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Washington, DC 20554

NOTICE OF EX PARTE COMMUNICATION

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To Whom It May Concern:

On November 14, 2005, I met with staff of the Wireless Competition Bureau's Industry Analysis and Technology Division to discuss questions the staff had about the calculation of cost figures cited in the Mercatus Center's comment on Performance Measures for Universal Service Programs in this docket. In response to issues discussed at the meeting, I have prepared the attached Technical Appendix, which re-calculates some of the cost figures using more recent data and performs sensitivity analysis using different assumptions about elasticities of demand.

Using 2004 data, expenditures on universal service programs total $5.4 billion. Deadweight losses associated with contributions from long-distance and wireless total $2.14 billion. Thus the total cost of universal service programs is at least $7.54 billion. Even assuming that the elasticities of demand for long-distance and wireless are toward the lower range of estimates in the scholarly literature, the total deadweight loss is still $956 million, yielding a total cost of $6.36 billion. Clearly, the deadweight loss is too large to ignore when evaluating the cost and efficiency of universal service programs.

Sincerely,

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Technical Appendix: Calculating Costs of Universal Service Funding Mechanisms

Jerry Ellig

Federal universal service funds come from percentage assessments against telecommunications carriers' interstate and international revenues. Because firms' revenues often vary with the amount of service customers choose to buy, universal service contributions act like a usage-based tax. When applied to price-sensitive services such as long-distance and wireless, this tax leads to substantial reductions in usage and output. Consumers are worse off because they use less of the service, and telecommunications firms are worse off because they sell less of the service. (Economists call this reduction in consumer and producer welfare the "excess burden" or "deadweight loss" associated with the tax.)

The Mercatus Center's comment on universal service performance measures cites three types of cost figures for universal service programs: contributions, deadweight losses, and the total of the two. The figures cited in the comment were calculated in *Costs and Consequences of Federal Telecommunications and Broadband Regulation*, a Mercatus Center working paper.[1] This Appendix explains the calculations, updates them to reflect new data, and performs some sensitivity analysis for different elasticity of demand assumptions.[2] Calculations and data sources can be found in the spreadsheet accompanying this Appendix.

The Simple Analytics

For each service that makes universal service contributions, the size of the contribution is equal to the price change times the number of units of output sold under regulation, or $\Delta p \cdot Q_1$. The deadweight loss consists of two parts: forgone consumer surplus and forgone producer surplus.

When universal service contributions raise the price of a service, consumers use less of the service, and they are worse off as a result. The value that consumers forgo, minus the price they would have paid, is the forgone consumer surplus. The change in consumer surplus is approximately equal to one-half of the change in price attributable to universal service contributions times the change in quantity induced by the price change, or $.5 \cdot \Delta p \cdot \Delta q$.

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[1] Jerry Ellig, *Costs and Consequences of Federal Telecommunications and Broadband Regulation* (Feb. 2005), *available at* http://www.mercatus.org/article.php/1074.html.

[2] Calculation methods are based on those in Jerry Hausman and Howard Shelanski, "Economic Welfare and Telecommunications Regulation: The E-Rate Policy for Universal-Service Subsidies," *Yale Journal on Regulation* 16 (Winter 1999): 36-37; Jerry Hausman, "Taxation Through Telecommunications Regulation," *Tax Policy and the Economy* 12 (1998): 31.

When inflated prices prompt consumers to use less of a service, producers sell less of it. The operating profits they lose on the sales they do not make is called forgone producer surplus. Forgone producer surplus is approximately equal to the change in quantity induced by the price increase times the difference between the price that would exist in the absence of universal service contributions minus the marginal cost, or $\Delta q \cdot (p_2 - m)$.

The total deadweight loss is thus equal to $.5 \cdot \Delta p \cdot \Delta q + \Delta q \cdot (p_2 - m)$. The total cost is just the sum of universal service contributions plus deadweight losses for each service that makes contributions.

