The "State" of Universal Service

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Abstract

The introduction of competition forces regulators to address the historical practice of using of implicit cross subsidies to maintain uniformly low local telephone service rates. The Federal Communications Commission recently adopted rules to remove a portion of these implicit subsidies by adopting an explicit universal service program. This program, however, only addresses a small portion of the problem and leaves to the states problems associated with intrastate cross subsidies. In this paper we examine several alternative universal service programs that states may adopt. Overall, we find that universal service programs that base subsidy dollars on the cost of providing service have little effect on telephone penetration rates and result in large taxes, which distort market outcomes and drive those paying into the system from the network. Large universal service programs also cause competitive distortions. Furthermore, we find that cost-based mechanisms do an equally poor job when we use normative criteria, such as the effect the programs have on the distribution of income.

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> "Today, telephones are not a luxury, but obviously a necessity, and it's obviously middle and low-income people who are hit hardest. If we had to start fresh and do it over again, we certainly wouldn't tax the use of telephones." Representative Robert Matsui, Democrat, California.[3]

The three percent federal excise tax on telephone service has attracted significant attention recently. Several congressional representatives argue that taxes on telecommunications threaten the development of the Internet and have introduced a bill that would repeal the excise tax.[4] This rhetoric is politically appealing and may in some cases be correct. We examine the effect different telecommunications taxes, whose revenues are used to subsidize high-cost services, have on the market.

Regulators have historically used implicit cross subsidies to keep local rates relatively uniform across markets. Such policies have been justified as a means to promote universal service.[5] However, in order to keep rates low in high-cost areas, regulators artificially increase rates for long-distance, business, and other services. This results in distortions similar those of the federal excise tax.[6] These distortions also affect competition for the provision of telecommunications and related services. So far, however, universal service programs have largely eluded public scrutiny because they are hidden. The introduction and expansion of competition forces regulators to make these implicit subsidies explicit and competitively neutral. Such exposure is likely to increase public scrutiny, as the programs become more transparent. In this case, however, many will claim that these programs increase penetration rates and are needed to promote universal service. We present an analysis of the costs associated with universal service programs. This analysis is intended to inform the debate on universal service, providing estimates of the effects implicit and explicit subsidies have on telephone penetration rates. In addition, we provide information on who benefits and loses from such programs.

The Telecommunications Act of 1996 allowed competitors to enter local markets. While the inefficient use of implicit cross subsidies was sustainable under a regime of regulated monopoly, this practice is not sustainable in a competitive environment. As a result, state and federal regulators are re-examining their historical universal service programs. The Telecommunications Act also attempts to move from implicit to explicit

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[3] San Francisco Chronicle, March 27, 2000.

[4] H.R. 1234, 106th Congress, introduced March 23, 2000.

[5] Mueller (1997) provides an extensive background on the history and evolution of universal service policy in the U.S.

[6] In many ways the implicit cross subsidies and artificial inflation of rates are more insidious than a simple excise tax because these distortions affect investment decisions and are shaping the development of competition.

subsidies. Universal service policies are deeply ingrained in regulatory schemes making them one of the most expensive, controversial, and competitively important portions of Act.

To implement the Act, the FCC recently adopted a new federal universal service program for large carriers. A cornerstone of the new plan is its use of a forward-looking cost model that estimates the cost to provide telephone service to each wire center. The FCC's plan allows all eligible telephone carriers access to these funds and targets its support to relatively high-cost areas within high-cost states.[7]

In its universal service decision, the FCC determined that the federal program should guarantee that rates are comparable across states, but left it to the states to develop programs that would address intrastate differences. Thus, the federal program does little to address the large differences between rates and costs that exist within many states. The FCC's program provides approximately an additional $250 million to its non-rural, or large, company universal service program.[8]

Assuming local companies receive $32 per month from each residential line, we estimate that a shortfall in revenues of nearly $3 billion annually exists in high-cost areas. We arrive at this estimate by calculating the difference between estimated costs, net of federal support, and $32 per month. This large shortfall in high-cost areas is currently recovered through artificially inflated rates for other services. As competition develops, state regulators will be forced to address the disparity between rates and costs.[9] To correct these problems, regulators can either allow rates to move in line with costs or they can implement a program that provides all carriers access to an explicit subsidy equal to the difference between rates and costs.

The National Regulatory Research Institute (NRRI) (1998) conducted a survey in 1998 asking states to report whether or not they have implemented a state universal service plan, were in the process of implementing one, or had no plans to implement an intrastate fund. The NRRI reports that fourteen state commissions indicated that, in 1998, they had a universal service fund that was either functioning or was under revision. An additional 22 states had either approved a new fund or had one pending. While many

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[7] The 1996 Act leaves it to the states to determine whether or not a particular carrier is eligible to receive universal service subsidies. As expected, eligibility requirements have proven to be a contentious issue (Rosston and Wimmer, 1999).

[8] In 1999, these explicit federal high-cost programs cost approximately $1.7 billion. The Universal Service Administrative Corporation (1999) reports that the total projected funding requirement for the high cost programs for the fourth quarter 1999 is $433.328 million. Simply annualizing the quarterly requirement leads to our $1.7 billion estimate. This estimate does not include any increases that will come about because of the adoption of the new universal service program, which will begin in 2000. In addition to the high-cost program, the FCC also provides subsidies to low-income subscribers. This program provides approximately $500 million of federal support annually.

[9] Alternatively, it is argued that efficient competition cannot evolve until regulators address these problems.

states have implemented some form of universal service, many note that they were waiting for the FCC's decision before moving forward with their own programs.[10]

The purpose of this paper is to understand the costs and benefits of state universal service programs given the existence of the federal program. We begin with a short review of the theory underlying universal service and then move to a summary of the FCC's cost estimates for providing service. The cost model suggests that only a small percentage of lines should be considered high-cost lines.

We examine the magnitude of potential intrastate universal service schemes. We assume that states will adopt programs that target support to high-cost wire centers. We assume that states will provide subsidies to wire centers by taking the difference between estimated costs, net of federal subsidy, and a benchmark.[11] To understand the effects of such programs, we compare the costs of a $32.18 and a $50 benchmark. In addition to providing state regulators information about the effects of such programs and their costs, our analysis gives a rough estimate of the amount of implicit cross subsidies presently in the system.[12] Finally, we augment the cost-model data with demographic data to examine the characteristics of consumers who receive support under potential state programs.

We find that increasing subsidies to high-cost areas has a large impact on the size of the program, but is likely to have a de-minimus effect on subscribership. Furthermore, cost-based programs do a poor job of targeting subsidies to low-income households, and minorities are more likely to be net contributors under such programs. These infirmities hold true in the vast majority of states and the country as a whole.

II. Theory of "Universal Service"

The essential goal of the universal service is to ensure that people stay connected to the network. Two primary reasons have been put forth to justify universal service subsidies: telephone service is an essential service, and that there are "network effects."[13]

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[10] These programs are typically a part of state efforts to move access charges closer to costs and are part of efforts to rebalance rates. For example, in the NRRI survey, Illinois reports that it has opened a Docket on universal service addressing high cost support and alternatives for rate rebalancing or the creation of an intrastate fund (NRRI, 1998, page 33.)

[11] Because it is very difficult to reverse the flow of subsidies, it is likely that the new federal program will remain in place for some time. We therefore examine potential state programs assuming the federal program remains in place. An analysis of only the federal program gives similar results although the magnitude of the effects is smaller.

