Universal Service

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1. Introduction/Overview

"Digital Divide," "Digital Inclusion," "Universal Service," "Universal Service Obligation," and "National Information Infrastructure (NII) Initiative." These expressions all have the sound of virtue. Who could be against closing the digital divide or expanding universal service? But, in fact, when one explores the meaning of these terms in greater detail and, more importantly, the manner in which they are implemented and funded, the concepts become much less virtuous.

These are basically political clichés, which have clouded the economics goal(s) that underly the term. [1] In this article we argue that what is addressed by these phrases is a resource allocation issue. The programs designed to implement these allocation goals have, for the most part, been unsuccessful. For clarity and expository purposes, we parse the notion of universal service and the digital divide into three parts: The desired goal(s), the implementation methods that are available – the instrument used and those that have been proposed, and the funding mechanisms that are utilized to implement the concepts.

We explore the definition and the rationales offered for universal service including: increasing telephone penetration, network externalities, income redistribution, and infrastructure development. We propose to judge them against economic theory and empirical evidence; the instrument(s) used to obtain these goal(s) and, finally, we will examine the efficacy of the mechanism itself – all are found deficient. Our own empirical analyses as well as those of others support these results. Although we will examine the policy throughout the world, we will concentrate on the United States,

because of the availability of data and the changing nature of the policy with the passage of the Telecommunications Act of 1996.

The article is organized as follows: First we give an overview of the concept of universal service -- and why it remains an issue. We then explore the changing nature of the definition focusing on a brief history of the concept. Then, the theoretical model is examined and empirical research is explored. Finally we briefly explore an alternative method for funding universal service programs. We close with policy recommendations.

2. Definition

Universal service is a phrase that many people in the telecommunications industry recognize, but may have different ideas of what it means. In the United States, universal service is the social obligation imposed on the telecommunications industry to ensure that residential exchange rates are low and that rural telephone rates will not be higher than urban rates. It is the principle that exchange service will be subsidized in order, it is alleged, to increase telephone penetration. The definition of universal service has expanded to include access to Internet service.[2, 3]

In the current international context of technological change, privatization and de-regulation are forcing a reconsideration of universal service policies: The goal is being challenged by alternative technologies and the instrument is inconsistent with the promotion of competition; the funding mechanism lacks sustainability in the face of competition. Nevertheless, the policy is expanding to include the Internet. However, the definition has been shifting ever since it was first introduced in 1907 when it encompassed the universality of the nationwide AT&T system (to the exclusion of competitors) (Mueller 1997).

When we discuss universal service, we use the definition of universal service as the provision of exchange telephone access at prices which are below their costs. However, this definition embodies three notions: the goal, the instrument and the funding mechanism. We wish to address these separately. It is our belief that the confounding of definition with these different pieces has, in large part, led to misunderstanding of the underlying policy issues.

2.1 Goals

Even though several rationales have been offered for universal service policy and universal service has become part of national telecommunication policies around the world, the objective of the policy has never been entirely clear. Several different objectives of the concept have been offered (Johnson 1988; Crandall & Waverman 2000; Laffont & Tirole 1999). The possible justifications are: increase subscription, network externalities, income redistribution, regional planning, and infrastructure development (Crandall 1999, Laffont & Tirole 1999). All have the objective, at least in principle, to improve the economy. We will focus on three overarching goals: increasing telephone penetration, the expansion of the infrastructure, and income redistribution. We examine if these goals are achieved under current practices.

Until recently, the regulator did not need to recognize the distinction between those aspects of traditional regulation intended to control the incumbent's exercise of market power, and those designed to achieve socially desirable policy objectives, such as universal service. Indeed, to some extent it may have been useful for regulatory authorities to obscure the costs of certain social policies by embedding them within the pervasive regulation of an incumbent firm.

2.2 Instrument

Funding

Although many methods are available to implement Universal Service, two generic methods are used. The first is pricing the service below cost, thus bringing the marginal subscriber on to the network. This we denote as a service subsidy. (We defer for a moment where the funds come from.) The second method would be the equivalent of giving the consumers funds to purchase the telephone connections. The analogy would be food stamps in the United States. We denote this as a targeted subsidy. The major distinction between these is who receives the subsidies. In the first case, it is the telephone company. Only indirectly do the consumers benefit. In the second, it is the consumers. The United States has practiced both methods.

The means chosen by most countries to reach the goal of universal service has been to price exchange access below cost, or provide the service at "affordable" rates. This implicit assumption is that the lower rates will meet the goal. It is with this instrument that we take exception. To be an effective instrument, below cost pricing of the service should be efficient – it should be cost effective and competitively neutral.

We will demonstrate that this is not the most effective method to achieve the goal – it misses the target, it is expensive to fund and, coupled with the funding mechanism, may be counter productive.

2.3 Funding Mechanism

Implicit Tax

Pricing other telecommunications services significantly above cost has been the predominate method of funding the below-cost pricing of universal service. This

method acts exactly like a tax on the over-priced telecommunications services. Two policy questions arise with this method: 1. Is this an efficient method to raise the funds? 2. Has this "tax" been sanctioned by the legislative process?

The answer to the first question is "No" and the second it usually "No," although this question is beyond the inquiry of this article. We will focus our efforts on the first question: Are there more effective methods to raise the funds for universal service?

Cross-subsidies

In the absence of government subsidies or intervention to promote universal service, residential basic monthly service charges can be under-priced only if other telephone services and products are over-priced, assuming the telephone companies are allowed to, and do, earn a fair rate-of-return on their invested capital. Thus, business rates for exchange service have been much higher than residence rates for the same service offering and arguably well above the direct cost of providing that service; trunk or long distance, both domestic and international rates, have traditionally exceeded their direct cost by enough to be major generators of revenue to support exchange service or other enterprises such as the postal service. In short, an elaborate system of cross-subsidies has, in general, been put in place over time to shelter residential exchange rates.

2.4 A Moving Target

All this changes with the decision to promote competitive telecommunications markets. For the transition to competition to succeed, asymmetric measures to control market power should be phased out as the incumbent's market power diminishes. However, if the regulator wishes to maintain some market interventions in the new competitive market in order to meet social policy goals, then a new method for this will have to be devised—one that does not rely on the market power of the incumbent, that

will be sustainable in an environment with more than one firm, and that will be minimally distorting to the market outcome.[4]

Whatever the definition, the rationale for universal service is generally laudable – improve the economy, increase telephone/Internet penetration, improve education/medical care. But, in the cases we examine, the instrument is not effective in obtaining the goal either because the funding mechanism is in conflict with the goal, the instrument is too broad and/or the action does not achieve the desired result. The conclusion is that the policy is ill-advised and, not only does it not achieve the desired ends, it is counterproductive.

