THE EFFECTS OF PROVIDING UNIVERSAL SERVICE SUBSIDIES TO WIRELESS CARRIERS

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I. INTRODUCTION*

The Telecommunications Act of 1996 allows competitive telecommunications carriers to receive subsidies from the Federal Universal Service Fund (USF) for serving high-cost areas. To become eligible, a carrier must be designated by the Federal Communications Commission (FCC) or a state public utility commission (PUC) as a Competitive Eligible Telecommunications Carrier (CETC), and agree to meet certain standards, such as providing a plan that includes local calling and agreeing to serve all customers within the area where they receive USF subsidies. Both wireline carriers (Competitive Local Exchange Carriers, or "CLECs") and mobile wireless carriers (Commercial Mobile Radio Service, or "CMRS" carriers) are eligible for subsidies.

USF subsidies to CETCs are growing rapidly. Since the first CETC designation in 1999, disbursements to CETCs from the High Cost Fund (HCF)[1] have grown at a compound annual growth rate of 185 percent; since 2003, they account for more than 90 percent of the fund's growth. In 2006, CETC subsidies exceeded $820 million, or 21 percent of all HCF disbursements. Of this amount, $771 million, or 94 percent, went to wireless companies. Under the current regime, CETC subsidies are expected to continue to grow at a rapid pace.

The rapid growth of CETC subsidies has led to concerns about the long-run sustainability of the USF. In February 2007, FCC Chairman Kevin Martin told a meeting of the Federal-State Joint Board on Universal Service (Joint Board) that if current trends continue, payments to CETCs could more than triple, to $2.5 billion, by 2009, and stated flatly that "the current trajectory is

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[1] As discussed further below, HCF is the largest element of the USF program and the one aimed directly at subsidizing telephone service in costly-to-serve areas. The other major components are the Low Income Fund, the Schools and Libraries Fund and the Rural Health Care Fund.

unsustainable."[2] Members of the Joint Board share Chairman Martin's concern: On May 1, 2007, the Board found that "without immediate action to restrain growth in competitive ETC funding, the federal universal service fund is in dire jeopardy of becoming unsustainable."[3] It recommended that the Commission immediately cap subsidies to CETCs and consider a variety of reforms designed to limit or reverse the growth of CETC subsidies in the future.[4]

The growth of CETC subsidies is a direct result of the eligibility rules under which USF funds are allocated. For example, the current rules permit multiple carriers to receive funds for serving the same area, allow carriers to receive subsidies for multiple telephone lines within the same household, and specify that competitors receive the same subsidy per line as the incumbent serving the same territory (or "study area"), even if they have lower costs. In addition, when a CETC is certified in an area, it receives subsidies for all of its customers in that area, including customers it was already serving without subsidies.

Some policymakers have suggested these rules are overly permissive, especially as they relate to wireless CETCs, and that they result in duplicative subsidies that do not efficiently serve the goals of the universal service program. Testifying before the Senate Commerce Committee in March 2007, for example, Joint Board Member Billy Jack Gregg noted that

> Under the current system, far more than affordable access to the telecommunications network is being provided. The High Cost Fund now provides support to multiple networks in high cost areas, where previously none had been able to exist without a subsidy. If a customer in a high cost area receives two landlines from the incumbent wireline ETC, and three wireless phones from a competitive ETC, all of these lines receive high cost support. Even more bizarre, if the rural incumbent ETC actually loses lines, support for both the incumbent ETC

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[2] See Remarks of FCC Chairman Kevin Martin Before the Federal-State Board on Universal Service En Banc Meeting, February 20, 2007 (available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-271011A1.pdf). The $2.5 billion estimate was based on the assumption that CETC applications currently pending before the Commission would be approved, but that no further designations would be made in 2008 or 2009.

[3] Federal-State Joint Board on Universal Service, *In the Matter of High-Cost Universal Service Support, Recommended Decision,* WC Docket No. 05-337, CC Docket No. 96-45, (Released May 1, 2007), at ¶4. [Hereafter *Jt. Board 2007 Recommended Decision.*]

[4] *See Jt. Board 2007 Recommended Decision* at ¶5.

> and the competitive ETC will go up as a result of the equal support rule. The result has been a rapid escalation of support as competitive ETCs have rushed in to take advantage of the rules created by the FCC.[5]

Wireless CETCs, not surprisingly, argue the subsidies are well spent. At the core of their argument is the assertion that USF subsidies permit wireless carriers to expand their infrastructures, and thus expand the availability of wireless service or provide consumers with more choices than they would have had in the absence of the subsidies. Both the FCC and state PUCs have relied on these arguments to justify their decisions to designate CMRS carriers as CETCs.

In this paper, we present the results of an empirical analysis of the effects of USF subsidies on wireless coverage. Using data from 2003-2006, we estimate the impact of the subsidies, by study area, on both wireless availability (i.e., coverage from any carrier) and choice (i.e., availability of service from multiple carriers). Our results do not support CMRS carriers' arguments with respect to the impact of subsidies on coverage and choice. To the contrary, we find no statistically significant relationship between subsidies and either the availability of wireless service from any carrier or the number of carriers offering service. Simply put, our results suggest that USF funding does not significantly increase the availability of mobile telephone service in high cost areas.

In Section II we briefly describe the USF fund, the role of CETCs within the USF program, and the growth of subsidies to wireless CETCs. Section III presents the public policy rationale for CETC funding. The Section goes on to explain that CETC subsidies, as currently structured, do not promote lower prices in high costs areas, and that their effect on availability is at best indirect and highly attenuated. In addition, Section III presents testable hypotheses. In Section IV, we empirically test the hypotheses developed in Section III and present the results of our regression

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[5] *Testimony of Testimony of Billy Jack Gregg, Director, Consumer Advocate Division, Public Service Commission of West Virginia*, *Before the Communications Subcommittee, Senate Commerce, Science and Transportation Committee* (March 1, 2007), at 9-10. (available at

analyses. Section V presents a brief summary of our findings and their implications for public policy.

II. THE UNIVERSAL SERVICE FUND AND THE ROLE OF CETCS

The concept of universal telephone service is usually credited to AT&T President Theodore Vail, who embraced the idea in the company's 1907 Annual Report.[6] Congress adopted universal service as a goal in the preamble to the Communications Act of 1934, stating that one purpose of the Act was to make telecommunications services available to "all the people of the United States" at "reasonable charges."[7]

Throughout most of the 20th Century, the FCC and state PUCs sought to advance these goals primarily through a system of implicit subsidies – for example, by setting rates above costs in urban areas and requiring telephone companies to use the excess revenues to subsidize below-cost rates in rural areas.[8] Such implicit cross-subsidies were only possible, however, because of the monopoly structure of the telecommunications industry.

A. The Telecommunications Act of 1996 and the Modern USF

By introducing competition into local telephone markets, the 1996 Telecommunications Act effectively made implicit cross-subsidies untenable, since incumbent carriers ("incumbent local exchange carriers," or ILECs) could no longer charge above-cost prices in some areas to subsidize below-cost prices in others: If prices were above cost in some areas, competitive carriers would

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http://commerce.senate.gov/public/_files/Testimony_BillJackGregg_WVPubServiceCommiss_BillyJackGreggTestimonySenateCommerce3107.pdf) [Hereafter *Gregg Testimony*.]

[6] For a brief history of universal service policies in the U.S., *see* Robert W. Crandall and Leonard Waverman, *Who Pays for Universal Service?* (Washington, DC: Brookings Institution, 2000), at 5-11.

[7] *See* Communications Act of 1934, 47 U.S.C.A. § 151 (stating the law is enacted "for the purpose of regulating interstate and foreign commerce in communication by wire and radio so as to make available, so far as possible, to all the people of the United States, a rapid, efficient, Nation-wide, and world-wide wire and radio communication service with adequate facilities at reasonable charges.")

[8] *See* Federal Communications Commission, *In the Matter of Federal-State Joint Board on Universal Service, Report and Order,* CC Docket No. 96-45 (May 8, 1997) at ¶¶7-12. [Hereafter *First Report and Order*.] For a timeline showing pre-1996 developments in universal service policies, see http://www.neca.org/source/NECA_AboutUs_279.asp.

enter and force prices down to the competitive level, thus eliminating the source of the subsidy. The modern Universal Service Fund grew out of Congress' recognition that the goals of universal service could no longer be achieved through such hidden cross-subsidies. Accordingly, the Act called for a system of explicit subsidies, funded by taxes on interstate and international telephone services; in addition, it made competitive carriers eligible for USF support.[9]

B. Overview of the Universal Service Program

Even by U.S. government standards, the USF program is extraordinarily complex. To put the role of CETCs in context, the discussion below presents a brief overview.[10]

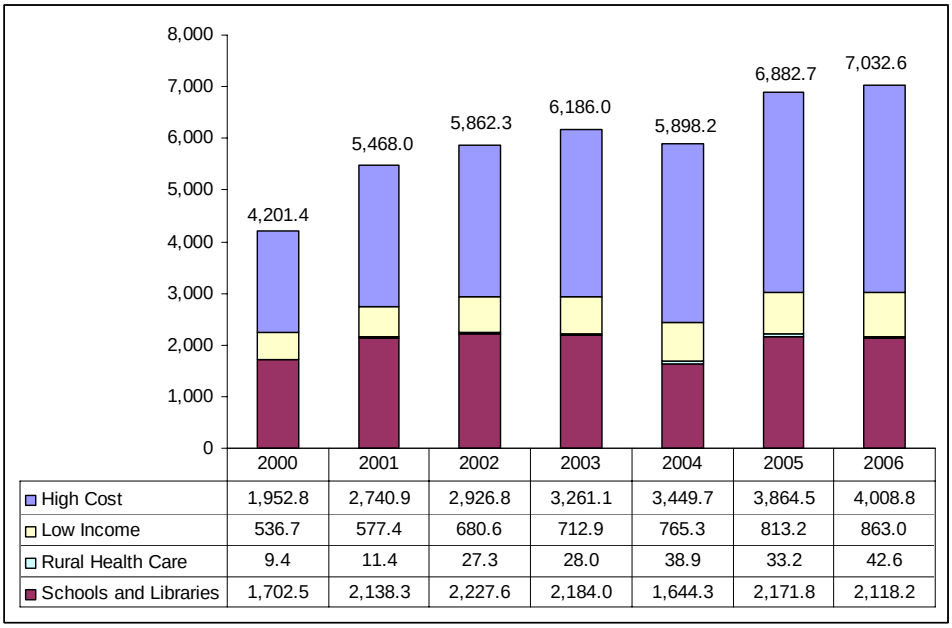
1. Structure

The USF is comprised of four major funds. In addition to the HCF, there are separate funds for support of Low Income programs, Rural Health Care, and Schools and Libraries. The HCF is far and away the largest component, accounting for over 57 percent of spending 2006, as shown in Figure 1.

[9] *See* 47 U.S.C. 214 (e).

[10] For a complete description of the USF program, see Thomas W. Hazlett, *"Universal Service" Telephone Subsidies: What Does $7 Billion Buy?* (June 2006) (available at www.senior.org/Documents/USF.Master.6.13.06.pdf).

Figure 1:
USF Funding by Program, 2000-2007 ($Millions)[11]



	2000	2001	2002	2003	2004	2005	2006
High Cost	1,952.8	2,740.9	2,926.8	3,261.1	3,449.7	3,864.5	4,008.8
Low Income	536.7	577.4	680.6	712.9	765.3	813.2	863.0
Rural Health Care	9.4	11.4	27.3	28.0	38.9	33.2	42.6
Schools and Libraries	1,702.5	2,138.3	2,227.6	2,184.0	1,644.3	2,171.8	2,118.2

The HCF fund, in turn, has seven subcomponents, which are summarized in Table 1. Five of these account for nearly all expenditures: High Cost Loop Support (HCLS), which targets rural carriers that face relatively high costs; High Cost Model Support (HCMS) which targets non-rural carriers in states where costs exceed the national average by a substantial amount; Interstate Common Line Support (ICLS), which provides compensation for interstate access charges for (mostly) rural carriers; Interstate Access Support (IAS), which offers essentially the same type of support to (mostly) non-rural carriers; and, Local Switching Support (LSS), which compensates small rural companies for their high fixed costs associated with switching equipment. Both ILECs and CETCs are eligible to receive HCF support from any of the HCF subcategories.

[11] See Federal-State Joint Board on Universal Service, *Universal Service Monitoring Report* (various years) (available at http://www.fcc.gov/wcb/iatd/monitor.html.) Expenditures for 2006 are extrapolated based on the first three calendar quarters.

