



An Empirical Exploration of the Unbundled Local Switching Restriction

**Z-Tel Public Policy Paper No. 3
Z-Tel Communications, Inc.
601 S. Harbour Island Blvd., Suite 220
Tampa, Florida 33602**

March 2002
(Original Version: November 2001)

An Empirical Exploration of the Unbundled Local Switching Restriction*

Abstract: In this paper, we examine empirically the impact of the ULS restriction on the realization of competition for residential and small business consumers in the United States. Econometric analyses suggest that the ULS restriction reduces both the absolute and relative level of competition for residential and small business telecommunications consumers. Our estimates indicate that the ULS restriction has reduced CLEC market share of residential and small business customers by an average of 36%.

I. Introduction

Nearly six years after the passage of the Telecommunications Act of 1996 and two years after the FCC's *UNE Remand Order*, competition for mass-market, residential and small business customers remains elusive in many, if not most, states. In the *UNE Remand Order*, the FCC ordered access to unbundled local switching ("ULS") in order foster competition for these mass-market consumers, but the FCC simultaneously placed a significant restriction on the availability of ULS in the Top 50 metropolitan statistical areas ("MSAs").

This Z-Tel Public Policy Paper shows that where the availability of ULS is restricted, there is substantially *less* competition for residential and small business customers. In fact, an empirical examination of the FCC's own data shows that residential and small business customers benefit from significantly *more* competitive entry in regions where the ULS restriction does not apply than in regions where the restriction applies.

These results undermine the fundamental rationale for the FCC's rule. Nearly two years have passed since the *UNE Remand Order*, and entry strategies based on the patchwork availability of ULS have had sufficient opportunity to develop. The FCC's rationale for the restriction was that entry via "self-provisioning" of switching could occur in the restricted areas as robustly and timely as entry by means of ULS. This empirical analysis shows that not to be

* This policy paper was originally released in November of 2001. After helpful comments and suggestions by numerous parties, the statistical analysis was updated and the changes to this analysis are reflected in this paper.



the case: competition for residential and small business customers in states where the restriction applies lags behind competition in areas where ULS is unrestricted. In short, residential and small business consumers in restricted areas face considerably less competition and are still waiting for choices.

II. Background on the Unbundled Local Switching Restriction

Unbundled local switching is a key component of the UNE-Platform, which new entrants utilize to provide competitive local service to mass-market, residential and small business customers. In the *UNE Remand Order*, the Federal Communications Commission (“FCC”) reiterated its position that CLEC access to unbundled local switching (“ULS”) is necessary to bring competition to the mass market. Specifically, the FCC concluded, “that, in general, lack of access to unbundled local switching materially raises entry costs, delays broad-based entry, and limits the scope and quality of the new entrant’s service offerings.”¹ Primary motivators for the FCC decision include the desire “to encourage the rapid introduction of competition in *all* markets, including residential and small business markets”;² to allow CLECs “to serve the *greatest number* of customers”;³ and “to benefit *all* Americans by opening *all* telecommunications markets to competition.”⁴

But despite those findings, the FCC restricted access to unbundled local switching under certain conditions. Specifically, the FCC chose to remove the unbundled switching obligations of the ILECs for customers with more than three switched access lines in the densest portions (density zone 1) of the fifty largest Metropolitan Statistical Areas (“MSA”), as long as the ILEC provided access to enhanced extended links (“EELs”) in these areas. The rationale for this exclusion was that in these regions, sufficient alternatives to ILEC-provided switching (namely, self-provisioning of switching) existed so that entrants could serve in a “timely” manner residential and small business consumers at levels of comparable scale and scope as access to unbundled local switching would allow.

¹ In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, THIRD REPORT AND ORDER AND FOURTH FURTHER NOTICE OF PROPOSED RULEMAKING, CC Docket No. 96-98, ¶253 (rel. Nov. 5, 1999) (“*UNE Remand Order*”).

² *Id.* at ¶9 (emphasis added).

³ *Id.* at ¶10 (emphasis added).

⁴ *Id.* at ¶2 (emphasis added).