3. The History of the Concept

3.1 Early years

The history of the concept of universal service goes back to the time of Theodore Vail; however, it has changed over time to suit the industry's needs. Vail, the head of the Bell System, coined the term "universal service" in the early years of the twentieth century when he was attempting to rescue the Bell System from its financial troubles and consolidate the network. The term that he used was "one system, one policy, universal service." In this context he was promoting a marketing technique to ensure that potential subscribers would subscribe to the Bell system (Mueller 1997 pp. 93 - 103).

Vail offered to end his competitive wars with independent telephone companies, to interconnect with them, and to accept a framework of exclusive franchises and government regulation (Mueller 1997 p. 108). By his motto "One System, One Policy, Universal Service" Vail meant that service would be "universal" only in the sense that any subscriber could place a call to any other subscriber, because networks would be

interconnected (Mueller 1997 p. 96). The cross-subsidies that maintain universal service policies today could not exist then, for the simple reason that telephone companies offered few services beyond local service, and there was thus no source of revenue to fund such cross-subsidies (Mueller 1997 pp. 37 - 42).

When Congress passed the Communications Act of 1934 establishing the FCC, the term "universal service" did not appear anywhere in the Act, although the principle that service should be widely available was affirmed.[5,6] At that time, "Congressional records contain(ed) no mention of telephone penetration levels" (Mueller 1997 p. 157). During the 1940s and 1950s, as long distance service developed, the revenue from long distance provided a source of funds which regulators could use to keep local rates low.[7] Since the Bell System provided both services until 1984, the cross-subsidy from long distance service to local rates was accomplished as a matter of bookkeeping within the system.[8]

In the early 1970s as competition was entering the Bell System market, the term was revised to an order to argue that Bell System was engaged in desirable cross-subsidies, which supported this universal service concept. The argument then was that the competitors for long distance were "cream-skimming" – only targeting the high-margin long distance service. This would eliminate the ability to raise these "desirable" cross subsidies. (We discuss the mechanism to fund these subsidies below). This was the defense that the company used throughout the 1970s in order to slow down competitive inroads into its markets.

When AT&T was divested in 1984, it lost the local service market and kept the long distance market; thus this flow of funds between the services had to be handled on an arms-length basis. The old subsidy flow was replaced by the "access charges" that local companies charged long distance carriers to originate or terminate long distance calls.[9]

Although the campaign of the 1970s was not altogether successful, it imbued the legislatures and certain members of the public with the virtues of universal service; so much so that when the Telecom Act of 1996 was passed as an Amendment to the 1934 Act, it was put into this legislation (Mueller 1997 pp. 167–70).[10] The revised Telecommunications Act of 1996 enshrined "universal service" as a national policy goal; however, the term had assumed a much different meaning from the one Vail had used years earlier (Mueller 1997 pp. 167–70).[11]

3.2 Current Environment

Competitive forces, technology, and the convergence of industries such as telephony, broadcast media, publishing, and computers are transforming the economies of the world. The regulatory structure in each industry has been distinct, with different methods of social control, goals and objectives. The convergence of these industries has created new problems and issues for policy makers and analysts.[12]

The traditional telephone monopolies are disappearing, although vestiges of their market power may continue for some time.[13] New regulatory tools of incentive regulation and competitive entry are replacing the traditional rate-based, rate-of-return regulation, and rate structure setting methodologies (Laffont & Tirole 1999 pp. 16–17).

Many issues arise because of this transition: Are the competing regulatory structures at odds with one another? What market structure will emerge? What market structure is desired? One element of traditional regulation, however, remains and still impedes the development of an effective competitive transition—the universal service obligation.

4. Goals

4.1 Increasing Penetration/Promoting Subscription

The objective most often cited for universal service is that of increased penetration or promoting subscription.[14] This justification takes several forms. First, some suggest that the subsidization of local service corrects for externalities associated with the network, in that the value of the telecommunications system is increased for all subscribers when more people participate—an effect that may not be fully internalized in each individual's decision with respect to subscription. (Johnson 1988; Laffont & Tirole 1999 p. 219; Mueller & Schement 1996 pp. 275–76) Second, more widespread subscription may be seen as a public good, valued for its own sake, or as a matter of perceived fairness. Third, some argue that wider subscription facilitates the delivery of public services and participation in community and political affairs.

In the United States, as in most western European countries, the vast majority of households now subscribe to telephone service (Belifonte). It is difficult to argue that the external benefit to existing subscribers is high when new subscribers are added.[15] Furthermore, if such effects were significant, telecommunications firms would partially internalize them, since they would increase demand for services by inframarginal subscribers (Laffont & Tirole 1999 pp. 229–30).

The story is less clear in developing countries. This issue has been addressed in several fora, such as the International Telecommunication Union and World Bank, with mixed results (ITU xxx) general, a strong relationship exists between increased telephone penetration and economic growth, but it is not necessarily causal. While a mixture of evidence points to telecommunications having an impact on economic development, it

is also clear that promoting universal service as traditionally practic ed is an inefficient method to achieve that goal

Externalities

A rationale for increasing penetration has been that of externalities. There are three externalities associated with telephone service: network or access, call, and calls-beget-calls.

Network

A network becomes more valuable as additional subscribers are added to it. This is known as network externality (Littlechild 1975). The network externality arises each time an additional subscriber joins the network because there is now one more party that the previously existing network can reach. It is thought that this benefit continues to accrue as the network increases.[16] This externality may be more critical in developing countries where the systems have very low penetration. However, when a country has obtained a high level of penetration, this argument loses much of its force. There are large proportions of subscribers whose access, insofar as it enables one to reach and be reached by them, is irrelevant, except to the extent that the costs to all are reduced due to economies of scale. However, someone having access can still give rise to benefits for others, whether subscribers or not.

If the service were priced at its marginal cost, it would not have the socially optimal number of subscribers because of these network externalities. Hence, it is alleged that the service should be price subsidized.[17] If the subscribers as a group could internalize this externality – that is subsidize the potential subscribers who would otherwise not join the network -- in order that they would join the network, all subscribers would benefit.

Call

Another externality associated with the network is the call externality. The call externality arises from the impact, positive or negative, upon the called party, which is in addition to the benefit received by the caller, who, by definition, must regard the benefit to be at least as great as the cost. Obviously, not all calls received are regarded as beneficial by those called, and one manifestation of this is unlisted numbers. But, on balance, the call externality is likely to be positive.

"Calls-beget-calls"

Taylor (1994) identified and estimated the "calls-beget-calls" phenomenon. It arises when a call creates other calls. For example, if I call someone but only reach her answering machine, she will call back (hopefully). This is in contrast with the traditional notion of the call externality in which a person receives a positive externality (or negative, in the case of a tele-marketer) when she receives a call but does not have to pay for it.

