Regulatory Behavior and Competitive Entry

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ABSTRACT

The Telecommunications Act of 1996 provided for three forms of competitive entry into local telephone markets. First, entrants could use their own facilities to provide services, and interconnection with incumbent networks was mandated. Second, entrants to use total service resale to resell incumbent services at a discount to be based on avoided cost. Third, entrants could lease unbundled network elements (UNEs), possibly in combination with their own facilities, to provide services. UNEs were to be priced "based on costs." Since the passage of the Act, debate has raged in academic circles, hearing rooms and courtrooms on virtually every aspect of the terms for setting the relevant rates. Relatively little evidence on the effects on competitive entry has been provided: primarily due to a lack of comprehensively available data. This study uses new data collected by the Federal Communications Commission on all three forms of competitive entry. We examine a variety of models aimed at determining the effect of regulatory decisions on entry. Our approach is descriptive – what does the data suggest? We find states with low UNE prices have less facilities-based entry, with more ambiguous effects on the other two forms of entry. We find that long-distance entry (the *quid pro quo* provided by the Act in exchange for opening local markets to competition) has a large positive impact on entry, but the causation is unclear. Further, long-distance entry appears to complicate modeling the effect of UNE prices.

Introduction

In the wake of the Telecommunications Act of 1996, opinions abound concerning the ways in which regulatory behavior may or may not have affected the rate and type of competitive entry. Of particular interest has been the pricing of unbundled network elements (UNEs) and the setting of resale discounts. State regulators have been charged with setting these wholesale prices, subject to rules enacted by the Federal Communications Commission (FCC). A lengthy and continuing legal battle has ensued regarding jurisdictional issues over how much guidance (if any) the FCC has over the way in which state regulators set these prices. The Supreme Court finally established the right of the FCC to specify rules for the state to follow, but is still to decide on the merits of those rules. Amidst the legal wrangling, extreme views have prevailed regarding the impact of the FCC rules and the way in which the states have implemented them:

> "Entrants will make efficient decisions about the mix of resale and facilities-based competition only if their access to existing networks is provided at prices that accurately reflect economic costs. Subsidizing services by providing them at TSLRIC sends the wrong price signals and leads to incorrect decisions. When prices are too low, excessive use of underpriced facilities will result and thus distort the decisions of resellers. The entry and expansion of resellers is thus not only encouraged, but also financed by underpriced facilities. Moreover, when network services are priced too low, the building of competing facilities is likely to be discouraged. Thus, rather than stimulating facilities-based competition, TSLRIC pricing discourages it."[1]

> "Appropriate pricing of unbundled network elements, transport, and access termination is crucially important for promoting effective competition. The extent to and the speed with which competition will develop depend critically on having prices for unbundled network elements and services that are as close to efficient economic costs as possible. The more prices exceed efficient economic costs, the less entry there will be. The less entry there is, the less likely it will be that effective competition will develop in local exchange markets, and, if effective competition does develop, it will happen more slowly. There is only one cost measure that fulfills …. that cost measure is the long-run forward-looking economic cost, or Total Element Long run Incremental Costs."[2]

[1]Sidak and Spulber (1997), page 1152.
[2]Nicholas Economides (1999), pp. 455-483.

Much ink has been spilled and many trees felled debating the appropriate economic principles for satisfying the Act's requirements that wholesale prices be "based on cost."[3] Somewhat less evidence is available for determining the actual effects that regulatory decisions about prices have had. The Eighth Circuit found that the argument that "competing carriers will incur only minimal costs in gaining access to incumbent LECs' networks and have no incentive to build their own is merely speculative at best."[4] This paper provides evidence on how differing state pricing decisions have differentially affected the rate and types of competitive entry.