[12] We are unaware of any efforts to set local service rates in line with costs.

[13] See Mueller (1997).

To keep people connected to the network,[14] economists agree that targeting subsidies to consumers who would disconnect in the absence of a subsidy is more efficient than basing subsidies on the cost of providing service.[15] Under a cost-based plan, much of the subsidy is directed to consumers with high incomes who would remain connected even if prices reflect costs. This makes the program larger than is necessary and requires higher tax rates, which distort market outcomes. Low-income consumers living in low-cost areas may subsidize high-income users living in high-cost areas. Thus, it is likely that the program tends to be an income transfer program that makes one group better off at the expense of others, rather than a program that ensures people remain connected to the network. By contrast, if the subsidy is targeted to those who are not presently connected the network or who might choose to disconnect in the absence of a subsidy, penetration rates would remain high and the distortions caused by taxes would be less severe. Moreover, because taxes on telecommunication services will be used to raise revenues, a large program, and concomitant high tax rates, may actually decrease penetration levels because the cost of using the network increases for those not receiving a subsidy.[16]

Others have studied this problem, and generally come to the conclusion that it is inefficient to tax a relatively elastically demanded service (long distance) to subsidize the price of a relatively inelastically demanded service (local monthly service). Crandall and Waverman (1998) provide the most extensive discussion of the problem, along with a review of prior literature. They summarize the results of research, all of which come to the same conclusion: the price of local service has very little impact on the decision to subscribe to telephone service. Crandall and Waverman present evidence from the literature that the elasticity of demand for local service ranges from -0.006 to –0.17, with most of the more recent estimates well below –0.1. In their own estimates, Crandall and Waverman find the local monthly rate is insignificant in the subscription decision. However, they do find that the installation charge has a small impact on subscription decisions. As a result, they conclude that if there is any subsidy, it should be in the form of a Link-up program that subsidizes initial connection fees.

The FCC recognizes the effectiveness of targeted subsidies to increase penetration rates and provides subsidies based on need through its Lifeline and Link-up programs. These programs provide support to low-income consumers by lowering monthly flat-rated charges and providing support to reduce the cost of connecting to the network. Many states have adopted and/or expanded such programs. However, state and federal

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[14] High penetration rates are obviously one of the goals at the FCC, as evidenced by their periodic monitoring of these levels.

[15] Eriksson, Kaserman and Mayo (1998) show that the FCC's targeted low-income subsidy programs, Lifeline and Link-up, more effectively increase penetration rates than its cost-based programs.

[16] Hausman, Tardiff, and Belinfante (1993) find that because consumers base decisions to purchase a service based on the total surplus they receive from it, artificially increasing the price of services, such as long distance, decreases the net value consumers receive from connecting to the network.

high-cost universal service programs will continue to provide support based on the cost of service, regardless of consumers' abilities to pay.

III. What does it cost to provide phone service?

The FCC (with significant input from interested parties) has developed a model that estimates the cost of providing local telephone service. The Hybrid Cost Proxy Model (HCPM) divides regions served by non-rural carriers into roughly 12,493 geographic areas based on the current location of incumbent local exchange carrier wire centers (or switches and those served by a particular switch). For each wire center, the model estimates the cost of the various components used to provide local telephone service: loop, switching, signaling and transport, etc. Based on the differences in local conditions, population density and other factors, the model estimates the cost of providing local service in each wire center. These wire centers serve approximately 161 million switched access lines.

The HCPM estimates that average cost of local telephone service is $23.84 for the non-rural companies. The majority of lines have cost estimates that are less than $30 per month and only a small minority of lines is estimated to cost more than $50 per month. Approximately 45 percent of the lines have estimated costs that are less than $20 per month. Nearly 90 percent of the lines (87 percent) have costs below $30; 94 percent are below $40 per month; and 97 percent have costs below $50 per month. It is clear that only a small percentage of all lines are estimated to have costs that are substantially higher than the amount consumers pay for local service. The intention of the universal service program is to provide a subsidy to companies (and ultimately consumers) living in areas with high costs in order to keep rates down in these areas.[17]

IV. Potential State Programs

The FCC's federal universal service program addresses only a small portion of the total cross subsidy embedded in current rates. In order for competition to develop efficiently, state and federal regulators both need to align rates more closely with costs. Such a proposition, however, is politically unappealing. The stated concern is that allowing rates to move in line with costs would result in significant decreases in penetration rates. As shown by Hausman et al. (1993), this fear does not necessarily hold

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[17] Loop length is the primary driver of costs and is a function of population density. To gain a clearer understanding of this relationship, we regressed the natural logarithm of average monthly cost per line in each wire center on the natural log of population density. Population density is measured as the ratio of the number of total switched lines in a wire center to the total number of square miles in that wire center. This simple regression indicates that a 10 percent increase in switched lines per square mile results in a 2.6 percent reduction in a wire center's average cost per line and explains about 80 percent of the total variation in costs.

because rate rebalancing will cause some prices to decrease at the same time that others increase. The decrease in some prices will increase penetration, offsetting some of the loss in subscribers from other rates increasing. Hausman et al. show that the decision to subscribe to telephone service depends on the utility a customer receives from all telecommunication services, including long distance calling, and increases in the price of long distance services reduces penetration rates. In addition to their analysis, the introduction of substitutes, such as wireless alternatives, is likely to dampen further the effect a movement of wireline rates to cost would have on penetration.

In this section, we estimate the size of a universal service program each state would have to adopt to be consistent with the FCC $32.18 benchmark ($32 benchmark). In addition, we estimate the tax rate state regulators would have to impose on intrastate end-user revenues to fund the state program. We then compare the $32 benchmark with alternatives, including programs that would eliminate the subsidy altogether, target it to low-income households, and use an alternative benchmark of $50. Table 1 includes only the subsidy necessary to support the relatively large, or in FCC parlance, non-rural companies.[18]

Table 1 estimates the size of the universal service programs states would have to adopt to keep rates consistent with $32 and $50 benchmarks. We add estimates of the tax rates each state would have to adopt to fund these programs explicitly. The size of the program is calculated by taking the difference between each wire center's estimated cost and the sum of any federal subsidy and the appropriate benchmark. For example, consider a wire center with an estimated monthly cost of $42 per line that is slated to receive a monthly federal subsidy of $3 per line. Under a $32 benchmark, the estimated monthly state subsidy is $7 per line.[19] Under a $50 benchmark, the lines in this wire center would not receive a subsidy. Based on the estimated size of the fund, we develop "tax rates" for each state. Taking the ratio of the estimated size of each state's non-rural company universal service program to1998 Intrastate End User Telecommunications Revenue gives our estimated tax rates. We obtained data on state end-user revenue from Table 2.3 of the FCC's January 2000 report: State-by-State Telephone Revenue and Universal Service Data.

In these calculations we exclude lines from "rural" companies in our estimates of the size of the state's universal service program, but include their revenues in our estimates of tax rates. We do this for a number of reasons. As discussed above, the FCC has yet to address how the subsidies to rural companies should be adjusted in light of the 1996 Act, and has not parameterized its model for small, rural companies. Thus, we are

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[18] We exclude any subsidy that would be required for rural, or small, companies in these calculations. See discussion below. The "non-rural" companies do serve a large number of rural, high cost lines; they are simply deemed "non-rural" by the FCC because of different regulatory and subsidy treatment afforded to smaller carriers.