While these externalities may be a rationale for pricing exchange-service below-cost, Coasian alternatives exist to deal with the issue as Crandall and Waverman (2000, p. 25) point out.[18]

4.2 Infrastructure Development

Closely related to both the externality and the penetration arguments is infrastructure development rationale. The idea is that economic growth and development can be promoted by the expansion of the telecommunications network. Some see subsidies to telecommunications infrastructure in rural areas as a policy to promote business development and employment in those areas. For example, in the United States, universal service policy strives to maintain equity between rural and urban consumers.[19]

4.3 Income Redistribution

An objective of universal service policy could be the redistribution of income to households perceived to be needy because of low income or other attributes (Laffont & Tirole 1999 pp. 219–29). Subsidizing the price of local service could provide a mechanism for redistribution, to the extent that the subsidized service is a larger proportion of the expenditures of the customers the government wishes to favor.

5. Evaluation/Critique of Goals & Instruments

5.1 Increase Penetration

The goals of universal service and the instrument used to obtain the goals cannot be easily parsed out. We critique the instrument below cost pricing used to achieve universal service, the related cross-subsidy arguments, and its implications for competitive entry. While we illustrate the arguments with the telephone industry; however, the arguments apply equally to the Digital Divide or National Information Infrastructure ("NII"). [20]

If promoting subscription were the goal of universal service policy, thensubsidizing rates for local service generally is an extremely inefficient means for achieving that goal. Inframarginal subscribers do not need a subsidy to remain on the service. Only the marginal subscribers have to be subsidized to remain on the system at prices that cover the cost of access. If, for example, at the full cost of subscriber access, ten percent of today's subscribers would no longer subscribe, these customers could be given a direct subsidy for one-tenth of the cost of the current subsidy to all subscribers.

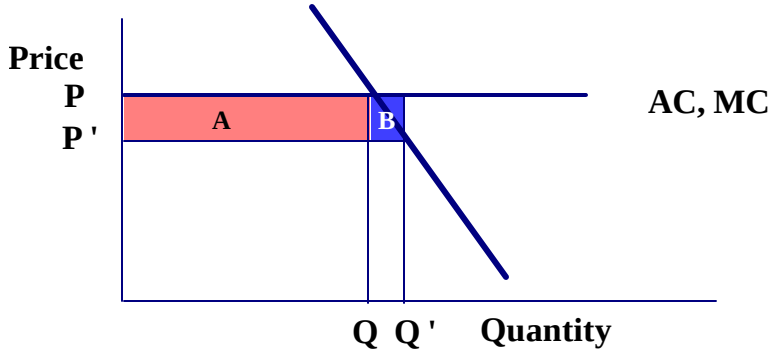

Figure 1. Service Subsidy Required.

In the above diagram, the current subsidy required is the sum of the two shaded areas (A + B) to support the service subsidy required to add the incremental subscribers (Q – Q'). The same increment could be added by subsidizing only these marginal subscribers by directly giving the dark shaded area (B) to the incremental subscribers (Q - Q').

The preferred method of addressing the problem is by targeting a subsidy directly to the individuals who need them, rather than to subsidize the service for all customers. [21] In the United States, state Commissions have taken small steps in this direction. Most states have "Lifeline" programs funded jointly by states and by a federal subsidy scheme, which defray part of the cost of local service for qualifying low-income subscribers (Hausman 1998 pp. 15–16; Laffont & Tirole 1999 pp. 231–35). There are inherent difficulties in targeting subsidies to marginal subscribers, but a qualification test with any power must be more efficient than simply subsidizing everyone (Hausman 1998 pp. 15–16; Laffont & Tirole 1999 pp. 231–35). The policy is particularly egregious since the service is among the most inelastic of all telecommunications services – between -.01 and -.02 (Taylor 1980 pp. 200-04). This implies that a decrease in price of ten percent (10%) will only expand the system by an additional one-tenth to one-fifth of a percent (.1 to .2 %).

Furthermore, the current policy implicitly assumes that the decision to subscribe depends entirely on the price of local service, rather than on the prices of other

telecommunications services. In the United States, at least two empirical analyses indicate a significant negative cross-elasticity between the long distance and subscriber access.[22] That is, the higher the price of toll services, the less the demand for subscriber access service. When one considers that the only reason to subscribe to the telephone system is to make or receive a call, this makes sense. Access is a derived demand—derived from the demand for local, toll and international usage; as these prices increase, there will be less demand for subscriber access. In fact, studies have suggested that the greatest single factor prompting households to disconnect phone service is the accumulation of high toll bills (Mueller & Schement 1996 pp. 186–290). Thus, it is counterproductive to raise the price of long distance service in order to finance subsidies for local service. Targeted programs such as toll blocking, which help households control their toll bills, may be more effective in promoting subscription.

Others concur with this observation; for example, Crandall and Waverman (2000) found universal service pricing policies have a minimal effect on subscriber penetration, do not address the causes of non-subscription – installation and disconnection due to unpaid long distance bills – and the subsidy is raised via surcharges on local and long distance calls, which feeds back on the second cause of non-subscription. Moreover, an adverse impact on economic welfare occurs, because the services to which the surcharges are applied are more elastic than exchange access.

Crandall and Waverman estimate (crudely) the effects of rebalancing the rates to "costs." Crandall and Waverman examine two goals of Universal Service: (1) insuring that everyone has a telephone and (2) the redistribution of income from rich to poor and urban to rural subscribers. They use the various cost models developed in the USA. Of course, welfare gains accrue when the services are re-priced because of the highly inelastic nature of the subscriber price elasticity and the relatively higher long distance

prices. However, the interesting aspect of the result is among states. The states with largely rural population may not even gain from the current practice, due to the higher long distance charge the rural resident incurs to support the exchange subsidy.

5.2 Income Redistribution

The first objection using universal service to promote income redistribution is that, if the objective is to transfer income, it would be more efficient to do this directly by giving money to the targeted households, rather than indirectly by subsidizing a service they may or may not wish to consume.[23]

The second objection is that a subsidy for the price of a given service does a poor job of targeting benefits to needy groups. Different consumers use services such as long distance in different amounts, but these choices are not strongly related to differences in income. If customers are segmented by income, one finds a mix of high and low volume customers within each income group. In other words, a person's income does not determine whether she is a low or high volume long distance user. For the lowest income segment Crandall examines, those with household income below $10,000 annually, forty-five percent of the average monthly bill represents charges for long distance service (Crandall 1998 p. 403). Thus, a system that relies on high long distance prices to fund low prices for local service would ask a poor household that happens to make many long distance calls to subsidize a wealthy household that makes few calls. Our data, presented below, not only support this conclusion, but also amplify it.

