the consumers' willingness to pay).

To sum up, the argument based on network externalities, though quite prominent in the debate, appears to provide only a very limited degree of support for the USO.

1.2.2 REDISTRIBUTION

The USO can be seen as a special case of *redistributive pricing*, that is a policy meant to affect redistribution through prices instead of (or in addition to) income taxation and/or *direct* transfers. From that perspective it bears some similarities with policies involving public provision of private goods, in-kind transfers etc. The basic feature of these policies is that some essentially private goods like education, child care or health care are provided either free of charges or at (sometimes highly) subsidized prices.

The recent economic literature has shown that such policies can be *optimal in a second-best setting*, that is when the policy makers do not have the necessary information to implement (potentially) more efficient policies like direct transfers.⁶ A detailed survey of this literature would, however, be beyond the scope of this paper and we shall restrict ourselves to reviewing the arguments which are most relevant for the problem under investigation.

The precise rationale of policies like public education or subsidized health care has for a long time

been a puzzle to economists. Even though they may create some externalities, education and health care are not, strictly speaking, public goods. In particular, exclusion is usually possible and the marginal cost of serving an additional individual is generally not equal to zero (or negligible). Consequently, one may wonder why the government would find it beneficial to intervene in their provision.

Probably, the most convincing argument is that public education or subsidized health care may be a way to reduce some of the most striking inequalities in a society. However, they are not the only conceivable instruments to achieve this goal and to complete the argument, one has to establish their effectiveness with regard to alternative instruments.

Consider the case of health care. Provision at subsidized prices may create over-consumption and thus imply an inefficient outcome. Consequently, if the objective of the public authorities is to help the less-healthy individuals it would appear more efficient to do so directly, through a personalized transfer. Now, this is certainly true in a (hypothetical) world where public authorities can perfectly observe individual characteristics and can distinguish the needy from the well-off individuals. In reality, this is hardly the case and direct transfers to less-healthy individuals may be difficult to implement. Specifically, if sick individuals are entitled to some transfer, everyone has an incentive to pretend that he is needy and the verification of these claims would be impossible or very costly. However, if instead health care expenses are subsidized, the redistribution appears to be better targeted, even though it may come at the expense of some inefficiency (over-consumption).

To sum up, though potential generators of inefficiencies, price subsidies (or public provision at free or highly subsidized rates) may be an effective instrument of redistributive policies if alternative instruments (like personalized transfers) are not feasible for informational (or other) reasons.

The arguments presented so far can justify various kinds of public policies, ranging from direct intervention (through the creation of a public service)⁷ to more indirect forms of price regulations. The USO, falls into the second category and it can be used to achieve two types of redistribution:

- Towards high-cost customers (e.g., rural households in the postal or telecommunications sector). This is, for instance, achieved through uniform pricing. However, pricing need not be uniform. Indeed, this type of redistribution occurs whenever price differentials (between consumer groups) fall short of reflecting cost differentials.
- Towards low-income (or otherwise needy) individuals. Prominent examples of measures aimed at affecting this type of redistribution include *social tariffs* in telecommunications or electricity.

A recent document by the Federal Communication Commission (see FCC (1996)) provides interesting illustrations for both types of redistribution. It explicitly distinguishes *high cost support* (subsidization of consumers in *high cost areas*) from support for low-income consumers (which, as is emphasized is not limited to specific geographic areas). Specifically, as far as the second aspect is concerned, it advocates some modifications (and extensions) of the existing *Lifeline* and *Link Up* program. Quite interestingly, this document also recommends universal service support for institutions like schools and libraries (irrespective of their location).⁸ Here the redistributive character of the policy appears indirectly, though the subsidization of other (essentially) redistributive programs like public education.⁹

So far, we have drawn our examples from telecommunications and electricity, the sectors where the redistributive dimension of the USO is the most apparent. In the postal sector, on the other hand, the redistributive argument is no less important, but its relevance less obvious at first. In this sector,

cost differentials arise mainly because of the locations (and types) of the addressees; the paying customers, on the other hand, are the senders. To establish that a USO can operate redistribution between, say, urban and rural individuals, it thus has to be shown that the eventual beneficiaries of the USO are not so much the senders, but rather the addressees, and specifically, the high-cost households within this group. This claim is supported by at least three arguments.

First, the very existence of cost differentials according to the location of the addressee is, to a large degree, due to the USO. It is because operators face the obligation of delivering to the addressees mailbox at a given frequency that rural delivery is more expensive. In the absence of a USO, reduced frequency, post office box delivery or similar measures could be implemented by the operator in order to eliminate the excess costs in rural delivery. Such an adjustment, would certainly have a much more significant impact on rural households than on the senders of the various mail items.

Second, in the absence of a USO, the postal operators could charge rural households for the delivery cost differentials by imposing a (periodic) fixed fee on those who opt for home delivery (rather than at some collective delivery point).¹⁰ In reality, such *connecting charges* do, of course, not exist in the postal sector (at least in Europe), but this does not mean that the operators might not find such a pricing scheme optimal if the USO were removed. Now, the arguments which oppose such differential fees (and which may make them hard to accept on political grounds) are essentially of redistributive nature. From that perspective, the redistributive role of the USO is that it precludes certain (non linear) pricing schemes which would impose a heavier burden on high cost customers.