We know of only two other papers that present empirical evidence on this question. The conclusion of one:

> "we examined the major drivers and determinants of local exchange competition and investigated the hypothesis that inefficient local exchange prices are having an impact on competition and the hypothesis that they are inhibiting competition for residential customers. Examining data as of the end of 1998, we found support for both hypotheses."[5]

That paper found evidence that higher UNE prices reduced collocation activity, reduced the number of CLECs that enter, and that higher resale discounts tend to promote resale entry. All of these results were small, however, and of limited statistical significance. Our results are somewhat different. Our findings suggest ***that states with lower UNE prices have less facilities-based entry.*** Contrary to expectations, we find no evidence that states with lower UNE prices have more non-facility entry. Instead, we have the puzzling result that in some specifications, states with lower UNE rates also have less CLEC entry; however this depends on whether and

[3] For a good survey of these debates, see Alleman and Noam (1999).
[4] Iowa Utils. Bd. v. FCC, 120 F.3d at 816 (8th Cir. 1996).
[5] Ros and McDermott (2000).

how we account for 271 approval in the model. Our findings also suggest that there is less entry in states with higher residential retail rates although our evidence for this is not conclusive.

Data

There are two data sources that can be used to examine competitive entry, both from the FCC. From 1997 to 1999 the FCC collected voluntary information from ILECs on UNEs and resold lines used by CLECs. Beginning in December of 1999, the FCC used Form 477, requiring reporting from both ILECs and CLECs and including CLEC lines provided solely over its own facilities as well as UNE and resold lines. The differences between the two data sets are summarized in Table 1:

Table 1: FCC Data on Local Competition

	Voluntary Filings	**Form 477**
Time period used	1997-1999	1999 -
voluntary/compulsory	Voluntary	Compulsory for all Carriers with over 10,000 lines in a state
publicly available?	yes	Limited data available due to confidentiality concerns. Firm level data and some state level data is not available.
data collected	resold lines, UNE lines, # of CLECs authorized by state, % of end-user lines served out of wire centers in which there are collocation agreements	resold lines, UNE lines, facilities-based lines, # CLECs, # zip codes with competitive alternatives

The present study is the first to use the new (and not publicly available) CLEC data. The earlier data has the advantage of being publicly available with the disadvantages of being voluntary, limited (in particular, no facilities-based data from CLECs), and no longer in use. The new data, while superior in terms of coverage and mandatory reporting, has the disadvantage of the underlying data not being publicly available.

Unlike previous studies, we exclusively focus on the UNE prices and discount rates of RBOC jurisdictions. We assume that most of the CLEC entry is occurring in ROBC jurisdictions. The strategies, cost characteristics, and regulatory histories are more uniform across these than for other ILECs. This provides us with 48 jurisdictions (including the District of Columbia, but excluding Wyoming because the latter does not have regulator-determined UNE rates).

One additional note on the data is in order. The effect of regulatory policy on competitive entry is uniquely suited to the American environment, given the large number of state jurisdictions reaching independent determinations on wholesale and retail rates. The ability to use this diversity in the future, however, may be increasingly constrained. The combination of mergers and interLATA entry conditions have systematically been reducing the variation among the states. Merger conditions have frequently included discounts on UNE rates from the state-determined rates. The reviews of RBOC 271 applications have included comparisons of UNE rates across different states with the result of pressures to conform UNE rates to those in the initial states in which 271 approval has been granted (New York and Texas). For example, in its review of SBC Communications Inc.'s 271 application in Kansas and Oklahoma,

> "Justice noted that the rates SW Bell charges competitors for the use of UNEs are 'significantly higher' in Kansas and Oklahoma than in Texas, where the telco recently obtained FCC permission to offer interLATA services."[6]

This was followed by a voluntary change in SW Bell's UNE prices:

> "In an attempt to allay regulators' concerns about the rates it charges interconnecting carriers, Southwestern Bell Telephone Co. is offering competitors in Kansas and Oklahoma discounted rates for unbundled network elements (UNEs), as well as other concessions."[7]

As the diversity of UNE rates across states diminishes, it will be more difficult to study the effects of differing state regulatory decisions as well as increasingly difficult to maintain accurate data. The present study may well be the last opportunity to use data relatively "untainted" by these considerations.