Crandall and Waverman explore the demographics of telephone use based on data from the United States, Canada and the United Kingdom (Crandall and Waverman 2000 Chapter 3). Here again, it is noted that low-income subscribers purchase a significant amount of long-distance services. Moreover, within each strata there is a wide dispersion of calling activity that is hidden by only examining the means. This extreme

skewness within the strata implies that generating the subsidy through a surcharge on long distance rates will result in an income transfer between the poor and the rich from the heavy to the light users, respectively.

Using the USA data, a rebalancing of the rates produces a consumer surplus gain of 1.5 billion dollars. All the income strata gain except the lowest three. These three strata lose two less than ten dollars a year per household. Crandall and Waverman conclude that to hold exchange rates below cost through high long distance prices is inefficient.

We examine detailed data on *total* telecommunications usage and billing—wireless, cable, Internet, local and long distance calling, as well as traditional wire-line telephony access—stratified by income and other demographic data from the United States. These data confirm that consumers, even those with low incomes, choose to purchase packages of wireless, cable, and other services with prices at least as high as local phone prices would be in the absence of the current subsidy.

5.4 Expenditures

We examine household telecommunications expenditures across services and note that spending on discretionary services is greater than on basic telephone service. These services are not subsidized, indeed, some of these services provide the subsidy!

If we examine all of the discretionary spending by the low-income subscribers in the United States (see Figure 4 & 5), the level of spending is much greater than what is spent for subscriber access. Thus, it is far from clear that raising the price of "discretionary" services in order to fund subsidies for local service is an effective means of transferring wealth to those customers who are most needy. This is illustrated in the following figures and table.

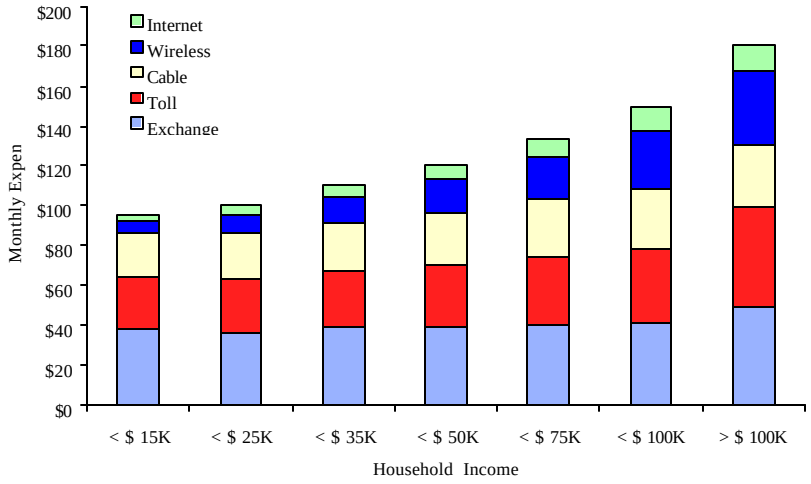

Figure 4. **Expenditures by Income Strata.**[24]

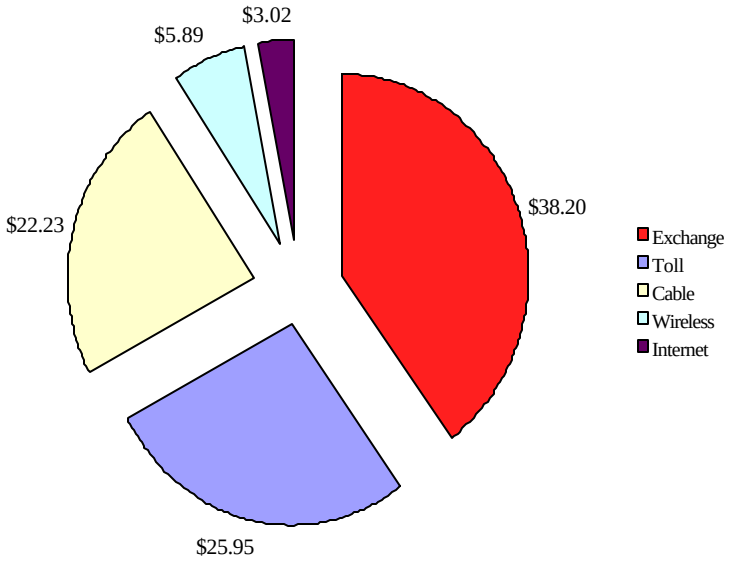

Figure 5. Expenditures by Household with Income under $ 15,000.[25]

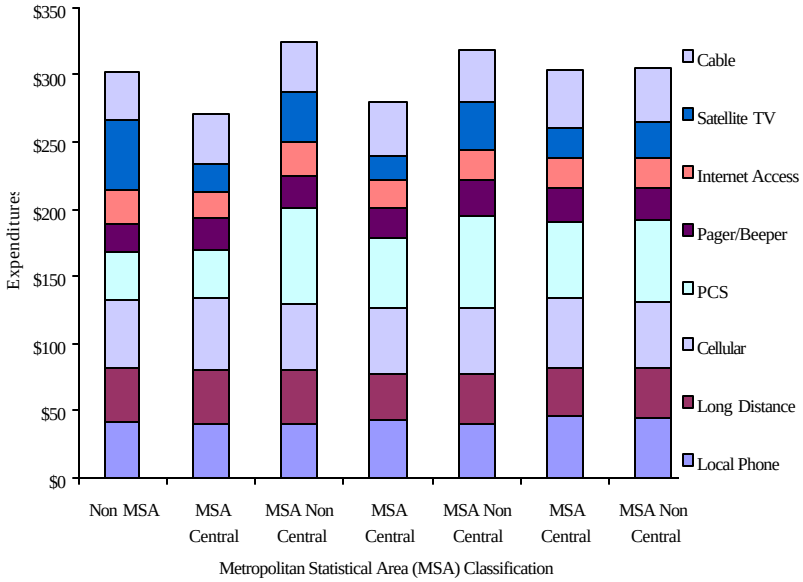

Figure 6. **Monthly Household Expenditures by Statistical Area Classification.** [26]

Table 1. Telecommunications Expenditures by Household above and below $15,000.[27]

Household Income	Less than $ 15K	Greater than $ 15K
Exchange	$ 38.20	$ 39.74
Toll	25.95	32.33
Cable	22.23	26.51
Wireless	5.89	17.90
Internet	3.02	7.69

Similarly, Crandall and Waverman explore the burden of household telecommunications expenditures across countries. Their empirical evidence shows that spending on durables - refrigerators, etc. - in most cases has higher penetration than telephone service, but these durable goods are not subsidized. [28]They also note that installation and calling charges may be more important than subsidized access as a driver of penetration.