Table 1:
Components of the High Cost Fund[12]

Fund	Description	2006 Total (millions)	% of 2006 HCF
High Cost Loop Support (HCLS)	Available to rural price-cap and rate-of-return incumbent carriers and competitive carriers providing service in the areas of these rural companies, which must be designated as ETCs by their state commissions or the FCC. Provides support for the "last mile" of connection for rural companies in service areas where the cost to provide this service exceeds 115% of the national average cost per line. Subject to an annual indexed cap, based on the prior year's rural HCL support and a Rural Growth Factor, which allows HCL support to change based on annual changes in the GDP-Chained Price Index (GDP-CPI) and the total number of working loops of rural carriers. HCLS payments to CETCs are not capped.	$1,284	32.16%
Interstate Common Line Support & Long-Term Support (ICLS /LTS)	Available only to rate-of-return incumbent carriers (mostly rural and some non-rural carriers) and competitive carriers providing service in the areas of these companies, which must be designated as ETCs by their state commissions or the FCC. ICLS helps to offset interstate access charges and is designed to permit each rate-of-return carrier to recover its common line revenue requirement. ICLS is based on annual projected data submitted by incumbent carriers each March 31 and is subject to an annual true-up process based on actual data submitted by incumbent carriers each December 31 for the previous calendar year. Because competitive carriers receive ICLS based on the incumbent carriers' data filings, which are used to calculate per-line rates, competitive carriers do not need to file projected or true-up data for ICLS. As of July 1, 2004, ICLS payments replaced what was previously Long-Term Support (LTS) funding.	$1,231	30.84%
Interstate Access Support (IAS)	Available only to price-cap incumbent carriers (mostly non-rural and some rural carriers) and competitive carriers operating in the service area(s) of a price-cap carrier, which must be designated as ETCs by their state commissions or the FCC. IAS helps to offset interstate access charges. FCC rules target IAS to $650 million annually. IAS is provided on a portable, per-line basis.	$657	16.46%
Local Switching Support (LSS)	Available to rural incumbent carriers serving 50,000 lines or fewer (mostly rate-of-return and some price-cap carriers) as well as competitive carriers providing service in the areas of these rural companies, which must be designated as ETCs by their state commissions or the FCC. LSS is designed to help carriers recoup some of the high fixed switching costs of providing service to fewer customers.	$467	11.70%
High Cost Model Support (HCMS)	Available only to non-rural incumbent carriers (mostly price-cap carriers) and competitive carriers providing service in the eligible wire centers of these non-rural companies, which must be designated as ETCs by their state commissions or the FCC. Based on a forward-looking economic cost model. The model generates the statewide average cost per line, which is then compared to the national average cost per line to determine eligibility for forward-looking support. If the statewide average cost per line exceeds two standard deviations of the national average cost per line, the state qualifies for HCM support.	$332	8.32%
Safety Net Additive Support (SNAS)	Sub-component of HCLS; available to rural price-cap and rate-of-return incumbent carriers and competitive carriers providing service in the areas of these rural companies, which must be designated as eligible telecommunications carriers (ETCs) by their state commissions or the Federal Communications Commission (FCC). SNAS is support "above the cap" for carriers that make significant investment in rural infrastructure in years when High Cost Loop (HCL) support is capped.	$20	0.50%
Safety Valve Support (SVS)	Sub-component of HCLS support, which is available to rural price-cap and rate-of-return incumbent carriers and competitive carriers providing service in the areas of these rural companies, which must be designated as eligible telecommunications carriers (ETCs) by their state commissions or the Federal Communications Commission (FCC). Safety valve support is additional support, above the high cost loop cap, that is available to rural carriers that acquire high cost exchanges and make substantial post-transaction investments to enhance network infrastructure.	$1	0.03%
Total		**$3,992**	**100%**

2. Growth of the High Cost Fund

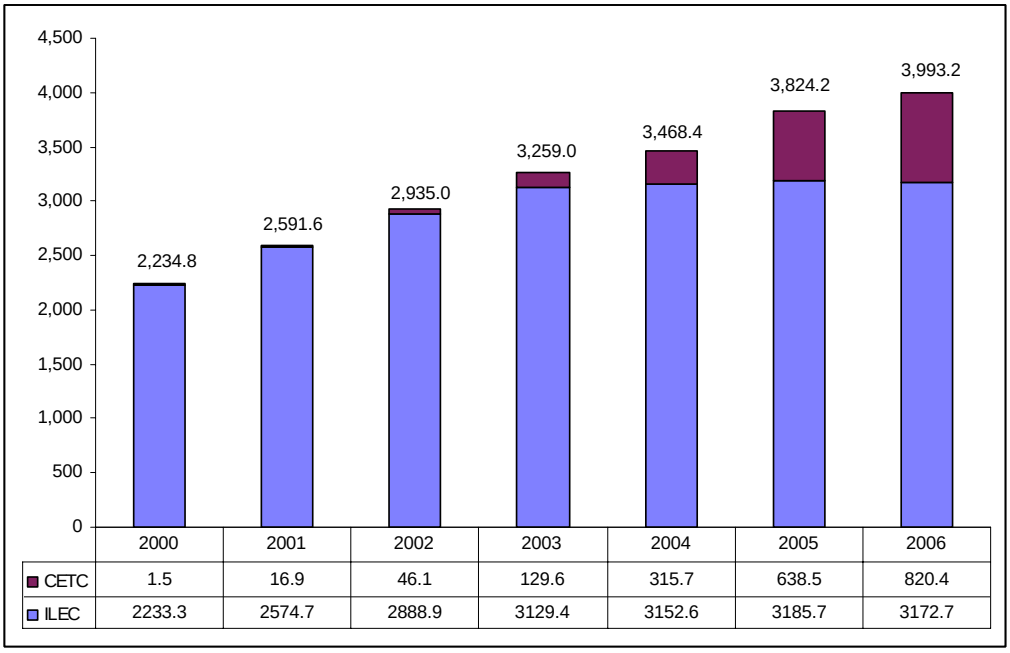
As indicated in Figure 1 above, the USF program has grown rapidly since 2000, but virtually all of this growth is attributable to growth of the HCF. Total USF expenditures grew from $4.2 billion in 2000 to $6.9 billion in 2006. HCF subsidies increased from $1.9 to $4.0 billion (105

[12] Sources: Universal Service Administrative Company website, available at: http://www.universalservice.org/, and Federal Communications Commission *Universal Service Monitoring Report,* CC Docket No. 98-202 (2006). Note that the total HCF figure shown differs slightly from that implied by Figure 2, due to rounding.

percent), while the three other funds combined grew from $2.2 billion to $3.0 billion (34 percent). Thus, the HCF accounted for about 73 percent of the overall growth in USF spending between 2000 and 2006.

Within the HCF, funding for CETCs has accounted for virtually all of the growth in the fund since 2003, as shown in Figure 2.

Figure 2:
CETC vs. ILEC Support from the High Cost Fund[13]
(2000-2006; $millions)



	2000	2001	2002	2003	2004	2005	2006
CETC	1.5	16.9	46.1	129.6	315.7	638.5	820.4
ILEC	2233.3	2574.7	2888.9	3129.4	3152.6	3185.7	3172.7

The continuing rapid growth of the USF is not what Congress had in mind when it passed the Telecommunications Act. To the contrary, "Congress thought that competition and new technologies would reduce, not increase, the overall need for universal service support by lowering costs."[14]

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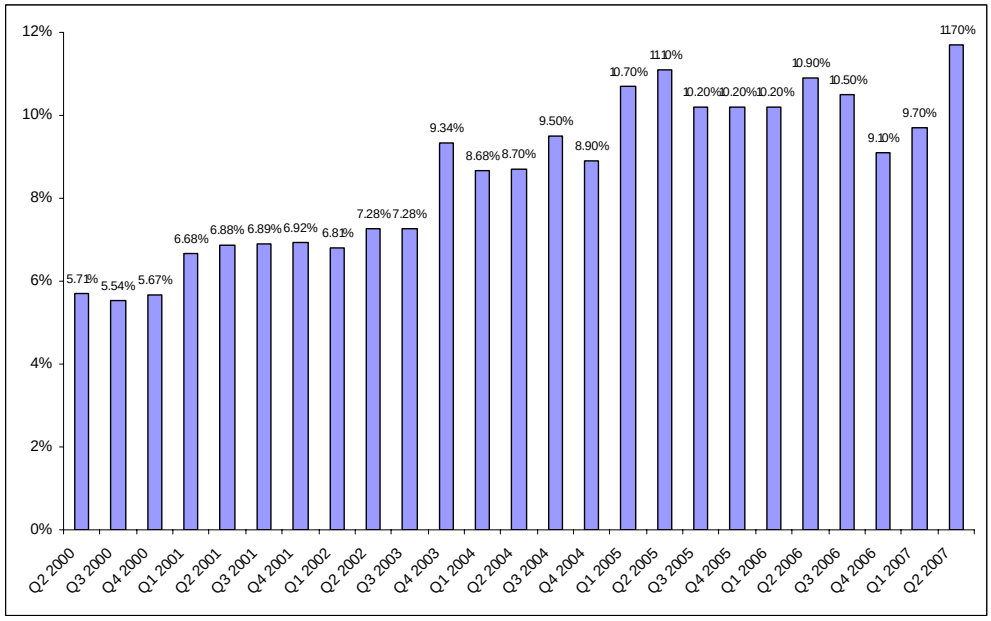
[13] Source: USAC data; figures differ slightly from Figure 1 above.

[14] See Federal-State Board on Universal Service, *In the Matter of Federal State Board on Universal Service, CC Docket 96-45, Recommended Decision* (February 27, 2004) at ¶65, n. 80 (citing S. Rep. No. 23, 104th Cong., 1st Sess. 26: "The Committee expects that competition and new technologies will greatly reduce the actual cost of providing universal service over time, thus reducing or eliminating the need for universal service support mechanisms as actual costs drop to a level that is at or below the affordable rate for such service in an area."). [Hereafter *Jt. Board 2004 Recommended Decision.*]

3. Universal Service Fund Revenues

The USF is not supported by general tax revenues. Instead, USF's revenues come from an ad valorem "contribution" imposed on telecommunications carriers, calculated as a percentage of total interstate and international telephone revenues. As USF disbursements have grown, and long distance revenues have declined, the tax rate (or "contribution factor") required to fund the USF has increased dramatically, from 3.2 percent in 1998 to 11.7 percent for the second quarter of 2007, as shown in Figure 4.[15]

Figure 3:
USF Contribution Factor, 2000-2006



To preserve the fund's solvency, the FCC has taken a variety of steps to broaden the contribution base, including, in June 2006, increasing the proportion of CMRS carriers' revenues subject to

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This sentiment was echoed by the Act's key sponsors at the time. *See e.g., Gregg Testimony* at 7 (quoting Senator Ted Stevens, "[The Act] opens up the local market to competition while still preserving the concept of universal service…by taking advantage of new technologies which are intended to reduce the cost of all services, including universal service. In fact, I find it interesting that the Congressional Budget Office has said that this bill will reduce the cost of universal service from the existing system by at least $3 billion over the next five years.").

taxation and requiring Voice-Over-Internet-Protocol carriers to contribute.[16] As Figure 3 demonstrates, however, these steps have not been sufficient to prevent continuing increases in the contribution rate, which is now higher than it has ever been.

C. USF Subsidies to Wireless Carriers

The eligibility of wireless carriers for USF subsidies is based on two key principles adopted by the Commission in its *First Report and Order* implementing the 1996 Act, "competitive neutrality" and "technological neutrality."[17] These principles, the Commissioned reasoned, were consistent with the competitive industry structure envisioned by the Act and with its desire to create a "level playing field," in which competitors would have access to the same types of support available to incumbents. As CETC subsidies rose, however, the Commission began, as early as 2001, to express concerns that they could "result in excessive fund growth."[18] Since then, it has sought on multiple occasions, as it said in one key decision, to subject CETC subsidies to a "more stringent public interest analysis."[19] These efforts, however, have not produced the desired results: Subsidies to CETCs continue to grow very rapidly, both in absolute terms and as a percentage of USF disbursements.

1. Early Decisions

As noted above, the 1996 Telecommunications Act created the statutory basis for CETCs by making USF funding available for all Eligible Telecommunications Carriers. Primary responsibility

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[15] Federal Communications Commission, *Proposed Second Quarter 2007 Universal Service Contribution Factor*, CC Docket No. 96-45 (March 15, 2007).

[16] See Federal Communications Commission, *In the Matter of Universal Service Contribution Methodology*, WC-Docket No. 06-122 (June 27, 2006).

[17] *See First Report and Order* at ¶¶ 45-51.

[18] *See* Federal Communications Commission, *In the Matter of Federal-State Joint Board on Universal Service,* CC Docket No. 96-45 (November 8, 2002) at ¶5, n. 14 (citing 2001 orders expressing concerns about fund growth).

[19] *See* Federal Communications Commission, *In the Matter of Federal-State Joint Board on Universal Service, Virginia Cellular, L.L.C. Application for Designation as an Eligible Telecommunications Carrier in the Commonwealth of Virginia, Memorandum Opinion and Order,* CC Docket 96-45 (January 22, 2004) at ¶4. [Hereafter *Virginia Cellular Order.*]

for designating ETCs rests with state PUCs, though the FCC is permitted to do so in cases where states do not have authority. The FCC also has authority to define additional eligibility criteria.[20]

One of the first issues the FCC grappled with in implementing the new USF was determining what types of carriers should be eligible. In its 1997 *First Report and Order*, the Commission concluded that support should be provided on a technologically neutral basis, and recognized that "a policy of technological neutrality will foster the development of competition and benefit certain providers, including wireless, cable, and small businesses, that may have been excluded from participation in universal service mechanisms if we had interpreted universal service eligibility criteria so as to favor particular technologies."[21] Instead, it determined that all carriers providing USF services would be eligible regardless of the technology used, and that support payments for customers who switched from incumbents to competitors would effectively be "portable" – that is, when a customer switched from an incumbent to a competitor, the funding would follow the customer.[22] As Billy Jack Gregg explained in recent Congressional testimony,

> [U]niversal service high cost support, as modified by the Commission for the advent of competition, was [initially] a technologically and competitively neutral "zero sum game:" the universal service subsidy was portable to whichever ETC won the customer. The ETC gaining the customer won the subsidy, the ETC losing the customer lost the subsidy.[23]

Two years later, however, in 1999, the Commission abandoned the "zero sum" approach in favor of providing subsidies based on *all* lines served by a CETC, rather than only those lines captured or "won" from incumbents. As a result, a single household can now receive subsidies for multiple phone lines, including – for example – a landline and one or more wireless lines. As

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[20] *See* 47 U.S.C. § 214(e).

[21] *See First Report and Order* at ¶49.

[22] CETCs still receive the same per line support as incumbents. *See* Universal Service Administrative Company website, available at: http://www.universalservice.org/hc/competitive-carriers/ ("A competitive carrier that is designated as an ETC can receive High Cost support that is determined by the number of lines it serves using its own facilities and the per-line support received by the ILEC in whose service area the CETC is competing.")

Commissioner Gregg put it, "The unforeseen consequences of these actions have been dramatic. By deciding to support all lines of all ETCs in high cost areas, the Commission opened the door to supporting multiple wireless networks which supplied supplementary, rather than substitute services."[24]

In 2000, the Commission confirmed its willingness to designate wireless carriers as CETCs in its *Western Wireless Wyoming Order*.[25] The matter came before the Commission after Western Wireless applied for ETC status with the Wyoming PUC, which disclaimed statutory jurisdiction. While other state PUCs had previously granted CETC status to wireless carriers,[26] Western Wireless was the first to come before the FCC. In granting the Western Wireless petition, the Commission reiterated its support for CMRS eligibility, noting that "in the Universal Service Order, the Commission concluded that universal service support mechanisms and rules should be competitively neutral," that "the principle of competitive neutrality includes technological neutrality," and thus that "a common carrier using any technology, including CMRS, may qualify for designation so long as it complies with the section 214(e) eligibility criteria."[27]

The Commission's next major policy statements on CRMS funding came in two 2004 ETC designation orders. In its *Virginia Cellular* and *Highland Cellular*[28] orders, it reaffirmed the eligibility of wireless carriers for ETC status, but also expressed concerns about the rapid growth of CETC

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[23] *See Gregg Testimony* at 8.

[24] *See Gregg Testimony* at 9.