The Models

We have examined competitive entry data for the three distinct forms of entry envisioned by the Act: total service resale, use of UNEs, and complete facilities-based entry. Ideally, these would be modeled as a simultaneous system since these entry decisions are interdependent. However, given the limited degrees of freedom and (as we shall see) the similarity of the models for the different forms of entry, two and three stage least squares models have not performed well.[8] We did conduct Hausman simultaneity tests for facilities and non facilities-based lines ($p = .87$) and for UNE and resold lines ($p = .95$). This tests the hypothesis that the difference is coefficients between the two-stage and OLS (independent equations) approaches is not systematic. In both

[6] *Telecommunications Reports*, December 11, 2000, page 8. The other paper is Jamison (2001).
[7] *Telecommunications Reports*, January 8, 2001, page 12.
[8] The signs of the coefficients are consistent with the results we will show, but there are few statistically significant coefficients in the second stage equations.

cases we find no evidence to support the need for simultaneous estimation. Hence, we will approach the three forms of entry through independent OLS estimation.

Table 2: Independent Variables and their Sources

variable	description	source	mean standard deviation
Arb dev from cost	average UNE rate minus 1999 embedded cost, as a percent	arbitration data from *State Arbitration Monitor, State Telephone Regulation Report, 1997*	21.7% 23.5%
employment	1999 statewide employment	*Demographics* Magazine	2,704,448 2,739,244
pricecap	1999 regulatory regime: 1=price caps; 0=Rate of Return; 0.5=sharing	State Telephone Regulation Report *White Paper*, April 3 and 17, 1998	74% with price caps
average UNE rate	statewide average UNE rate (interim)	*State Arbitration Monitor*	$17.24 $5.79
density	population density: persons/mi^2	census data	397 1419
1999cost	1999 average embedded loop cost for the RBOC	NECA universal service costs	$22.44 $4.45
resale discount	average statewide resale discount	industry contacts	18.21% 3.05%
business discount	average statewide discount for 1FB service	industry contacts	17.96% 3.52%
low UNE	lowest UNE price available - the final rate is used if there has been a final cost decision	*State Arbitration Monitor* and updated through industry contacts	$15.64 $5.51
UNE-cost	average UNE rate minus 1999 embedded cost	derived from above	$-5.21 $3.92
HCPM loop	statewide average forward-looking loop cost estimated in the FCC HCPM model	FCC	$22.41 $4.50
employment change	change in state employment 1990-2000	*Demographics* Magazine	544,253 605,785
busrate, resrate, BUSRES	average 1FB rate, 1FR, and their ratio	*Bell Operating Companies Exchange Service Telephone Rates*, Dec. 31, 1995, NARUC	busrate: $35.97 ($8.62) resrate: $13.90 ($3.79) BUSRES: 2.66 (.57)
271	dummy variable for states with approved interLATA entry, as of April, 2001.[9]		4 states with

[9] Our dependent variables are as of June 30, 2000 at which time only 1 state had 271 approval. In order to protect the confidentiality of the UNE line counts, we use 4 states in our 271 variable, including OK and KS that obtained

Our dependent variables, dated June 30, 2000, are summarized next:

Variable	Mean	Std. Deviation	Minimum	Maximum	N
# of CLECs	5.23	4.79	0	21	48
resold lines	87,151	126,583	0	623,515	48
UNE lines	83,500	181,959	0	1,114,451	48
facilities-based lines	86,923	114,704	0	573,455	48
Total CLEC lines	257,574	394,156	0	2,157,618	48

So, total CLEC lines are almost equally split between the three alternate forms of entry.[10]

Facilities-Based Entry

All of these regressions[11] use total facilities-based lines by state as the dependent variable. A combination of wholesale prices, retail prices, state demographics, costs, and regulatory variables were used as independent variables. Table 3 reports the regression results for each model.

271 approval after June 30, 2000, and TX in which SBC gained 271 approval on June 30, 2000. As of this writing, there is an additional state (MA) with 271 approval.

[10] We use the term "facilities-based" entry to denote lines served *totally* over CLEC facilities. Lines served with a combination of UNEs and CLEC facilities are denoted "UNE lines." Note that this differs from the usage in Ros and McDermott, where "facilities-based" refers to entry that uses UNEs.