5.5 Other Issues

The universal service policy is not practiced in other regulated sectors in the USA (Crandall and Waverman 2000, Chapters 3 & 4). Except for electricity, no support for

other regulated industries exists. Electric service is supported via a government entity - the Rural Utilities Service (RUS) of the Department of Agriculture[29] -- and a few publicly operated companies, and government sponsored power generation.[30] None of the support is through the distortion of the rate structure. No universal service requirement exists in this or other networks, with the exception of the RUS, which is scaling back. "However, only telephone is burdened by the enormous cross-subsidies paid by businesses, some urban residents, and heavy long distance users, designed to keep rates for rural "high-cost" areas artificially low." (Crandall and Waverman 2000, p. 88) "Telephone service is unique in the political demands it places on regulators for cross-subsidization." (Crandall and Waverman p. 79) Empirical analysis and data – primarily from the USA -- support their conclusions.

6. Evaluation/Critique of Instrument

Distorting the prices of telecommunications services is a particularly costly method for financing universal service subsidies. The services with elevated prices are generally those for which demand is more elastic than for local service. The current universal service policy thus represents Ramsey pricing in reverse. Because the burden of this funding is concentrated on certain telecommunications services, rather than drawn from general revenues, the base of the "tax" is relatively narrow, and the markups on the prices of the services generating the subsidy are quite high. Finally, the telecommunications sector is undergoing rapid changes, as new technology appears and as competition is introduced; the danger of dynamic distortions in the development of these markets is particularly acute. Examining only the first two of these concerns, Hausman estimates that for every dollar raised by increasing the price of long distance service, the welfare cost to consumers is $1.65 (Hausman 1998, pp. 13–14). This far

exceeds estimates of the comparable deadweight loss associated with a dollar of general revenue, which is approximately forty cents.

Crandall finds that if rates were to be rebalanced, without any universal service mechanisms to cushion the effects, the average welfare loss among the lowest income group would be only about six dollars per year, compared with an average expenditure for telecommunications among that group of about $490 per year (Crandall 1998 pp. 405–06).

7. Evaluation/Critique of Funding Mechanism

7.1 Pricing Above Costs

In many countries, as part of the pervasive regulation of the incumbent, authorities have intervened to hold rates for basic local service at levels below those that would have been set by firms in a competitive market (Laffont & Tirole 2000, pp. 217–20). In order to ensure revenue sufficiency, these regulators have allowed incumbent firms to set relatively high prices for other services the firms provide, such as interexchange access, termination of international calls, long distance service, some local rates for business customers, and "vertical services" such as calling features.[31]

The effects of this policy in the United States are quite striking. Figure 6 gives an overview of the market intervention on prices, by major service category, for the areas in twenty-eight states where GTE provides local telephone service as the incumbent. The bars show contribution, calculated as the difference between revenue at current rates and direct or TSLRIC cost, in dollars per year by category.[32] Reading from left to right, Figure 6 shows large positive contributions for interstate-switched access,[33] intrastate-switched access, toll calls within GTE's serving areas, and vertical services.[34] The bar on the right side of Figure 6 shows a large negative contribution for residential

local service. It is unlikely that this pattern of prices represents profit-maximizing behavior by the firm, since local service is generally found to be the least elastic of the service categories shown in Figure 1 (Taylor 1980 p 162).

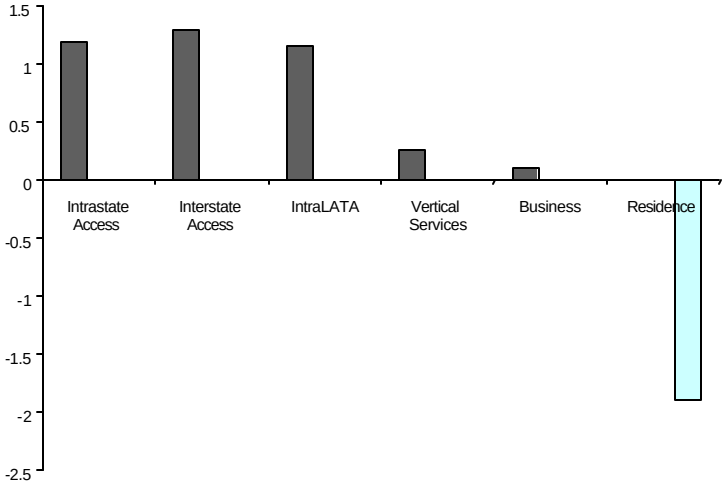

Figure 2. Contribution by Service Category.[35]

For comparison, Figure 7 shows what the contributions would look like if rates were rebalanced to yield the same total revenue, but with a constant percentage markup over TSLRIC by service category.[36] It is difficult to know the market equilibrium levels of these rates with certainty, if there were effectively competitive markets for each of the service categories shown in Figure 7. If we assume, however, that all firms in the market have cost levels similar to GTE's, and thus consistent with the revenue level in Figure 7, and if we decline to make any assumptions as to how Ramsey prices might differ from the constant-markup prices, then Figure 7 can serve as a rough guide to the level of contribution each service category would generate at market rates.[37] The *differences* between the two sets of bars thus provide an indication of the degree to which regulation has intervened to displace the current rates from these "market" or cost-based levels. "For the leftmost category alone, interstate switched access, the difference in revenue between the two price levels is about $1.2 billion per year for GTE; for the local carriers in the U.S. as a whole it is about $5.9 billion."[38]

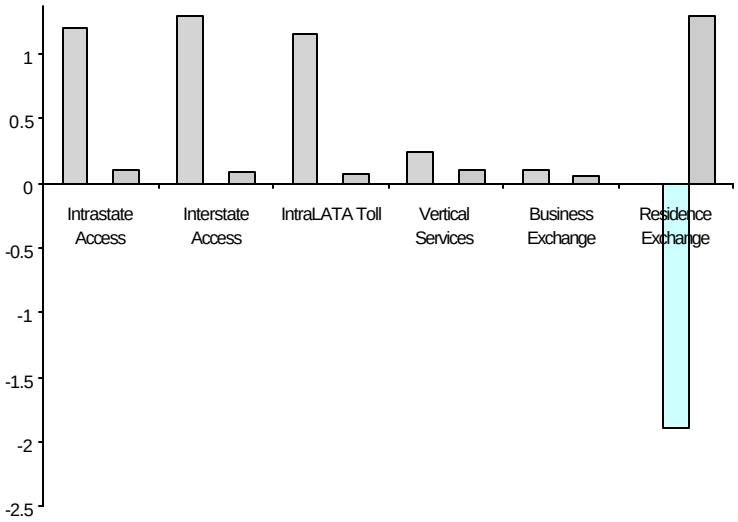

Figure 7. Contribution by Service Category, Rebalanced.[39]