Third, a large proportion of letters (and mail items in general) are sent by businesses, and economic analysis shows that firms generally manage to shift (at least part of) costs to their clients. Put

differently, cost increases will, in general, lead to price increases.¹¹ Under uniform pricing in the postal sector, banks for instance, have no reason to charge rural customers more for the mailing of their bank statements than they charge their urban customers. However, if mailing costs were different, a bank may find it profitable to differentiate fees according to the location of a customer.¹² A similar argument goes through for many other types of businesses and, in particular, for mail-order corporations. Consequently, it is very likely, that the burden of a removal of the uniform pricing requirement would eventually fall on the high-cost customers.

To sum up, these arguments have shown that the USO does indeed benefit rural households (implying high delivery costs), so that the first type of redistribution (low to high cost) is certainly as relevant in the postal sector as it is in other network industries. The relationship between USO and income based redistribution (the redistribution we referred to above as the second type), on the other hand, is probably weaker in the postal sector than in telecommunications and electricity. However, one can certainly think of the universal availability of *free* mail delivery as an in-kind transfer which, as explained above, can be an integrated part of a redistributive policy.

On normative grounds, this role of USO, as an instrument of redistributive policy, probably provides its most compelling theoretical justification. Various other arguments will be outlined below that do provide additional and complementary support to the USO. However, those arguments wouldn't by themselves be enough to make a convincing case for the USO.

The economic literature reviewed then suggests two different questions. The first one is to know if it is optimal to use the USO rather than other more *standard* redistributive instruments (transfers and income taxes, say). A detailed theoretical investigation of this issue would be beyond

the scope of this paper (see, e.g., Cremer and Gahvari (1995, 1996) for a formal analysis and a review of the relevant literature). We shall therefore restrict our attention to the practical aspects by presenting a simple empirical test which allows one to evaluate the costs and benefits of USO compared to an alternative policy of direct transfer. The second question concerns the optimal design (and financing) of a USO conditional on the fact that public authorities have decided to use this instrument. This is the problem we shall focus on in section 3.

1.2.3 PUBLIC/MERIT GOOD

It can be argued that a uniform and universal communications or transportation network (post, telecommunications, railroad) presents the character of a “public good” because:

- it “binds the nation together;”
- it is essential for the functioning of a democracy;
- for ethical reasons, society finds it unacceptable that anyone be excluded from communications services.

This argument relies on the idea that the existence of the network is valuable in itself, independently of the specific services it provides to the consumers. Consequently, it may apply even when the provided service is essentially a private good.

The USO can then simply be seen as a way of contributing to the provision of this public good. As mentioned earlier, this argument can be combined with the previous one and it can then explain why redistributive pricing ought to be used in network industries rather than in other sectors where the public good aspect may not be present.

1.2.4 REGIONAL POLICY

The USO can also be an instrument of regional policies. For instance, uniform pricing can be a way to subsidize rural customers, in order to encourage households and firms to locate in rural areas (or to

prevent them from moving away). Similarly, maintaining basic public services (like post offices or public phones) in small villages may contribute toward preventing the decline of rural areas.

Though quite compelling at first, this argument has to be qualified under closer scrutiny. The main flaw is that the relationship between universal access to some networks and regional development may be quite complex. Consequently, there may be unwanted side-effects and an overall positive impact is not always guaranteed. For instance, experience has shown that access to an efficient transportation network may speed up a region’s decline instead of fostering its development.

1.2.5 POSITIVE APPROACHES: SOME ILLUSTRATIVE ARGUMENTS

So far our approach has been essentially normative. We have studied how a USO can be justified on welfare grounds (taking into account the various constraints that the policy makers may face). If the main concern of policy makers is effectively to maximize welfare, these arguments also have a positive bearing and can explain why a USO is imposed in many network industries.

In reality, however, these policies may also emerge for different reasons, associated with the political process itself. For instance, *rural* pressure groups may advocate uniform pricing because alternative policies (such as direct transfers) are not considered as credible or because uniform pricing is less visible, and thus more easily accepted by the *public opinion*. Similarly, the existence and the scope of the USO could also be explained by regulatory capture. This would be the case if the entrants successfully lobby in favor of strict restrictions on the (incumbent) historic operator’s pricing policy with the intent of weakening its competitive position. At the opposite extreme, one can also think of situations where the historic operator itself may use its leverage on the regulator to maintain a

stringent USO as this may justify some of its privileges (e.g., monopoly protection in some market segments).

2. Cost of Universal Service

Much of the debate on the USO has concentrated on measuring its cost. However, it appears that the very notion of cost of USO is rather ambiguous; both definition and measurement are problematic. In addition, it will appear that the cost of the USO (whatever its definition) depends on the overall regulatory structure (see Section 3). Consequently, there does not appear to exist a general way of measuring the cost of the USO. Instead, there are several competing concepts and the precise measure that must be used depends both on the question one wants to address and on the regulatory environment.

2.1 Definition

There are at least two possible definitions, or types of definition, depending on the perspective which is adopted.

