Recovering Network Subsidies Without Distortion

by Michael Einhorn

Columbia Institute for Tele-Information
Graduate School of Business
Columbia University
809 Uris Hall
New York, NY 10027
(212)854-4222

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Michael A. Einhorn[1]
Antitrust Division
U.S. Dept. of Justice
Washington, D.C.

1. Introduction

Since the Federal Communications Commission's Above 890 and Carterfone decisions, American telecommunications regulators have permitted greater competition in service and equipment provision that has driven many prices to levels more consistent with underlying costs. While generally efficient and beneficial to many customers, the process has nonetheless reduced the ability of the public network to finance universal service and lifeline subsidies and to recover undepreciated capital costs.[2] As competition and technology continues to evolve in the next decade, these pressures will increase yet more. The public network may increasingly resemble the economists' underfinanced public good; it will continue to serve as the channel of last resort to interconnect users who do not have alternative means of interconnection, but groups of related users may nonetheless have incentives to interconnect over private networks that do not have subsidy requirements.

Reform could follow two avenues. First, regulators may

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[1]Opinions are personal and not those of the U. S. Dept. of Justice.

[2]As part of an historic regulatory compact between regulators and telephone monopolies, network equipment has been depreciated over longer lifetimes than is now justified by market technology.

attempt to prescribe (or implement rules that would generate) more efficient prices in the local exchange where subsidies are required. Alternatively, network services and related customer-owned equipment can be taxed in some fashion to recover necessary subsidy amounts. We shall now compare the various options.

2. Price Reform for Cost Recovery

Under current regulatory procedures, local company revenue requirements are recovered largely from flat-rate subscriber line charges, dedicated transport and access lines, usage-sensitive charges for customer toll calls, and per minute NTS and TS charges assigned to interconnected long-distance carriers. Because some fixed costs are recovered through per minute charges, usage prices now exceed marginal usage cost. To avoid excessive usage prices, long-distance carriers, alternative access providers, and end-users now have inefficient incentives to route traffic around local company facilities.

Because bypass technologies and alternative networks attract customers, the public network and its remaining customers face a growing cost burden. The bypass problem began with individual microwave links that directly interconnected distant voice users, but now broadly includes competitive transport of special and switched access minutes from central offices to points of presence, dedicated interconnection of local area networks, wireless alternatives to local access, and emerging wireline access provided over television cable. In addition, powerful bit compression,

error-detection, and call control techniques can now be implemented through customer premises equipment that may reduce significantly user needs for network transmission capacity. When local companies offer discounted switched or virtual private services that are competitive with these alternatives, sustainable prices can recover less than previously.

From a perspective of pure economic theory, the answer to the cost recovery problem is well known. If a service price exceeds marginal cost, economic inefficiency results when consumer quantities demanded are reduced. Regulators may therefore ensure efficiency simply by recovering capital costs and needed subsidies exclusively through service prices that do not affect demands, if they exist. Because telephone subscription now is a virtual necessity, many have contended that customer hookup and fixed monthly charges can be effectively raised without reducing either customer number or usage; such prices then may be efficient instruments for cost-recovery. However, if this were done, average monthly intrastate and interstate customer line charges for NTS cost recovery would total between $25 and $30. As a matter of political reality, this suggestion seems hopeless; the FCC was stymied in its 1984 attempt to increase subscriber line charges for NTS cost recovery to $6/month, and most state commissioners are not inclined to allow customer flat-rate fees to increase.[3]

[3]Flat-rate interconnection fees for other network providers is also problematic. Because long-distance carriers and competitive access providers would recover interconnection charges through customer rates, flat-rate charges would disproportionately increase customer prices charged by small competitors and would therefore lead to a noncost-related advantage for the larger.

Additionally, emerging local access competition may render these prices nonsustainable.

