understate average per customer local service revenues to LECs, excluding toll calls.

Second, there is some evidence that residential prices are typically lower in rural areas than in urban areas. A Commission publication states that large multi-exchange carriers tend to have lower residential rates in their small exchanges, and their rural exchanges tend to be small.[15] A 1990 Wisconsin study found that exchanges in the smallest size category (<2000 stations) averaged $9.14 for local residential service, while those in the largest size category (>25,000 stations) averaged $14.01.[16] However, there is also some evidence that low residential service prices tend to be associated with small local calling areas. Thus customers with low flat-rate charges for local service may spend more on local toll calls, resulting in comparable total local telephone bills in rural and urban areas.[17]

Third, grouping local service costs into six categories undoubtedly obscures

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[15] Reference Book, p. 32. On the other hand, residential rates charged by small single-exchange carriers may exceed the national average.

[16] Reference Book, p. 34. The quoted rates exclude the subscriber line charge.

[17] Bill harvesting data available from PNR and Associates are consistent with this price pattern. PNR found that the average local bill in rural (non-MSA) regions contained $10.11 of toll calls, while the average local bill in urban/suburban (all MSA) regions contained $8.11 of toll calls. The associated total bills are $30.52 in rural regions and $29.55 in urban regions. PNR's toll averages are calculated for bills with at least one toll call. The PNR data were collected in 1995. However, data reported in the Reference Book (p. 45) show that rural consumers spend less on total telephone services than urban consumers. In 1993, rural consumers spent an average of $55.10 per month for all telephone services, including all toll calls, while urban consumers spent $58.60

considerable cost variation within each category. In particular, some residential customers in the third category, where local service costs average $11.85, may actually have costs above the average residential price of $17.63. Thus there may be some high cost customers which our methods fail to count.

Toll Service Calculations

There are also three basic inputs to our toll service calculations: 1) the number of minutes of interstate and intrastate toll calls an average residential customer makes, 2) the average interstate and intrastate access charges, and 3) the economic cost of access. We used 1995 PNR and Associates data for interstate and intrastate average residential minutes and used Commission data to calculate average access charges. It is widely accepted by LECs and interexchange carriers alike that access rates charged to long distance carriers greatly exceed the long-run economic cost of access services. We assumed the economic cost of access is a penny per access minute, a figure adopted in Marcus-Spavins that is at the high end of the existing access cost estimates.[18] While the actual economic cost of providing access may be lower than this estimate, the number is within the range of estimates produced by various studies of access costs. For example, a New England Telephone study estimates a switched access cost of 0.24 cents a minute; USTA

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[18] Michael J. Marcus and Thomas C. Spavins, "The Impact of Technical Change on the Structure of the Local Exchange and the Pricing of Exchange Access: An Interim Assessment," 1993.

estimates switched access costs at 1.3 cents a minute. The switching cost in the Hatfield study is 0.18 cents per minute, transport would add to that cost. The relevant data for the toll analysis are reported in Table A.3.

Our estimates of the potential per-customer toll savings resulting from pricing access at cost is simply the product of the margins on interstate and intrastate access and their respective average residential minutes of toll calling. This calculation produces an estimated monthly savings on interstate toll calling of $3.48 and on intrastate toll calling of $6.76, for a total monthly savings of $10.24. For the two groups of high cost local service customers, the estimated annual toll services (interstate + intrastate) benefit is $3,374,393,396.

We can get some perspective on these numbers by comparing them to average monthly toll expenditures today. PNR's 1995 data show an average monthly toll expenditure of $25.38.[19] Thus the estimated savings from reduced access charges amount to a little more than a third of an average consumer's toll bill today. Most of these savings come from intrastate toll where the margin on access charges, 9.75 cents per conversation minute, is particularly high.

Once again, some caveats should be kept in mind about this estimate. First, the distribution of long distance usage across customers is highly skewed. In any

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[19] The Reference Book (p. 44) provides two estimates of average monthly residential toll expenditures based on data from the Census Bureau's 1993 Communications Services Survey: $30.65 and $32.58. About $19-20 of the monthly expense is for interstate services with the remainder going to intrastate services.

given month, a large fraction of customers make few or no toll calls.[20] Customers will receive benefits from reduced access charges in proportion to the amount of toll calls they make. Thus some fraction of residential customers may receive little or no benefit from reduced access charges, while other customers may receive very substantial benefits.