[11] Note that all regressions were run including CLEC line counts from "voluntary" providers of data - carriers with less than 10,000 lines in a state. There is approximately a 2% difference in total CLEC lines when voluntary data is included, and the regression results are not affected to any noticeable degree.

Table 3: Regression Models for Facilities-based Entry

Independent Variables	**Dependent Variable: Total Facilities-based Lines by State: Model #**										
	1	2	3	4	5	6	7	8	9	10	11
Arb dev from cost	-658 (.019)										
employment	.0413 (.000)	.0415 (.000)	.0412 (.000)	.0409 (.000)	.0407 (.000)	.04 (.000)	.0395 (.000)	.0402 (.000)	.0447 (.000)	.0407 (.000)	.0398 (.000)
pricecap	5425 (.689)	8495 (.562)	9362 (.51)	10137 (.489)	2064 (.89)						
average UNE		2485 (.05)	4334 (.01)	4371 (.013)		3606 (.007)		3531 (.003)	3741 (.002)	4186 (.009)	3649 (.002)
1999cost			-3334 (.09)	-3616 (.086)	-1877 (.365)						
resale discount				-403 (.852)	-4.45 (.998)	508 (.795)				966 (.642)	
low UNE					2482 (.173)						
UNE-cost							3768 (.01)				
HCPM loop						-3961 (.011)	-1960 (.152)	-4034 (.008)	-4055 (.006)	-4291 (.01)	-4423 (.003)
employment change									-.0262 (.051)		
residential rates											2630 (.070)
271										-17,858 (.49)	
Adjusted R^2	.88	.88	.88	.88	.87	.89	.89	.90	.90	.89	.90

Notes: The numbers in each cell are the raw coefficients. The numbers in parentheses below are the p values (2-sided test). We also tried population density (positive coefficient, p=.62), business retail rates (positive coefficient, p = .537), the ratio of business to residential rates (negative coefficient, p=.43), and log-linear forms, but these did not produce any improvements

and the coefficients for the variables shown in the table did not change materially. We also tried GLS with almost identical results to OLS.

Our particular interest is in the regulatory variables. We found no evidence that regulatory regime matters for facilities-based entry, except through its effect on the UNE rates that a state adopts. We also found no evidence that retail business rates or their relation to residential rates matter, contrary to Ros and McDermott. They used a different business rate variable, the PBX trunk rate rather than the 1FB rate.[12] However, their finding that retail rates matter is confirmed by our result that higher retail residential rates tend to promote facilities-based entry. Our prior on the effect of residential rates on CLEC entry is ambiguous. Residential CLEC entry may be more profitable in states with higher residential rates due to arbitrage opportunities. An alternative hypothesis would be that states where the PUC set higher residential rates would have set lower business rates, thus reducing the incentive for CLECs to provide telephone service to business customers.

The four variables with fairly consistent significance are:

- employment: scale effects are clearly present with larger states (measured by total employment) having more facilities-based entry, *ceteris paribus*;
- UNE rates: the higher the statewide UNE rate for unbundled loops, the lower facilities-based entry;

[12] Although our business rate variable may or may not be the best one to use, there is some intuition that the level of business rates or the degree of price distortion may not matter. Business rates have historically been set at such high levels, that it is not clear that it matters if one state's rates are higher than another's. Competition should be expected to erode these noncompetitive rates in any case.

- HCPM loop: used as a proxy for the cost of building facilities in a state, this shows that more costly it is to build facilities, the less facilities-based entry will occur;
- resrate: higher retail local residential rates tend to promote facilities-based entry.