[19] For 29 states, there is no federal subsidy, either from the new federal plan or the "hold harmless." As a result, these states would have to fund the entire difference between the cost and the benchmark.

assuming that states, in the near term, will adopt programs for the large non-rural carriers, but will impose a tax on all end-user revenues. If the states only tax non-rural customers, our estimated tax rates are too low.[20] In addition, because rural telephone companies typically operate in much less densely populated areas, their inclusion is likely to increase the size of the subsidy. As a result, the tax rate percentages presented in the table below are likely to underestimate the true magnitude of the tax rates that would be necessary to maintain the benchmarks if all lines were included. The effect on the table is that the tax rates are likely to be too low and the relative rankings of states may change because some states have more lines served by rural telephone companies. Finally, non-rural companies serve well over 90 percent of all customers, so any error introduced by the exclusion of rural companies is likely to be small.

V. Subsidy and Tax Rates

Table 1 shows that with a $32 benchmark, the implied state tax rates range from a low of zero in the District of Columbia, where the cost of local service is well below $32 in every wire center, to a high of 8.28% in Maine. The median rate is Ohio's 3.07%. The weighted average across all states is 2.41%. These tax rates would be applied to intrastate services only, so that they would not be added to the federal tax on interstate services of 5.7%.[21, 22]

Some typically rural western states have relatively low rates – Wyoming (3.72%) and Idaho (4.22%) – compared to southern states – Kentucky (7.00%); Louisiana (5.30%); and Alabama (5.25%). These differences occur for at least two reasons. First, many rural western states have large expanses of uninhabited territory, while the south appears to be characterized by large areas with sparse population. As discussed above, population density of inhabited areas is the main driver of costs. Second, our estimates only include non-rural companies. To the extent that non-rural companies have sold their more rural exchanges or do not serve the rural areas in the states they cover, many rural areas are not included in our estimates. This may hold more in the western states where US West has sold many of its rural exchanges to "rural" telephone companies.

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[20] Below, we estimate the effect taxes used to fund any universal service program will have on subscribership. In these estimates we do not include the lines of rural subscribers. Thus, our estimates of the number of subscribers lost because of taxes to fund universal service are a lower bound.

[21] See, the FCC's Proposed Second Quarter 2000 Universal Service Contribution Factor (March 7, 2000).

[22] Notice that the interstate tax rate exceeds the estimated intrastate rate in 43 of the 51 cases. The difference in tax rates gives companies the incentive to "misreport" intrastate revenues as interstate revenues when the intrastate tax is higher. Because distinctions between intrastate and interstate revenue are often arbitrary or difficult to determine, such distinctions distort carrier decisions. See Rosston and Wimmer (1999).

Moving to a $50 benchmark affects both the absolute level of the tax and the relative rankings of the states. There is not a perfect correlation in the rankings of tax rates between a $50 subsidy and a $32 subsidy. The highest intrastate tax state becomes Montana, with a tax rate of 4.31%. Maine falls to the 47th highest, because it has relatively more lines at central offices with costs between $32 and $50. The overall weighted average tax rate falls to under 1% because the total intrastate subsidy declines from $2.9 billion annually to about $1.2 billion annually. The states that save the most, as measured as the reduction in tax rates, are Alabama, Maine, Kentucky, Mississippi, West Virginia, and Vermont – all of which experience at least a 4 percentage point drop in universal service tax rates. As expected, a relatively small increase in the benchmark has a significant impact on the amount that intrastate telecommunication services must be taxed to fund the program.

VI. Effects of Universal Service Reform on Penetration

Wimmer and Rosston (2000) estimate the effect a reduction in the size of state subsidies would have on the number of subscribers. In this work, we find that increasing the benchmark from $32 to $50 results in a less than one half of one percent reduction in penetration rates. We also show that the reduction in penetration can be reduced at a relatively low cost if only low-income consumers continued to be supported at a level consistent with a $32 benchmark. These results, however, only tell half of the story.

We extend these results in two significant respects. First, we present the estimated effects subsidies have on the number of subscribers on a state-by-state basis. This shows the heterogeneous effects of raising the benchmark. Second, we make use of elasticity estimates to estimate the additional subscribers who would join the network if rates for intrastate toll and local service in low-cost areas were reduced.

To estimate the total effect an increase in the subsidy would have on subscribership, we begin by estimating the effect increasing the benchmark has on subscribers who lose their subsidy. We look at eliminating the subsidy entirely, changing the benchmark and adopting targeted low-income subsidies. We then estimate the increase in penetration that would result from the decrease in the tax rates on other services.

Eliminating the high cost support would allow rates to reflect true costs in all areas. We adopt the convention that monthly rates would not rise above $100 per month because alternative technologies are likely to be substituted for land-line service (see Wimmer and Rosston (2000) and Crandall and Waverman (1999)). We also assume that elasticities measured around current rates would also apply to significantly higher local rates. Given this, overall penetration would only decrease by about one-half of one percentage point, and the maximum decline in penetration would be 1.83% in Vermont. Vermont has a 95.4 percent penetration rate according to the FCC Penetration Report so that penetration in Vermont would decrease to 93.6% if the state adopted a plan to eliminate state high-cost support.

We also investigate the impact of alternative benchmarks on penetration rates. Specifically, we estimate the effect maintaining a benchmark of $32 for all low-income subscribers, but allowing rates to high-income users to move to cost. The number of subscribers would decrease by about 0.29% nationwide and 1.21% in Vermont. All of these people disconnecting from the network would be households with incomes above $20,000 per year, measured in 1990 dollars. Finally, we estimate the effect increasing the benchmark to $50 with and without low-income support maintained at the $32 benchmark. Moving from a $32 benchmark to a $50 benchmark reduces the cost of the program by almost $2 billion annually. Tax rates are cut by more than one half and penetration falls by less than 0.3%. Use of a $50 benchmark combined with low-income support maintained at the $32 level results in less than a 0.2% reduction in lines. Under this scenario, the largest loss would again occur in Vermont, where penetration would fall by an estimated 0.84%. While a loss of lines would occur because residents lose a portion of their subsidies under these alternative scenarios, subsidy dollars would be saved. Vermont would reduce the size of its universal service subsidies by more than $9 million per year and cut its tax rate approximately in half if it moved from a program with a $32 benchmark to one with a $50 benchmark for high-income subscribers with more generous low-income support. West Virginia, Kentucky, Mississippi, New Hampshire, and Alabama would also reduce their tax rates by at least two percentage points by moving to an income-based plan and a $50 benchmark. This discussion, however, overestimates the decline in subscribership because it does not account for the effect the increase in tax rates has on subscribership.

As with any social program, the largest costs are those that are not observable. The continuation of high-cost support programs, implicit or explicit, will continue to reduce subscribership among those who are net losers under the system. The tax rates derived above, along with elasticity estimates, allow us to estimate the effect these taxes have on subscribership. We use elasticity estimates from Crandall and Waverman (1999) and Hausman, Tardiff, and Belinfante (1993) to estimate of the increase in subscriptions due to the lower tax rates that lead to lower urban telephone rates and lower rates for intraLATA toll calls and interLATA calls. We continue to use the estimate of –0.075 for the local service elasticity estimate. We use cross-price elasticities for local service with respect to the price of intrastate intraLATA toll and interLATA service of -0.0086 and -0.0019, respectively.