If no service were entirely price-inelastic, the least distorting means of increasing price above marginal cost in order to recover public network costs and subsidies is Ramsey pricing. Under Ramsey pricing, product prices must exceed marginal costs in inverse proportion to the demand elasticities of the related services; Ramsey rules have been devised for uniform prices, two-part tariffs, and nonlinear price schedules. To set Ramsey prices, regulators must know marginal costs, demand elasticities, and limits to price increases that arise from potential competition; direct regulatory price setting then is a difficult undertaking that allows for considerable misrepresentation and politicking. However, recent economic research has shown that utilities that are regulated by price-caps have long-run incentives to reach Ramsey prices without regulator need to measure demand elasticity or marginal cost.

However, the Ramsey outcome -- particularly when constrained by political limits on basic service prices and competitive entry -- may provide a diminishing amount of revenues to local companies; in the end, this cost burden may be too large and local carrier networks may be nonsustainable. This outcome can primarily be the result of local company prices that exceed costs (rather than direct cost competition) and is not necessarily efficient.

3. **Tax Strategies**

The above inefficiencies arose because subsidy and cost burdens were recovered exclusively through local company services; this created an inefficient price-cost differential that customers and alternative providers attempted to avoid with private lines, private networks, and customer premises equipment such as VSATs. The asymmetry might be reduced if necessary costs and subsidies can be recovered from a wider base of payers in the population-at-large or from a wider group of network users.

From the perspective of theoretical economic efficiency, general sales, personal income, or property taxes are nearly ideal ways of generating financial support for a public network; i.e., subsidy dollars could be recovered through an x% tax on personal consumption, income, or property. If cost dollars were so recovered, the local company could compete without the asymmetric pricing distortions that it now carries. Except for the possible substitution of leisure for work or savings for consumption, these taxes would influence no person's choice between any two affected products.[4] Whatever theoretical validity these taxes may have, they are politically problematic; any general tax increase is more likely to be earmarked for deficit reduction, public infrastructure, and perhaps foreign aid long before making its way to a communications subsidy. It is difficult to imagine that taxpayers would willingly pay a higher general tax in order to subsidize telephone companies.

Much as highway dollars are now financed by taxes on gasoline,

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[4]This is because flat-rate sales taxes increase both prices by the same percentage, while a personal income or property tax affects no price at all.

network subsidies could instead be recovered exclusively from users or providers of communications equipment and services who directly benefit from the network. We shall then consider tax schemes that are relatively easy to implement, that symmetrically affect service choices, and that do not disproportionately burden upon any provider. In a design-neutral scheme, no telecommunications customer would shift from one communications technology to another simply to avoid contributing to a subsidy.[5]

As one nondistorting means of recovering network subsidies, taxes could be assessed on property that is now owned by network competitors. Since property taxes affect no company's marginal costs, prices based on these costs are unchanged from their "no-tax" levels. However, if property taxes are implemented, each company's asset base must be assessed. Since replacement costs are difficult to ascertain, assessments must realistically be based on embedded historic cost. If so evaluated, the tax burden could differently affect two direct competitors with different plant vintages; it may inefficiently disadvantage either new competitors if costs generally inflate or incumbent providers if costs decrease. Similarly, sales taxes on new carrier equipment would unfairly disadvantage new providers and aggressive incumbents that install disproportionately more new equipment than their rivals.

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[5]We aim for a limited objective -- design-neutrality in the network. An additional ideal property would be that no customer has an incentive to reduce usage of the network. As discussed below, taxes that do not affect prices do theoretically exist but may be impractical for other reasons. Under present cost recovery schemes, toll usage may be seriously diminished; per minute carrier common line charges for NTS cost recovery now account for 40% of long-distance prices and more problems may result in the traffic-sensitive category.

Profits taxes would be levied on the difference between provider revenues and costs; the latter includes labor, materials, capital, and energy. An economic theorist would point out that a profit-maximizing producer has identical incentives to price output, choose inputs, and enter and exit markets with and without a positive profits tax; profits taxes then preserve competitive results. However, because competition also drives profits to zero, profit taxes on competitive providers may contribute little toward network subsidies. As the cost burden is passed back to a diminishing group of noncompetitive services, our initial problem reemerges and the local company may fail to recover its costs at all.