Resale

Our regression results for models with resold lines as the dependent variable appear in Table 4:

Table 4: Regression Models for Resale Entry

Independent Variables	**Dependent Variable: Resold Lines: Model #**							
	12	13	14	15	16	17	18	19
Arb dev from cost								
employment	.0538 (.000)	.0393 (.000)	.0381 (.000)	.0384 (.000)	.0394 (.000)	.0389 (.000)	.0385 (.000)	.0511 (.000)
pricecap								
average UNE	2730 (.082)	3241 (.119)		2567 (.218)	3254 (.122)	2615 (.189)	2451 (.221)	1576 (.389)
1999cost								
resale discount		2837 (.362)	1889 (.543)	2246 (.466)	2862 (.365)	2345 (.430)		
business discount							2114 (.410)	
low UNE								
UNE-cost								
HCPM loop	-5005 (.012)	-5300 (.03)	-3649 (.10)	-4513 (.065)	-5441 (.042)	-6317 (.009)	-6806 (.009)	-4430 (.029)
employment change	-.0821 (.000)							-.0789 (.000)
BUSRES				-26,526 (.135)				
busrate					188 (.888)			
resrate						8089 (.030)	8462 (.027)	1843 (.344)
271								43,028 (.161)
Adjusted R^2	.85	.78	.77	.79	.78	.80	.80	.86

These results indicate clear scale effects. There is also evidence that resale entry is more common in states with low growth rates. The coefficient on the resale discounts has the expected sign (higher discounts tend to increase resale) but are not statistically significant.

Resold lines decrease with the cost of facility-based entry (represented by the HCPM loop proxy). That is, CLECs are reselling more lines in states with lower cost.

UNE Lines

Our regression models for UNE based lines appear in Table 5:

Table 5: Regression Models for UNE Entry

Independent Variables	**Dependent Variable: UNE lines: Model #**							
	20	21	22	23	24	25	26	27
Arb dev from cost								
employment	.0581 (.0000)	.0357 (.000)	.0350 (.000)	.0360 (.000)	.0468 (.000)	.0466 (.000)	.0384 (.000)	.0678 (.002)
average UNE	9985 (.022)		847 (.863)		11,644 (.017)			4368 (.333)
1999cost								
resale discount		-4672 (.437)	-4568 (.483)	-4104 (.509)	3976 (.576)	-462 (.948)	-3109 (.606)	
low UNE							3616 (.343)	
UNE-cost		9.05 (.923)		UNE-HCPM 1493 (.725)		10,710 (.057)		
HCPM loop	-7606 (.152)		-2154 (.663)		-8226 (.136)			-3100 (.502)
employment change	-.0606 (.218)							employment squared $-2.55x10^{-9}$ (.092)
271		316,619 (.000)	311,182 (.000)	305,579 (.000)			321,389 (.000)	259,680 (.001)
resrate							7223 (.292)	
Adjusted R^2	.47	.61	.60	.61	.46	.44	.62	.63

Observations

- Our UNE models are the least satisfactory, both statistically and intuitively.
- Scale effects are evident.

- States with 271 approval appear to have significantly more UNE lines.
- UNE prices do not have statistically significant impacts on UNE lines -- if anything, the effect appears to be a that higher UNE prices go along with *more* UNE entry. We discuss this puzzling result later in the paper.

The 271 variable is not surprising. However, it is consistent with (at least) two quite different hypotheses or a mixture of the two. First, it may be that 271 entry is granted where there is more UNE based entry. That is, CLEC entry is more likely in states that have satisfied the conditions of 271. Second, 271 approval may trigger additional entry via UNEs. Since facilities lines showed no relationship with the 271 variable but facilities-based entry takes more time, it is possible that one CLEC response to 271 approval is to accelerate entry via UNEs. So, it is not clear which causes which. To the extent that 271 entry is granted only after sufficient UNE-based entry, it is inappropriate to include 271 entry as an explanatory variable. To the extent that increased UNE-based entry is a response to 271 approval, then it should be included.[13] To complicate matters further, the statistical significance of the UNE rates appears to depend critically on whether or not 271 entry is included as an independent variable. We will return to this issue when we examine total CLEC entry below.