While Figure 6 and Figure 7 reveal a large flow of funds across services, they obscure reality in two important ways. First, the charts show aggregates across geographic areas; thus, they fail to show the very large differences in cost from one area to another. Recent cost modeling has suggested that costs can vary by an order of magnitude, even within the serving area of a rural central office. Figure 7 suggests that, on average, residential local rates have been set almost twenty-three dollars per month below their market levels. In some low-density rural areas, however, this difference might be much larger—several hundred dollars per month—while in some urban areas residential rates may be much closer to, and even above, their costs. Second, the Figures are averages across individual customers. In aggregate, the two price vectors shown in the charts yield the same revenue. However, the distribution of usage for access, long distance, and vertical services across customers is highly skewed; for example, only six percent of the end-user locations served by GTE generate almost half of the demand for interexchange access. As a result, the two price vectors produce very different revenues when the demand of an individual customer, or market segment, is evaluated. If, for example, a new local carrier were to enter GTE's serving area in Texas, and attempt to serve all of GTE's local residence customers, it would find that

the revenue from all services would fail to cover costs for seventy-eight percent of those customers.[40]

This system of price manipulation has been sustainable, if inefficient, in a sole-provider environment. With the introduction of competition, two new concerns arise. First, the high margins for services on the left side of Figure1 will induce firms to focus their entry strategies on the minority of customers who have high demand for those services. Second, the low current prices for local service largely will preclude entry into local service markets.[41] This will especially be true for rural areas where costs are high, relative to the average rates.

7.2 Other Mechanisms

Crandall and Waverman examine the effect of a tax in the United States context to accomplish universal service goals, but find it does not do as well as rebalancing the rates. They review other Federal Communications Commission (FCC) programs, and note that residential competition will likely not come about without a rebalance of residential rates to cost. Providing a competitive environment by raising exchange rates cannot be easily accomplished in the political/regulatory environment in which the FCC operates. They suggest the simplest proposal is to "ratchet" up the local rates, given the ineffectiveness of the other alternatives they examined (Crandall and Waverman p. 140).[42]

In the United States, the Telecommunications Act of 1996 requires that rates in rural areas be "reasonably comparable" to those in urban areas. However, since rural customers generally rely more heavily on long distance service, raising long distance rates to subsidize rural subscribers is counterproductive. Further, it is far from clear that all rural subscribers are needy. For example in Colorado, the rural areas contain some of the most affluent regions in the state, if not the country. One only has to mention

Aspen and Vail to drive home this point. These communities receive preferential rates and the serving companies receive the money from the telephone industry's "Universal Service Fund." One would think that Vail and Aspen homeowners could afford unsubsidized phone service.[43]

8. An Alternative

But regulators wish to continue to intervene in local service markets. This means that the generally available rate for basic service in many areas will be held below market levels; there may also be requirements with respect to quality, tariffing, and other nonprice attributes of the service. The above discussion, by making this assumption, does not necessarily endorse this policy; however, we believe that important elements of the current market intervention will persist for a long time.

This section briefly reviews the use of auctions for determining which carriers should undertake a universal service obligation (USO), and what compensation they should receive for performing this function. The auction would reveal carriers' valuations of the USO, determine the number of USO providers endogenously, and provide an alternative to traditional cost-of-service regulation.

Weller (1998 pp. 645 - 48) suggested that a process of competitive bidding could serve this purpose.[44] The regulator would define the market intervention it wished to impose in the form of a universal service obligation. An auction would then determine which carriers should undertake this obligation and the compensation those carriers should receive in return.

Competitive bidding has been used by governments for many years to procure products and services—to choose the most efficient supplier, and to ensure that the government obtains the most advantageous price. Auctions have also been employed to

assign rights to government-held resources, such as spectrum or offshore oil deposits—to direct these resources to their highest valued use, and to maximize the resulting revenue. Auctions are particularly useful in valuing items for which it would otherwise be difficult to establish a price—because of their novelty or complexity, or because of the lack of observable market prices for comparable items. In this case, the "item" to be auctioned is an obligation to supply service to private customers, but at prices, terms, and conditions the firm would not have chosen voluntarily.[45]

To summarize the framework set forth, we will propose that the regulator should first define the universal service obligation it wishes carriers to undertake. We also define the market area for which this obligation would be assigned, suggesting that these should be relatively small, standard geographic areas. The universal service obligation for each small geographic area should be put up for auction when one or more of the carriers nominates that area for bidding. The auction would be a single-round, sealed bid; the form of the bid would be the per-customer support amount the carrier would require.

The low-bidder would win the rights to serve that market and receive the support. The auction would allow more than one carrier to win, with the number of winners in a given area determined endogenously. A limited form of conditional bidding is used to take account of possible economies of density. Repeated auctions over time allow this framework to adapt to changes in technology, costs, or policy objectives.[46]

8.1 Why an Auction?

Most of the discussion about universal service, in the United States and elsewhere, has focused on estimating the cost of the basic service, and deriving support levels by comparing this cost to some estimate or assumption regarding revenue. Compared to this alternative, an auction offers a number of advantages over traditional cost-of-

service approaches as a means to select universal service providers, and to determine the level of support payments.

Auctions have the advantage of:

- Speed of sale,
- Revealing information about buyers' valuations (in this case, sellers' valuations),
- Preventing dishonest dealing between the seller's agent and the buyer (here, the buyer's agent and the seller).[47]

The application of auctions to universal service has all three of these advantages.

9. Conclusion And Recommendations

9.1 Conclusions

The major distortion in the telephone industry is universal service, or the subsidization of subscribers' access to the network. This paper has shown that universal service is inefficient as a means of obtaining its intended goal. Because it is not directed to the marginal subscribers, it is costly to support; because it is not targeted directly to the needy subscribers, it misses its goal. Fundraising through cross-subsidies from other services is counterproductive—higher prices for the services providing the subsidies reduce the demand for subscriber access from the group which it is intended to aid. The subsidies inhibit effective competition because of artificially low prices for subscriber access, and high prices for other services, thus preventing the market from testing the efficiency of the provider. This can lead to inefficient entry in the high-priced markets and preclude efficient, low-cost entry in the subsidized markets. This is incompatible with competition policy. If a democratic process determines that subsidies are desirable, these should be targeted to the end-users and funded directly through government. While the myth of universal service—as currently embedded in regulatory

policies—is without economic foundations, universal service arguments nevertheless continue to plague the telecommunications industry to the detriment of business, the public and potential competitors. The issue should be re-examined in light of the criticisms above.