[25] *See* Federal Communications Commission, *In the Matter of Federal-State Joint Board on Universal Service, Western Wireless Corporation Petition for Designation as an Eligible Telecommunications Carrier In the State of Wyoming,, Memorandum Opinion and Order* (December 26, 2000) [Hereafter *Western Wireless Order*].

[26] *See Western Wireless Order* at ¶10.

[27] *See Western Wireless Order* at ¶11.

[28] *See* Federal Communications Commission, *In the Matter of Federal-State Joint Board on Universal Service, Highland Cellular, Inc. Petition for Designation as an Eligible Telecommunications Carrier In the Commonwealth of Virginia, Memorandum Opinion and Order* (April 12, 2004) [Hereafter *Highland Cellular Order*], and *Virginia Cellular Order, supra* note 19. For a complete discussion of the two orders and their implications, *see* Mark C. Bannister, "Virginia Cellular and Highland Cellular: The FCC Establishes a Framework for Eligible Telecommunications Carrier Designation in Rural Study Areas," *Federal Communications Law Journal* 57;3 (2005), 516-552 [Hereafter *Bannister*.]

subsidies and, as noted above, recognized the need to subject CETC designation petitions to "more stringent" analysis. Thus, for example, it based its approval of the petitions explicitly on the carriers' commitments to use USF subsidies to expand coverage,[29] and to submit annual progress reports.[30] The Commission made clear it was growing "increasingly concerned" about the growing impact of CETC subsidies on the size and financial stability of the USF fund.

> Although we find that grant of this ETC designation will not dramatically burden the universal service fund, *we are increasingly concerned about the impact on the universal service fund due to the rapid growth in high-cost support distributed to competitive ETCs.* Specifically, although competitive ETCs only receive a small percentage of all high-cost universal service support, the amount of high-cost support distributed to competitive ETCs is growing at a dramatic pace.[31]

In fact, the Commission had already put in place a mechanism for addressing its concern about the rapid growth in CETC subsidies: In November 2002 it had specifically asked the Joint Board for recommendations on how to revise CETC designation rules.[32]

2. The 2004 Joint Board Recommendation and 2005 ETC Eligibility Order

The Commission's 2002 *Order* asked the Joint Board to review several issues relating to CETCs, including the calculation of support (i.e., whether CETCs should receive the same per-line subsidies as incumbents), whether CETC support should be capped, whether multiple lines within a single household should continue to be eligible for support, and whether, in general, the CETC designation process needed to be made more rigorous.[33]

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[29] *See e.g., Virginia Cellular Order* at ¶16 (noting that "Virginia Cellular has further committed to use universal service support to further improve its universal service offering by constructing several new cellular sites in sparsely populated areas within its licensed service area but outside its existing network coverage.").

[30] *See Virginia Cellular Order* at ¶46. In addition, the Commission put in place a framework for assessing whether CETCs, whose service territories do not always correspond exactly with ILEC study areas, do not "cherry pick" low cost customers by, for example, seeking designations to serve only relatively high-density areas. See ¶¶32-35.

[31] *See Virginia Cellular Order* at ¶31 (*emphasis added*).

[32] *See* Federal Communications Commission, *In the Matter of Federal-State Joint Board on Universal Service, Order*, CC Docket No. 96-45 (November 8, 2002). [Hereafter *2002 Order*.]

[33] *See 2002 Order* at ¶¶7-10. CETC subsidies in 2002 were tiny by current standards: CETCs in the third quarter of 2002 received only $14 million out of $803 million in HCF subsidies. *See also Id.* at ¶4.

In its February 2004 *Recommended Decision*,[34] the Board focused squarely on the issue of wireless CETCs, and recommended that the Commission end its policy of subsidizing multiple lines to individual customers and instead limit support to a single, "primary line" for each customer.[35]

> Supporting multiple connections for multiple networks is not necessary to achieve reasonably comparable access in rural areas, and creates a potential for fund growth that threatens the sustainability of the universal service fund. Accordingly, supporting primary connections better fulfills the sufficiency requirements of the Act.[36]
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> * * *
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> Continued support of multiple connections for multiple networks in rural and high-cost areas threatens fund sustainability. Currently, the support flowing to a high-cost area increases automatically when a competitive ETC is designated, according to the number of connections it serves. Competitive ETCs now receive a small fraction of total high-cost support, but their support has increased dramatically over the past few years. Much of this growth represents supported wireless connections that supplement, rather than replace, wireline service. Our examination of the record reveals a potential for uncontrolled growth as more and more competitive ETCs are designated in rural and high-cost areas.[37]
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> * * *
>
> [W]e disagree with commenters who argue that supporting multiple connections is necessary to ensure reasonably comparable access to wireless service in rural areas. Mobility is not a supported service. Deployment of rural wireless infrastructure is an important policy goal, but the reasonable comparability principle does not justify supporting multiple connections to achieve it. We emphasize that, under our recommended approach, support would be available for wireless connections to the extent that customers choose to obtain connectivity through primary connections provided by wireless ETCs.[38]

The Board also recommended changes in the eligibility requirements and reporting obligations of CETCs, largely based on the framework already endorsed by the Commission in *Virginia Cellular*.

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[34] *See* Federal-State Joint Board on Universal Service, *In the Matter of Federal-State Joint Board on Universal Service, Recommended Decision,* CC Docket No. 96-45 (February 27, 2004) [Hereafter *2004 Recommended Decision*].

[35] *See 2004 Recommended Decision* at ¶ 56 (recommending "that the Commission limit the scope of high-cost support to a single connection that provides access to the public telephone network.").

[36] *See 2004 Recommended Decision* at ¶ 64.

[37] *See 2004 Recommended Decision* at ¶ 67.

[38] *See 2004 Recommended Decision* at ¶ 63.

Before the FCC could act on the Joint Board's recommendations, Congress stepped in, passing legislation prohibiting it from implementing the proposed primary line rule.[39] However, the Commission did adopt the Joint Board's recommended new rules requiring an applicant for CETC designation to agree to provide service throughout its designated service territory,[40] to submit a five-year plan detailing how it will "use universal service support to improve service within the service areas for which it seeks designation,"[41] and to submit detailed annual reports covering its use of USF subsidies and its compliance with the certification requirements.[42] The new requirements were made mandatory for both future and existing CETCs designated by the Commission, and the Commission specifically encouraged state PUCs to adopt them as well.[43]

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[39] *See* Federal Communications Commission, *In the Matter of Federal-State Joint Board on Universal Service, Report and Order,* CC Docket 96-45 (March 17, 2005) at ¶16, referencing the Consolidated Appropriations Act, 2005, Pub. L. No. 108-447, § 634, 118 Stat 2809 (2004) [Hereafter *2005 ETC Designation Order*].

[40] *2005 ETC Designation Order* at ¶22 ("[W]e agree with and adopt the Joint Board recommendation to establish a requirement that an ETC applicant demonstrate its capability and commitment to provide service throughout its designated service area to all customers who make a reasonable request for service. We conclude that this requirement, which we adopted in the Virginia Cellular ETC Designation Order and Highland Cellular ETC Designation Order, is appropriate as a general rule to ensure that all ETCs serve requesting customers in their designated service area.")

[41] *2005 ETC Designation Order* at ¶23. ("Specifically, we require that an ETC applicant submit a five-year plan describing with specificity its proposed improvements or upgrades to the applicant's network on a wire center-by-wire center basis throughout its designated service area. The five-year plan must demonstrate in detail how high-cost support will be used for service improvements that would not occur absent receipt of such support. This showing must include: (1) how signal quality, coverage, or capacity will improve due to the receipt of high-cost support throughout the area for which the ETC seeks designation; (2) the projected start date and completion date for each improvement and the estimated amount of investment for each project that is funded by high-cost support; (3) the specific geographic areas where the improvements will be made; and (4) the estimated population that will be served as a result of the improvements.")

[42] *2005 ETC Designation Order* at ¶69 ("Every ETC designated by the Commission must submit the following information on an annual basis: …progress reports on the ETC's five-year service quality improvement plan, including maps detailing progress towards meeting its plan targets, an explanation of how much universal service support was received and how the support was used to improve signal quality, coverage, or capacity; and an explanation regarding any network improvement targets that have not been fulfilled…. detailed information on any outage lasting at least 30 minutes…. the number of requests for service from potential customers within its service areas that were unfulfilled for the past year…. the number of complaints per 1,000 handsets or lines …. certification that the ETC is complying with applicable service quality standards and consumer protection rules….certification that the ETC is able to function in emergency situations….certification that the ETC is offering a local usage plan comparable to that offered by the incumbent LEC….certification that the carrier acknowledges that the Commission may require it to provide equal access to long distance carriers in the event that no other eligible telecommunications carrier is providing equal access within the service area.")

[43] *2005 ETC Designation Order* at ¶19. ("We encourage state commissions to require ETC applicants over which they have jurisdiction to meet these same conditions and to conduct the same public interest analysis outlined in this Report and Order. We further encourage state commissions to apply these requirements to all ETC applicants in a

Noting that it had been prohibited from Congress from adopting the primary line rule, the Commission expressed hope that the new eligibility criterion would be sufficient to restrain the growth of CETC subsidies.

> Nevertheless, we believe the rigorous ETC designation requirements adopted above will ensure that only ETCs that can adequately provide universal service will receive ETC designation, thereby lessening fund growth attributable to the designation and supporting the long-term sustainability of the universal service fund.[44]

As it has turned out, however, CETC funding has continued to grow rapidly since the 2005 *Order* was issued.

3. Recent and Projected Growth of CETC Subsidies

As shown in Figures 4 and 5, both the number of CETC designations and the amount of CETC subsidies were growing rapidly prior to the FCC's *2005 Order*, and they have continued to grow rapidly since. Wireless CETCs account for a the vast majority of the growth: Of 66 new CETC designations since 2004, two-thirds were CMRS carriers; and, as shown in Figure 5, of the $504.8 million increase in total CETC subsidies between 2004 and 2006, wireless CETCs accounted for $466.4 million, or 92 percent.

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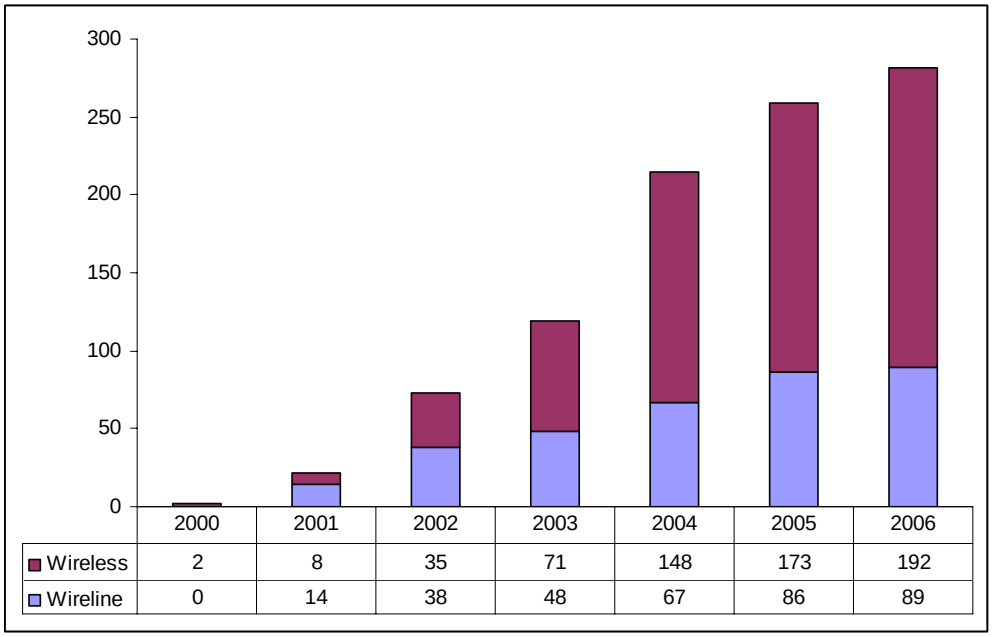
manner that is consistent with the principle that universal service support mechanisms and rules be competitively neutral.")

[44] *2005 ETC Designation Order* at ¶5

Figure 4:
Number of CETC Designations, 2000-2006[45]



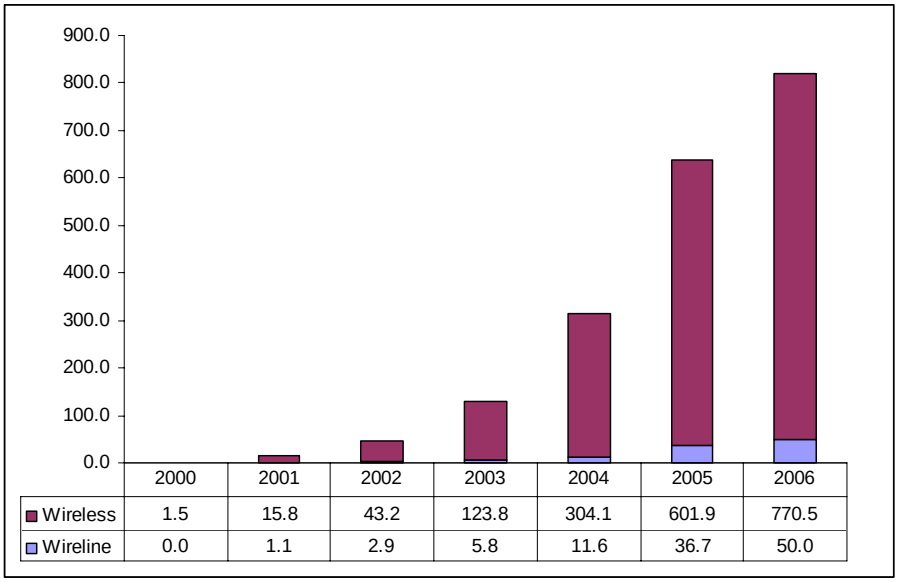
	2000	2001	2002	2003	2004	2005	2006
Wireless	2	8	35	71	148	173	192
Wireline	0	14	38	48	67	86	89

[45] Represents number of CETC study areas. CETC study areas typically represent all areas served by the CETC within a single state, and often encompass more than one ILEC study area. In 2006, there were a total of 1,439 ILEC Study Areas. Of these:

- 859 study areas had at least one CETC receiving subsidies;
- 841 study areas had at least one wireless CETC receiving subsidies;
- 472 study areas has more than one wireless CETC receiving subsidies;
- 759 study areas had only wireless CETCs receiving subsidies;
- 100 study areas had wireline CETCs receiving subsidies;
- 18 study areas had only wireline CETCs receiving subsidies;
- 82 study areas had both wireline and wireless CETCs receiving subsidies;
- 23 study areas had both multiple wireless and multiple wireline CETCs receiving subsidies.