The trickiest aspect of these calculations, aside from actually getting the relevant data, is ascertaining how much of a change in quantity occurs as a result of a regulation-induced price change. The change in quantity can be calculated from the change in price with the aid of an estimate of the price elasticity of demand. The price elasticity of demand measures how responsive quantity is to price. It is equal to the percentage change in quantity divided by the percentage change in price. The elasticity of demand is defined as $(\Delta q/q)/(\Delta p/p)$. If one has an estimate of the elasticity and also the values of p, Δp, and q, then one can solve for Δq.

All of the cost estimates cited in the Mercatus comment are derived from these simple mathematical relationships. Data or estimates of p, q, Δp, and elasticities of demand are available from published studies or FCC reports.

One additional factor complicates the calculations. Because the *Costs and Consequences* study sought to estimate the costs of all major telecommunications regulations, it first calculates the deadweight loss associated with all regulations affecting long-distance and wireless, then allocates that deadweight loss among the various regulations in proportion to their share of the total price change for each service. Thus, for long-distance, the study estimates the combined effects of access charges and universal service contributions on prices, quantity, and deadweight losses, then allocates the deadweight loss to access charges and universal service in proportion to their shares of the price change. Similarly, for wireless, the study estimates the combined effects of universal service contributions, local number portability, enhanced 911, number pooling, and Communications Assistance to Law Enforcement, then allocates the deadweight loss among these various regulations in proportion to their shares of the price change.

Long-Distance

	U. Service Contribution	Deadweight Loss	Total
Baseline	$2.7 billion	$1.16 billion	$3.86 billion
LD elasticity = -	$2.7 billion	$581 million	$3.28 billion

.35			

In the *Costs and Consequences* working paper, the deadweight loss associated with universal service contributions from long-distance service is approximately $1.16 billion. This assumes that the elasticity of demand for long-distance service is equal to -0.7, a consensus value widely reported in scholarly literature.[3]

In recent years, however, the elasticity of demand for long-distance may have fallen as the price of long-distance has fallen. For some consumers, the incremental price of long-distance has fallen to zero as a result of "all distance" service packages that charge no additional price for long-distance minutes. If the elasticity of demand has fallen by half, then the deadweight loss would fall to $581 million, for a total cost of $3.28 billion.

Wireless

The wireless deadweight loss estimates cited in the Mercatus comment are also from the Mercatus Center's *Costs and Consequences* working paper. The calculations were based on a combination of 2003 and 2004 data. After discussion with FCC staff regarding assumptions and data sources, I have recalculated a revised baseline that reflects the most recent data available from 2004.

The total universal service expenditure funded by contributions from wireless increases from $1.4 billion in 2003 to $1.76 billion in 2004. This occurs because wireless accounted for 32.6 percent of universal service contributions in 2004, up from 24.8 percent in 2003.[4] The deadweight loss in the revised baseline is approximately $100 million higher than the $873 million figure cited in the comment. At $978 million, it is equal to 56 percent of the contribution from wireless service.

Universal service charges will affect the quantity sold differently, depending on whether they take the form of a per subscriber charge or a per-minute charge. This is because the measured elasticity of demand for wireless subscription is lower than the measured elasticity of demand for wireless minutes. Since universal service charges are assessed as a percentage of revenues, they arguably take the form of a per-minute charge. The baseline calculation assumes that all universal service contributions and other regulatory costs vary with the number of minutes.

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[3] For calculation methods and references, see Jerry Ellig, *Costs and Consequences of Federal Telecommunications and Broadband Regulation* (Feb. 2005), pp. 9-10, *available at* http://www.mercatus.org/article.php/1074.html. Data sources and calculations are also available in the spreadsheet accompanying this Appendix, titled "Universal Service DWL."

[4] FCC, *Trends in Telephone* Service (2005), tbl. 19.17.

Many of the regulatory costs, however, likely vary with the number of subscribers rather than the number of minutes. Moreover, many consumers might even perceive the universal service charge as a fixed monthly charge, since most buy a fixed number of minutes each month as a result of "bucket" pricing plans. Therefore, it is appropriate to perform sensitivity analysis using a variety of elasticity assumptions.