2.1.1 PROFITABILITY COST

The profitability cost can be defined as the loss in profits incurred by the operator due to the USO. Put differently, it measures the *burden* that the USO imposes on the operator. The proper way to measure this cost consists of comparing the profits realized by the operator at the market equilibria with and without USO. This is obviously not an easy task for it requires estimating the hypothetical equilibrium that would occur if the USO were removed, allowing all the operators to adjust their prices accordingly.

The existing measures (such as that based on the Net Avoidable Cost approach) may indeed fall short of assessing the so-defined profitability cost. These measures are essentially based on accounting arguments and they coincide with our definition only if prices and market structure do not

change substantially when the USO is abandoned and if the operator has no direct benefits from serving certain *non-profitable* consumers (reputation, long term strategy, etc.).¹³ They can nevertheless be useful as first approximations. In addition, they may have interesting interpretations in some specific contexts. For instance, if the USO is financed through cross-subsidies (see Section 3) the methods based on Fully Distributed Cost essentially measure the total amount of cross-subsidies. This estimation may be of some interest but one has to keep in mind that it does not reflect a cost *per se*.

Note that if the operator is a regulated firm which faces a binding profit constraint (at whatever level), the profitability cost is, in principle, equal to zero.¹⁴ Though surprising at first, this simply means that the profitability cost is not the appropriate concept to use in this context. In this case, the welfare cost defined below appears to be a more appropriate measure.

2.1.2 WELFARE COST

The welfare cost can be defined as the deadweight loss implied by the USO. To keep the argument as simple as possible we shall assume here that the deadweight loss can be approximated by the loss in total (consumer plus producer) surplus. The welfare cost is then obtained by comparing the total surplus achieved at a hypothetical equilibrium without USO with the total surplus realized under the USO.

Let us illustrate this by the simplest possible example. Consider the case of a single operator that faces two types of consumers, high-cost (say rural) and low-cost (say urban) customers. The highest value of total surplus is achieved if each type of consumer pays a price which equals marginal cost of serving that consumer.¹⁵ Clearly, this implies that rural customers would pay a higher price than urban customers. Next, to introduce universal service, assume that the operator faces a uniform pricing constraint. The price will then be some

(weighted) average of the respective costs. Rural customers benefit as they now pay a price below cost, while the urbans lose by paying a price above cost. It can then easily be shown that the decrease in surplus of the urban customers exceeds the increase in surplus of the rural customers. Hence, aggregate surplus decreases as uniform pricing is imposed.

One can cast this discussion within the traditional equity-efficiency tradeoff framework. Redistributive policies which act through the price system (and lead to *distorted* prices), have an efficiency cost. This cost has to be balanced against their redistributive benefits which depend on the weights of the different consumer groups in the public authority's social welfare function.¹⁶ Because of these benefits, the overall welfare-impact of the policy may well be positive. Consequently, focusing solely on the cost of the USO may be somewhat misleading; the cost is only part of the story and even if it can be properly defined and correctly measured it does not indicate the overall impact of the policy. A first attempt to correct this problem is presented in the next section.

2.2 A Broader View: Evaluating Costs and Benefits of Universal Service

The welfare benefits of the USO (through its redistributive impact) may be even harder to evaluate than its cost. They depend on the weights which the policy makers attach to the different groups of consumers and these weights are, in general, not observable.

Cremer et al. (1997) suggest a simple and operational method, inspired by cost-benefit analysis, which allows one to measure the overall welfare impact of the USO even if the objective function of the policy makers is not known. The idea is to compare the USO with alternative (second-best) policies *while holding the redistributive effort constant*. No attempt to directly assess the redistributive benefits of the USO policy is made

by the authors. Instead, they use an indirect approach which consists in a comparison of two policies (the USO and an alternative instrument), which achieve a *given amount of redistribution*, in terms of the efficiency costs they involve. The alternative policy against which the USO is tested is that of direct transfers financed through the general budget and involving some *cost of public funds*

To illustrate this method, let us assume that there are only two consumer groups, respectively indexed r and u (rural and urban households, say).¹⁷ Assume that the currently imposed USO benefits the r type consumers, for instance because prices are uniform even though the cost of serving these customers is higher. Next, consider the (hypothetical) equilibrium that obtains if the USO is removed. Let ΔU_r denote the difference in surplus of the r type consumers between the USO equilibrium and the equilibrium without USO. As the r 's are the beneficiaries of the USO, one has $\Delta U_r > 0$. Similarly, let $\Delta U_u, \Delta \pi^m$ and $\Delta \pi^c$, denote, respectively, the corresponding variations in the surplus of type u consumers, the profits of the USO operator (indexed by m) and the profits of the competitors (index by c). Note that $\Delta U_u < 0$ while the sign of the other variations is *a priori* ambiguous. Finally, consider a direct transfer to r type individuals, implying an efficiency cost of λ per unit (the so-called *marginal cost of public funds*) which is determined to exactly compensate r consumers for the removal of the USO (this ensures then that the redistributive effort is held constant.). Cremer et al. (1997) show that the difference between the level of aggregate welfare achieved with the USO and that realized under the alternative cash transfer policy (without USO), ΔW can be expressed as follows:

$$\Delta W = (1 + \lambda)\Delta U_r + \Delta U_u + (1 + \lambda)\Delta \pi^m + \Delta \pi^c.$$

This expression provides a simple and operational test for the relative efficiency of the USO

compared to the alternative system of cash transfers. If ΔW is positive, then the USO is a more effective instrument of redistributive policy than the direct transfers. Intuitively, this means that the welfare cost associated with distorted prices is less than that associated with the financing of cash transfers through the general budget. If, on the other hand, ΔW is negative the conclusions are reversed and cash transfers are welfare enhancing.¹⁸

As far as data requirement is concerned, this test is not more demanding than the assessment of the welfare cost of the USO discussed in the previous section, with the sole exception that it requires an estimate of the cost of public funds λ . Such are available in the literature and are in the range of [0.2–0.3].