Second, access charges may vary by population density because of the variation in access charges across carriers. In general, it is difficult to assess to what extent the variation across carriers correlates with population densities. However, for the small group of primarily rural NECA carriers, interstate access charges exceed the national average by a wide margin, 13.82 versus 6.04 cents per conversation minute.[21] Thus the very limited available evidence on rural versus urban access charges suggests we may understate the potential benefit from reduced access charges to rural consumers.

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[20] PNR's data for 1994 show that about 15 percent of local service customers do not make any interlata calls in a month.

[21] Table 36, Trends in Telephone Service, Common Carrier Bureau, May 1996.

Table A.1
Monthly Loop & Basic Local Service Costs: Base Case[1]

People Per Square Kilometer	0-10	10-100	100-500	500-1,000	1,000-5,000	>5000
Loop[2]	$40.89	$32.89	$8.89	$6.62	$6.20	$5.30
Port[2]	$1.02	$1.02	$1.02	$1.02	$1.02	$1.02
Switching, Signaling, Transport and Operator Services[2]	$0.72	$0.72	$0.72	$0.72	$0.72	$0.72
Billing and Customer Service[3]	$1.22	$1.22	$1.22	$1.22	$1.22	$1.22
Total Local Service	$43.85	$35.85	$11.85	$9.58	$9.16	$8.26
Number of Residential Loops[4]	9,023,777	18,427,054	16,668,290	11,998,326	34,192,302	7,915,355

Sources:
1) Base case assumptions: (a) the cost of capital is 10 percent and (b) overhead expenses are six percent.
2) Hatfield Associates, The Costs of Basic Network Elements: Theory, Modeling and Policy Implications, March 29, 1996.
3) 1993 New Hampshire Incremental Cost Study, New England Telephone Company, p. 119.
4) Hatfield Associates and Federal Communications Commission, Statistics of Communications Common Carriers, 1994/1995 edition.

Table A.2
Monthly Loop & Basic Local Service Costs: Alternative Case[1]

People Per Square Kilometer	0-10	10-100	100-500	500-1,000	1,000-5,000	>5000
Loop[2]	$46.17	$37.13	$10.02	$7.46	$6.99	$5.96
Port[2]	$1.15	$1.15	$1.15	$1.15	$1.15	$1.15
Switching, Signaling, Transport and Operator Services[2]	$0.81	$0.81	$0.81	$0.81	$0.81	$0.81
Billing and Customer Service[3]	$4.41	$4.41	$4.41	$4.41	$4.41	$4.41
Total Local Service	$52.54	$43.50	$16.39	$13.83	$13.36	$12.33
Number of Residential Loops[4]	9,023,777	18,427,054	16,668,290	11,998,326	34,192,302	7,915,355

Sources:
1) Alternative case assumptions: (a) the cost of capital is 11.25 percent and (b) overhead expenses are 18.05 percent.
2) Hatfield Associates, The Costs of Basic Network Elements: Theory, Modeling and Policy Implications, March 29, 1996.
3) Set at 25 percent of the average price for unlimited residential service, $17.63.
4) Hatfield Associates and Federal Communication Commission, Statistics of Communications Common Carriers, 1994/1995 edition.

Table A.3
Toll Service Data

	Monthly Residential Minutes of Toll Calling[1]	Access Charge Per Conversation Minute[2]	Economic Cost of Access per Conversation Minute[3]
Interstate	75	$0.0662	$0.02
Intrastate	69	$0.1175	$0.02

Sources:
1) PNR and Associates, 1995 data.
2) Federal Communications Commission. Statistics of Communications Common Carriers, 1994/1995 edition.
3) Michael J. Marcus and Thomas C. Spavins, "The Impact of Technical Change on the Structure of the Local Exchange and the Pricing of Exchange Access: An Interim Assessment," 1993.

Figure A.1
Monthly Basic Local Service Cost