Value added taxes are commonly used internationally to finance government expenditures. A producer's value added is the difference between its revenues and costs, excluding labor and capital; this difference is equal to the sum of wages and capital payments. Value added taxes are appropriately assessed in the production chain wherever value added is positive, from providers of raw materials through to the retail outlets that sell to ultimate customers.

The aggregate value added in an industry is the difference between retail revenues less raw material and energy costs. Because these latter costs are quite modest in telecommunications, value added in this industry is roughly equal to retail revenues; a proportional value added tax then would generate roughly the same amount as a revenue tax on retail sales. Revenue taxes may alternatively be administered as sales taxes on each retail

transaction.

The revenue tax has two practical advantages over a value added tax. First, by eliminating input producers from the tax chain, revenue taxes seem considerably simpler to administer than value added taxes. To economize on accounting operations needed for a value added tax, nonintegrated upstream and downstream companies may have inefficient incentives to vertically integrate and vertically integrated producers may be inefficiently advantaged. No such incentive or advantage arises under a revenue tax.

Secondly, value added taxes permit tax writeoffs for new purchases of materials and energy, but no compensating allowance is made for material that has already been purchased and currently embedded in provider plant. This asymmetry evidently disadvantages incumbent providers.

If levied on retail customer purchases of network services and equipment, revenue/sales taxes can extend the tax base to competitive services and equipment and may go well beyond the present switched network domain where subsidies now are exclusively generated. If levied proportionally on all retail prices of service and equipment, these taxes would symmetrically increase all affected prices and therefore not distort consumer choices. We then must consider what items should be included in the tax base.

4. **The Tax Base**

Before the FCC's Above 890 and Carterfone decisions, AT&T and local non-Bell companies had exclusive rights to carry voice

traffic and install equipment on the public switched network. The network had three major components: switches, transport facilities (i.e., copper wire, coaxial cable, microwave equipment), and signal origination and transmission equipment located on customer premises (i.e., handsets, inside wire). Aiming to choose the efficient mix of network input needed for long-run expansion, system engineers considered the relative costs of deploying each piece of equipment. Because switching and transport were substitutes for one another and handsets were a customer-assigned complement that could not substitute for either, system planning centered around optimally deploying switching and transport equipment. Evidently, neither a proportional sales tax on purchases of equipment nor a tax on network revenues would have distorted the relative costs of affected substitutes; consequently, both taxes would have been design-neutral.

In contrast to the network monopolies of forty years ago, network equipment now can be classified: switches (public, private, and virtual private); transport (public, private, and virtual private), centrally controlled network signalling, signal originating and transmission equipment on customer premises (wireless and wireline handsets, PCs, TVs, and FAX machines), and complementary nodal intelligence. The first four components now are substitutes for one another. Large customers may now install private switches (PBXs) or use virtual private switches (Centrex) to economize on network transmission. Similarly, carrier transport, LANs, CAP transport, private lines, virtual private lines, SDNs, and VSATs are transmission technologies that are

substitutable for one another and for network switching. Out-of-band signalling capability can be located in the network to reduce needs for in-band capacity. Due to the advent of wireless technology and compression and error-detection techniques that can be remotely located, customer premises equipment can substitute for network transmission. With potential substitution between these network elements, all design choices can be extremely price-sensitive; a design-neutral tax should not affect the relative tradeoff between any two substitutable elements.

Because a sales tax on new purchases of carrier equipment cannot realistically be assessed on network equipment that is already in place, a tax on carrier equipment may disadvantage new entrants and aggressive incumbents that may tend to install disproportionately more new equipment than their rivals. An alternative sales tax strategy that does not so disadvantage these parties and that otherwise maintains design-neutrality could be assessed on sales of carrier services and customer premises equipment that can be used to interconnect with the network.