Counting each CETC designation in an ILEC study area separately, there were 1,926 unique CETC-ILEC study area combinations where subsidies were paid. Of these, 1,770 designations (91 percent) were for wireless CETCs, and 156 (9 percent) were for wireline CETCs.

Figure 5:
CETC Subsidies, 1999-2006, $Millions



	2000	2001	2002	2003	2004	2005	2006
Wireless	1.5	15.8	43.2	123.8	304.1	601.9	770.5
Wireline	0.0	1.1	2.9	5.8	11.6	36.7	50.0

One reason subsidies are growing rapidly is that many CETCs are large, publicly traded corporations which operate in multiple states, and are able to apply for designations throughout their expansive service territories. For instance, Alltel Wireless, the largest single recipient of CETC support, serves more than 11 million wireless customers in 35 states.[46] In 2006, Alltel had revenues of $7.9 billion, income from continuing operations of $823.7 million, and received approximately $226 million in HCF subsidies. This accounted for about 29 percent of all HCF payments to CETCs, and approximately 27 percent of the company's income from continuing operations.[47]

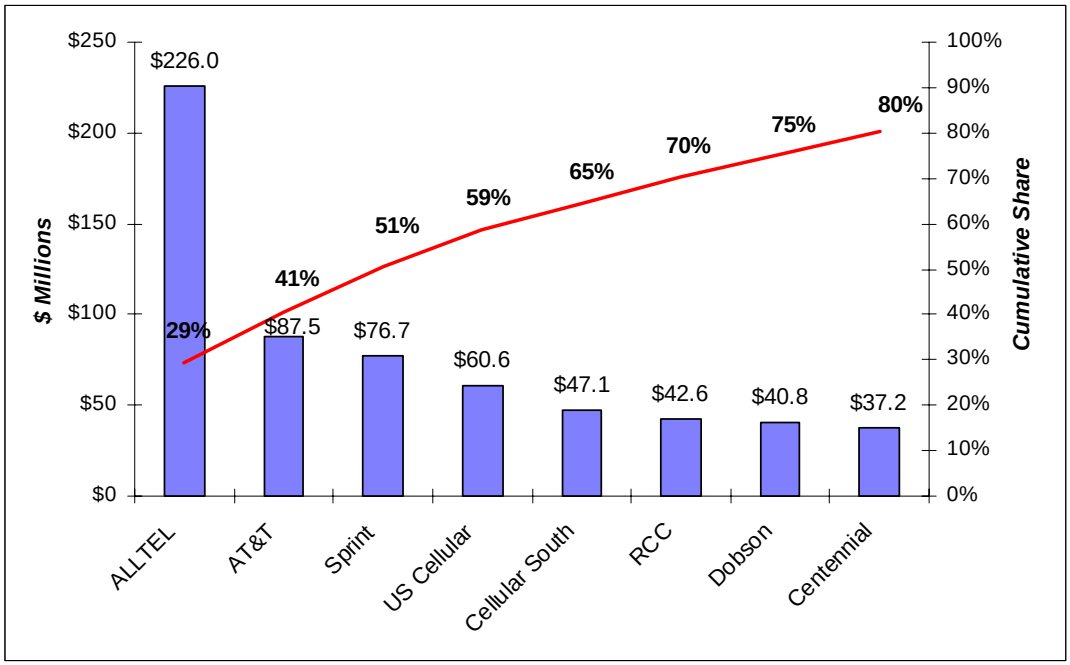
As illustrated in Figure 6 below, the top ten recipients of CETC funding received about $618 million in 2006, or approximately 80 percent of all CETC funding. Subsidies to these firms are

[46] See *Testimony of Richard Massey Before the U.S. Senate Committee on Commerce, Science and Transportation* (March 1, 2007) [Hereafter *Massey 2007*.]

[47] See Alltel Corporation, *Form 10-K for the Year Ended December 31, 2006* at F-7. According to filing, "Alltel expects to receive approximately $65.0 to $70.0 million of USF support each quarter during 2007." (*Alltel 10-K* at 9). Note that Alltel spun off its wireline business during 2006; its income from continuing operations reflects the income from its cell phone business, which is the source of its CETC subsidies. Alltel also received USF funds for its ILEC operations, which are not included in any of the figures reported here.

growing even more rapidly than CETC funding overall. Between 2004 and 2006, Alltel's subsidies more than doubled, Sprint's more than tripled, and AT&T's increased by more than 800 percent.[48]

Figure 6:
Distribution of Wireless CETC Subsidies, by Carrier, 2006



4. The Current Debate

As noted above, on May 1, 2007 the Joint Board issued a new set of recommendations for reforming the USF program. Based on estimates from the FCC staff, it found that

> Based on current estimates, competitive ETC support in 2007 will reach at least $1.28 billion if the Commission takes no action to curtail this growth. Moreover, if the Commission were now to approve all competitive ETC petitions currently pending before the Commission, high-cost support for competitive ETCs could rise to as much as $1.56 billion in 2007. High-cost support to competitive ETCs is estimated to grow to almost $2 billion in 2008 and $2.5 billion in 2009 even without additional competitive ETC designations in 2008 and 2009.[49]

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[48] See Federal-State Joint Board on Universal Service, *Universal Service Monitoring Report* (various years) (available at http://www.fcc.gov/wcb/iatd/monitor.html.) In cases where firms have merged (e.g., Alltel and Western Wireless), subsidies for the merged firms were combined for all years.

[49] *Jt. Board 2007 Recommended Decision* at ¶4.

Some observers believe even these projections are too conservative. For example, Joint Board member Billy Jack Gregg testified before Congress in March 2007 that "If Cingular, the largest wireless carrier, continues to seek ETC status, Verizon Wireless, the second largest, will be forced to follow suit. The result will be a High Cost Fund surpassing $6 billion and approaching $7 billion."[50] There is widespread agreement that such growth is unsustainable.

Accordingly, the Joint Board recommended an immediate cap on CETC subsidies. The recommendation, if approved by the FCC, would cap current outlays on a state-by-state basis, so that any increases in support to existing or newly designated CETCs in each state would have to come out of the subsidies being paid to other CETCs within the state. While the Board did not single out wireless CETCs, the impact of the proposed cap would be felt primarily by wireless carriers which, as noted above, receive more than 90 percent of the money. Not surprisingly, the proposal has generated significant opposition.[51]

III. USF AND THE ECONOMICS OF WIRELESS TELEPHONY

Do USF subsidies to wireless carriers advance the goals of the USF? Do they increase investment in wireless infrastructure, thereby making coverage available in areas where there otherwise would be none? Do they result in lower prices, thus making wireless service more affordable and increasing wireless penetration? What precisely are the causal links that might lead to these results? In this section, we first summarize the main arguments that have been offered for providing USF subsidies to wireless carriers. Next, we evaluate those rationales from the perspective of economic theory. Finally, we develop testable hypotheses, which form the basis for the empirical analysis we present in Section IV.

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[50] *See Gregg Testimony* at 11.

[51] See, e.g., Jeffrey Silva, "Industry in Uproar Over Proposed Wireless Cap," *RCR Wireless News* (May 16, 2007), available at http://www.rcrnews.com/apps/pbcs.dll/article?AID=/20070516/FREE/70516004/1005. The Board also

A. Policy Rationale for Subsidizing Wireless CETCs

The policy rationale (and statutory justification) for providing USF subsidies to wireless carriers is to advance the goals of the HCF, i.e., to "promote availability" and "increase access" to telecommunications services "at affordable rates" in rural and other high cost areas. For wireless CETCs, subsidies should result in better coverage, lower prices, or both, in areas where service is subsidized. As noted above, the FCC's *ETC Designation Order* explicitly requires wireless carriers to use USF funds for these purposes; specific network improvements must be described in each CETC's five-year network improvement plan, and verified in its annual reports.[52]

Proponents of the subsidies argue that they are serving these goals, and that, as Alltel recently said in Congressional testimony, "America is getting a great return on its investment in wireless universal service"[53] because the subsidies have produced a "tremendous expansion of wireless service into rural areas."[54] In an *ex parte* presentation to the FCC, Alltel argued that the subsidies "[advance] Universal Service by making service available to unserved and underserved areas,"[55] and "are critical for the build-out of wireless networks in rural areas."[56]

Regulators have relied on these arguments in their decisions to designate wireless carriers as CETCs. For example, Alltel cites the Wisconsin public service commission, which found that,

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recommended the FCC move expeditiously to implement longer-run, more fundamental reforms and promised to make specific recommendations within 6 months. See *Jt. Board 2007 Recommended Decision* at ¶14.

[52] Another rationale offered for providing support to CMRS carriers is that, because wireless carriers pay into the fund, they should be allowed to draw money out. Such a rationale makes little sense, however: The purpose of the fund is to make affordable telecommunications services available throughout the U.S., and the funds collected should thus be used for that purpose. If the goal were to make whole those paying into the fund, the appropriate course would be to not collect the taxes in the first place.

[53] *Massey 2007* at 7.

[54] *Id.* at 7.

[55] Alltel Wireless, "Wireless Universal Service," *Notice of Ex Parte Presentation: Federal-State Joint Board on Universal Service*, CC Docket Nos. 96-45; 05-337, (Presented January 11, 2007), at 15. [Hereafter *Alltel Ex Parte*.]

[56] *Alltel Ex Parte* at 23 ff.

> While it is true that ALLTEL is currently serving in at least some of these areas, the availability of high cost support for infrastructure deployment will allow ALLTEL to expand its availability in these areas.[57]

The company also offers specific examples of areas where it says it has expanded service as a direct result of USF subsidies, including Kansas, Montana, South Dakota and Nebraska.[58] Other proponents of the subsidies make similar points.[59]

A closely related rationale for USF subsidies is that they result in increased competition (which presumably could only be achieved if the subsidies first resulted in expanded coverage). For example, Alltel argues that wireless subsidies benefit consumers by "Introducing the benefits of competition in rural areas…."[60] It also cites "testimonials" in which PUCs find that "designating ALLTEL as an ETC in areas served by rural companies will increase competition in those areas and, so, will increase consumer choice,"[61] and "designating ALLTEL as an ETC is in the public interest because it is likely to promote competition and provide benefits to customers in rural and high-cost areas by increasing customer choice…."[62] The FCC has found that, while increased choice by itself is not a sufficient basis for granting a CETC designation, it is among the factors the Commission will consider.[63]

A third argument is that USF subsidies to wireless carriers contribute to "affordability." Alltel cites the FCC's *Western Wireless Wyoming Order*, which found that "the provision of competitive

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[57] *Alltel Ex Parte* at 20 citing unspecified Wisconsin ETC Order.

[58] *Alltel Ex Parte* at 23 ff.

[59] *See e.g.,* "Rural Cellular Association Opposes Proposed Cap That Targets Wireless Carriers' Access to Universal Service Support," Press Release (May 15, 2007), available at http://www.prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/05-15-2007/0004589376&EDATE=. (stating "The proposed targeted cap would impede wireless carriers in their efforts to construct more cell sites in rural areas so as to improve consumer access to wireless phone and data services in rural areas.").

[60] *Alltel Ex Parte* at 11.

[61] *Alltel Ex Parte* at 20 citing unspecified Wisconsin ETC Order.

[62] *Alltel Ex Parte* at 19 citing unspecified Michigan ETC Order.

[63] See *2005 ETC Designation Order* at ¶44 ("The Commission takes into account the benefits of increased consumer choice when conducting its public interest analysis. In particular, granting an ETC designation may serve the public interest by providing a choice of service offerings in rural and high-cost areas. The Commission has determined

service will facilitate universal service to the benefit of consumers in Wyoming by creating incentives to ensure that quality services are available at just, reasonable, and affordable rates."[64]

In sum, the primary policy rationales offered for USF subsidies to wireless carriers, and certainly the rationales most closely related to the statutory purposes of the program, are that they increase availability, promote competition, and make telecommunications services more affordable.

B. The Economics of USF Subsidies and Wireless Investment

How precisely do USF subsidies achieve these goals – that is, from an economic perspective, how do they affect the incentives of wireless carriers with respect to the coverage they provide, the markets they serve and the prices they charge? In the sections below, we explain that there is no economic basis for believing CETC subsidies affect rural wireless prices at all, and that there are good reasons to believe that the relationship between subsidies and coverage, if it exists at all, is likely to be weak.

1. CETC Subsidies Cannot Have a Significant Effect on Rural Wireless Prices

Wireless prices are set primarily, if not exclusively, in a national market – and in any case are certainly not set in markets as small as the individual study areas that form the basis for CETC subsidies. In its most recent report on competition in CMRS markets, the FCC noted that "Despite the smaller number of mobile operators in rural areas as compared to urban areas, there is no evidence in the record to indicate that this structural difference has enabled carriers in rural areas to raise prices above competitive levels,"[65] and cited evidence that "[W]ith the national carriers expanding their networks into rural areas, rural wireless carriers were forced to modify/lower their

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that, in light of the numerous factors it considers in its public interest analysis, the value of increased competition, by itself, is unlikely to satisfy the public interest test.")

[64] *Alltel Ex Parte* at 18.

[65] See Federal Communications Commission, *Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Eleventh Report,* WT Docket No. 06-17 (September 29, 2006) at ¶88. [Hereafter *Eleventh Report.*]

pricing, which in turn has been pressuring their ARPUs."[66] CTIA, the association of wireless carriers, has made the same point, citing evidence that customers have access to the same level and variety of rate plans regardless of whether they live in urban or rural areas.[67] Because wireless prices are set nationally, targeted subsidies to rural areas simply cannot have a differential effect on prices in those areas.

Because the CMRS business is competitive, economic theory predicts that, in the long run, most or even all subsidies received by CMRS carriers, regardless of their source, may ultimately be passed through to consumers in the form of lower prices, better service or a combination of the two. Even to the extent wireless consumers ultimately benefit, however, the benefit is spread across all wireless consumers, and does not differentially benefit consumers in rural or other high-cost areas.[68] That is, the subsidies do not advance the goals of the USF with respect to making telecommunications services in these areas more affordable.[69]

2. The Relationship Between USF Subsidies and Availability is Tenuous

The argument that USF subsidies increase the availability of wireless services in rural areas relies ultimately on the notion that subsidy payments alter CMRS carriers' investment incentives, causing them to make investments in rural areas that would not otherwise be made. Such

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[66] *Eleventh Report* at n. 203 (citing Tim Horan, "Implications of AT's Results On U.S. Wireless Industry," Daily Datatimes, CIBC World Markets, Jan. 23, 2006).