This Z-Tel Public Policy Paper evaluates empirically the effect of the ULS restriction on the extent of competition in the residential and small business markets and finds that the restriction is hampering competitive entry. We first consider the impact of the switching restriction on the share of residential and small business consumers served by CLECs. Using CLEC market share statistics supplied by the FCC, we find that the absolute level of competition for residential and small business customers is lower in states where the switching restriction applies to large portions of the state population. Thus, the econometric analysis suggests that the switching restriction reduces the overall level of competition for residential and small business telecommunications consumers.

Second, we evaluate empirically the effect of the switching restriction on the level of CLEC entry in the residential and small business consumer group relative to larger telecommunications consumers. Because the size of the residential and small business markets vary by state, it is sensible to account for this variation in measuring the intensity of CLEC entry into the residential and small business market.⁵ Our regression analysis, using FCC and Census data, indicates that the switching restriction reduces the relative level of competition for residential and small business consumers.

III. Empirical Analysis

The empirical analysis to test the incumbent hypothesis is straightforward. Data from publicly available sources are utilized and empirical models are generated to test whether the ULS restriction plays any role in the level of CLEC market share in a state. Our approach differs from existing analysis on the ULS restriction. Specifically, we employ econometric methods to evaluate any systematic effects of the ULS restriction on competition. Earlier “studies” of the ULS restriction have used, at best, anecdotal evidence, and most consist of little more than public policy propaganda and rhetoric.

The FCC’s *Local Competition Report* (Tables 6 and 8) provides CLEC and ILEC access lines by state and the percentage of CLEC and ILEC lines serving

⁵ For example, if 50% of CLEC lines serve residential and small business consumers, this share has a very different meaning if 80% of the total lines in the market serve residential and small business consumers versus 30% of the total lines. In the former case, CLECs appear to pursue residential and small business consumers with less intensity than in the latter.



residential and small business customers.⁶ The *Local Competition Report* also provides the total number of lines in the state. Data on these variables is provided for 35 states. The U.S. Census Bureau's website (www.census.gov) provides median household income and population data for these 35 states. The percentage of the state's population residing in the fifty largest MSAs where the ULS restriction applies also is computed from Census data.

It is important to note that because of proactive actions by many States, the FCC's ULS restriction is not applicable in all of the fifty largest MSAs. For example, in Texas, the "T2A" interconnection agreement assured unrestricted access to ULS.

The variables employed in the empirical analyses include:

<i>CLECSHR</i>	Market Share of CLECs for residential and small business consumers;
<i>TARGET</i>	Percentage of CLEC lines serving residential and small business customers divided by percentage of state lines serving residential and small business customers;
<i>LINES</i>	Total access lines in the state serving residential and small business customers;
<i>CITYPOP</i>	Population of state living in city centers of metropolitan areas;
<i>INC</i>	Median household income in the state;
<i>RESTRICT</i>	Percentage of state population in restricted, Top 50 markets.

The variable *CLECSHR* measures the absolute level of competition in the state for residential and small business consumers. *TARGET* captures the intensity with which CLECs target residential and small business consumers relative to other, larger consumers. This variable exceeds (is below) 1.00 if the CLECs have a greater (smaller) percentage of residential and small business customers than the market as a whole. To illustrate the meaning of the variable *TARGET*, consider a state where the share of residential and small business lines is 60%. If CLECs acquire customers in a random fashion or target all consumers

⁶ Federal Communications Commission, Common Carrier Bureau, Industry Analysis Division, *Local Telephone Competition: Status as of December 31, 2001* (May 2001) ("*Local Competition Report*").



equally, then the expected percent of residential and small business lines is 60% (the market's distribution of such lines). If the CLEC's share of residential and small business lines is 20%, alternately, then CLECs are pursuing larger customers more aggressively. If 80% of CLEC lines are serving residential and small business consumers, then the CLECs are targeting the residential and small business consumers with greater intensity than larger customers.