Findings From the Voluntary Survey on Resold Lines and Collocation

We used data from the June 1999 voluntary survey to corroborate our finding on resold lines and UNE loops. The earlier FCC data is consistent with our current findings. We re-estimated Model #13 with the earlier data. Resold lines were found to be a function of:

[13] In truth, 271 approval and entry are simultaneously determined. Unfortunately, there are too many unobservable variables (e.g., strategic and political factors) to estimate such a model satisfactorily.

variable	coefficient	p value
employment	.0303	< .0001
average UNE	2301	.09
resale discount	454	.034
HCPM	-254	.874

R^2 = .81.

These results are largely consistent with those in Model #13 although the resale discount is much more significant and the HCPM loop cost is much less significant.

We also estimated Model #22 from the earlier FCC data. There were so few UNE loops and little variation across the states that the number of UNE loops was not a viable dependent variable. Instead, we used the percent of lines served out of wire centers in which there were collocation agreements (this variable was also examined by Ros and McDermott). Collocation indicates a likelihood that UNEs are either being used or the intention is to use UNEs. The model yielded the following results:

variable	coefficient	p value
employment	1.14	.000
271	-583,696	.477
resale discount	-55,985	.252
average UNE	62,369	.060
HCPM	-96,127	.013

R^2 = .92

These results are generally consistent with those in Model #22. We show that the UNE-HCPM variable is positive and significant, corroborating our result that higher UNE rates tend to be positively associated with greater use of UNEs. The coefficient on the 271 variable in June 1999 was statistically insignificant. This regression provides little insight as to whether UNE lines increased in New York and Texas before or after 271 as compared to other states. The

percentage of wire centers that have collocation agreements is an imperfect proxy for UNEs especially since UNE loops nationwide grew by over 250% between June 1999 and June 2000.

Interestingly, if we use % collocation as the dependent variable (that is how the FCC reported the data) in place of the number of lines available to collocators, the average UNE rate has a ***significant negative*** impact ($p = .034$). This matches the finding in Ros and McDermott (2000). Superficially, this seems to indicate that UNE use is inversely related to UNE rates. However, this only means that lower UNE rates contribute to the coverage of collocation agreements, not that there is actually more UNE use.

Discussion

The UNE rate variable is the most ambiguous, and potentially counterintuitive result. We expected that lower UNE rates would promote UNE entry, but there is no evidence of this. In order to further investigate this effect, we also constructed some models with total nonfacilities entry (UNE+ resold lines) and total CLEC entry as dependent variables. The results are in Table 6:

Table 6: Additional Regression Models for Aggregate CLEC Entry

Independent Variables	Dependent Variable								
	Resold + UNE lines	Resold + UNE lines	Resold + UNE lines	Total CLEC lines	Total CLEC lines	Total CLEC lines	Total CLEC lines	Total CLEC lines	Facilities Lines
Model	#28	#29	#30	#31	#32	#33	#34	#35	#36
arb dev from cost	-1786 (.164)								-493 (.05)
employment	.0896 (.000)	.1120 (.000)	.0734 (.000)	.1250 (.000)	.1257 (.000)	.1126 (.000)	.1632 (.000)	.1834 (.000)	.0339 (.000)
pricecap	27,984 (.657)								
average UNE		12308 (.023)	3242 (.62)	19,189 (.007)	20,831 (.003)	5925 (.407)	19,285 (.012)	25,302 (.001)	
HCPM loop		-12,382 (.066)	-6976 (.307)	-21,289 (.009)	-19,750 (.014)	-13,966 (.068)	-20,015 (.012)	-21,190 (.007)	
employment change		-.1426 (.025)			-383,029 (.110)			-461,487 (.053)	
employment squared							$-3x10^{-9}$ (.233)	$-4.7x10^{-9}$ (.062)	
resale discount			-2401 (.787)	1807 (.861)	1284 (.902)	2604 (.787)	3178 (.751)	-4102 (.695)	
resrate				15,900 (.204)		21,145 (.062)	16,927 (.17)		
271			336,103 (.004)			326,004 (.009)			
nonfacilities lines									.0824 (.009)
adjusted R^2	.62	.67	.70	.77	.77	.80	.77	.78	.90