Finally, it should be noted that the comparison presented here rests on the assumption that cash transfers are indeed feasible on informational grounds. In other words, the *needy* individuals can be identified in a costless way. As argued above, this may, in practice, not be the case and this problem has to be kept in mind when interpreting the result of the welfare test. It is of no relevance if the calculated value of ΔW is positive, for the USO is then unambiguously the better policy. However, some precautions are necessary when the computed value of ΔW turns out to be negative. In that case, one needs to closely examine the feasibility of cash transfers in the context of the particular sector. If they are altogether not feasible, the comparison becomes meaningless. On the other hand, if their implementation implies a cost, the welfare evaluation should be adjusted accordingly and the welfare performance of the USO policy relative to the transfer policy reassessed.

3. Implementation and Financing

In this section, we consider, and attempt to evaluate, the different possibilities to organize and finance a USO. We first study the case of a monopolistic operator and then that of a (partly or

totally) liberalized sector. Our aim is to go beyond a mere enumeration of scenarios and of their respective advantages and disadvantages. Instead, we cast the different problems within a unified analytical framework which integrates the building blocks we have established in the previous sections. This approach allows us to provide an in-depth study of the essential underlying issues and (hopefully) to provide some new insights which may clarify the debate on the USO.

The monopoly case is of some interest in itself for it continues to be empirically relevant, at least for the time being. In addition, it is a useful starting point for our analysis. It allows us to introduce and analyze a certain number of problems in the simplest possible way. This sets the ground for the analysis of liberalized industries which gives rise to a large set of new issues.

We shall show that under monopoly, the USO and its financing mechanism create a number of “distortions” which adversely affect overall efficiency. This efficiency loss has to be balanced against the benefits (in terms of redistribution, public good provision etc.) to determine the appropriate extent of the USO, i.e., the degree at which qualifying consumers ought to be subsidized. Moreover, for a given level of benefits, the design of the policy and of the financing mechanism ought to be such that efficiency losses are as small as possible. Though by no means trivial, this problem is rather standard and resembles in many respects a traditional Ramsey pricing problem.

In the presence of competition, on the other hand, additional distortions may arise. The design of the USO and its financing mechanism may now determine the very nature of competition that can be sustained in the sector. It can affect the viability of existing operators as well as the entry process in the industry. To take full advantage of efficiency gains from potential or actual competition it then becomes important to design the USO and its financing mechanism in a *competitively neutral* way.

This is a complex problem as it implies that the regulatory policy must strike the right balance between two potentially conflicting objectives. On the one hand, competitive neutrality requires that no *excessive* protection ought to be granted to the USO operator for this might interfere with the entry process (and jeopardize the viability of potentially more efficient entrants). On the other hand, if the USO is not compensated in an appropriate way, its viability may be threatened by possibly less efficient entrants (who may find a niche in the market because of phenomena such as *cream skimming*). This may be a threat to both the USO itself, and to the efficiency of the competitive process in the industry.

Our analysis will show that the design of the financing mechanism is the crucial ingredient for the reconciliation of these potentially conflicting objectives. The choice of the appropriate financing mechanism will involve various tradeoffs which are, to a large extent, sector (and country)-specific. Consequently, it is not possible to determine a single mechanism which would be appropriate in all sectors (and in all countries). A thorough analysis of the various policies is nevertheless useful in that it allows us to reach a better understanding of the advantages and disadvantages of the available mechanisms, so that policy makers will be in a position to evaluate the different options on an informed basis.

3.1 Monopolistic Sector

If there is a single operator in the industry, there are essentially only two ways to finance universal service: cross-subsidies and transfers from the regulator to the firm. Transfers raise the usual issue of whether or not the operator should be required to balance its budget. From that perspective a transfer to finance the USO is very much like a transfer to finance fixed costs and such transfers are often deemed unacceptable for a variety of reasons.

To keep the presentation as simple as possible we start with the case where transfers are indeed ruled out and concentrate on cross-subsidies. Transfers will be reintroduced later and we shall also allow for a financing scheme combining the two instruments.

Let us consider the following highly stylized model of a network industry. There is a single, public (or regulated) operator which is required to balance its budget. Further, assume for the time being that costs are linear in output and that there is no fixed cost (the impact of more general technologies will be discussed below). There are different types of consumers who differ in their impact on the operators cost (and possibly in other characteristics like income or preferences). More specifically, the (average and marginal) cost of providing service differs between consumer groups. In case of the telecommunications or electricity sectors one can think, for instance, of rural and urban customers. Similarly, in the postal sector, costs (and especially the costs for mail distribution) depend on the location of the addressee (rural or urban) and differ between types of consumers (households or firms).