1. THE ULS RESTRICTION AND THE LEVEL OF COMPETITION

This section describes the empirical test designed to measure the impact of the ULS restriction on CLEC market share of residential and small business customers (*CLECSHR*). The absolute level of competition for residential and small business customers in a state is defined as the percent of residential and small business access lines in a state served by CLECs.⁷ The level of competition is specified as a function of state market size in terms of residential and small business access lines, household income, and the ULS restriction. The econometric equation therefore is:

$$CLECSHR = \alpha_0 + \alpha_1 RESTRIC + \alpha_2 LINES + \alpha_3 INC + \alpha_4 CITYPOP + \varepsilon \quad (1)$$

where the α 's are the estimated coefficients and ε is the econometric disturbance term. If CLECs favor markets with greater telecommunications demand, more densely populated markets, and large household incomes, then the signs of the estimated coefficients on *LINES*, *CITYPOP*, and *INC* should be positive ($\alpha_2, \alpha_3, \alpha_4 > 0$). A positive sign on *RESTRIC* indicates that the ULS restriction is conducive to competitive choice for residential and small business consumers. Alternately, if the ULS restriction limits opportunities for competitive entry for residential and small business customers, a negative relationship between the restriction and CLEC market share is expected. Because the ULS restriction is designed to limit the opportunities for competitive entry by UNE-P CLECs, our a priori expectation is that the sign on *RESTRIC* will be negative.

⁷ This is the "mass market" market definition that the FCC utilized in the *UNE Remand Order* regarding ULS.



Equation (1) is estimated by Ordinary Least Squares (OLS) and the Minimum Chi-Square (MCS) methods.⁸ The Minimum Chi-Square Method is essentially a weighted least-squares technique, where the weight is the inverse of the square root of the variance of the dependent variable.⁹ This weighting scheme corrects for the heteroscedastic errors (theoretically) endemic to models with dependent variables expressed in percentage terms (i.e., dependent variables that are based on grouped data). Importantly, this heteroscedasticity leads only to inefficient estimates (the t-statistics are too low), not biased estimates. The Minimum Chi-Square technique did improve the efficiency of the estimated coefficients.¹⁰

The marginal effects from the OLS estimates of Equation (1) are provided in Table 1.¹¹ All of the explanatory variables except *LINES* are statistically significant at the 10% level using OLS and 5% level using MCS. The fit of the regression is good for cross-sectional data (the R^2 is 0.29 for the untransformed data and 0.86 for the weighted data). For the OLS regression, the F-statistic of the Ramsey RESET test is 1.34, which is not

Variable	Equation (1): <i>CLECSHR</i>	Mean [St. Dev.]
Constant	-0.24 (-6.48) ^{a,b}	...
<i>LINES</i>	1.10E-09 (0.94)	3,874,127 (3,758,247)
<i>CITYPOP</i>	0.08 (2.56) ^{a,b}	0.29 (0.156)
<i>INC</i>	2.24E-06 (2.59) ^{a,b}	42435 (5,977)
<i>RESTRICT</i>	-0.04 (1.70) ^{a,b}	0.34 (0.25)
<i>CLECSHR</i>	...	0.036 (0.03)

^a Statistically Significant at 10% level or better with OLS.
^b Statistically Significant at 5% level or better with MCS.

⁸ Jack Johnston and John DiNardo, *Econometric Methods*, 4th ed., McGraw-Hill: New York (1997), pp. 433-4.

⁹ For the linear specification, the variance for state j is $p_j(1 - p_j)/n_j$, and for the semilog specification the variance for state j is $(1 - p_j)/n_j p_j$, where p_j is the dependent variable and n_j the denominator of p_j (in this case, the state total of residential and business access lines).

¹⁰ The White test suggests that the null hypothesis of homoscedastic errors cannot be rejected ($F = 0.32$, Probability level 0.95).¹⁰

¹¹ The marginal effects are computed from a semi-logarithmic regression model. The RESET test indicated that the semilog specification was preferred to the simple linear specification. The marginal effects are computed by multiplying the estimated coefficients by the mean of *CLECSHR* (0.036). The linear model performed similarly to the semilog model, and the coefficient on *RESTRICT* was -0.07 (with t-statistic of 1.86). The Minimum Chi Square method for the linear specification did not materially influence the estimated coefficients, but, as in the semilog case, reduced the estimated t-statistics. In the linear model, all variables were statistically significant at the 10% level or better. However, for the linear model, the null-hypothesis of the RESET test was easily rejected.



statistically significant at standard levels. RESET is a rather general test for specification errors related to omitted variables, incorrect functional form, and correlations between the explanatory variable and the error (e.g., caused by endogenous variables).¹² The insignificant RESET F-statistic indicates our model does not suffer from these major types of specification error.