Universal service is poor public policy based on subsidizing telephone carriers rather than the subscribers directly affected. The subsidy does not distinguish among the rich and poor subscribers and, to the extent that the subsidy comes from services with strong cross elasticities, the policy is self- defeating.

Moreover, because they distort the incumbent's rates, the current subsidies distort the development of competition. High rates for services that generate the subsidy, such as interexchange access, long distance, and calling features, create an artificial incentive for entry into markets for customers such as large businesses with high concentrations of these services. At the same time, low rates for local service make it unattractive for new firms to compete for customers with lower usage levels, especially for residence customers. Furthermore, the rate distortion makes it difficult for the market to reveal whether the incumbent is an efficient provider of service. If a new carrier can offer lower rates to a business customer in an urban area, that may indicate the new firm is more efficient than the incumbent, but it may simply mean that the incumbent has charged high rates for that customer as part of the pervasive scheme of cross-subsidy. Similarly, if no entrant can match the incumbent's rate for local service to a residence subscriber in a rural area, this may show the incumbent is the most efficient provider, but it probably means only that the local rate to that customer has been below the incumbent's cost. This anticompetitive effect of universal service can be minimized by minimizing the subsidy itself, and also by making the necessary subsidies explicit and portable among the local carriers chosen as universal service providers.

9.2 Recommendations

We suggest a more focused policy. The goals should be examined in light of the above discussion, but most importantly, the instrument for obtaining the goal(s) should be examined. As the policy currently stands, "… universal service policies are a very imprecise system of income redistribution and have a large cost in terms of economic welfare." (Crandall and Waverman p. 167) The source of the subsidy should be examined. The current means, based on implicit taxes on long distance services, are inefficient and may be inequitable. Liberalization will change the focus and subsidies will not be sustainable in this competitive environment. We recommend that the universal service programs be shrunk and targeted.

We argue here that the current universal service policy is inefficient as a means of obtaining its intended goal for the following reasons:

it is not directed to the marginal subscribers,

it is not directed to the needy subscribers,

it may not be desired, nor necessary,

the pricing practice does not obtain the desired goal, and

the means of raising the funds to support the subsidy may be counter-productive.

If regulators insist on subsidizing the services, the auctions approach offers an more efficient solution.

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[1] One is reminded on the oft-quoted saying of Keynes "Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist. Madmen in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back." (Keynes 1964, p. 383).

[2] This type of effort has begun to be called "The Digital Divide." While, perhaps more catchy and market oriented than universal service; however, it suffers from the same infirmities this paper addresses. (See Laffont & Tirole 1999 pp. 16–17).

[3] "Rather than go overseas, Mineta, 68, (United States Secretary of Commerce) says he will lead a September tour of up to a dozen U.S. cities and towns to promote electronic commerce and 'digital inclusion.'" (Cox 2000, p. 8B) http://www.usatoday.com/usatonline/20000811/2542549s.htm Accessed August 13, 2000.

[4] In terms of the taxonomy developed by Cherry and Wildman (1996), the traditional pervasive regulation imposes a universal service obligation on the incumbent, which is asymmetric and unilateral. The challenge for the regulator is to develop a new approach in which the obligation is symmetric (in that it can be applied to firms other than the incumbent) and multilateral (it involves a transaction entered into voluntarily, in which the carrier takes on the obligation in return for compensation).

[5] See 47 U.S.C. § 151 (1994).

[6] The wording in the preamble is: "to make available, so far as possible, to all people . . . a rapid, efficient, Nation-wide, and world-wide wire and radio communications service . . . at reasonable charges . . . ." 47 U.S.C. § 151; see also Mueller (p, 157).

[7] State regulators also relied on revenues from private line services, business lines, touch-tone service, and, later, calling features such as call-forwarding and call-waiting, to subsidize local service. See Laffont & Tirole (1999 p. 3); and Mueller (1996 pp. 156 - 157).

[8] See Hausman (1998 p. 16); see also Gabel (1967 pp. 129–32) (providing a discussion of the process known as "Separations").

[9] See 47 C.F.R. pt. 69 (1999); Access Charge Order, 93 F.C.C. 2d 241 (Feb. 28, 1983).

[10] The telephone companies implied that the 1934 Telecommunications Act had required the telephone companies to provide universal service. They relied on the term "affordable service," which appeared in

the 1934 Act. However, the Act contains no mention of universal service nor of pricing exchange service below cost. Indeed, the confusion remains today for example, Crandall & Waverman (2000) stated that universal service was embedded in the Telecommunications Act of 1934. (p. 165). "Affordable rates" were mentioned, not below-cost rates. Affordable rates could simply mean rates with no monopoly rents. It certainly does not indicate an "embrace" of the universal service subsidy.

[11] By 1996 it was clear that the Internet was emerging as a significant force. Thus, the United States Congress added access to the Internet for schools and libraries to the 96 Act. That is, in addition to including residential voice telephony as part of universal service requirement, the Act included the provision of Internet access for schools and libraries at reduced rates.

[12] See Kahn (1970) for a discussion of pre-incentive regulation. For a review of the more recent incentive regulation, see Laffont & Tirole 1999 pp. 37 – 96.

[13] See Laffont & Tirole 1999 pp. 265–72, and the references cited therein, for most recent documentation of this convergence.

[14] See Laffont & Tirole 1999 pp. 217–18.

[15] Households who choose not to subscribe are those for whom the value of subscription is low. It is likely that the external benefits to other households of having those households subscribe is correspondingly low as well.

[16] In the United States, this could be the possible rationale for charging subscribers to larger exchanges more for access than subscribers to smaller exchanges.

[17] Littlechild (1975) first addressed this; Willig and Klein (1977) had a paper on the proper pricing of this externality in the mid-seventies, which was incorporated into Willig (1979).

[18] Coasian alternative defined

[19] See 47 U.S.C. § 254 (Supp. III 1997).

[20] A similar concept is applied to the NII as noted in the following quotation from the Telecommunications Act: "(E)xtend the 'universal service' concept to ensure that information resources are available to all at affordable prices. Because information means empowerment—and employment—the government has a duty to ensure that all Americans have access to the resources and job creation potential of the Information Age." 47 U.S.C. § 254 (Supp. III 1997).

[21] Universal service is the acknowledged goal of the subsidy; however, as pointed out two decades ago, and repeatedly since then, regulators have not addressed the incidence of the subsidy. Targeted subsidies are preferable, if subsidies are supported at all, to the service subsidies currently applied in the industry. See Johnson, pp. 74; Laffont & Tirole 1999 pp. 219; see also Hausman 1998 pp. 17.

[22] See Taylor (1984) pp. 200–04; Hausman et al., pp. 178.