Ruling out, for the time being, the possibility of nonlinear pricing, the USO corresponds essentially to a pricing policy under which (at least some) high-cost customers pay a price below their cost while some other individuals pay a price higher than their cost. Roughly speaking, high-cost individuals are subsidized by low-cost individuals (recall the budget-balancing assumption).

Uniform pricing fits this definition, but it is just one of the possible cases (an extreme case in some sense). Roughly speaking, any policy where price differentials are smaller than cost differentials can be referred to as universal service.

The determination of optimal prices (and, hence, the optimal design of the USO) is then essentially a Ramsey pricing (or *taxation*) problem with heterogeneous individuals and with the possibility that the objective function reflects

redistributional concern. Notice that universal service and its financing go hand in hand here. Because of budget balancing, price subsidies to high-cost customers can only be financed through (implicit) *taxes* on low cost customers.

Clearly, the solution to this problem does not, in general, involve uniform pricing (over consumer types for a given product or service). However, uniform pricing can be imposed as an *additional* constraint (justified by political economy and/or horizontal equity arguments). Note that in the case of a single-product firm, balanced budget and uniform pricing constraints combined completely determine its prices; there is no discretion left and the pricing problem reduces to an accounting exercise. For a multi-product firm, however, this is not the case anymore. Uniform pricing implies a particular pattern of cross-subsidies for any given product, but cross-subsidies between products (if any) are left to be determined.

These arguments remain valid under more general technologies, but the interpretations are then more complicated. In particular, one can introduce a fixed cost. Universal service (and specifically redistributive) considerations then result in prices which differ from the traditional Ramsey prices (obtained by maximizing unweighted total surplus). If the fixed cost is sufficiently large it is possible that all consumers pay a price which exceeds their *marginal* cost. However, because of the redistributional concern, the high-cost customers pay less than they would if prices were set merely according to efficiency considerations.

So far, we have considered only linear pricing policies.¹⁹ However, in many network industries, particularly the telecommunications and the electricity sectors, pricing schedules are generally non-linear. There is typically a periodic fixed fee which implies that the per unit charge paid by the consumer depends (and generally decreases) with quantity, even if the pricing schedule is otherwise linear. In many instances, quite sophisticated

non-linear pricing schedules are used.²⁰ The availability of such pricing policies does not invalidate the arguments presented in this section. However, it adds more flexibility, both for the design and for the financing of a USO. For instance, in the telecommunications sector, cost differentials are to a large extent explained by locational variations in the cost of providing access to the network, marginal costs (of the communications volume) being very similar. The subsidization of rural customers may then take the form of a below cost access fee, compensated by an above cost charge on urban customers. It should also be pointed out, that non-linear pricing schedules are a particularly attractive instruments as far as the support of low-income customers is concerned.²¹

Whatever the specific intend of the policy, the availability of non-linear pricing is always a plus.²² It tends to reduce the distortions associated with the financing of USO and it is also an effective tool to target the subsidies in a more effective way.²³ Nevertheless, the essential features of the financing mechanism described above remain unaffected. Under monopoly, and in the absence of a transfer from the regulator, a subsidization of some consumer groups is necessarily paid for by other consumers (be it through a higher linear price or through a higher fixed fee).

Finally, let us reintroduce the possibility of a transfer to the operator. First, notice that for any *given* level of the transfer, the problem essentially remains the same as above (cross-subsidies without transfer) and the pricing *rules* do not change. Actual prices (and in particular, the extent by which high-cost customers are subsidized) do, however, depend on the transfer. This illustrates a point made above, namely, that universal service *per se* and the mechanism used to finance it are inter-dependent.

The determination of the *optimal* transfer is a slightly more complicated problem. How the transfer itself is financed is a crucial factor. If lump-sum taxes were available, such a transfer could be fi-

nanced without any efficiency loss and it would become the dominant instrument (no additional surcharges would need to be levied). Under the more compelling assumption that the financing of the transfer also involves an efficiency loss (the so-called marginal cost of public funds) this result does not, however, hold. The optimal financing mechanism is likely to be based on both instruments (cross-subsidies and transfers) and it strikes a balance between their respective efficiency costs (marginal deadweight loss associated with surcharges vs. marginal cost of public funds).

3.2 Liberalized Sector

Many of the arguments presented in the previous section remain valid if there are several competing operators. However, as discussed above, additional questions arise in such a context. There are now several alternative ways to organize and to finance the USO. In addition, the introduction of competition now introduces additional sources of distortions which may be associated with the financing mechanism. As in the monopoly setting, there continues to be a welfare loss associated with the fact that some consumer pay prices which are above their cost and the appropriate design of the financing mechanism has to account for this welfare loss.

However, the financing of the USO may now create additional distortions in that it may interfere with the very nature of the market structure which can be sustained in the sector. On the one hand, an inappropriate financing mechanism may be an obstacle to the entry of potentially more efficient operators in the industry. On the other hand, it may also give rise to the emergence of inefficient entry in that regulatory restrictions may foster the emergence of possibly less efficient operators in some market niches. Consequently, the design of the financing mechanism has to account for its impact on the industry structure. If the entry process is otherwise deemed to be efficient, this implies that the financing of the USO has to be achieved

in a *competitively neutral* way, hence, minimizing its interference with the market process *per se*.