Some intelligence and devices in customer locations are media and equipment for reading, storing, and displaying information. Much like human eyes, brain, and voice, these media can be used in conjunction with network technology to provide one-way or two-way information flow but are not substitutable with any transmission capability of any network carrier. Examples of information storage and display complements include text, floppy disks, CD-ROMs and drives, videogames, TV and radio programs, movies and VCRs, printers, scanners, voice synthesizers, voice recognition devices,

answering machines, voice mail and E-mail software, financial services systems, airline reservation systems, credit card verification, and the data bases of information providers such as Compuserve and Prodigy. While taxing these components enlarges the tax base and reduces the tax rate needed to provide a certain subsidy amount, the prospective base of information media is very complex and ever-changing; due to the administrative complexity that would be necessary to keep up with information media, it is probably wise to not tax this nodal intelligence.

The prospective base of network components that can be symmetrically taxed then includes calling and access revenues from local companies, interexchange carriers, competitive data networks, cellular and PCS carriers, cable companies, satellite operators, and competitive access providers. Proportional equipment taxes can be assessed on wireless and wireline handsets, personal computers, modems, FAX machines, ATM machines, and televisions, as well as inside wire and VSATs.

5. The Universal Service Subsidy

We now consider two issues regarding the universal service and lifeline subsidies that would seem to be a necessary part of any cost recovery requirement -- how should payments be made and whom should be subsidized?

Regarding means of payment, dollar subsidies can be paid as income grants to qualifying individuals or earmarked for use exclusively with specific network services. The first approach

makes dollars to available consumers without lowering their service prices and therefore provides no incentive to purchase service that would otherwise be foregone; the second approach reduces each subscriber's actual payments for interconnection. Since new network subscribers provide benefits to other existing users,[6] the second approach may be an appropriate way to encourage marginal subscribers to join the system. This also seems more consistent with the original motivation behind universal service subsidies and is also more politically palatable; the public may more willingly accept medical, food, and housing subsidies for the deserving poor rather than general use-as-you-will grants. The subsidy amount should be nondistorting and therefore should not vary with a recipient's choice of primary access technology, be it copper wire, coaxial cable, fiber optic, or wireless.[7]

Regarding the rural service subsidy, aid to all rural users seems overly generous. Rural communities include ranchers, farmers, mining companies, lumber concerns, and vacation resorts that chose their location primarily as a business matter. It is arguable whether these businesses and their employees are more entitled to communications subsidies than brokerage houses and banks that must locate in urban areas. While the rural middle class may indeed be disadvantaged if faced with the true costs of telecommunications, other cost inequities between rural and urban dwellers (such as housing costs) favor the former. Wireless

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[6]I.e., each member may place calls to and receive calls from the new subscriber.

[7]At some future point, second lines for personal computer interconnection might qualify, but doing this now seems premature.

technology will reduce rural access costs considerably.

Subsidy recipients then should be means-tested in some manner. Rather than assigning telephone companies the managerial responsibility and costs of administering the subsidy program, the existing tax code can be modified to provide necessary subsidies. Individuals or families with less than a predesignated income level can be regarded as indigent and may deduct all monthly fixed charges from their owed taxes. People, such as students, who do not pay taxes can apply for telephone stamps from the government.

6. Conclusion

This paper has not addressed three major issues in cost recovery. First, to what extent should currently undepreciated local company plant be written off and not recovered from ratepayers? Second, should costs now recovered from interconnection fees for competitive transport be recovered as fixed costs? Third, should local company depreciation rates be accelerated in order to finance broadband deployment? These issues are highly political and invite extensive discussion.

Whatever fixed amounts must be recovered, this paper has offered a design-neutral scheme for generating the necessary revenues. Sales taxes should be assessed on all carrier usage and access revenues (i.e., local companies, interexchange carriers, competitive data networks, cellular and PCS carriers, cable companies, satellite operators, and competitive access providers) and customer premises equipment used to originate or process voice,

data, or video signals through communications channels (wireless and wireline handsets, FAX machines, personal computers, modems, ATM machines, and televisions). Nodal intelligence that purely complements network capabilities should not be taxed (text, floppy disks, CD-ROMs and drives, videogames, TV and radio programs, movies and VCRs, printers, scanners, voice synthesizers, voice recognition devices, answering machines, voice mail and E-mail software, financial services systems, airline reservation systems, credit card verification, and data bases).