We estimate the total number of lines currently lost because of the taxes necessary to support the rural high cost funding for each of the four scenarios above. These are the numbers of lines gained that would ultimately offset some of the lines lost from increasing rural rates – in other words these are the hidden losses due to the current higher tax rates. A $32 benchmark results in a decline of over 200,000 lines, approximately 0.2 percent of all lines. The number of lines lost because of tax rates drop off quite rapidly, to below 100,000, if a $50 benchmark is used. Approximately 140,000 lines are lost if a $50 benchmark with a low-income subsidy is used. Overall, these numbers do not completely offset the estimated number of lines lost from discontinuing the subsidy. However, the number of lines that would be gained from removing the rural tax from a $32 benchmark offset approximately 40% of the number of lines lost from removing the subsidy altogether.

In Table 2 we present the total effect that changes in the subsidy have on the number of subscribers and tax rates. The first set of numbers gives the results for eliminating the subsidy entirely. The first column in this set shows that the tax rate will fall to zero. The second column shows the net number of lines that would be lost from moving from a $32 benchmark to elimination of the subsidy. These numbers are calculated by adding the number of lines that would be saved (a positive number) because the tax rate fell to the number lost (a negative number) because the subsidy fell. Thus, a negative number indicates that the number of residential lines would fall if the benchmark were raised. The third column reports the effect as a percentage of total residential lines in the state. Overall, after accounting for tax rates, we find that the total number of lines lost would be reduced to only 60% of the estimate that did not account for the adverse effect of higher tax rates. The median decline is 0.4% and the nationwide decline is 0.3%. Again, Vermont declines by the greatest amount – 1.1%. Eliminating the subsidy program altogether would only cause a decrease in penetration of greater than 1% in three states. In the majority of states, the net effect of no subsidy program at all would be below one-half of a percent. One state, Nevada, would actually experience an increase in subscribership if the rural subsidy were eliminated.

The remaining three sets of numbers in Table 2 present similar figures for a $50 benchmark and programs targeting low-income households. After accounting for tax effects, the two low-income programs result in a less than 0.2% decline in the number of residential lines. The majority of the states in this case would experience a less than 0.3% decline under the low-income only program, with the majority seeing a decline of less than 0.2% under the $50 benchmark combined with a low-income subsidy. Maintaining a targeted low-income subsidy while eliminating the rural subsidy would decrease penetration by 0.81% in Vermont. These calculations assume that there is no difference in the price elasticity of demand between low-income and high-income households. If high-income households have relatively more inelastic demands, these numbers overestimate the reduction in penetration that would be caused by a reduction in the subsidies.

These calculations imply that regulators' efforts to improve subscribership by maintaining the web of implicit subsidies are largely ineffective – eliminating them entirely would have a small effect on subscribership and that decline could be mitigated substantially by instituting a targeted low-income program. The increase in rates required to subsidize high-cost areas reduce subscribership and distort both consumer and producer actions. As discussed by Crandall and Waverman (1995), a removal of the subsidies provides an even larger benefit because it results in more accurate signals to consumers and competitors. Crandall and Waverman estimate this welfare gain to be on the order of $8 billion per year.

While the new universal service programs address many of the distortions caused by historical policies, they introduce a whole new set of problems. Large universal service funds, and resultant taxes, not only affect telecommunication markets by artificially increasing particular service prices, but also through the subtle effects they have on firms' incentives. As discussed by Rosston and Wimmer (1999), regulators have adopted a slew of nonsensical jurisdictional definitions to determine which services will

be taxed to fund universal service programs and regulators have a large say in which carriers are eligible for support.

The current federal program taxes interstate end-user telecommunications revenues to fund its subsidies. According to FCC rules, this excludes data services and requires regulators to determine the portion of bundled offerings, which may include non-telecommunication and intrastate services, are subjected to the tax. The increase in IP telephony and data services, along with the introduction of new services, means that the definition of telecommunications revenue will become increasingly murky and difficult to enforce.[23] More important, the use of arbitrary distinctions affects producer and consumer incentives. As a result, consumers will be given inefficient consumption signals and network design may be affected. These distortions hurt efficient competition because firms may gain a competitive advantage through the anomalies inherent to the regulatory process rather than providing consumers with the best products.[24] Simply allowing rates to move toward cost eliminates these problems.

There are also disputes about which companies qualify to receive universal service funding.[25] Historically, only incumbent wire-line telephone service providers have been eligible to receive subsidy dollars.[26] The introduction of an explicit federal program requires state regulators to certify carriers as "eligible telecommunications carriers" before they can draw from the fund. The importance of becoming an eligible carrier declines as the benchmark is raised and consumers, not regulators, determine which carriers and technologies serve rural customers.

Another concern with large state universal service programs is that program size is unlikely to fall over time. The introduction of competition is likely to lead to a variety of innovations that regulators are unable to anticipate. These new innovations are likely to lead to decreases in operating costs in rural areas, obviating the need for universal service programs.[27] The implementation of a large fund may serve to slow such advances because current beneficiaries of the program will attempt to use the regulatory process to protect their subsidies. Additionally, carriers may be slow to adopt a cost-saving

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[23] In addition, and in part because of, tax-avoidance incentives will place increased pressure on regulators to redefine the services that will be taxed.

[24] For a more detailed discussion of these issues, see Rosston and Wimmer (1999).

[25] The FCC and the states have adopted a set of standards carriers must meet before becoming eligible for funding. These requirements require carriers to adopt particular pricing policies and maintain certain standards. Thus, regulators have limited consumer and producer options (see, Rosston and Wimmer; 1999).

[26] The incumbent telephone companies have also been the only companies with a "carrier of last resort" requirement.

[27] Whinston (1998) reports that evidence from recently deregulated industries, such as railroads, airlines, and natural gas, shows that each substantially improved its efficiency. Whinston summarizes evidence that shows real operating costs fell by over 25 percent following deregulation.

technology if it is determined that adoption may reduce subsidy dollars or threaten eligibility status.

A rational universal service policy minimizes distortions, achieves clear, well-articulated goals, and has no impact on the competitive process. To do this, the policy should ensure that the incentives for tax avoidance are small and consumers have the ultimate say in which firms thrive. The fast pace of technological change and the ability of firms to respond to incentives makes it very difficult, if not impossible, to develop rules that withstand the dynamics of the market.

VII. Demographic Factors

While current universal service programs do not appear to have the desired effect of substantially increasing subscribership, they may be considered, in a normative sense, desirable if they transfer income from high-income consumers to low-income consumers. We matched demographic data from the 1990 census, aggregated by wire center, to examine the effects universal service programs have on the distribution of income.[28] However, there is little reason to expect the cost of providing service to be closely correlated with household income. Below, we use demographic data to determine the types of households who would benefit and lose under the scenarios considered above.

Income

We begin by examining the flow of subsidies related to different income classes. For each income level, Table 3 provides the percentage of lines accounted for by households in that income category. For example, households with incomes below $10,000 account for 8% of the lines served by non-rural companies in Alaska. The second column for each income group is the percentage of the subsidy dollars accounted for by that income group. Households with incomes below $10,000 per year would receive 2% of the subsidy dollars in Alaska. Finally, the third column for each income level reports the difference between the first two columns. Households in the lowest income category in Alaska receive 5% (difference is due to rounding) less in subsidy dollars than they account for as a percentage of lines. For each state, some income categories will have a positive differential and other will have a negative differential and the sum across all income categories will equal zero.