[23] See A. B. Atkinson & J. E. Stiglitz (1976). Laffont and Tirole discuss caveats to Atkinson and Stiglitz's results where some of the assumptions underlying the result may not be met, for example, if the inequality the government wishes to correct cannot be observed directly. See Laffont & Tirole pp. 228–32.

[24] See PNR & Associates, Request™ (1999). ReQuest™ is a national residential survey that provides market information concerning consumer behaviors, attitudes, switching probabilities and price sensitivity. Each year, PNR surveys over 45,000 households to collect information on household expenditures, penetration rates, and attitudes on telecommunication products and services. Households are randomly selected from a national panel of households and are weighted to correspond to census distributions for age, income, household size and marital status. ReQuest™ covers local telephony, short distance toll, long distance, wireless (cellular, PCS, and paging), cable, internet, calling card, coin, and international long distance. The data displayed in the accompanying figures and table is based on surveys conducted during the first quarter of 1999. See Indetec/PNR, ReQuest (visited Mar. 13, 2000) <http://www.pnr.com/Products___Services/Market_Information/Consumer_Market_Info/ReQuest/request.htm>

[25] See PNR & Associates, Bill Harvesting™ (1999). Bill Harvesting™ is a study based on PNR's continuous data acquisition of actual customer bill data from a national cross-section of approximately 2,000 households per month. See Indetec/PNR (visited Mar. 13, 2000) Bill Harvesting <http://www.pnr.com/Products___Services/Market_Information/Consumer_Market_Info/Bill_Harvesting/bill_harvesting.htm>

[26] See id.

[27] See PNR & Associates.

[28] Low-income consumers, without the need for complex subsidies, purchase other discretionary services as well.

[29] The RUS also supports rural telephone development in the USA.

[30] Garbacz and Thompson (forthcoming 2001) take exception to this lack of cross-subsidies in other utilities.

[31] These cross-subsidies are well known in the industry and have been addressed most recently by Laffont and Tirole (2000 pp. 15, 144–47).

[32] Telecommunications Service Long Run Incremental Cost ("TSLRIC") is the additional cost to the firm attributable to offering a given increment of service. See Laffont & Tirole pp. 24–25. Here, the increment is a broad category of service. As a practical matter, it is difficult to estimate TSLRIC costs with any accuracy. See Alleman (1999 pp. 159–79). The estimates used here were developed internally by GTE (now part of Verizon) and reported in Weller (1999). If the figures were constructed using cost estimates from a different model, the absolute values of t he bars might change somewhat, but the general pattern would remain much the same.

[33] This is access provided through the switched telephone network for long distance calls that originate in one state and terminate in another. The FCC regulates these rates. See 47 U.S.C. § 15 (1994).

[34] Note that, if the dark and light bars were summed, the result would be a positive number. This is because the sum of the contributions from GTE's different service offerings must cover GTE's common costs of about $2 billion.

[35] Information in Figure 2 is taken from Weller (1999) pp. 649.

[36] Since the aggregate revenue in Figure 7 is the same as that in Figure 6, and all of the costs are also the same, the rebalanced rates in Figure 7 also generate about $2 billion in contribution toward the common costs of the firm. See Weller (1999) pp. 649 n.11.

[37] Ramsey pricing is a means of maximizing consumers' welfare while insuring the firm breaks even. In its simplest form, Ramsey pricing prices services above cost in proportion to the inverse of the services' demand elasticities. In effect, one can think of the constant-margin rates as the result of "mindless Ramsey pricing" by a firm unable to take account of differences in demand, and the current rates as "reverse Ramsey prices" since the pattern of markups is exactly the opposite of what one would expect from a firm setting Ramsey prices. See Laffont & Tirole pp. 60–69. For this reason, the constant-markup rates provide, if anything, a conservative reference point. If firms did take demand into account in setting prices, one might expect the markup for local service rates to be higher than the uniform level shown here.

[38] Weller (1999) pp. 650. This figure includes only rates for the larger service areas designated "nonrural" under the Telecommunications Act of 1996. See Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (1996) (codified at 47 U.S.C. § 254 (Supp. III 1997)). The national total would thus be somewhat higher. On the other hand, the current access rates include recovery of a portion of the costs of a new fund to subsidize telecommunications services for schools and libraries. See 47 U.S.C. § 254(c)(1). The Fifth Circuit has recently reversed a requirement established by the FCC that contributions to these funds be recovered through access rates. See Texas Office of Public Util. Counsel v. FCC, 183 F.3d 393 (5th Cir. 1999).

[39] Information in Figure 6 is taken from Weller (1999) pp. 650.

[40] For this analysis, we have assumed that the competitor's costs are the prices for unbundled network elements that have been established on an interim basis by state regulators in Texas. This is a conservative basis for calculating the entrant's costs; if GTE were to sell its current output vector in Texas at those prices, GTE's revenue would be about 36% lower than it is today.

The observed pattern of entry into local telecommunications markets in the United States appears to be consistent with these incentives. Significant entry has already occurred in markets for local business services. At the same time, there has been little competitive activity in local markets for residential service. See Baumol & Sidak, (1994 p. 7).

[42] Since the publication of Crandall and Waverman's book (2000), the FCC has adapted the CALLS proposal, which is a step in the prescribed direction. Federal Communications Commission Sixth Report and Order in CC Docket Nos. 96-262 and 94-1 Report And Order in CC Docket No. 99-249 Eleventh Report and Order in CC Docket No. 96-45, May 31, 2000. See Darby (2000) for a discussion of the economics of the proposal.

[43] Vail is in Eagle County, Colorado, and has an average per capita assessed property value of about $51,500. See Eagle County Government - Eagle County, Colorado (visited Mar. 28, 2000) <http://www.eagle-county.com/frames/gov.htm> (listing the total taxable assessed property value of Eagle County as $1,647,562,700); Eagle County Government - Eagle County, Colorado (visited Mar. 28, 2000) <http://www.eagle-county.com/frames/vis.htm> (listing the population of Eagle County as about 32,000).

[44] Laffont and Tirole provide a discussion of this work, referring to it as the "GTE proposal." See Laffont & Tirole pp. 244–50; see also Klemperer, pp. 227–31.

[45] Perhaps the closest parallel is a program under which the United States government subsidizes airline services on routes that might not otherwise be served in the wake of airline deregulation. See 14 C.F.R. pt. 271 (1999). The government enters into contracts that obligate the carrier to provide a specified level of service, and the contracts are awarded through a process of competitive bidding. A similar process is used in Great Britain to select franchisees to provide rail service. See Weller (1999) pp. 645–48.

[46] We will not discuss the specifics of the auction proposal here. For a more detailed description, see Weller (1999) pp. 655–73.

[47] See Elmar Wolfstetter (1996) p, 369.