It appears that the statistical significance of the average UNE rate for total CLEC entry disappears in the presence of the 271 variable. Given the size of the coefficient on the 271 variable and the sensitivity of the UNE coefficient to its presence or absence, we ran some

further regressions using interaction terms between UNE rates and 271 entry. Table 7 contains these results:

Table 7: More Total CLEC Line Models

independent variables	**Dependent Variable: Total CLEC Lines**				
	Model #37	Model #38	Model #39	Model #40 47 states	Model #41 47 states
employment	.1049 (.000)	.1369 (.000)	.1484 (.000)	.1032 (.000)	.0862 (.000)
Change in employment		-.2049 (.001)	-.1936 (.003)		.0834 (.03)
HCPM loop	-14,224 (.047)	-14,261 (.026)	-13,593 (.029)	-8451 (.023)	-7701 (.031)
resrate	13,490 (.047)	8390 (.170)	10,809 (.097)	6224 (.085)	7815 (.028)
Average UNE				5205 (.075)	3585 (.211)
UNE rate x 271	-26,038 (.143)	-39,580 (.017)	Using low UNE in place of average UNE -105,375 (.577)		
UNE rate x not-271	7980 (.194)	9869 (.073)	13,843 (.012)		
271	1,083,754 (.010)	1,440,943 (.000)	1,883,378 (.423)		
Adjusted R^2	.82	.86	.85	.90	.91

There are two interaction terms to permit the UNE rate coefficient to vary between states with 271 approval and those without. The difference between the coefficients is statistically significant at the 5% level, although neither coefficient is by itself.[14] Given the size of the 271 impact and its apparent relationship with the effect of UNE rates, and given the likelihood that

[14] This was confirmed by running an additional regression in which average UNE and the interaction of average UNE and 271 were separate independent variables. The sign on the latter was negative and statistically significant.

271 entry and strategic decisions[15] may create simultaneity problems, models #40 and #41 omit the one state which had 271 approval in June, 2000.

In most of these models, CLEC lines increase with residential rates and the effect is significant at the 90 percent significance level. Note also that (model #41) states with higher rates of employment growth tend to have significantly more total entry, once 271 is omitted. This is consistent with an expectation that markets with higher growth rates would be easier to enter (from both a cost and marketing perspective).

There is also no evidence that states with lower UNE rates have more entry, except in states with 271 approval – and that raises a variety of strategic issues that seem to call for a more complex simultaneous model. There are several possible explanations for failing to find an inverse relationship between UNE rates and the use of UNEs:

- First, the complementary nature of these two forms of entry may be sufficiently strong that the negative effect on facilities-based entry carriers over to UNE entry as well.
- Second, capital markets may sufficiently punish non facilities-based CLECs that access to capital forces there to be less UNE entry when facilities-based entry is deterred (via lower UNE prices).
- Third, lower UNE prices would be expected to lead to more nonprice discrimination.[16] To the extent this is feasible, it may inhibit entry more than the lower UNE prices could enhance it.

[15] Some of the strategic possibilities are examined in Laffont and Tirole (2000).

[16]See, for example Weisman, and Kang (2001) or Weisman and Kondaurova (2001).

- Fourth, lower UNE prices may appear to be more unsustainable upon predicted court challenges to the rates that regulators set.
- Fifth, as competition erodes the high margins on retail business rates, the UNE rates may become an effective floor on retail business rates. If this were the case, then higher UNE rates would represent increased profit potential in the long-run for CLECs and ILECs alike.[17]
- Sixth, high UNE rates could be correlated with unobservable factors that encourage CLEC entry. Note, for example, that UNE rates are determined by state commissions and could be measuring unobservable characteristics of those commissions.
- Seventh, average UNE prices in a state are the weighted average of the often deaveraged zone level UNE rates. Thus our UNE variable measures the average rate that CLECs pay for UNE loops, not the marginal price they face at the point of entry. Optimally we would have CLEC line counts at the zone level.
- Eighth, we have relatively small sample size and degrees of freedom, thus it may be difficult to separate out regulatory effects from price effects.