In nine states, the share of lines accounted for by the lowest income group exceeds the share of subsidy dollars received by households with incomes below $10,000. This indicates that, on average, low-income households in those states receive less than their proportionate share of universal service subsidies. For the country as a

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[28] The demographic data were obtained from PNR and Associates, a consulting company that is involved with several aspects of the cost modeling effort. PNR matched demographic data from the 1990 Census with the wire center boundaries used by the HCPM. From PNR we were able to obtain, among other things, the number of households in each wire center that were headed by people of different races or ethnic groups, a breakdown by income, family type, and several other factors.

whole, the lowest income categories account for a higher percentage of subsidy dollars than their share of lines. It is important to remember, however, that this does not necessarily make the rural high cost subsidy a "progressive" scheme. The data show that the vast majority of low-income households receive no benefit from high cost funding, yet are required to pay into the system. In all but 3 states, less than one half of the low-income residents get any subsidy dollars. In those three states, slightly more than half of the low-income residents would get subsidy dollars but a large number of the highest income households (more than 37.5%) would also get subsidy dollars. As a result, most low-income residents would pay into the system, while many high-income households would be receiving a subsidy.

Race

We have undertaken a similar exercise to study the effects of state subsidy programs on different ethnic groups. Table 4 presents the results of the analysis for different ethnic groups by state. The first set of numbers presents the conditional probability households in a particular ethnic group receive a subsidy. The conditional probabilities are calculated by taking the ratio of the number of subsidized lines for each ethnic group to the total number of lines accounted for by that ethnic group. The results show the probability of getting a subsidy for each different ethnic group in each state. The results show a wide variation between states and between ethnic groups within states.

For example, in New Jersey 1% of white households would receive a subsidy and 50% of white households would receive a subsidy in Alabama. The largest differential between black and white households occurs in Wyoming where 37% of white households would receive a subsidy compared to only 2% of black households. In contrast, in North Dakota, 50% of black households would receive a subsidy compared to only 13% of the white households.[29] These differences are simply due to households' locational choices – Black, Hispanic and Asian households tend to locate in urban areas with lower costs and Native American households tend to locate in more sparse areas with higher costs.

The second set of numbers in Table 4 shows the differential between the share of lines and the share of subsidy for each group. This differs from the conditional probability because the differential incorporates the size of the subsidy to each group, not just the likelihood that a subsidy is granted. As in the income table, the sum of the differentials must add to zero. The results are similar to the nationwide results presented in Wimmer and Rosston (2000), but once again, there is significant variation between the states. In 44 states, Blacks and Hispanics account for a higher percentage of lines than they account for in subsidy dollars. On the other hand, Native Americans receive a higher percentage of subsidy dollars in 36 states than their proportionate share of lines.

Overall, our results examining the correlation between the flow of subsidy dollars and who benefits are not surprising. Regulators have chosen to use a very blunt instrument, cost of service, to allocate subsidy dollars. As expected, the primary flow of

[29] Viginia and North Dakota have the highest differential between Hispanic and White households.

dollars is from urban areas to rural areas. Because low-income households are likely to live in both rural and urban communities, the subsidy does a poor job of redistributing income. Moreover, because certain ethnic groups are concentrated in rural or urban areas, the subsidy does what would be expected. In short, our analysis shows that cost-based subsidies do as poor of a job when the distribution of income is used as criteria as it does when subscribership is used as the criteria.

VIII. Conclusions

Universal service programs are a large and competitively important piece of the future of the telecommunications sector. State regulatory decisions about the future will have significant impacts on the welfare of their residents, although these decisions may have little impact on the overall level of telephone penetration rates.

In the near future, state regulatory agencies will be making decisions on how the difference between the cost of service and what consumers pay will be affected by the introduction of competition. The most obvious implication is that raising or eliminating the benchmark can save a lot of money with very little impact on penetration. In addition, it may be possible to offset reductions in subscribers with a targeted low-income subsidy that costs significantly less than the proposed broad-brush program. This holds true across all states.

The analysis also shows that the vast majority of low-income customers end up with no subsidy dollars, yet they are forced to pay rates above cost to fund the universal service program. At the same time, there are high-income customers who benefit from subsidized rates. A true universal service program would target subsidies to low-income consumers in danger of falling off the network and would not require these households to contribute to a program that subsidizes the telephone lines of high-income households.

Table 1 --Subsidy and Tax Rates by State

State	Intrastate End User Telecommunications Revenue ($MM)	$32 Benchmark Annual Support	$32 Benchmark Tax rate	$50 Benchmark Annual Support	$50 Benchmark Tax rate
AK	278	$835,509	0.30%	$500,650	0.18%
AL	1,777	$93,259,371	5.25%	$19,351,357	1.09%
AR	1,012	$34,000,770	3.36%	$16,721,769	1.65%
AZ	1,657	$27,183,572	1.64%	$14,395,978	0.87%
CA	16,077	$113,587,249	0.71%	$64,566,354	0.40%
CO	1,918	$32,513,248	1.69%	$13,033,034	0.68%
CT	1,398	$8,266,193	0.59%	$719,417	0.05%
DC	464	$0	0.00%	$0	0.00%
DE	274	$4,686,233	1.71%	$432,388	0.16%
FL	6,996	$87,178,973	1.25%	$31,641,710	0.45%
GA	3,622	$61,713,162	1.70%	$15,738,668	0.43%
HI	459	$9,852,199	2.15%	$3,091,394	0.67%
IA	1,038	$15,870,476	1.53%	$6,308,712	0.61%
ID	410	$17,303,759	4.22%	$8,715,966	2.12%
IL	5,722	$125,577,174	2.19%	$65,875,495	1.15%
IN	2,453	$94,341,348	3.85%	$36,457,133	1.49%
KS	1,135	$24,676,901	2.17%	$11,516,325	1.01%
KY	1,492	$104,501,903	7.00%	$31,306,776	2.10%
LA	1,807	$95,736,986	5.30%	$39,944,970	2.21%
MA	3,086	$9,975,493	0.32%	$3,108,467	0.10%
MD	2,437	$20,021,330	0.82%	$4,341,663	0.18%
ME	523	$43,269,427	8.28%	$17,642,361	3.38%
MI	4,918	$130,136,306	2.65%	$39,021,845	0.79%
MN	1,970	$85,864,269	4.36%	$51,037,190	2.59%
MO	2,226	$143,460,586	6.44%	$82,050,449	3.69%
MS	1,049	$60,318,094	5.75%	$7,666,621	0.73%
MT	351	$24,445,604	6.97%	$15,110,558	4.31%
NC	3,532	$148,951,743	4.22%	$38,954,468	1.10%
ND	271	$11,301,489	4.18%	$7,281,735	2.69%
NE	782	$46,203,626	5.91%	$30,345,601	3.88%
NH	494	$23,931,564	4.84%	$7,883,574	1.60%
NJ	4,452	$1,953,586	0.04%	$0	0.00%
NM	623	$16,219,302	2.60%	$5,444,426	0.87%
NV	622	$32,492,422	5.22%	$26,169,965	4.21%
NY	9,008	$75,394,652	0.84%	$28,455,938	0.32%
OH	5,044	$154,611,756	3.07%	$51,282,476	1.02%
OK	1,266	$58,807,728	4.64%	$28,695,247	2.27%
OR	1,308	$30,535,490	2.33%	$11,495,836	0.88%
PA	5,148	$63,855,906	1.24%	$19,065,758	0.37%
RI	368	$1,371,186	0.37%	$42,966	0.01%
SC	1,659	$43,553,495	2.63%	$5,081,425	0.31%
SD	276	$12,202,031	4.42%	$7,905,508	2.86%
TN	2,238	$103,792,149	4.64%	$27,172,338	1.21%
TX	8,801	$285,338,944	3.24%	$159,538,380	1.81%
UT	680	$9,414,482	1.38%	$5,578,052	0.82%
VA	3,031	$158,538,072	5.23%	$65,969,226	2.18%
VT	261	$20,977,778	8.03%	$6,495,818	2.49%
WA	2,365	$34,032,139	1.44%	$14,918,456	0.63%
WI	2,267	$81,754,402	3.61%	$30,141,817	1.33%
WV	685	$44,969,497	6.56%	$8,636,557	1.26%
WY	192	$9,810,649	3.72%	$4,088,299	1.05%
Overall	121,923	$2,938,590,222	2.41%	$1,190,941,114	0.98%