We shall distinguish between settings where the USO is imposed on a exogenously determined operator and those where the designation of the universal service operator is part of the mechanism used to implement the policy. Exogenous designation occurs, for instance, if the USO obligation is imposed in an *ad hoc* way on the historic (public or previously public) operator but not on new entrants. Regulatory settings under which the USO is imposed on *all* operators do also fall into this category, but they give rise to specific problems which need to be addressed. Alternatively, the operator facing the USO can be endogenously determined, e.g., through an auction.

3.2.1 THE UNIVERSAL SERVICE OBLIGATION IS

IMPOSED ON A SINGLE, SPECIFIED OPERATOR

Two sub-cases are distinguished and examined in turn, depending on whether or not the operator under USO is the sole responsible for its financing.

THE OPERATOR WHO FACES THE USO IS SOLELY RESPONSIBLE FOR THE FINANCING.

This setting is similar to the monopoly case considered above. Specifically, the USO is financed through cross-subsidies between the customers of the corresponding operator. As above, one can also consider the case where a direct subsidy from the government contributes towards the budget of the operator.

Though similar, the current setting and the monopoly case are, however, not completely equivalent. Specifically, competition may limit the ability of the operator to finance the USO through cross-subsidies. The surcharges levied on some consumer groups may open the door to cream skimming (by possibly less efficient competitors) which creates additional distortions and may threaten the viability of the operator.

These problems can be alleviated (though not eliminated) through the definition of a *reserved*

sector, that is a set of products (services) or activities (like mail distribution) for which the operator enjoys monopoly protection. Nevertheless, the fundamental problem remains, namely, the *tax base* (the set of goods on which surcharges can be levied to finance subsidies to some consumer groups) is restricted in an artificial way. In light of optimal tax theory, this is likely to bring about a welfare loss.

This point can be explained as follows. From standard microeconomic theory we know that the deadweight loss associated with a tax increases more than proportionally with its per-unit rate. Consequently, the welfare loss per-unit of tax revenue increases as the tax increases. Now, this implies that for a given total tax revenue, the total welfare loss will be smaller if many goods are taxed at a low rate than if few goods are taxed at a high rate, i.e., the larger the tax base, the smaller the welfare loss. This argument is traditionally presented in the context of commodity taxation. However, it immediately carries over to surcharges levied as part of a system of cross-subsidies which are in essence just a special case of commodity taxes.

ALL OPERATORS CONTRIBUTE. This essentially amounts to creating a universal service fund, financed through implicit or explicit taxes on the operators who are not subject to a USO. The proceeds of this fund are then used to finance a transfer to (partially) compensate the universal service operator for his obligations. The result is a wider tax base (as opposed to the above situation) which, by the optimal taxation argument presented above leads, at least potentially, to a welfare improvement. In addition, the contributions imposed on the competitors may reduce the threat of cream skimming. If the universal service taxes are properly designed, a competitor can only capture a market segment if he is more efficient than the incumbent operator. Consequently, the competitive process can work in a more efficient way and the survival of the in-

cumbent (universal service) operator is threatened only if he is less efficient than the other firms.

There are several alternative ways to levy the contributions to the universal service fund :

- Universal service taxes (or fees); for instance, specific taxes levied on the competitors' sales.
- Access surcharges; this option is of course only available if the competing operators have to use (part of) the USO operator's network.²⁴
- Lump sum entry fees, which can be implemented by selling or auctioning off licenses to operate in the sector (see, e.g., the postal sector in Germany).

Let us start by discussing and evaluating the first two of these options. The following arguments can be put forward:

- Universal service taxes and access surcharges are equivalent if there is no possibility of bypassing the network and if the network constitutes an input which has to be used in *fixed proportions* (it cannot be substituted by other inputs).
- Access surcharges appear to involve less transactions cost than taxes. This is so because it is sufficient to increase the access fee which is levied anyway. It is not clear, however, how significant the difference really is, especially if the sales of the competing operators are in any event subject to some form of commodity taxation.
- If bypass or input substitution are possible, access surcharges may induce inefficient bypass and/or production inefficiencies.
- Universal service taxes are more transparent to the consumers; the financing of universal service is clearly separated from other issues (marginal cost of access, financing of the network's fixed costs, etc.) which may affect the determination of the access charge.

Summing up, if both of these options are available, taxes appear to be a better instrument. The third

option amounts to a lump-sum tax on operators. It should not result in distorted prices (a sunk entry cost does not affect the pricing decisions of a profit-maximizing operator) but it may adversely affect entry. In other words, from a purely static perspective (for a given number of active operators) it appears to be tempting to resort to this instrument.²⁵ From a dynamic perspective, however, lump sum fees may have a negative effect on welfare as they reduce the number of active operators and prevent entry of otherwise efficient firms.

At this point, a very important remark about the *incidence* of universal service taxes (or entry surcharges) is in order. We have referred to taxes and access charges as being levied on the operators. However, one should keep in mind that their burden (or at least part of it) will fall eventually on the consumers. In this regard, the tax incidence literature is very insightful. An established result is that the exact extent to which the tax is reflected in the consumer prices depends on the market structure and on the characteristics of demand and technology, but *not* on whom the tax is formally levied. Specifically, whether a tax is formally levied on the operators or on their consumers does not affect the way its burden is eventually split between the agents. Put differently, the price paid by consumers at the after-tax equilibrium solely depends on the market fundamentals and is independent of purely regulatory or legal definitions.