[67] *Comments of CTIA-The Wireless Association In the Matter of Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Eleventh Report,* WT Docket No. 06-17, (February 17, 2006), at 25, note 61.

[68] Even if the subsidies are ultimately passed on to consumers, they do not enhance overall consumer welfare. In the absence of market failure (and no general market failure has been asserted), such subsidies can *at best* transfer wealth from one group of consumers (taxpayers) to another (in this case, CMRS customers).

[69] Another mechanism by which the subsidies could, in theory, reduce telecommunications prices in rural areas is by increasing competition with wireline carriers, thus forcing them to reduce their rates. In the areas where subsidies are provided, however, it is assumed that wireline rates are already below costs (hence the need for subsidies). As a practical matter, retail wireline telephone rates in rural areas are, with few exceptions, still set by state regulators, not the marketplace.

investment could take several forms, including the construction of new cell phone towers, installation of new cell sites on existing towers, and various forms of network upgrades.[70]

In order for USF subsidies to generate meaningful expansions of coverage, they must give carriers incentives to make investments that meet two criteria.

First, the investment must extend coverage to a region where service previously was unavailable. In principle, this condition can take three forms: (a) service is expanded to an area where there previously was *no telephone service*, even from a wireline carrier; (b) service is expanded to an area where there previously was *no wireless coverage*; or, (c) service is expanded to an area already served by other wireless carriers, but which was *not served by the carrier receiving the subsidy*. Given that the USF program requires wireline carriers to make service available at affordable rates to their entire service territories, with only very limited exceptions, the number of instances in which the first condition is met is expected to be quite small, and in any case there is no significant policy debate about whether subsidies would be appropriate in such cases. Thus, we ignore this case in the remainder of our analysis. Conditions 1(b) and 1(c), however, correspond directly to the debate, noted above, about whether USF should subsidize multiple carriers in the same study area.[71] We refer to investments satisfying condition 1(b) as "availability-enhancing investments" and investments satisfying condition 1(c) as "choice-enhancing investments." That is, availability-enhancing investments are those that provide coverage where none existed before, from any carrier, while choice-enhancing investments are those that increase the number of wireless carriers serving

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[70] *Eleventh CMRS Report* at ¶ 124 ("In the mobile telephone industry, capex consists primarily of spending to expand and improve the geographic coverage of networks, increase the capacity of existing networks so they can serve more customers, and improve the capabilities of networks (by allowing higher data transmission speeds, for example).") *See also 2005 ETC Designation Order* at ¶23 (Stating that a CETC's network improvement plan "must include: (1) how signal quality, coverage, or capacity will improve due to the receipt of high-cost support throughout the area for which the ETC seeks designation" but also noting "service quality improvements in the five-year plan do not necessarily require additional construction of network facilities.").

[71] *See* Section II.C, above.

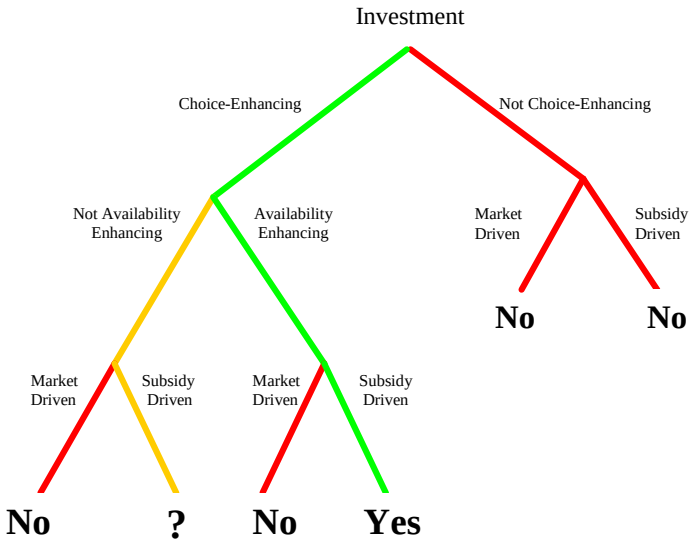
the same territory. Note that all availability-enhancing investments are also choice-enhancing, in that they increase the number of available choices from zero to one.

The second major criterion for USF subsidies to increase availability is that they must give CMRS carriers incentives to make investments they would not have made in the absence of the subsidy. Wireless carriers have invested heavily to expand their networks in recent years, due to a rapid increase in the demand for wireless services,[72] and some of this investment has gone to extend wireless service to previously un-served regions. If market forces would have driven a carrier to invest in a given piece of infrastructure even in the absence of a subsidy, then that investment cannot be credited to the USF program. We refer to investments that would have occurred without the subsidy as "market-driven," and investments that occur as a result of the subsidy as "subsidy-driven."

These criteria for evaluating the relationship between USF subsidies and investment are summarized in Figure 7 below. Note that only subsidies which are both availability-enhancing and subsidy-driven clearly satisfy the statutory objectives of the USF program. Subsidies which are choice-enhancing and subsidy-driven advance the objectives of the program only to the extent "choice" and "competition" are regarded as legitimate goals of the program, which is a subject of debate as indicated by the "**?**" in the figure. All other investments, even if they are in and of themselves economically efficient and welfare enhancing, by definition do not serve the objectives of the USF program.

[72] *See e.g., Eleventh Report at* ¶158..

Figure 7:
USF Subsidies, Investment and the Goals of Universal Service



The question for policymakers is whether and to what extent USF subsidies to wireless CETCs create incentives for carriers to make investments that satisfy these criteria. There are good reasons to believe they do not, primarily because the amount of USF subsidies paid to wireless carriers is not based on their coverage, but instead on the total number of subscribers they serve in subsidized areas.

First, CETCs, including wireless CETCs, receive subsidies based on the number of lines they serve in a given study area, *even if they were serving those lines prior to being designated as a CETC.* As noted by one of the leading law review commentaries on the USF program:

> Based upon existing federal rules, when a wireless provider is recognized as a CETC in a high-cost study area, it may seek universal service support for all of its wireless "lines" or subscriptions in that area. This may mean that without any visible change in the type of service provided to local customers, even if the wireless services were initially deployed without any expectation of federal subsidy, the newly designated CETC is able to draw universal service funding for those services.[73]

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[73] *See Bannister* at 517.

The impact of this rule, in economic terms, is that a substantial proportion of CETC subsidies are expended on services provided to infra-marginal customers – customers who, by definition, would have received (and, indeed, already were receiving) the same services from the same carriers, even without the subsidy.

Second, because USF subsidies are paid to CETCs on the basis of the number of customers they serve in subsidized areas, not the number of households they cover or the number of square miles in their service territories, they do not provide direct incentives for carriers to make either availability- or choice-enhancing investments. Whatever economic incentives USF subsidies provide to increase coverage is indirect, i.e., a result of the fact that the demand for a CMRS carrier's services is in part a function of the extent of its coverage. That is, customers are more likely to purchase service from a carrier whose network serves places where they spend a great deal of time, such as their home, their workplace and the primary commuting routes they travel on a regular basis.[74] Thus, a carrier that expands coverage in an area where it receives USF subsidies may expect to sign up more customers who live and work in the newly covered territory, and, thus increase the amount of subsidies it receives. This is the most direct and obvious mechanism by which USF subsidies could encourage CMRS carriers to expand coverage.

However, carriers can also increase the amount of subsidies they receive by making investments that expand choice but do not expand availability, and even by making investments that expand neither. Faced with the higher effective per subscriber revenues that USF subsidies provide, a carrier *may* choose to expand coverage to an area that is not already served by other carriers, on the theory that it can sign up the most new customers by providing service where none is already available. On the other hand, it may also choose to invest the same amount to expand its network

into an area where other carriers already provide service, in hopes of winning share in what may be, for example, a more densely populated area, i.e., to make an investment that is choice-enhancing but not availability- enhancing. The carrier also has a third option: instead of expanding coverage at all, it may seek to increase subscribership in the subsidized area by investing in more retail outlets, a bigger advertising budget, or other marketing activities.[75] USF subsidies provide economic incentives to serve more customers within a subsidized study area, but carriers can achieve this objective without expanding either the availability of wireless service or the choice set of competing wireless providers.[76]

Another factor that muddies the connection between USF subsidies and investment is that CMRS carriers have powerful market-based incentives to expand coverage in rural areas which are completely independent of the demand for "home area" cell phone service, and thus unrelated to the extra revenue per customer USF subsidies provide. This is because customers, in addition to valuing coverage in their "home" areas, also value networks that provide "regional," "national" or even "worldwide" coverage.[77] For example, consumers who live in urban areas but occasionally travel into rural ones are willing to pay more for service from a carrier whose network provides service in those areas. In economic terms, consumers are willing to pay for the "options value" of having service available in rural areas, even though they are unlikely to use that service frequently (or ever) in most of the places where it is available.

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[74] *See Eleventh Report at* ¶173.

[75] At least one CETC application we reviewed stated explicitly that the carrier intended to use its USF subsidies for "increasing the number of retail outlets … at which customers may obtain supported services." See *In the Matter of Federal-State Joint Board on Universal Service, Centennial USVI Operations Corp. Petition for Designation as an Eligible Telecommunications Carrier in the United States Virgin Islands* CC Docket No. 96-45 (April 29, 2005) at 11.

[76] As discussed below, regulators attempt to channel investment into coverage- or at least choice-enhancing investments.

[77] *See* e.g., *Eleventh Report* at ¶55. *See also Alltel 10-K* at 7 (stating "Alltel's ability to compete also depends on its ability to offer regional and national calling plans to its customers.")

The upshot of this aspect of CMRS demand is that carriers have economic incentives to build out coverage in rural areas which are completely independent of whether those areas are eligible for USF funds. For example, they will construct cell phone towers along interstate highways in order to serve travelers on those roads, even though most of the travelers on those roads have cell phone numbers associated with other areas, and thus do not affect the carrier's USF subsidies one way or another.

Taken together, these factors dilute (though they do not eliminate) the economic incentives USF subsidies provide to expand coverage in rural, high-cost areas. From an economic perspective, however, they imply that the actual effect of USF subsidies on wireless availability and choice in rural America is likely to be far less than what a casual observer would expect, given the gross amount of the subsidy.

Another way CETC subsidies could affect investment incentives is through regulation. As noted above, the FCC has adopted regulations for wireless CETCs that require them to submit five-year plans for network improvements and to report annually on their progress in implementing those plans. These requirements, however, are only mandatory for CETCs designated by the FCC, i.e., in states where PUCs do not have authority over wireless CETCs. While the Commission "encouraged" state PUCs with CETC jurisdiction to adopt its eligibility criteria, it did not require them to do so, and many have not.[78] Perhaps more to the point, it is far from clear how successful even the most ardent regulator could be in monitoring and enforcing regulatory incentives. For example, regulators cannot easily observe what a carrier's optimal network expansion path would

[78] A recent survey conducted by the National Regulatory Research Institute (NRRI) reports that 30 of 51 jurisdictions have imposed annual reporting requirements, and that 20 jurisdictions have taken steps to require five-year quality improvement plans. *See* Jing Liu, *State Certification Requirements for Eligible Telecommunications Carriers*, National Regulatory Research Institute (February 2007).

have been in the absence of subsidies, and therefore cannot readily distinguish between market driven and non-market driven investment.[79]

To summarize, economic theory provides useful insights into the relationship between USF subsidies and wireless investment. It strongly suggests (at least) that USF subsidies do not have a differential impact on the price of telecommunications services in subsidized areas. Theory also suggests that the effectiveness of subsidies in increasing availability and choice is likely to be more limited than their overall magnitude would suggest, but it does not eliminate completely the possibility of some effect. The question of whether there is an effect, and if so how large, is thus an appropriate focus for empirical analysis.[80]

C. Testable Hypotheses

USF subsidy payments to wireless CETCs may plausibly increase access to telecommunications services by expanding the geographic areas in which wireless service is available

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[79] "Five year plans" of the sort mandated by the Commission also risk locking carriers into deployment plans which may turn out, as markets and technologies develop, to be inefficient and thus in need of modification. [See, e.g., *Application of Alltel Communications, Inc., for Designation as an Eligible Telecommunications Carrier in the State of Georgia,* (Letter from Glenn S. Rabin to Marlene H. Dortsch, Secretary, Federal Communications Commission, October 13, 2005), at 10. ("Alltel submits that these [five-year] plans must be flexible and are subject to change in response to general consumer demand, changes in technology and other appropriate factors. The priority under which each cell site is to be constructed is subject to change depending upon requests for service and other market factors.")] But regulators will have a difficult task distinguishing changes required by such developments from simple "opportunistic behavior" on behalf of carriers wishing to escape deployment commitments.

[80] One important data point on this issue is provided in a recent filing by a group of rural telecommunications carriers challenging Sprint/Nextel's designation as a CETC in the state of Virginia. That filing provides a detailed analysis of Sprint/Nextel's coverage since it received its CETC designation for Virginia, and concludes that "Contrary to its promises and representations, Sprint/Nextel has expanded coverage in only a fraction of the Virginia study areas in which it is currently designated, despite having had three years in which to build out its network. As a result, several of Sprint/Nextel's designated study areas (particularly its rural study areas) remain wholly outside its coverage area. Instead, and as commenters warned in 2004, Sprint/Nextel has targeted its coverage in Virginia to densely-populated areas and interstate highways, while conveniently ignoring many of the study areas that Sprint/Nextel represented it would serve when it designated the company as an ETC, and upon which representations the Commission premised its designation." See *In the Matter of Federal-State Board on Universal Service, Petition for Revocation of Sprint/Nextel's Designation as an Eligible Telecommunications Carrier in the State of Virginia* CC Docket 96-45 (June 4, 2007) at 2. The need for additional research into the effectiveness of regulation is acknowledged by NRRI. *See e.g.,* Liu at 25 ("It would also be useful also to evaluate the effectiveness of each approach to determine whether the adoption of more stringent certification rules makes a difference on ETC performance in areas such as quality of service, appropriate use of USF support, pricing, competition, and customer satisfaction.") The regression analyses reported below provide evidence that differences in regulatory stringency do not affect wireless availability or choice.

from any carrier. They might also increase the number of choices available to wireless consumers in subsidized areas. We advance two sets of hypotheses that relate directly to these questions.

- **Hypothesis I:** CETC subsidies enhance *availability*. Specifically, other things equal, subsidy payments to wireless CETCs in a given study area increase (a) the proportion of inhabitants of the study area residing in territory with wireless telecommunications coverage and/or (b) the proportion of square miles in the study area with coverage.