Table 2 -- Effects of Subsidy on Penetration

	No Subsidy			$50 Benchmark			$50 + Low Income			Low Income Only		
State	Tax Rate	Lines Lost relative to $32	Pene.	Tax Rate	Lines Lost relative to $32	Pene.	Tax Rate	Lines Lost relative to $32	Pene.	Tax Rate	Lines Lost relative to $32	Pene.
AK	0.00%	(113)	-0.1%	0.18%	(55)	-0.1%	0.19%	(49)	-0.1%	0.02%	(103)	-0.1%
AL	0.00%	(10,985)	-0.7%	1.09%	(8,725)	-0.6%	3.09%	(4,538)	-0.3%	2.57%	(5,594)	-0.4%
AR	0.00%	(4,760)	-0.8%	1.65%	(2,489)	-0.4%	2.51%	(1,232)	-0.2%	1.70%	(2,277)	-0.4%
AZ	0.00%	(2,167)	-0.1%	0.87%	(1,207)	-0.1%	1.21%	(669)	0.0%	0.69%	(1,090)	-0.1%
CA	0.00%	(8,759)	-0.1%	0.40%	(5,891)	0.0%	0.51%	(3,769)	0.0%	0.21%	(4,742)	0.0%
CO	0.00%	(3,377)	-0.2%	0.68%	(2,214)	-0.1%	1.03%	(1,461)	-0.1%	0.58%	(2,122)	-0.1%
CT	0.00%	(824)	-0.1%	0.05%	(752)	0.0%	0.15%	(619)	0.0%	0.11%	(676)	0.0%
DC	0.00%	-	0.0%	0.00%	-	0.0%	0.00%	-	0.0%	0.00%	-	0.0%
DE	0.00%	(382)	-0.1%	0.16%	(347)	-0.1%	0.70%	(226)	-0.1%	0.59%	(250)	-0.1%
FL	0.00%	(9,094)	-0.1%	0.45%	(6,238)	-0.1%	0.79%	(3,575)	-0.1%	0.52%	(4,989)	-0.1%
GA	0.00%	(8,102)	-0.3%	0.43%	(6,036)	-0.2%	1.01%	(3,317)	-0.1%	0.78%	(4,385)	-0.2%
HI	0.00%	(997)	-0.2%	0.67%	(724)	-0.2%	1.18%	(476)	-0.1%	0.74%	(632)	-0.1%
IA	0.00%	(2,038)	-0.3%	0.61%	(1,261)	-0.2%	0.95%	(799)	-0.1%	0.55%	(1,279)	-0.2%
ID	0.00%	(1,711)	-0.5%	2.12%	(996)	-0.3%	2.93%	(612)	-0.2%	1.51%	(992)	-0.3%
IL	0.00%	(13,831)	-0.3%	1.15%	(7,374)	-0.2%	1.53%	(4,716)	-0.1%	0.76%	(8,460)	-0.2%
IN	0.00%	(11,200)	-0.5%	1.49%	(7,026)	-0.3%	2.27%	(4,682)	-0.2%	1.28%	(7,386)	-0.4%
KS	0.00%	(2,947)	-0.4%	1.01%	(1,763)	-0.2%	1.48%	(1,059)	-0.1%	0.82%	(1,703)	-0.2%
KY	0.00%	(12,365)	-0.9%	2.10%	(8,693)	-0.7%	4.59%	(4,280)	-0.3%	3.54%	(6,096)	-0.5%
LA	0.00%	(10,079)	-0.6%	2.21%	(6,515)	-0.4%	3.85%	(3,058)	-0.2%	2.70%	(4,382)	-0.3%
MA	0.00%	(1,137)	0.0%	0.10%	(783)	0.0%	0.15%	(593)	0.0%	0.08%	(854)	0.0%
MD	0.00%	(2,227)	-0.1%	0.18%	(1,746)	-0.1%	0.38%	(1,186)	-0.1%	0.28%	(1,477)	-0.1%
ME	0.00%	(4,562)	-0.9%	3.38%	(2,904)	-0.6%	5.26%	(1,788)	-0.4%	3.15%	(2,694)	-0.5%
MI	0.00%	(15,628)	-0.4%	0.79%	(11,439)	-0.3%	1.52%	(6,928)	-0.2%	1.06%	(9,086)	-0.2%
MN	0.00%	(7,909)	-0.5%	2.59%	(4,353)	-0.3%	3.29%	(2,644)	-0.2%	1.49%	(4,237)	-0.3%
MO	0.00%	(15,207)	-0.9%	3.69%	(7,742)	-0.4%	5.00%	(4,061)	-0.2%	2.86%	(7,181)	-0.4%
MS	0.00%	(7,285)	-0.8%	0.73%	(6,359)	-0.7%	3.50%	(2,852)	-0.3%	3.21%	(3,216)	-0.4%
MT	0.00%	(2,377)	-0.9%	4.31%	(1,223)	-0.5%	5.37%	(736)	-0.3%	2.31%	(1,315)	-0.5%
NC	0.00%	(18,337)	-0.6%	1.10%	(13,644)	-0.5%	2.48%	(7,591)	-0.3%	1.91%	(9,983)	-0.3%
ND	0.00%	(1,197)	-0.7%	2.69%	(559)	-0.3%	3.31%	(326)	-0.2%	1.43%	(660)	-0.4%
NE	0.00%	(4,488)	-0.8%	3.88%	(2,115)	-0.4%	4.70%	(1,260)	-0.2%	1.96%	(2,445)	-0.4%
NH	0.00%	(2,342)	-0.4%	1.60%	(1,638)	-0.3%	2.52%	(1,170)	-0.2%	1.40%	(1,636)	-0.3%
NJ	0.00%	(227)	0.0%	0.00%	(227)	0.0%	0.01%	(165)	0.0%	0.01%	(165)	0.0%
NM	0.00%	(1,864)	-0.3%	0.87%	(1,238)	-0.2%	1.70%	(645)	-0.1%	1.30%	(932)	-0.2%
NV	0.00%	917	0.1%	4.21%	(550)	-0.1%	4.55%	(364)	0.0%	0.74%	1,317	0.2%
NY	0.00%	(9,162)	-0.1%	0.32%	(5,793)	-0.1%	0.49%	(3,898)	-0.1%	0.28%	(6,020)	-0.1%
OH	0.00%	(18,206)	-0.4%	1.02%	(12,439)	-0.3%	1.76%	(7,934)	-0.2%	1.12%	(11,418)	-0.3%
OK	0.00%	(6,184)	-0.6%	2.27%	(3,677)	-0.3%	3.47%	(1,808)	-0.2%	2.18%	(2,816)	-0.3%
OR	0.00%	(2,851)	-0.2%	0.88%	(2,112)	-0.2%	1.45%	(1,284)	-0.1%	0.85%	(1,622)	-0.1%
PA	0.00%	(7,419)	-0.2%	0.37%	(5,307)	-0.1%	0.70%	(3,281)	-0.1%	0.48%	(4,469)	-0.1%
RI	0.00%	(122)	0.0%	0.01%	(119)	0.0%	0.08%	(95)	0.0%	0.08%	(98)	0.0%
SC	0.00%	(5,831)	-0.5%	0.31%	(5,216)	-0.5%	1.33%	(2,924)	-0.3%	1.16%	(3,213)	-0.3%
SD	0.00%	(961)	-0.5%	2.86%	(589)	-0.3%	3.55%	(329)	-0.2%	1.40%	(429)	-0.2%
TN	0.00%	(11,795)	-0.6%	1.21%	(8,735)	-0.4%	2.80%	(4,683)	-0.2%	2.17%	(6,259)	-0.3%
TX	0.00%	(29,246)	-0.4%	1.81%	(16,417)	-0.3%	2.47%	(8,892)	-0.1%	1.31%	(14,213)	-0.2%
UT	0.00%	(537)	-0.1%	0.82%	(385)	-0.1%	1.02%	(247)	0.0%	0.39%	(273)	0.0%
VA	0.00%	(17,758)	-0.6%	2.18%	(10,505)	-0.4%	3.35%	(6,480)	-0.2%	2.07%	(10,642)	-0.4%
VT	0.00%	(2,535)	-1.1%	2.49%	(1,758)	-0.8%	4.33%	(1,173)	-0.5%	2.69%	(1,681)	-0.8%
WA	0.00%	(3,038)	-0.1%	0.63%	(2,136)	-0.1%	0.95%	(1,305)	-0.1%	0.51%	(1,678)	-0.1%
WI	0.00%	(10,008)	-0.6%	1.33%	(6,584)	-0.4%	2.17%	(4,150)	-0.2%	1.36%	(6,073)	-0.3%
WV	0.00%	(5,369)	-0.9%	1.26%	(4,338)	-0.7%	4.02%	(2,080)	-0.3%	3.47%	(2,531)	-0.4%
WY	0.00%	(1,068)	-0.7%	2.13%	(699)	-0.4%	3.18%	(453)	-0.3%	1.71%	(667)	-0.4%
U.S.	0.00%	(319,692)	-0.3%	0.98%	(211,636)	-0.2%	1.58%	(122,461)	-0.1%	0.97%	(175,824)	-0.2%