We attempted to test the third reason by examining states where the interim UNE rates were subsequently raised when setting final UNE rates. We used a dummy variable for those states that increased the average UNE rates, as well as those where the urban UNE rate was subsequently raised. Neither variable came close to statistical significance (p values well above .50). Thus, this measure provides no support for the hypothesis that the sustainability of low UNE prices was a factor discouraging the use of UNEs.

[17] Of course, this depends on the eventual nature of competitive dynamics in the industry. In particular, in an umbrella pricing scenario, the above reasoning could be valid.

We also examined two possible omitted variables that could account for our results. We had limited data (30 states) for non-recurring charges which are an additional cost of competitive entry. The coefficient on non-recurring charges was positive and not statistically significant. We also included a variable indicating whether or not a state had deaveraged UNE prices. The coefficient was again positive, but statistically insignificant.

Our results differ from those in Ros and McDermott (2000). There are several reasons for this. First, they did not have access to the data that we used in this paper. Second, we focused on RBOC jurisdictions whereas they included all state jurisdictions. Third, their major finding was that retail price distortions affect competitive entry while we did not find evidence of this. Their retail price data differed from ours - especially their business rates. We used 1FB rates (where available, otherwise usage was imputed to the available measured service plans) while they used the PBX trunk rate. Fourth, their UNE rate data appears to differ from ours - possibly by inclusion of some GTE rates from some jurisdictions. The most important difference, however, was that they did not have direct data on the three forms of competitive entry that we used in this study.

Other studies have used the number of CLECs as a dependent variable, so we examined the relationship between number of CLECs in a state jurisdiction and our independent variables.

Two suggestive models are:

Independent variable	**Dependent variable: # of CLECs**	
employment	$1.48x10^{-6}$ (.000)	$2.85x10^{-6}$ (.102)
employment squared		$-1.13x10^{-13}$ (.000)
average UNE price	-.0199 (.755)	.0888 (.102)
HCPM loop	-.125 (.129)	-.1373 (.035)
resrate	.060 (.461)	-.0098 (.879)
adjusted R^2	.81	.89

Of particular interest is the effect of UNE prices on the number of competitors. Our results are inconclusive.

Although both Ros and McDermott and Jamison find that lower UNE prices increase the number of CLECs (both find statistically significant results), our results do not point in that direction. It is possible that their results are affected by their inclusion of RBOC and non-RBOC jurisdictions, while we focus exclusively on RBOC jurisdictions. In particular (formerly) GTE UNE rates have generally been set higher than RBOC rates and there may be less extensive competitive entry in those jurisdictions for reasons other than UNE prices. The potential for additional variation in entry strategies according to whether the incumbent is an RBOC or not is one reason why we choose to focus on RBOC jurisdictions in this paper.

Conclusions

We summarize our conclusions in terms of the types of variables that might affect competitive entry.

- Demographic: there are clear scale effects with larger jurisdictions having more competitive entry. There is some indication that the effect is nonlinear. In addition, there is suggestive evidence that there is less entry in states that have been growing the most rapidly.
- Cost: there is less facilities-based entry where such entry is more costly (proxied by the HCPM loop costs). Resale and UNE-based entry appear to be similarly affected, although the statistical results are inconclusive.
- Retail rates: in some specifications, there appears to be less competitive entry (principally facilities-based) where residential rates are lower. These findings are generally statistically significant at the 90% level. We did not find any meaningful evidence that the degree of rate distortions between business and residential rates matters, although this may be due to incorrect measures of rate distortions.
- Wholesale prices: resale discount rates appear to have no predictive power for any form of entry. States with higher UNE rates have more facility-based entry. The effect of UNE rates on CLEC entry is positive, and in some specifications statistically significant if states with 271 approval are excluded. Further research is needed to investigate this puzzling result.
- 271 approval appears to have a significant impact (positive) on UNE-based entry, although the direction of causation is unclear. 271 approval leads to considerable complications in understanding the impacts of UNE prices on entry decisions – also a subject for further analysis.

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