For purposes of Hypothesis I, coverage is measured two ways: (a) by the proportion of households in the study area are that are covered by at least one wireless network (the "covered POPs share"); and (b) by the proportion of land area in the study area is covered by at least one wireless network (the "covered area share"). If USF subsidies to wireless carriers increase the availability of wireless services in subsidized study areas, we should observe a positive correlation between these two measures of coverage, on the one hand, and wireless CETC subsidies, on the other.

- **Hypothesis II:** CETC subsidies enhance *choice*. Specifically, other things equal, subsidy payments to wireless CETCs in a given study area increase (a) the population-weighted number of choices available in an area, and/or (b) the proportion of consumers with multiple choices of CMRS carriers.

For purposes of Hypothesis II, we measure the extent of choice among wireless providers in two ways: (a) by the total number of "pops" (i.e., residents of households with coverage) of all carriers providing service in the area (the "covered pops density index"), and, (b) the proportion of the population with coverage from three or more wireless carriers (the "triple carrier index"). If CETC subsidies increase choice, we should observe a positive correlation between these indices of competition, on the one hand, and wireless CETC subsidies, on the other.

In addition to these primary hypotheses, we also test hypotheses related to the impact of regulation on availability and choice. Specifically, all of our regressions include zero-one "dummy" variables for states where (a) wireless CETCs are subject to FCC regulation (and thus to the requirements of the *2005 Designation Order* to submit five-year network upgrade plans and annual

reports) or (b) the state PUC has adopted equivalent regulations. If these regulations achieve their goals, we should observe a correlation between these regulatory variables, on the one hand, and availability and/or choice, on the other.

IV. EMPIRICAL ANALYSIS

In this section we report the results of our empirical tests of the hypotheses developed immediately above. We describe the data we gathered, the regressions specifications associated with the various hypotheses, and the empirical results.

A. The Data

CETCs receive USF subsidies based on the number of customers served in each ILEC study area, and the amount they receive is based on the amount per line received by the ILEC in that study area. Accordingly, the appropriate unit of observation for analysis is the ILEC study area.

Our dataset contains data for 1374 study areas,[81] capturing essentially all study areas in the 48 contiguous states.[82] Our "left hand side" or "dependent" variables are measures of wireless coverage, based on publicly-available coverage maps provided by the wireless carriers themselves, collected in late 2006.[83] Thus, our dependent variables reflect the extent of wireless coverage at a point in time. The same is true for some of our "right hand side" or "independent" variables, such as household income and population density, which also represent data as of 2006. On the other

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[81] Due to constraints on data availability for certain variables employed in the analysis, a small fraction of study areas had to be excluded or combined with other study areas when constructing the dataset. Our panel of 1374 study areas contains 95.5% of all 1438 individual study areas nationwide. This small discrepancy is explained by the fact that certain study areas either had to be discarded due to missing data, or were consolidated with other study areas, due to a lack of disaggregated data. Finally, note that the statistical analysis below incorporates between 1372 and 1373 observations, depending on the regression, due to the exclusion from the analysis of data points deemed to be outliers.

[82] We exclude Alaska and Hawaii from our empirical analysis, as well as non-state territories such as Guam and Puerto Rico.

[83] *See* Nicholas Vantzelfde, *The Availability of Unsubsidized Wireless and Wireline Competition In Areas Receiving Universal Service Funds,* Criterion Economics (June 2006). Coverage maps may overstate the *absolute* level of coverage to the extent they fail to capture variations in signal strength or to reflect the presence of "dead zones" within broader areas of coverage. However, our analysis does not depend on absolute coverage levels but rather on *differences* in availability and/or choice *across* study areas. Hence, the overstatement problem (however large or small it may be) does not affect our regression results.

hand, as discussed further below, we hypothesize that the effect of CETC subsidies is felt over time. Thus, our data on CETC subsidies is the cumulative amount of support for 2003-2006.

The dependent variables used in our analysis are listed in Table 2. Descriptive statistics for these variables (as well as for our independent variables) are reported in Appendix A.

Table 2: Dependent Variables Employed in Empirical Analysis

LHS Variable	Description	Associated Hypothesis	Captures Non-Duplicative Coverage Exclusively?
Covered POPs Share	Share of population with coverage from one or more wireless carriers	I	Y
Covered Area Share	Share of area covered from one or more wireless carriers	I	Y
Coverage POPs Density Index	Cumulative number of POPs with coverage from all carriers providing service in the area[84]	II	N
Triple Carrier Index	Competitive index: share of population served by three or more carriers	II	N

The primary independent variable of interest to us is the amount of HCF subsidies received by CETCs in each ILEC study area. The FCC and the Universal Service Administrative Corporation (USAC) report the amount of subsidies paid to individual CETC study areas. (CETC study areas typically represent all ILEC study areas in each state for which the CETC is eligible to receive funds). They also report the number of lines each CETC serves in each ILEC study area, as well as the per line subsidies paid to the ILEC. We use this data to estimate this CETC support by

[84] The denominator of the coverage POPs index is simply the population of a study area. The numerator of the coverage POPs index is calculated as follows:

$$\sum_{n=1}^{N} n * P_n$$

Where n gives the number of carriers and P_n gives the number of people served by that number of carriers. Hence, populations with two carriers are given twice the weight of populations with one carrier, and so on. (Populations covered by zero carriers are given zero weight).

ILEC study area, based on the fact that CETCs receive the same amount of per-line support as ILECs. The data available allows us to estimate cumulative CETC funding at the ILEC study area level for the years 2003-2006, but not for earlier years. Fortunately, this time interval captures the crucial period over which CETC funding grew to become a significant fraction of the USF. The datasets used and procedures employed to arrive at our estimate of CETC subsidies at the level of the ILEC study area are described in Appendix B.

In our regression analyses, CETC subsidies are always measured relative to the denominator of the dependent variable. Thus, our CETC variable is calculated as subsidies divided by land area (in square miles) for regressions in which covered area share is the dependent variable, and as subsidies divided by total population in all other regressions.

In addition to CETC funding, our analysis employs several independent variables that allow us to control for various factors that may also affect wireless coverage. As shown in Table 3, we include variables thought to affect the demand for cellular telephone service, including measures of population density, age, and income; variables thought to affect costs, including a measure of topology (i.e., variations in elevation) and an interaction term between population density and topology; regulatory dummies (as discussed above) reflecting states in which wireless CETCs are subject to requirements to submit five year plans and annual reports; and, an additional dummy variable to allow for differences across study areas occupied by Regional Bell Operating Companies (RBOCs), and those that are not. Our independent variables are listed and described in Table 3.

Table 3: Independent Variables		
Variable Name	**Description**	**Category**
(CETC $)/(Population)	Cumulative CETC funding (dollars, 2003-2006) per person	Policy Variable of Interest
(CETC $)/(Area)	Cumulative CETC funding (dollars, 2003-2006) per square mile	Policy Variable of Interest
Pop Density (80%)	Population per square mile for land area capturing 80% of population	Demand & Cost Driver
Elevation	Standard deviation of elevation, captures effect of uneven topography on costs	Cost Driver
Interaction of Elevation and Pop Density (80%)	Interaction term indicating differential impact of density in areas with uneven topography	Interaction Term
Median Income	Median household income	Demographic variable
Median Age	Median age (in years)	Demographic variable
RBOC	Dummy variable equal to one if study area contains an RBOC, zero else	Dummy variable
State Regulatory Indicator	Dummy variable equal to one if study area located in a state whose PUC has adopted FCC-recommended reforms regarding annual reporting and five year plans, zero else	Policy Variable of Interest
FCC Regulatory Indicator	Dummy variable equal to one if study area located in a state in which the FCC is responsible for directly regulating CETCs, zero else	Policy Variable of Interest

B. Regression Specifications

We specify four sets of regressions, corresponding to the four coverage metrics given in Table 2: (a) covered POPs share; (b) covered area share; (c) covered POPs density index; and (d) the triple carrier index.

The regressions allow us to isolate the effect of CETC subsidies on our various coverage metrics, while holding constant other factors that may affect coverage. If the dependent variable is the covered POPs share or the covered area share, the estimated regression coefficients and standard errors allow us to test Hypothesis I. In these regressions, a finding that the coefficient on CETC funding is positive and significantly different from zero would lend support to wireless carriers' arguments that the subsidies increase overall wireless coverage. By the same token, if the coefficient on CETC funding is positive and significantly different from zero in the regressions

using the coverage POPs density index or the triple carrier index, this would provide support for the argument that the subsidies increase the number of wireless choices available to consumers in these areas.

The other primary variables of interest are the two regulatory variables. If the coefficients on these dummy variables were positive and significantly different from zero, it would lend support the proposition that regulators can provide effective regulatory incentives for CETCs to use subsidies to expand their networks in areas where they otherwise would not have done so.

C. Empirical Results

The results of our four regression analyses share several basic characteristics. In each case, our independent variables, taken together, explain a significant proportion of the variation in the dependent variable. Second, the coefficients on the individual independent variables generally have the hypothesized signs and are statistically significant. Third, neither the CETC funding variable nor the regulatory variables have the hypothesized effect on coverage or choice – that is, neither CETC subsidies nor the efforts of regulators to affect the ways those subsidies are spent have a positive effect on any of our measures of wireless availability or choice.

1. Population Coverage Regression

Table 4 displays the results of our regression analysis of the determinants of the proportion of the population that has wireless coverage from at least one carrier (the covered POPs share).

Table 4: Regression Output, Covered POPs Share Specification				
Variable Name	**Estimated Coefficient**	**T-Statistic**	**P > |t|**	**Statistically Significant?**
(CETC $)/(Population)	-0.00000663	-0.60	0.549	No
Pop Density (80%)	-0.00000783	-1.19	0.235	No
Elevation	-0.00031520	-10.74	0.000	Yes
Interaction of Elevation and Pop Density (80%)	0.00000006	3.05	0.002	Yes
Median Income	0.00000160	4.87	0.000	Yes
Median Age	-0.00165040	-1.72	0.086	Yes
RBOC	0.04478990	2.69	0.007	Yes
Regulatory Indicator	-0.01089260	-1.56	0.120	No
FCC Indicator	-0.00109980	-0.12	0.902	No
Constant	0.98818600	24.16	0.000	Yes
Number of Observations	1,372			
R-Squared	10.97%			
Prob > F	0.000			

The coefficients on our independent variables generally have the expected signs and most are statistically significant: Coverage is greater in areas that are flatter, have higher median income, and have younger populations. The negative effect of rough terrain on coverage is less pronounced when population density is high. Coverage is greater in areas where the incumbent carrier is an RBOC. The R-squared statistic indicates that this model explains approximately 11 percent of the variation in coverage across areas.[85]

With respect to the variables of primary interest, the estimated coefficient for CETC support per person is negative and not significantly different from zero, suggesting that CETC subsidies do not have an effect on the share of the population with wireless coverage in a study area. Similarly, the coefficients on both regulatory variables are negative and not statistically different from zero, providing no statistical evidence that requiring five-year plans, annual reports, or direct CETC

regulation by the FCC is an effective means of strengthening wireless carriers' incentives to invest their subsidies in increased coverage.

2. Area Coverage Regression

Table 5 displays the results of our regression analysis of the determinants of the proportion of total land area that has wireless coverage from at least one carrier (the covered area share).

Table 5: Regression Output, Covered Area Specification				
Variable Name	**Estimated Coefficient**	**T-Statistic**	**P > |t|**	**Statistically Significant?**
(CETC $)/(Area)	0.00000093	1.19	0.235	No
Pop Density (80%)	-0.00000575	-0.78	0.435	No
Elevation	-0.00068180	-20.61	0.000	Yes
Interaction of Elevation and Pop Density (80%)	0.00000010	4.19	0.000	Yes
Median Income	0.00000143	3.87	0.000	Yes
Median Age	-0.00037490	-0.35	0.723	No
RBOC	0.03732640	2.00	0.046	Yes
Regulatory Indicator	-0.01266350	-1.63	0.104	No
FCC Indicator	0.00826770	0.82	0.410	No
Constant	0.95015590	20.86	0.000	Yes
Number of Observations	1,373			
R-Squared	27.07%			
Prob > F	0.000			

Again, coefficients for the independent variables generally have the predicted sign and significance. Furthermore, the model explains over 27 percent of the variation across study areas. However, the estimated coefficient for CETC support per square mile, while positive, is not statistically significant, meaning that we cannot reject the null hypothesis that CETC support has no effect on coverage. As before, there is no statistical evidence that state adoption of FCC-recommended regulations, or FCC regulation of CETCs, have any effect on coverage.

[85] The R-squared statistic for this specification is smaller than in our other regressions, probably because there is relatively little variation in the dependent variable. Overall, 97% of the population in our study areas has coverage from at least one carrier, and 100% of the population has coverage in the vast majority of study areas.

3. Coverage Density Regression

Table 6 displays the results of our regression analysis of the determinants of the density of wireless coverage in an area, as measured by the Covered POPs Density Index.

Table 6: Regression Output, Coverage POPs Density Index Specification				
Variable Name	**Estimated Coefficient**	**T-Statistic**	**P > |t|**	**Statistically Significant?**
(CETC $)/(Population)	-0.00011760	-1.14	0.255	No
Pop Density (80%)	-0.00007350	-1.19	0.232	No
Elevation	-0.00359350	-13.11	0.000	Yes
Interaction of Elevation and Pop Density (80%)	0.00000050	2.64	0.008	Yes
Median Income	0.00004630	15.05	0.000	Yes
Median Age	-0.07760640	-8.65	0.000	Yes
RBOC	0.77704610	4.99	0.000	Yes
Regulatory Indicator	0.05924330	0.91	0.364	No
FCC Indicator	0.10389580	1.25	0.213	No
Constant	4.64059300	12.15	0.000	Yes
Number of Observations	1,372			
R-Squared	31.23%			
Prob > F	0.000			

The coefficients on the independent variables generally have the predicted sign, and most differ from zero at a statistically significant level. However, the estimated coefficient for CETC support per person is negative. A negative association between CETC support and the dependent variable is consistent with the notion that CETCs may be less prone, on average, to seek designation in study areas already occupied by multiple carriers. In any case, due to the low value of the T-statistic, we are obligated to accept the null hypothesis that CETC support has no effect on coverage density. Lastly, while the signs on the two regulatory variables are positive, they are not statistically significant. Thus, there is no statistical evidence that state adoption of FCC-recommended regulations, or FCC regulation of CETCs, has any influence on the density of wireless coverage.