Table 3 Effects of Subsidy by Income

	Income<10			Income<20			Income<30			Income <45			Income>45		
	Lines	Sub.	Dif.	Lines	Sub.	Dif.	Lines	Sub.	Dif.	Lines	Sub.	Dif.	Lines	Sub.	Dif.
AK	8%	2%	-5%	13%	6%	-8%	15%	17%	2%	19%	22%	3%	45%	53%	8%
AL	21%	27%	5%	20%	22%	2%	17%	18%	1%	19%	18%	-1%	22%	15%	-7%
AR	21%	27%	6%	22%	24%	2%	19%	19%	0%	19%	17%	-2%	18%	12%	-6%
AZ	14%	21%	7%	19%	25%	6%	18%	19%	1%	21%	19%	-2%	28%	16%	-12%
CA	11%	16%	5%	14%	23%	8%	15%	18%	3%	20%	20%	0%	40%	23%	-17%
CO	13%	15%	2%	17%	21%	4%	17%	19%	1%	22%	23%	1%	31%	22%	-9%
CT	9%	7%	-3%	11%	11%	0%	13%	13%	0%	20%	22%	2%	47%	47%	1%
DC															
DE	11%	15%	4%	15%	19%	4%	16%	20%	4%	23%	24%	1%	36%	22%	-14%
FL	15%	19%	5%	19%	25%	5%	19%	20%	2%	21%	19%	-2%	27%	17%	-10%
GA	14%	24%	10%	16%	22%	6%	16%	18%	2%	21%	19%	-2%	32%	17%	-15%
HI	9%	16%	7%	13%	20%	7%	15%	18%	3%	21%	21%	0%	43%	25%	-18%
IA	16%	15%	0%	20%	22%	2%	19%	21%	3%	22%	23%	1%	24%	18%	-5%
ID	14%	16%	1%	22%	24%	2%	20%	22%	2%	22%	22%	0%	22%	16%	-5%
IL	13%	16%	3%	15%	21%	6%	15%	19%	4%	21%	23%	1%	35%	21%	-14%
IN	14%	14%	-1%	19%	20%	1%	18%	20%	2%	22%	24%	2%	27%	22%	-4%
KS	14%	18%	3%	18%	23%	5%	18%	21%	3%	22%	21%	0%	28%	17%	-11%
KY	21%	27%	6%	21%	23%	3%	18%	18%	0%	20%	18%	-2%	21%	14%	-7%
LA	24%	31%	7%	21%	24%	3%	17%	17%	0%	18%	16%	-2%	21%	13%	-8%
MA	13%	10%	-2%	13%	14%	2%	14%	16%	3%	20%	24%	4%	41%	35%	-6%
MD	9%	16%	7%	11%	18%	7%	14%	19%	4%	21%	22%	1%	44%	26%	-19%
ME	15%	18%	3%	19%	22%	3%	18%	20%	2%	23%	22%	-1%	24%	18%	-6%
MI	15%	18%	4%	16%	23%	7%	16%	19%	3%	21%	21%	0%	32%	19%	-13%
MN	13%	19%	6%	16%	23%	7%	17%	20%	3%	23%	21%	-1%	32%	17%	-15%
MO	16%	24%	8%	19%	26%	7%	18%	20%	2%	21%	18%	-3%	26%	12%	-14%
MS	26%	32%	5%	22%	24%	2%	17%	17%	0%	17%	15%	-2%	17%	12%	-5%
MT	19%	18%	-1%	23%	23%	0%	19%	19%	0%	21%	22%	1%	19%	18%	0%
NC	17%	23%	6%	20%	23%	3%	18%	19%	1%	21%	20%	-2%	24%	16%	-8%
ND	17%	19%	2%	21%	21%	0%	20%	21%	2%	22%	22%	0%	20%	16%	-4%
NE	14%	17%	3%	20%	24%	4%	19%	21%	2%	23%	22%	-1%	24%	15%	-8%
NH	10%	11%	1%	14%	18%	5%	16%	18%	3%	23%	25%	1%	37%	27%	-10%
NJ	10%	12%	3%	12%	15%	3%	13%	16%	3%	20%	23%	4%	45%	33%	-12%
NM	17%	24%	6%	21%	26%	5%	19%	19%	1%	20%	17%	-3%	23%	14%	-9%
NV	11%	18%	7%	17%	17%	1%	18%	17%	-1%	23%	25%	1%	32%	23%	-8%
NY	15%	14%	-1%	14%	20%	6%	14%	20%	5%	19%	23%	4%	37%	23%	-14%
OH	16%	17%	1%	18%	20%	2%	18%	19%	2%	22%	23%	2%	27%	20%	-7%
OK	19%	26%	7%	21%	25%	4%	18%	19%	0%	20%	17%	-2%	21%	13%	-9%
OR	15%	17%	3%	20%	23%	4%	19%	20%	1%	22%	22%	0%	25%	17%	-7%
PA	15%	17%	2%	18%	23%	5%	17%	21%	4%	21%	22%	1%	29%	18%	-11%
RI	14%	8%	-6%	16%	12%	-3%	15%	14%	-2%	22%	24%	2%	33%	42%	9%
SC	17%	23%	6%	19%	21%	2%	18%	18%	0%	21%	20%	-2%	24%	17%	-7%
SD	17%	22%	6%	23%	26%	3%	21%	19%	-1%	22%	19%	-3%	18%	14%	-4%
TN	19%	24%	5%	20%	23%	3%	18%	19%	1%	20%	19%	-1%	23%	15%	-8%
TX	16%	24%	8%	19%	23%	4%	17%	18%	1%	20%	18%	-2%	28%	17%	-11%
UT	12%	15%	3%	18%	22%	4%	19%	23%	3%	24%	22%	-2%	26%	18%	-8%
VA	11%	19%	8%	15%	21%	6%	16%	19%	3%	21%	21%	-1%	37%	20%	-16%
VT	13%	14%	0%	18%	20%	2%	19%	20%	2%	23%	24%	1%	27%	22%	-5%
WA	12%	18%	6%	17%	23%	6%	17%	20%	3%	23%	21%	-2%	31%	18%	-13%
WI	13%	17%	3%	18%	22%	4%	18%	20%	2%	23%	22%	-1%	27%	18%	-9%
WV	24%	27%	3%	23%	26%	2%	17%	17%	0%	18%	17%	-1%	17%	13%	-4%
WY	15%	15%	0%	19%	21%	1%	18%	19%	1%	23%	22%	0%	24%	23%	-2%
U.S.	14%	21%	6%	17%	22%	6%	16%	19%	3%	21%	20%	-1%	32%	18%	-14%