It should also be mentioned that *pay or play* type taxes, where the competitor has the option of not paying the tax if he accepts himself the USO are a variant of the policies under investigation in this section. They present two additional features

- They may have the additional advantage of enhancing efficiency. In particular, they can prevent the designated operator from *inflating* the cost of universal service for otherwise the competitors would opt themselves for the USO. In that sense, a pay or play

system presents some similarities with the franchising policy considered below.

- However, they may impose additional monitoring cost on the regulator who may have to enforce the USO on several operators.

Let us finally turn to the issue of how the level of the universal service taxes (or access surcharges) should be determined. At first, one might be tempted to argue that the tax ought to equal the surcharge imposed (price minus marginal cost) by the universal service operator on its own clients.²⁶ However, on closer scrutiny one realizes that this is not, in general, correct. Optimal taxes and surcharges can easily be shown to depend on demand elasticities, technologies and market structure. Roughly speaking taxes and surcharges are equal only if the market is perfectly competitive, all operators have the same technology and the products sold by the universal service operator and those offered by its competitors are perfect substitutes.

3.2.2 FRANCHISING OF THE UNIVERSAL SERVICE OBLIGATION

So far, we have assumed that the USO is imposed on an exogenously determined operator. This has been traditionally the case in many industries. However, over the last few years, different arrangements have been proposed in the debate and are now being experimented in several countries. The essential feature of these alternative policies is that the designation of the universal service operator becomes itself part of the financing mechanism.

One can think, for instance, of the following mechanism. The regulator defines the USO and then organizes an auction. Operators submit a bid stipulating the compensation they require to fulfill this obligation and the franchise is awarded (for a given time period) to the least expensive operator. Note that the auctions may be local, that is, pertaining to the USO in a given geographical area.

The Australian system in the telecommunications sector comes close to such an arrange-

ment.²⁷ However, it differs in one respect, namely, that the USO is, in a first step, granted to one (or several) operator(s) designated by the Ministry. Every year, the Universal Service operator then nominates its *net cost areas*, areas where the USO imposes losses. Based on this report, the regulator AUSTEL, calculates the cost of the USO according to the avoidable costs method.²⁸ This cost constitutes the basis for the compensation of the USO, which is financed through levies on all *participating carriers*.²⁹ The regulator is required to publish the result of its calculations and the other operators can then compete for the USO. Specifically, if an alternative operator can credibly document that it will be able to fulfill the USO at a lower cost, it may become the designated USO operator, thereby being entitled to compensation from the other operators. Put differently, even though it falls short of a full-fledged auction based franchising scheme, the Australian system does make the supply of USO contestable.

The franchising system appears to have a number of attractive features.

- It tends to ensure that the USO is assumed by the most efficient operator at a (close to) minimum cost.
- It allows one to avoid a number of distortions associated with the mechanisms based on cross-subsidies (cream-skimming, inefficient bypass, adverse impact on entry).³⁰
- It escapes the transactions costs implied by the levying of a universal service tax.
- It requires less information than the alternative arrangements. In particular it is not necessary to evaluate (marginal) costs for different consumer types, demand elasticities, etc.

On the other hand, it also presents a number of new problems

- The regulator's expected payment for the discharge of the obligation will, in general, be lower the larger the number of (non-

colluding) bidders. Consequently, the franchising scheme may not be appropriate if the number of expected bidders is small and/or if collusion amongst bidders cannot be ruled out. Whether or not this problem is likely to arise depends, to a large degree, on the specificities of the industries (technologies, number of potentially active operators etc.). It also depends on the particular auction which is used; for instance, the specification of a *reservation price* can be expected to mitigate that problem.³¹ In addition, the local character of the auctions which tends to reduce an operator's start-up costs may also enhance the number of potential bidders.

- In most cases, the franchisee will have to invest in specific assets to fulfill the USO. This raises the question of how to compensate the firm for these investments, particularly in cases where the concession would not be renewed. If the franchisor cannot credibly commit to an appropriate compensation scheme, the franchisee will be induced to under-invest in the specific assets (anticipating the danger of "expropriation" at the term of the franchising contract) and significant production inefficiencies may result.
- A related problem is the appropriate evaluation of (sunk) assets of the incumbent that may be used by the franchisee. The relevance of this problem, once again, crucially depends on the specificities of the industry. It appears less important in a sector like telecommunications where existing infrastructures may have become obsolete and where alternative technologies are available (fiber optics or wireless access). However, even in those cases, the pricing of existing assets is important as it determines the speed of adoption of new technologies. At the other extreme there is, for instance, the railroad

sector. If the USO concern the operation of a certain number of trains per week between towns A and B , there does not appear to be a reasonable alternative to using the existing rail structure.