4. Carrier Choice Regression

Table 7 displays the results of our regression analysis of the determinants of the extent to which consumers have a choice of wireless carriers, as measured by the proportion of the population with coverage from three or more carriers.

Table 7: Regression Output, Triple Carrier Index Specification

Variable Name	Estimated Coefficient	T-Statistic	P > |t|	Statistically Significant?
(CETC $)/(Population)	-0.00005960	-2.06	0.040	Yes
Pop Density (80%)	-0.00004370	-2.53	0.011	Yes
Elevation	-0.00088520	-11.51	0.000	Yes
Interaction of Elevation and Pop Density (80%)	0.00000021	3.95	0.000	Yes
Median Income	0.00001210	14.06	0.000	Yes
Median Age	-0.01816380	-7.21	0.000	Yes
RBOC	0.17674110	4.04	0.000	Yes
Regulatory Indicator	0.02363300	1.29	0.197	No
FCC Indicator	0.03284840	1.40	0.161	No
Constant	0.93796730	8.75	0.000	Yes
Number of Observations	1,372			
R-Squared	26.66%			
Prob > F	0.000			

As in previous regressions, the coefficients on the independent variables generally have the expected sign and significance. The coefficient on CETC support per person suggests that CETC support has a negative and statistically significant effect on the proportion of the population with three or more carriers. As noted previously, such an outcome is consistent with the idea that CETCs may be disinclined to seek designation in study areas already served by multiple carriers. In any case, this result obviously does not support the hypothesis that CETC support increases the number of choices available to consumers (Hypothesis II). As with all of the other regressions, the coefficients on the two regulatory variables are not statistically significant, providing no statistical evidence that state adoption of FCC-recommended regulations, or FCC regulation of CETCs, has any influence on the choices available to consumers.

V. CONCLUSIONS AND IMPLICATIONS

USF subsidies to wireless CETCs have grown rapidly in recent years a result of the rules under which the USF program operates, fueling an important policy debate on whether these subsidies effectively serve the purposes of the universal service program. A central issue in that debate is whether and to what extent USF subsidies lead to increased availability of wireless services, either by making them more affordable or by increasing the extent of wireless coverage or choice. The economic framework we present demonstrates that USF subsidies cannot affect relative prices of wireless service in rural areas, as wireless prices are set in national markets. Economic theory also suggests USF subsidies do not create strong incentives for wireless carriers to invest in rural areas, but theory alone cannot answer the question of whether there is nevertheless some effect. To resolve the issue, we develop and empirically test specific hypotheses regarding the relationship between USF subsidies and wireless availability and choice, and find no evidence of a positive relationship. This result holds with respect to both overall coverage (whether based on covered populations or covered land area), and with respect to measures of competition and choice.

Our findings suggest that USF subsidies to wireless carriers do not have the effects their proponents claim. Since the subsidies do not appear to result in significantly greater wireless coverage or choice, policymakers should reconsider whether and in what way they serve the interests of the universal service program, and consider adopting reforms that would either reduce the amount of the subsidies, increase their effectiveness, or both.

Appendix A

Summary Statistics for Regression Variables		
Variable Name	**Mean**	**Standard Deviation**
Covered POPs Share	0.97	0.13
Covered Area Share	0.94	0.16
Coverage POPs Density Index	3.46	1.35
Triple Carrier Index	0.72	0.37
(CETC $)/(Population)	127.42	306.25
(CETC $)/(Area)	2259.96	4801.42
Pop Density (80%)	203.41	755.27
Elevation	81.91	123.63
Interaction of Elevation and Pop Density (80%)	33731.96	235415.40
Median Income	45240.46	10312.51
Median Age	39.48	3.53
RBOC	0.06	0.23
Regulatory Indicator	0.53	0.50
FCC Indicator	0.18	0.38

Appendix B

1. Introduction

This appendix outlines the algorithm employed to allocate wireless CETC subsidies to ILEC study areas in our sample.

Our regression analysis employs several variables observed at the study area level. While subsidies to ILECs are reported by ILEC study area, subsidies to CETCs are reported by CETC study area. CETC study areas are typically state wide, meaning that a single CETC study area may include multiple ILEC study areas. Moreover, some CETC study areas may include only portions of ILEC study areas (e.g., if a wireless carrier is only licensed to serve a portion of an ILEC study area).

There is no publicly available information on USF High Cost Fund disbursement totals to CETCs by ILEC study area. However, the Universal Service Administrative Corporation (USAC) does release data on the number of lines served by both ILECs and CETCs at the ILEC study are level. In addition, the FCC's 2006 *Monitoring Report*[1] contains data on HCF disbursements to ILECs at the ILEC study area level. As explained below, we utilize this data to apportion CETC subsidies to ILEC study areas.

In principle, CETCs and ILECs receive the same level of support per line. Therefore, our approach is essentially to estimate CETC support payments by first calculating the level of ILEC support per line in a given study area, and then to multiply the result by the total number of CETC lines in a particular study area. Finally, we apply a carrier-specific 'true-up' procedure that permits our funding estimates to sum to independently obtained carrier totals.

USAC releases separate line count data for four subcategories of the HCF: HCLS, HCMS, IAS, and ICLS. In addition to these four programs, CETCs are also potentially eligible to receive support from three additional subcategories: SNAS, SVS, and LSS.[2] As shown below, these three funding categories comprise roughly 15% of all CETC subsidies.[3]

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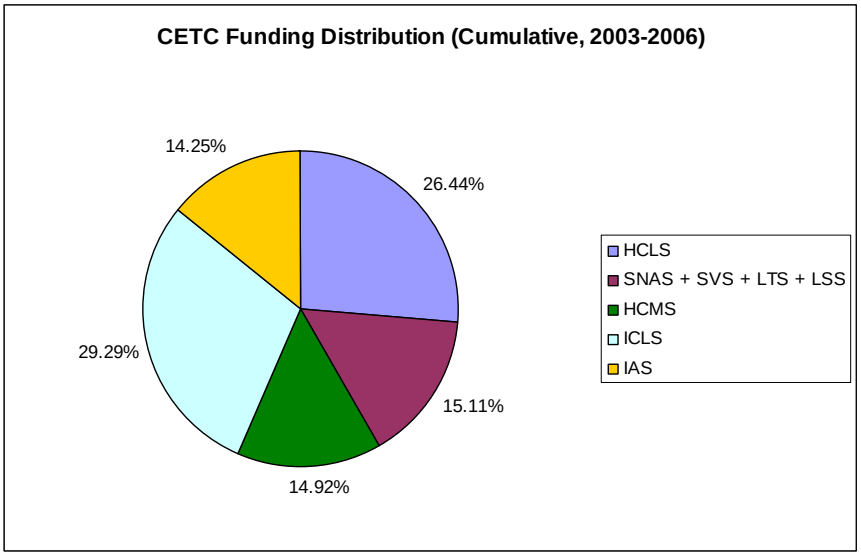
[1] Federal Communications Commission *Universal Service Monitoring Report,* CC Docket No. 98-202 (2006) (hereafter "*Monitoring Report*").

[2] In the past, LTS (or "Long-Term Support") comprised an additional funding subcategory that was subsequently phased out of the USF.

[3] Because USAC does not provide line count data for these three subcategories, our algorithm instead uses USAC-reported HCLS lines as a proxy. (See Part 3 for additional detail).

Figure B-1



Line counts are released on a quarterly basis for both ILECs and CETCs.[4] Our estimation algorithm employs line count data for 2003 – 2006. In keeping with the *Monitoring Report*, we use Q4 USAC line count data for each year to estimate annual line counts.[5] The USAC line count data contains variables indicating whether or not a CETC is classified as "Eligible," and whether or not it is classified an "ETC."[6] If a CETC fails to meet either of these criteria, our algorithm excludes it from the estimation process. The algorithm therefore assumes that such carriers have not yet begun to receive funding, although they may become eligible in future years.

2. Data Sample

Figure B-2 below is an excerpt from USAC's Q4 2006 HCLS line count file, sorted by CETC study area. It is readily apparent that RCC Minnesota and US Cellular operate in multiple ILEC study areas in the state of Maine, and that the number of HCLS lines that each CETC has tends to vary significantly across ILEC study areas. For example, in the Oxford West study area, RCC Minnesota has 413 HCLS lines, and US Cellular has 844. In the Lincolnville study area, RCC Minnesota reports 1353 HCLS lines, and US Cellular reports 1461. (Note also that RCC Minnesota and US Cellular are both classified as "ETC" and "Eligible" in each of these ILEC study areas).

[4] The USAC line count data can be found in four files, each of which is reported quarterly: (1) CETC Reported Lines by Incumbent Study Area - High Cost Loop Support (2) CETC Reported Lines by Incumbent Study Area - Interstate Common Line Support (3) CETC Reported Lines by Incumbent Study Area - Interstate Access Support (4) CETC Reported Lines by Incumbent Study Area - High Cost Model Support. Quarterly filings for 2003 – 2006 are available at USAC's website:
http://www.universalservice.org/about/governance/fcc-filings/

[5] The *Monitoring Report* relies on Q4 USAC line count data to estimate monthly support payments per loop for 2005. (See *Monitoring Report* at Table 3.16, and at note 41).

[6] In the context of the USAC data, classifying a carrier as an "ETC" signifies that the carrier has been designated an eligible telecommunications carrier and, contingent on meeting reporting requirements, may receive USF subsidies. Carriers classified as "Eligible" have complied with the administrative filing procedures necessary to receive funds.

Figure B-2

ST	ILEC SAC	ILEC Study Area Name	ILEC Reported Lines	Rural	SNA	CETC SAC	CETC Study Area Name	ETC	Eligible	CETC Reported Lines
ME	100002	OXFORD WEST TEL. CO.	7103	R	N	109001	RCC MINNESOTA, INC.	Y	Y	413
ME	100003	LINCOLNVILLE TEL. CO.	14697	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1353
ME	100004	CHINA TEL. CO.	3587	R	Y	109001	RCC MINNESOTA, INC.	Y	Y	588
ME	100005	COBBOSSEECONTEE TEL. CO.	927	R	N	109001	RCC MINNESOTA, INC.	Y	Y	101
ME	100007	ISLAND TEL. CO.	715	R	N	109001	RCC MINNESOTA, INC.	Y	Y	25
ME	100010	HAMPDEN TEL. CO.	3572	R	N	109001	RCC MINNESOTA, INC.	Y	Y	2691
ME	100011	HARTLAND & ST. ALBANS TEL. CO.	4063	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1061
ME	100015	COMMUNITY SERVICE TEL. CO.	11839	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1104
ME	100019	OXFORD COUNTY TEL. & TELE. CO.	6528	R	N	109001	RCC MINNESOTA, INC.	Y	Y	359
ME	100020	PINE TREE TEL. & TELE. CO.	7011	R	N	109001	RCC MINNESOTA, INC.	Y	Y	130
ME	100022	SACO RIVER TEL. & TELE. CO.	9691	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1344
ME	100024	SOMERSET TEL. CO.	12658	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1958
ME	100025	STANDISH TEL. CO.	20808	R	N	109001	RCC MINNESOTA, INC.	Y	Y	455
ME	100027	UNION RIVER TEL. CO.	1469	R	N	109001	RCC MINNESOTA, INC.	Y	Y	2
ME	100029	UNITY TEL. CO., INC.	5001	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1278
ME	100031	WARREN TEL. CO.	2032	R	N	109001	RCC MINNESOTA, INC.	Y	Y	337
ME	100034	WEST PENOBSCOT TEL. & TEL. CO.	2705	R	Y	109001	RCC MINNESOTA, INC.	Y	Y	866
ME	103313	NORTHLAND TEL. CO. OF MAINE	24654	R	N	109001	RCC MINNESOTA, INC.	Y	Y	4790
ME	103315	MID MAINE TELECOM, INC.	6382	R	N	109001	RCC MINNESOTA, INC.	Y	Y	2665
ME	100002	OXFORD WEST TEL. CO.	7103	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	844
ME	100003	LINCOLNVILLE TEL. CO.	14697	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	1461
ME	100004	CHINA TEL. CO.	3587	R	Y	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	537
ME	100005	COBBOSSEECONTEE TEL. CO.	927	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	132
ME	100007	ISLAND TEL. CO.	715	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	N	67
ME	100010	HAMPDEN TEL. CO.	3572	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	1204
ME	100011	HARTLAND & ST. ALBANS TEL. CO.	4063	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	234
ME	100015	COMMUNITY SERVICE TEL. CO.	11839	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	3129
ME	100019	OXFORD COUNTY TEL. & TELE. CO.	6528	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	1194
ME	100020	PINE TREE TEL. & TELE. CO.	7011	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	184
ME	100022	SACO RIVER TEL. & TELE. CO.	9691	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	13
ME	100024	SOMERSET TEL. CO.	12658	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	1201
ME	100025	STANDISH TEL. CO.	20808	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	342
ME	100027	UNION RIVER TEL. CO.	1469	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	87
ME	100029	UNITY TEL. CO., INC.	5001	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	399
ME	100031	WARREN TEL. CO.	2032	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	340
ME	100034	WEST PENOBSCOT TEL. & TEL. CO.	2705	R	Y	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	267
ME	103313	NORTHLAND TEL. CO. OF MAINE	24654	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	2385
ME	103315	MID MAINE TELECOM, INC.	6382	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	724

This data sample indicates that multiple CETCs may operate in the same ILEC study area. This can be seen readily if we sort the same file by ILEC study area, as in Figure B-3 below. Clearly, many study areas in Maine have multiple CETCs. This example is representative of the dataset: It is generally the case that there are multiple ILEC study areas associated with a given CETC, and it is frequently the case that there are multiple CETCs associated with a single ILEC.