Table 4--Effects of Subsidy by Race

	Conditional Probability						Differential					
	White	Black	Native Am.	Asian	Hispanic	Other	White	Black	Native Am.	Asian	Hispanic	Other
AK	4%	4%	1%	1%	4%	0%	15%	-5%	-4%	-3%	-2%	0%
AL	50%	37%	61%	19%	35%	44%	1%	-1%	0%	0%	0%	0%
AR	28%	29%	25%	11%	22%	26%	-4%	5%	0%	0%	0%	0%
AZ	5%	2%	12%	1%	5%	6%	-5%	-1%	5%	-1%	3%	0%
CA	4%	1%	9%	0%	2%	3%	16%	-5%	3%	-7%	-7%	0%
CO	11%	1%	17%	2%	8%	3%	7%	-4%	0%	-1%	-2%	0%
CT	9%	1%	12%	5%	1%	2%	10%	-6%	0%	-1%	-4%	0%
DC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DE	14%	12%	45%	3%	7%	19%	3%	-2%	0%	-1%	-1%	0%
FL	8%	6%	15%	2%	2%	3%	9%	-2%	0%	-1%	-7%	0%
GA	16%	14%	15%	2%	6%	1%	-2%	4%	0%	-1%	-1%	0%
HI	12%	1%	17%	8%	12%	8%	8%	-2%	0%	-8%	1%	0%
IA	11%	0%	7%	1%	3%	3%	4%	-2%	0%	-1%	-1%	0%
ID	16%	12%	10%	10%	18%	11%	0%	0%	0%	0%	1%	0%
IL	11%	1%	11%	0%	1%	2%	18%	-11%	0%	-2%	-5%	0%
IN	24%	1%	19%	6%	6%	11%	9%	-7%	0%	0%	-1%	0%
KS	13%	1%	10%	1%	5%	3%	7%	-5%	0%	-1%	-1%	0%
KY	42%	17%	38%	15%	35%	20%	6%	-5%	0%	0%	0%	0%
LA	30%	24%	38%	8%	15%	20%	4%	-3%	0%	-1%	-1%	0%
MA	3%	0%	5%	0%	0%	2%	7%	-3%	0%	-1%	-3%	0%
MD	8%	4%	6%	1%	1%	3%	12%	-8%	0%	-2%	-1%	0%
ME	39%	23%	47%	21%	28%	18%	0%	0%	0%	0%	0%	0%
MI	21%	1%	27%	3%	12%	15%	12%	-11%	1%	-1%	-1%	0%
MN	16%	1%	19%	1%	6%	4%	3%	-2%	1%	-1%	-1%	0%
MO	24%	3%	24%	3%	8%	19%	10%	-9%	0%	-1%	-1%	0%
MS	62%	63%	81%	41%	53%	60%	-3%	4%	0%	0%	0%	0%
MT	25%	6%	24%	7%	16%	51%	1%	0%	0%	0%	0%	0%
NC	31%	32%	74%	6%	22%	16%	-4%	3%	1%	0%	0%	0%
ND	13%	50%	60%	9%	24%	7%	-10%	0%	10%	0%	0%	0%
NE	19%	0%	17%	3%	9%	25%	6%	-4%	0%	-1%	-1%	0%
NH	22%	4%	21%	7%	10%	11%	1%	0%	0%	0%	0%	0%
NJ	1%	1%	2%	0%	0%	0%	8%	-2%	1%	-2%	-4%	0%
NM	14%	10%	31%	8%	23%	20%	-13%	-1%	9%	0%	6%	0%
NV	5%	1%	17%	1%	3%	2%	4%	-5%	5%	-2%	-2%	0%
NY	6%	0%	10%	0%	0%	1%	24%	-12%	0%	-3%	-9%	0%
OH	22%	2%	21%	4%	11%	9%	10%	-9%	0%	-1%	0%	0%
OK	23%	10%	40%	3%	12%	21%	1%	-4%	5%	-1%	-1%	0%
OR	12%	1%	21%	2%	11%	4%	-1%	-1%	4%	-2%	0%	0%
PA	10%	1%	8%	1%	3%	2%	10%	-8%	0%	-1%	-1%	0%
RI	7%	1%	7%	2%	1%	0%	6%	-2%	0%	-1%	-3%	0%
SC	30%	37%	32%	8%	16%	23%	-8%	9%	0%	0%	0%	0%
SD	21%	38%	27%	17%	30%	87%	-2%	0%	3%	0%	0%	0%
TN	35%	15%	29%	7%	21%	19%	8%	-8%	0%	0%	0%	0%
TX	16%	9%	15%	2%	12%	10%	10%	-5%	0%	-1%	-4%	0%
UT	4%	1%	12%	1%	3%	1%	-2%	0%	1%	-1%	3%	0%
VA	23%	21%	20%	2%	4%	11%	1%	2%	0%	-2%	-2%	0%
VT	47%	23%	53%	17%	33%	25%	1%	0%	0%	0%	0%	0%
WA	7%	1%	15%	1%	11%	5%	1%	-3%	3%	-3%	2%	0%
WI	23%	0%	38%	2%	6%	9%	5%	-4%	1%	-1%	-1%	0%
WV	51%	24%	45%	20%	37%	60%	2%	-2%	0%	0%	0%	0%
WY	37%	2%	72%	23%	25%	0%	3%	-1%	0%	0%	-2%	0%
U.S.	15%	11%	24%	2%	5%	5%	8%	-3%	1%	-2%	-4%	0%

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