Most economic studies that estimate the demand for wireless using the number of subscribers per hundred or the probability of subscription as the dependant variable yield elasticities of between -.43 and -.71.[5] That is, a 1 percent increase in the monthly subscription price reduces the number of subscribers by between four-tenths and seven-tenths of 1 percent. Interestingly, the elasticities of demand for wireless subscription are in the same range as elasticities of demand for second wireline phone lines in the U.S., which range between -.35 and -.59.[6] Intuitively, this similarity makes sense, since a wireless phone can substitute for a second phone line.

Studies that estimate demand employing minutes of use as the dependent variable yield much higher elasticities, between -1.12 and -1.29 using domestic U.S. data and between -1.71 and
-3.62 using international data.[7]

The Mercatus working paper and the baseline calculation in the table assume an elasticity of -1.12, consistent with the assumption that consumers perceive universal service charges as per minute charges. Two alternative calculations employ elasticities of -.71 and -.43, the range of estimated elasticities for wireless access rather than wireless minutes. Even at the lowest elasticity, the deadweight loss still totals $375 million—equal to more than 20 percent of the expenditures accounted for by contributions from wireless service.

	U. Service Contribution	Deadweight Loss	Total

[5] *See* Jerry Hausman, "Cellular Telephone, New Products, and the CPI", *Journal of Business & Economic Statistics* 17(1999) (estimating a demand elasticity of approximately -0.5 with 1988-1993 data); Jerry Hausman, "Efficiency Effects on the U.S. Economy from Wireless Taxation," *National Tax* Journal 53 (2000) (estimating a demand elasticity of -0.71); Mark Rodini et al., "Going Mobile: Substitutability Between Fixed and Mobile Access," Center For Research on Telecommunications Policy Working Paper Crtp-58 (Dec. 2002) (estimating an elasticity of -.43 with respect ot the monthly access charge and an overall price elasticity of demand of -0.6 with 2000-2001 data), *available at* http://ssrn.com/abstract=379661; Christopher Garbacz & Herbert G. Thompson, Jr., "Universal Telecommunication Services: A World Perspective," *Information Economics and Policy* (2005) (estimating an elasticity of -0.45).

[6] James Eisner & Tracy Waldon, "The Demand for Bandwidth: Second Telephone Lines and On-line Services," *Information Economics and Policy* 13 (2001): 308; Kevin T. Duffy-Deno, "Demand for Additional Telephone Lines: An Empirical Note," *Information Economics and* Policy 13 (2001): 295.

[7] For references, see Ellig, *Costs and Consequences,* fn. 44 and 45.

Figures in Mercatus Comment	$1.4 billion	$873 million	$2.27 billion
Revised Baseline	$1.76 billion	$978 million	$2.7 billion
Elasticity = -.71	$1.76 billion	$620 million	$2.4 billion
Elasticity = -.43	$1.76 billion	$375 million	$2.1 billion

Totals

Universal service subsidies are funded by contributions from long-distance, wireless, international, and the interstate portion of local telephone bills. For this reason, the sum of the "expenditure" figures for long-distance and wireless is less than the $5.4 billion total universal service subsidies in 2004. The Mercatus Center's *Costs and Consequences* study calculated deadweight losses only for long-distance and wireless; I know of no studies that calculate deadweight losses for international and interstate local. The deadweight loss for interstate local is likely quit small, since the demand for local wireline service is not very sensitive to price.

Based on the available figures, the total cost of universal service subsidies is equal to the total expenditure plus the deadweight losses associated with universal service contributions from long-distance and wireless. The baseline figure is thus

$5.4 billion (contributions)
+ $1.16 billion (LD)
+ $978 million (wireless)

= $7.54 billion.
Differing elasticity assumptions will, of course, alter these figures. Employing the lowest elasticity of demand figures used in the sensitivity analysis yields a total of

$5.4 billion (contributions)
+ $581 million (LD)
+ $375 million (wireless)

= $6.36 billion.

Even assuming relatively low elasticities, the total cost of universal service, including deadweight losses, is approximately $1 billion more than the expenditures. Clearly, deadweight loss is a significant cost that should not be ignored when considering the cost and efficiency of universal service programs.

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