Figure B-3

ST	ILEC SAC	ILEC Study Area Name	ILEC Reported Lines	Rural	SNA	CETC SAC	CETC Study Area Name	ETC	Eligible	CETC Reported Lines
ME	100002	OXFORD WEST TEL. CO.	7103	R	N	109001	RCC MINNESOTA, INC.	Y	Y	413
ME	100002	OXFORD WEST TEL. CO.	7103	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	844
ME	100003	LINCOLNVILLE TEL. CO.	14697	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1353
ME	100003	LINCOLNVILLE TEL. CO.	14697	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	1461
ME	100004	CHINA TEL. CO.	3587	R	Y	109001	RCC MINNESOTA, INC.	Y	Y	588
ME	100004	CHINA TEL. CO.	3587	R	Y	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	537
ME	100005	COBBOSSEECONTEE TEL. CO.	927	R	N	109001	RCC MINNESOTA, INC.	Y	Y	101
ME	100005	COBBOSSEECONTEE TEL. CO.	927	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	132
ME	100007	ISLAND TEL. CO.	715	R	N	109001	RCC MINNESOTA, INC.	Y	Y	25
ME	100007	ISLAND TEL. CO.	715	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	N	67
ME	100010	HAMPDEN TEL. CO.	3572	R	N	109001	RCC MINNESOTA, INC.	Y	Y	2691
ME	100010	HAMPDEN TEL. CO.	3572	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	1204
ME	100011	HARTLAND & ST. ALBANS TEL. CO.	4063	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1061
ME	100011	HARTLAND & ST. ALBANS TEL. CO.	4063	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	234
ME	100015	COMMUNITY SERVICE TEL. CO.	11839	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1104
ME	100015	COMMUNITY SERVICE TEL. CO.	11839	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	3129
ME	100019	OXFORD COUNTY TEL. & TELE. CO.	6528	R	N	109001	RCC MINNESOTA, INC.	Y	Y	359
ME	100019	OXFORD COUNTY TEL. & TELE. CO.	6528	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	1194
ME	100020	PINE TREE TEL. & TELE. CO.	7011	R	N	109001	RCC MINNESOTA, INC.	Y	Y	130
ME	100020	PINE TREE TEL. & TELE. CO.	7011	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	184
ME	100022	SACO RIVER TEL. & TELE. CO.	9691	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1344
ME	100022	SACO RIVER TEL. & TELE. CO.	9691	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	13
ME	100024	SOMERSET TEL. CO.	12658	R	N	109001	RCC MINNESOTA, INC.	Y	Y	1958
ME	100024	SOMERSET TEL. CO.	12658	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	1201
ME	100025	STANDISH TEL. CO.	20808	R	N	109001	RCC MINNESOTA, INC.	Y	Y	455
ME	100025	STANDISH TEL. CO.	20808	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	342
ME	100027	UNION RIVER TEL. CO.	1469	R	N	109001	RCC MINNESOTA, INC.	Y	Y	2
ME	100027	UNION RIVER TEL. CO.	1469	R	N	109002	UNITED STATES CELLULAR CORPORATION	Y	Y	87

3. CETC Funding Estimation Algorithm: An Example

The procedure for estimating CETC funding is best illustrated by example. Here we select a particular ILEC study area (South Central Bell-Louisiana) and work through the step by step calculations undertaken to arrive at a 2006 CETC funding estimate. Because USAC releases separate data files for HCLS, HCMS, IAS, and ICLS, we search the Q4 2006 versions of each of these four

USAC files for the study area code of South Central Bell-Louisiana (275183). The search reveals that the ILEC has entries in the HCMS and IAS files, but not in the HCLS or ICLS files. This is as expected, as South Central Bell – a BellSouth/AT&T subsidiary – is classified as an RBOC (and hence eligible for HCMS rather than HCLS), and is also a price-cap carrier (and hence eligible for IAS rather than ICLS). Since CETCs receive support based on the support received by the ILEC, any CETCs operating in this study area are potentially eligible only for IAS and HCMS subsidies.

According to USAC's Q4 2006 IAS line data, South Central Bell-Louisiana has five CETCs associated with it that are potential recipients of IAS support, as seen in Figure B-4. Out of these five, four have a "Y" in both the "ETC" and the "Eligible" columns. The remaining CETC (NPCR, Inc.) is excluded, because the USAC data indicates that this particular CETC has yet to comply with the necessary filing procedures.

Figure B-4

State	ILEC SAC	ILEC Study Area Name	Residential Reported Lines	Multi-Line Reported Lines	CETC SAC	CETC Study Area Name	Rural	ETC	Eligible	Residential Reported Lines	Multi-Line Reported Lines
LA	275183	SOUTH CENTRAL BELL-LA	1141481	470678	279006	NPCR, INC.	N	Y	N	25098	19012
LA	275183	SOUTH CENTRAL BELL-LA	1141481	470678	279008	SPRINT SPECTRUM, LP	N	Y	Y	323464	13815
LA	275183	SOUTH CENTRAL BELL-LA	1141481	470678	279009	ALLTEL COMMUNICATIONS, INC.	N	Y	Y	235022	0
LA	275183	SOUTH CENTRAL BELL-LA	1141481	470678	279010	NEW CINGULAR WIRELESS PCS, LLC	N	Y	Y	108592	23325
LA	275183	SOUTH CENTRAL BELL-LA	1141481	470678	279012	KAPLAN TELEPHONE CO. DBA PACE CO	N	Y	Y	5194	0

According to USAC's Q4 2006 HCMS line data, South Central Bell-Louisiana also has three CETC entries associated with it that are potential recipients of HCMS support, as seen in Figure B-5.[7] Out of these three, two have a "Y" in both the "ETC" and the "Eligible" columns. The remaining entry is excluded from the procedure.

Figure B-5

State	CETC SAC	CETC Study Area Name	Rural	ETC	Eligible	CETC Reported Lines	ILEC SAC	ILEC Study Area Name	ILEC Reported Lines
LA	279010	NEW CINGULAR WIRELESS PCS, LLC	N	Y	N	1,659	275183	SOUTH CENTRAL BELL-LA	1,938,774
LA	279010	NEW CINGULAR WIRELESS PCS, LLC	N	Y	Y	115,445	275183	SOUTH CENTRAL BELL-LA	1,938,774
LA	279012	KAPLAN TELEPHONE CO. DBA PACE COMMUNICATIONS	N	Y	Y	5,170	275183	SOUTH CENTRAL BELL-LA	1,938,774

The next step is to calculate the per-line support that the ILEC receives for HCMS and IAS. The *Monitoring Report* indicates 2006 funding levels for both HCMS and IAS, as shown in Figures B-6 and B-7. Note that, because the forward looking statewide average cost per line did not exceed two standard deviations above the national average, HCMS carriers in Louisiana were not eligible for HCMS payments in 2006, and South Central Bell-Louisiana thus received no HCMS subsidies.

Figure B-6

Table 3.25
High-Cost Model Support Payments by Study Area
(Dollars)

ID Code	Study Area Name	2006 Total
275183	SOUTH CENTRAL BELL-LA	0

[7] Note that the first entry is really a duplicate entry for New Cingular Wireless, reflecting HCMS lines that have yet to be deemed eligible.

Figure B-7

Table 3.28 Interstate Access Support Payments by Study Area (Dollars)		
ID Code	**Study Area Name**	**2006 Total**
275183	SOUTH CENTRAL BELL-LA	9,162,825

Figure B-7 shows that the ILEC received over $9 million in IAS subsidies, and Figure B-4 shows that it reported 1,141,481 residential IAS loops (column 4), and 470,678 multi-line IAS loops (column 5), for a total of 1,612,159 IAS loops.[8] Hence, our algorithm estimates that the ILEC received $9,162,825/1,612,159 = $5.68 per line in IAS support. This is the ratio that is used to estimate IAS payments received by CETCs.

Because Louisiana was not eligible for HCMS funding, support per line for this category is obviously zero for both ILECs and CETCs. However, had the ILEC received HCMS subsidies, we would have followed the same procedure, dividing the amount of HCMS subsidies by the total number of HCMS-supported lines (in this case, 1,938,774, as shown in Figure B-5) to calculate the average HCMS support per line.

The next step is to estimate total support payments to each CETC in the study area. The calculations for each of the CETCs are shown below:

Figure B-8

CETC SAC	CETC Study Area Name	Residential Reported IAS Lines	Multi-Line Reported IAS Lines	Total IAS Lines	ILEC's Per-Line IAS Support	Estimated CETC IAS Support
279008	SPRINT SPECTRUM, LP	323464	13815	337,279	$ 5.68	$ 1,916,950
279009	ALLTEL COMMUNICATIONS, INC.	235022	0	235,022	$ 5.68	$ 1,335,765
279010	NEW CINGULAR WIRELESS PCS, LLC	108592	23325	131,917	$ 5.68	$ 749,760
279012	KAPLAN TELEPHONE CO. DBA PACE CO	5194	0	5,194	$ 5.68	$ 29,520

Support estimates are derived by applying the ILEC support per line to the CETCs' total line count. For example, total CETC support for Sprint is simply 337,279*$5.68 = $1,916,950, and so on. Again, had the ILEC received HCMS support, we would have performed the same calculation, multiplying ILEC support per line by the number of reported CETC lines to arrive at estimated HCMS support for each CETC in this study area.[9]

[8] IAS is the only funding category for which USAC reports separate line counts for residential loops and multi-line loops. However, the *Monitoring Report,* our source for ILEC funding data, does not make this distinction. Hence, data availability dictates that we are unable to calculate per-line support separately for each type of loop. Instead, we are obliged to impose the simplifying assumption that the mix of loop types is the same across ILECs and CETCs. This introduces a degree of measurement error, to the extent that (1) CETCs and ILECs have different mixes of line types (2) Per-line IAS support differs across loop types.

[9] In the case of SNAS, SVS, and LSS funding, a slightly different procedure would be used. As noted in the Introduction, USAC does not provide line count data for SNAS, SVS, or LSS. Therefore, in the case of these funding subcategories, HCLS lines are used as a proxy for the true line count. (Subsidy payments for SNAS, SVS, and LSS are targeted to rural ILECs, as is HCLS). Support per line for these three subcategories is calculated as the sum of SNAS, SVS, and LSS funding received by the ILEC, divided by the number of HCLS lines reported by the ILEC. CETC support is then calculated by multiplying this ratio by the number of HCLS lines reported by the CETC in question. However, in the context of the current example, South Central Bell-Louisiana does not receive funding from any of these three subcategories, so this procedure is not relevant to this particular study area.

Because our regression analysis is concerned only with USF support of wireless CETCs, we also need to distinguish between subsidies to wireless and wireline CETCs. Fortunately, Table 3.28 in the *Monitoring Report* categorizes each CETC on this basis. It shows, for example, that Kaplan Telephone is a "WLINE" (wireline) carrier, as shown in Figure B-9, which we therefore exclude from the remainder of the calculations below.[10]

Figure B-9

Table 3.28 Interstate Access Support Payments by Study Area (Dollars)		
ID Code	**Study Area Name**	**Provider Type**
279012	KAPLAN TELEPHONE CO. DBA PACE COMMUNICATIONS	WLINE

All that remains is to apply a carrier-specific "true-up" multiple to each of our estimates. Data from the *Monitoring Report* allows us to estimate funding totals for each of the major carriers.[11] To make our disaggregated, study-area-level estimates consistent with these totals, the support estimates for each carrier are multiplied by an adjustment factor such that our total predicted support for a carrier will sum to the actual level of support received by that carrier. For example, summing across all Alltel study areas, our total 2006 predicted funding for Alltel comes to $238,239,552. However, the *Monitoring Report* indicates that Alltel's actual support for 2006 came to $225,994,176. Therefore, the true-up requires that we decrease our 2006 Alltel estimates for each study area by approximately 5 percent (225,994,176/238,239,552 = 0.95). Figure B-10 shows the carrier-specific adjustment as applied to our example, and the implied total CETC funding for the South Central Bell-Louisiana study area.

Figure B-10

CETC Study Area Name	Residential Reported Lines	Multi-Line Reported Lines	Total IAS Lines	ILEC Per-Line Support	Estimated CETC Support (Before True-Up)	Carrier-Specific True-Up Factor	Predicted CETC Support (After True-Up)
SPRINT SPECTRUM, LP	323,464	13,815	337,279	5.68	$ 1,915,745	0.76	$ 1,455,966
ALLTEL COMMUNICATIONS, INC.	235,022	-	235,022	5.68	$ 1,334,925	0.95	$ 1,268,179
NEW CINGULAR WIRELESS PCS, LLC	108,592	23,325	131,917	5.68	$ 749,289	0.7	$ 524,502
TOTAL PREDICTED CETC FUNDING FOR SOUTH CENTRAL BELL-LOUISIANA							$ 3,248,647

Thus, our estimate of total CETC funding for the South Central Bell-Louisiana study area in 2006 is approximately $3.2 million.

We followed this same procedure for each ILEC study area to arrive at the estimates of CETC funding per ILEC study area employed in the regression analysis.

[10] Obviously, it is straightforward to also calculate total CETC funding per study area, simply by not excluding the wireline carriers.

[11] We employ a name-based search algorithm to identify specific carriers in the database. Our algorithm designates any CETC with a name including "ALLTEL", "WESTERN WIRELESS," or "MIDWEST WIRELESS" as Alltel; any CETC with a name including "SPRINT" or "NPCR" as Sprint; any CETC with a name including "AT&T" or "CINGULAR" as AT&T; any CETC with a name including "RCC" as RCC; any CETC with a name including "UNITED STATES CELLULAR" as US Cellular; any CETC with a name including "DOBSON", "AMERICAN CELLULAR", or "HIGHLAND" as Dobson; and any CETC with a name including "CENTENNIAL", "MICHIANA", or "ELKHART," as Centennial. All other CETCs are allocated to a category labeled "Remainder."

4. Measurement Error & Robustness

As noted in Part 3, our true-up procedure is made necessary by the fact that our predicted CETC funding levels by study area may not sum exactly to the actual level for each carrier. The extent to which the true-up ratio differs from one reflects a discrepancy between actual and predicted funding levels, and can be thought of as measurement error in our CETC funding estimate. To get a sense of the overall scale of measurement error in our database, we compute the average true-up ratio for our CETC funding predictions – defined as the ratio of actual cumulative CETC funding for 2003-2006 to predicted cumulative CETC funding over the same time interval – and obtain a value of 1.05. Thus on average, actual CETC funding exceeds predicted funding by about 5 percent. Given the robustness of our regression results, a randomly distributed error of 5% in the CETC funding variable is extremely unlikely to affect our ultimate conclusions.

There are several possible sources of measurement error in our CETC subsidy estimation algorithm. First, due to the fact that HCLS lines may not match up perfectly with SNAS, SVS, and LSS lines, using HCLS lines as a proxy to predict SNAS, SVS, and LSS funding could potentially be a source of error. Second, as noted previously, the fact that we are unable to distinguish between residential funding per loop and multi-line funding per loop generates some measurement error when estimating IAS funding received by CETCs. In addition, due to possible timing discrepancies between the FCC and USAC, it is conceivable that a carrier listed by USAC as not "Eligible" or not an "ETC" (and thus having zero eligible lines) may actually have already begun to receive funding. Finally, some CETCs serve only a portion of the wire centers in a given study area, which generates measurement error to the extent that per-line support varies across wire centers within a given study area.