Not surprisingly, the regression model indicates that CLEC market share is higher in larger, more densely populated markets with relatively high median household incomes: the signs on *LINES*, *CITYPOP*, and *INC* are all positive. Both *CITYPOP* and *INC* are statistically significant at the 10% level or better, but *LINES* is not.

The negative and statistically significant coefficient on *RESTRICT* indicates that *the ULS restriction reduces competition for residential and small business consumers*. The coefficient on *RESTRICT* indicates that a 10 percentage point increase in the percent of population living in the restricted markets reduces, on average, the CLEC market share for residential and small business customers by 10%.¹³ In other words, the larger the restricted market, the more impact the restriction has on CLEC market share.

The econometric model (Equation 1) can be used to estimate the increases in CLEC market shares if the ULS restriction is eliminated. For each relevant state, Table 2 summarizes the increase in the percentage of residential and small business lines served by CLECs if the ULS restriction is eliminated. The increased level of competition for residential and small business customers

Table 2. Increase in Competition for Residential and Small Business Customers from Removing ULS Restriction

State	Percent Increase in Competition	State	Percent Increase in Competition
AZ	47%	MN	45%
CA	38%	MO	42%
CO	38%	NJ	38%
CT	29%	NC	28%
DC	63%	OH	29%
FL	39%	OR	37%
GA	39%	PA	42%
IL	51%	SC	3%
IN	23%	TN	19%
KS	22%	UT	45%
LA	26%	VA	19%
MD	35%	WA	36%
MA	44%	WI	24%
MI	36%	Avg	36%

¹² James Ramsey (1969) "Tests for Specification Errors in Classical Linear Least Squares Regression Analysis," *Journal of the Royal Statistical Society, Series B*, Vol. 31, pp. 350-371. While able to detect a wide array of specification errors, the RESET test only indicates specification error is present. The RESET test provides no guidance as to the particular source of the specification error.

¹³ The impact is calculated using $\exp(-1 \cdot 0.10) - 1$, where -1.00 is the estimated coefficient β_1 from the semi-log model.



ranges from 3% in South Carolina to 63% in the District of Columbia. On average, eliminating the ULS restriction increases CLEC market share by 36% in states where the ULS restriction is relevant.¹⁴

2. THE ULS RESTRICTION AND THE INTENSITY OF COMPETITION FOR RESIDENTIAL AND SMALL BUSINESS CUSTOMERS

The econometric results above indicate that the ULS restriction reduces the absolute level of competition for residential and small business consumers. It is also important to understand the impact the ULS restriction may have on the *intensity* of CLEC competition for residential and small business customers. In this second model, we evaluate the intensity with which CLECs target the residential and small business markets within a state by examining the share of CLEC access lines serving residential and small business lines in a state relative to the total share of the residential and small business access lines in the state (*TARGET*).

This second model is similar to the first, except the dependent variable has changed:

$$TARGET = \beta_0 + \beta_1 RESTRIC + \beta_2 LINES + \beta_3 INC + \beta_4 CITYPOP + \varepsilon \quad (2)$$

where the β 's are the estimated coefficients and ε is the econometric disturbance term. Also, Equation (2) can be estimated with ordinary least squares. Our expectation is that CLECs target markets with larger, more densely populated markets with larger incomes ($\beta_2, \beta_3, \beta_4 > 0$). If the coefficient on *RESTRIC* is positive ($\beta_1 > 0$), then the ULS restriction promotes competition for residential and small business customers. If the coefficient is negative ($\beta_1 < 0$), however, then the restriction reduces competition in the residential and small business markets, directing CLECs to pursue alternative business plan. Given that the restriction precludes entry by particular CLECs, the a priori expectation is that the restriction will reduce competition for residential and small business market customers.

¹⁴ The average of *RESTRIC* and *CLECSHR* for all states where the restriction applies are 0.45 and 0.03. The marginal effect is computed using $[\exp(\beta_1 \cdot \Delta RESTRIC) - 1]$, or $\exp(-1 \cdot 0.45) - 1 = 0.36$, or 36%.