- The potential role of local communities and administrations raises an additional set of questions. Consider for instance the case of the postal sector where the USO which is to be auctioned off may involve the operation of a post office in a small village. Should the municipality be allowed to participate in such an auction and, if yes, on what terms? An argument in favor of its participation is that because of economies of scope, the municipal administration may well be the most efficient provider of such a service. However, given the complexities of public accounting systems, it appears difficult to organize such an auction on “fair” terms

Finally, it should also be pointed out that franchising different areas will not in general result in uniform pricing. While uniform pricing within a given area can be imposed as part of the franchising contract, it appears to be much more difficult to ensure the uniformity of prices throughout an entire country.³² Consequently, it may not be the appropriate solution when (for reasons alluded to above) public authorities intend to avoid geographical price differentials. ♣

Notes

1. Telecommunications in the US and the UK provide prominent examples.
2. Long distance.
3. See FCC (1996).
4. See, e.g., Cave (1996), Cremer, De Rycke and Grimaud (1997), Curien and Dognin (1995), FCC (1996), Golay and Dobbs (1996).
5. Networks can also create other types of externalities (e.g., a universal communications net-

work can present the character of a *public good*).

6. See, e.g., Boadway and Marchand (1995), Cremer and Gahvari (1997) and Guesnerie and Roberts (1984).
7. See Introduction.
8. Support for health care providers is also advocated, but it is restricted to those serving rural areas.
9. See our argument on education and the general problem of public provision of private goods above. Public libraries have rather similar characteristics.
10. The period (as opposed to item based) nature of such a fee should be pointed out. It would thus not violate the traditional principle that the sender pays for the mail item.
11. The precise extend of shifting depends on the characteristics of demand and supply and on the market structure.
12. A bank which would not do this would be at a competitive disadvantage on the low-cost segments.
13. The recent decision of Oftel (see Oftel, 1997) indicates that such benefits may indeed play a major role.
14. As long as the USO does not make it impossible to meet its budget constraint; see Gallet and Toledano (1997) for a discussion of this point. The same argument goes through (in the short run) for an operator subject to rate of return regulation. In the long run (when the capital stock is variable) the profitability cost under rate of return regulation is, however, not in general zero anymore.
15. Here, total surplus is merely the *unweighted* sum of the surplus of the producer and that of the different consumer groups.
16. To be more precise, a regulator who is only concerned with efficiency (and whose objective can thus be represented as the maximization of total surplus, with all consumer groups

- receiving equal weights) would favor marginal cost pricing. Redistributive objectives, on the other hand, can be introduced by considering an objective function which puts higher weights on some consumer groups. In that case, marginal cost pricing continues to be efficient, but it may not be the welfare maximizing solutions. If redistributive objectives are accounted for, it may well be desirable to deviate from the efficient solution in order to switch to a pricing system which is more favorable to consumer groups who receive a higher weight in the regulators objective function (e.g., low income or rural households).
17. See Section 3 for more details on this two-group specification.
 18. An example of the empirical application of this test is provided by Cremer, De Rycke and Grimaud (1997). This analysis is based on price and cost data, as well as demand estimates, for the French mail service (La Poste). It results in a positive value of ΔW (of about 1 billion FF), pointing towards a positive welfare impact of universal service (in the considered sector and country).
 19. Under linear pricing, the charge paid by a consumer is proportional to quantity, i.e., the per unit charge is independent of the consumption level.
 20. Including menus of two part tariffs, where the consumer can choose between different optional plans, implying each different levels of fixed fees and variable charges.
 21. See Cremer and Gahvari (1996) for a detailed discussion of this aspect.
 22. As long as the regulator is benevolent.
 23. The redistributive properties of non-linear pricing in the public sector are studied by Cremer and Gahvari (1995); see also Philips (1983) and Sharkey and Sibley (1993). Cremer and Gahvari show that non-linear pricing (implemented for instance through a menu of linear contracts) may be an effective way to extract higher payments from large (high-income) consumers, thereby lowering the payments of small consumers. Note that, in general, such a policy implies a high *marginal* price for small consumers (but a low access fee) and a low *marginal* price for large consumers (combined with a high access fee). On the applied side, Philips 1983) provides an enlightening discussion of *social tariffs* (based on the pricing policy in the Belgian electricity sector).
 24. Cremer, De Rycke and Grimaud (1995) provide a detailed analysis of this financing mechanism for the case of the postal sector.
 25. It has to be pointed out though that in a second-best world, the relative efficiency of different outcomes cannot simply be assessed on the basis of a mere counting of the number of distortions.
 26. This argument assumes that costs can be accurately determined which, as discussed above, is not a trivial task.
 27. See Cave (1996) for a more detailed presentation of this arrangement.
 28. See e.g., Cave, Milne and Scanlan (1994).
 29. Determined in proportion to *interconnect time*.
 30. The definition of an area offered to franchising is a delicate problem. If it is too large, it involves a significant amount of heterogeneity. Some types of consumers will suffer from the lack of competition within the area if bidding has been done only in terms of the uniform tariff. If, on the other hand, it is too small, low cost consumers may easily bypass the USO.
 31. There is, however, a commitment problem and the announced reservation price may not be perceived as credible. In that case it may fail to effectively deter collusion.
 32. In telecommunication, for instance, franchising the USO would concern mainly high cost (low demand). In urban areas, where demand is suf-

ficiently high, there may be room for several competing operators. Now, the price level can of course be part of the franchising contract, but it is hard to predict what will be the evolution of prices in the competitive areas (and prices may well differ between these areas).

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