The results from the estimation of Equation (2) are provided in Table 2. All of the explanatory variables, except for *LINES* and the constant term, are statistically significant at the 5% level or better (OLS). The fit of the regression is good for cross-sectional data with an R^2 of 0.26. The hypothesis of no specification error cannot be rejected: the F-Test from the Ramsey RESET test is 0.28, which is not statistically significant. The White test suggests that the null hypothesis of homoscedastic errors cannot be rejected.¹⁵

As with the absolute level of competition evaluated in the previous section, the *TARGET* regression model indicates that CLECs target residential and small business customers more intensely in larger, more densely populated states with relatively high median household incomes. The negative and statistically significant coefficient on *RESTRICT* again indicates that the ULS restriction reduces competition for residential and small business customers. The z-statistic on *RESTRICT* is 2.64, having a probability level lower than 0.01. The coefficient on *RESTRICT* indicates that a 10 percentage point increase in the percent of population living in the restricted markets reduces, on average, the CLEC's pursuit of residential and small business customers by 11%. If the ULS restriction were removed, the proportion of CLEC lines serving residential and small business customers would increase by about 53 percent or 21 percentage points.¹⁶

Variable	Equation (1): <i>TARGET</i>	Mean [St. Dev.]
Constant	-0.49 (1.22)	...
<i>LINES</i>	6.07E-09 (0.61)	3,874,127 (3,758,247)
<i>CITYPOP</i>	0.59 (2.17)*	0.29 (0.156)
<i>INC</i>	1.88E-05 (2.58)*	42435 (5,977)
<i>RESTRICT</i>	-0.47 (2.64)*	0.34 (0.25)
<i>TARGET</i>	...	0.45 (0.23)

* Statistically significant at the 5% level or better.

IV. Conclusions

The FCC's unbundling policy should be properly focused upon advancing the introduction of competition for all consumers, including mass-market residential and small business customers. In the *UNE Remand Order*, the FCC ordered unlimited access to unbundled local switching in many regions but placed substantial restrictions on ULS in the top 50 MSAs. The FCC's rationale

¹⁵ The F-Statistic for the White test is 0.66, having a probability level of 0.72.

¹⁶ For states where the restriction applies, the average value of *TARGET* is 0.396.



was that in large cities, CLECs could serve the entire mass market as intensely without access to ULS as CLECs could serve with access to ULS.

Our empirical analysis suggests that the FCC's policy of favoring one type of competition over another in those larger markets is in fact harming residential and small business consumers in those areas. Consumers in states where there is unrestricted availability of ULS enjoy a considerably more robustly competitive environment than their compatriots in restricted states. Business-focused, downtown CLECs are not serving mass-market, residential and small business consumers in states where the ULS restriction applies to the same extent that UNE-Platform and other entrants serve mass-market consumers in unrestricted areas.

Those harmed by the ULS restriction are residential and small businesses in states where the restriction applies. Even conservative estimates regarding the potential cost savings mass-market consumers would enjoy from competition indicates that millions of dollars of consumer welfare are being sacrificed by operation of this industrial policy. The empirical evidence shows that contrary to the FCC's conclusion in November 1999, entry by means of self-supplied switches (for residential and small business customers) is simply not as robust and timely as entry by means of unbundled local switching. The empirical evidence shows that CLECs of all types that seek to provide service to residential and small business customers are most definitely impaired in their entry efforts by the ULS restriction.



Addendum (March 12, 2002):

In February 2002, the Federal Communications Commission released an updated version of their *Local Competition Report (Local Telephone Competition: Status as of June 30, 2001, February 2002, Industry Analysis Division)*. This report provided updated data on the competition variables used in this policy paper (both *CLECSHR* and *TARGET*). In this Addendum to Policy Paper 3, we incorporate this new data into our analysis and re-estimate the regressions in Policy Paper 3 (eqs. 1 and 2). Using our most recent specification of the *RESTRICT* variable, the results of these regressions are provided in Table A-1 below. The original sample contained 35 observations, of which one was lost in the new dataset (data for two additional states was added to the new data, but for consistency these states are left out of the sample). Thus, the current dataset employed for these regressions contains 34 observations (68 total sample). As shown in Table A-1, the results are similar using the different datasets.

In an alternative specification of the model, we use observations from both Competition Reports, thus increasing sample size. By adding a dummy variable indicating the observation is from February 2002 (*DFEB*), we can test for a statistically significant difference in *RESTRICT* using the full dataset. The results from this regression are provided in Table A-2. The regression results indicated that *RESTRICT* does not have a statistically different effect between datasets for the *CLECSHR* regression. For neither regression is the interaction term statistically significant at the 10% level.



Table A-1. Comparative Regression Results

CLECSHR Regressions			
Variable	Original Data	New Data	Average of New and Original Data
<i>Constant</i>	-0.101 (2.29) ^a	-0.091 (1.43)	-0.096 (1.88) ^b
<i>LINES</i>	1.86E-09 (1.37)	1.92E-09 (0.98)	1.89E-09 (1.21)
<i>CITYPOP</i>	0.107 (3.02) ^a	0.120 (2.35) ^a	0.113 (2.78) ^a
<i>INC</i>	2.91E-06 (2.81) ^a	2.86E-06 (1.91) ^b	2.89E-06 (2.42) ^a
<i>RESTRICT</i>	-0.066 (2.99) ^a	-0.070 (2.16) ^a	-0.068 (2.65) ^a
R²	0.38	0.25	0.33
TARGET Regressions			
Variable	Original Data	New Data	Average of New and Original Data
<i>Constant</i>	-0.647 (2.38) ^a	-0.613 (2.02) ^a	-0.630 (2.32) ^a
<i>LINES</i>	7.99E-09 (0.96)	7.28E-09 (0.78)	7.64E-09 (0.92)
<i>CITYPOP</i>	0.644 (2.96) ^a	0.469 (1.93) ^b	0.557 (2.56) ^a
<i>INC</i>	2.36E-05 (3.70) ^a	2.41E-05 (3.38) ^a	2.38E-05 (3.75) ^a
<i>RESTRICT</i>	-0.401 (2.93) ^a	-0.259 (1.70) ^b	-0.330 (2.42) ^a
R²	0.41	0.33	0.39

T-statistics in parenthesis.
^a Statistically significant at the 5% level.
^b Statistically significant at the 10% level.



Table A-2. Alternative Specification
(Obs. = 68)

CLECSHR Regressions		
Variable	CLECSHR	TARGET
<i>Constant</i>	-0.096 (2.55) ^a	-0.630 (3.18) ^a
<i>LINES</i>	1.89E-09 (1.63)	7.64E-09 (1.26)
<i>CITYPOP</i>	0.114 (3.75) ^a	0.556 (3.51) ^a
<i>INC</i>	2.89E-06 (3.26) ^a	2.38E-05 (5.14) ^a
<i>RESTRICT</i>	-0.077 (3.65) ^a	-0.398 (3.61) ^a
<i>DFEB</i> × <i>RESTRICT</i>	-0.018 (0.99)	0.136 (1.43)
R²	0.30	0.37

T-statistics in parenthesis.

^a Statistically significant at the 5% level.

^b Statistically significant at the 10% level.



The Z-Tel Public Policy Paper Series is designed to arm policymakers and the public with a rigorous set of analytical tools and analyses regarding the development of local telecommunications competition. For more information, contact any of the following members of Z-Tel's Strategic Policy Department.

George S. Ford, Chief Economist	gford@z-tel.com
Thomas M. Koutsky, V.P., Law and Public Policy	tkoutsky@z-tel.com
Peggy Rubino, V.P., Eastern Region	prubino@z-tel.com
Ron Walters, V.P., Midwest-West Region	rwalters@z-tel.com
Richard Sampson, V.P., Qwest Region	rnsampson@z-tel.com

Other Z-Tel Public Policy Papers

Putting the Cart before the Horse: The History and Future of the UNE Platform, Z-Tel Public Policy Paper No. 1 (February 2001)

The TELRIC Test: Determining the “Zone of Reasonableness” for UNE Rates, Z-Tel Public Policy Paper No. 2 (November 2001)

An Empirical Exploration of the Unbundled Local Switching Restriction, Z-Tel Public Policy Paper No. 3 (rev. February 2002)

Does Unbundling *Really* Discourage Facilities-Based Entry? An Econometric Examination of the Unbundled Switching Restriction, Z-Tel Public Policy Paper No. 4 (February 2002)

©2001 Z-Tel Technologies, Inc. All rights reserved. Z-Tel is a registered trademark, and Z-Tel Technologies, Inc. is a trademark of Z-Tel Technologies, Inc. All other marks are trademarks of their respective owners.

