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An empirical investigation of the stepping-stone hypothesis.

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Abstract

To increase competition in local telephone markets, the 1996 Telecommunications Act required incumbent firms to lease important inputs to competitors at regulated prices. Defending this so-called stepping-stone hypothesis, the Federal Communications Commission argued that new entrants needed a foothold in the market- gained by leasing inputs- before they could build their own facilities. Conversely, critics denied the stepping-stone hypothesis by arguing that easier access to inputs discourages new firms from building facilities. Using a new state-level dataset, we empirically test the stepping-stone hypothesis by exploring the effect of regulated input prices on facilities-based entry. Contradicting key results of existing research, we find that under certain conditions, lower regulated input prices can increase facilities-based entry. These findings partially validate the stepping-stone hypothesis.

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1. Introduction

Since local telephone markets exhibit economies of scale, it is often cost prohibitive for new firms to compete against the incumbent firm without government regulation. The 1996 Telecommunications Act (the Act) was designed in part to increase local telephone competition by mandating new forms of input regulation. Creating new facilities-based entry was one important policy objective of the Act. To achieve this, the Act specifically encouraged competition by regulating key inputs for local telephone service. These key inputs are called unbundled network elements (UNEs) and refer to partitioned elements of the physical infrastructure of the incumbent that are leased to retail suppliers. The incumbent local exchange carrier (ILEC) is therefore required to lease the UNEs to potential competitors referred to as competitive local exchange carriers (CLECs). In order to achieve this policy objective, the Act implemented mandatory unbundling of network elements (UNEs). Thus, the ILEC was required to lease inputs to the CLECs at a price set by the regulator.

In a report released in 1999, the Federal Communications Commission defended its implementation of policy objectives by stating the following: We find our decision to unbundle [certain local network elements] is consistent with the 1996 Act's goals of rapid introduction of competition and the promotion of facilities-based entry.[1] By taking this position, the FCC clearly advocated the so-called stepping-stone hypothesis. This hypothesis contends that: 1) lower UNE prices promotes CLEC entry, 2) CLECs would proceed to build their own facilities. In other words, the stepping-stone hypothesis conjectures that CLECs will transition naturally over time from reselling the services of the incumbent providers to investing in their own facilities-based networks. The implication being that lower UNE prices today will lead to higher rates of deployment of competitive facilities-based networks tomorrow.

Industry changes following the Act provided researchers with an opportunity to test whether or not the stepping-stone hypothesis holds empirically. To date, even though the FCC advocates policies (i.e. liberalized UNE prices) derived from the validity of the theory, empirical research has not always supported their position. Studies by Eisner and Lehman (2001), Crandall, Ingraham, and Singer (2004), and Hazlett (2005) have all found evidence refuting the stepping-stone hypothesis. Willig et al (2002) and Hasset and Kotlikoff (2002) contend that lower UNE prices tend to increase competition and this increase in competition leads to higher levels of investment. In surveying the literature, Robinson and Weisman (2008) contend that the weight of credible empirical evidence fails to support the stepping-stone hypothesis. Using a new state-level dataset that spans multiple years, we empirically test the stepping-stone hypothesis by investigating the effect of UNE prices on facilities-based entry. We find evidence of a quadratic relationship between UNE prices and facilities-based entry. Specifically, the analysis reveals that a UNE price decrease can actually have a positive effect on facilities based entry. These results contradict the preponderance of the existing research, and, in part, validate the stepping-stone hypothesis.

The remainder of this paper is organized as follows. Section 2 provides a summary of the literature. Data and models are presented in Section 3. Section 4 discuses the results. Section 5 concludes.

[1] Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, Third Report and Order (released Nov. 5, 1999)

2. Literature Review

According to Hausman and Sidak (2005), mandatory unbundling is defended by both regulators and entrants. These defenders argue that UNEs are a complement to facilities-based entry. If UNEs and facilities-based entry are in fact complementary, then a decrease in the price of UNEs today will increase investment in facilities by CLECs tomorrow. In turn, the CLEC's cross-price elasticity of investment with respect to access-based entry is negative. In anecdotal support of the stepping stone hypothesis, Hausman and Sidak (2005) cite MCI as an example of an access-based provider transitioning into a facilities-based provider. The overarching objective of the FCC in mandating unbundling was to stimulate facilities-based competition dynamically over time. Dynamic efficiency, as explained by Robinson and Weisman (2008), can be expected to confer greater consumer benefits than a focus on static efficiency. Pindyck concurs with this long run view in arguing that

> *"The Telecom Act envisioned a world of independent physical networks competing with each other to provide telecommunications services in local markets. Unbundling was intended to help facilitate entry so this goal could be reached. The intent was not to have permanent regulation, but rather to transition from regulation to free market rivalry."* [2]

In 1999, UNE-P lines were less numerous than lines owned by CLECs.[3] When regulation changed in 1999, CLECs could lease UNE-P lines at more favorable rates. According to Hazlett (2006), this presented an ideal opportunity to test the stepping-stone hypothesis. The hypothesis predicts that a decrease in UNE-P rates will increase CLEC-owned lines. Results by Hazlett (2006) unambiguously contradict this hypothesis. As UNE-P lines increased by 300%, CLEC-owned lines experienced a markedly decreased rate of growth. In fact, the number of non-cable CLEC-owned lines decreased by 28% from the years 2000 to 2003. Most notably, the correlation between UNE-P lines and non-cable CLEC-owned lines was -0.997. In light of this evidence, Hazlett (2006) concludes that "rather than provide a stepping stone to new entry, the UNE-P regulatory offering appears to crowd out new investment."[4] In their survey of five industrialized countries, Hausman and Sidak (2005) find little evidence in support of the stepping-stone hypothesis. In Canada, for example, even though the absolute number of lines owned by CLECs increased substantially from 1999-2002, CLECs became increasingly dependent on unbundled loops. In effect, the Canadian CLECs substituted away from resale and towards local unbundled loops. It is noted that Canada had a less expansive unbundling policy than did many other countries. However, evidence from the other four countries in the Hausman-Sidak study was equally robust in that the stepping stone hypothesis did not appear to hold.

In perhaps the most frequently cited study on the stepping stone hypothesis, Crandall et al. (2004) investigate the validity of the hypothesis in the U.S. by utilizing a model of factor demand. Using data from 2000 and 2001, their dataset contains 56 state-level observations. Employing generalized least squares, they find a strong positive relationship between the log of

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[2] See Pindyck (2004, p. 2).

[3] UNE-P is the platform that allows the CLECs to deliver a complete service without the need for their own facilities. Weisman and Lehman write (2000, p. 344) that "UNE platforms enable a complete service to be provided solely through the use of UNEs."

[4] See Hazlett (2006, p. 488).

UNE average rates and the log of the ratio of facilities based lines to UNE lines. These results also appear to contradict the stepping stone hypothesis.

3. Data and Econometric Models

Our dataset covers the years 2002-2006. The data are state-level and include every state except The District of Columbia and Hawaii. The stepping stone hypothesis can be tested using alternative dependent variables. Our data provide the opportunity to use two dependent variables: *log (CLEC-owned)* and *log (CLEC-Owned lines)-log(UNE lines*). *Log(CLEC-owned)* is the dependent variable that measures the number of facilities-based lines owned by CLECs in a state during a given year while *log (CLEC-Owned lines)-log(UNE lines)* counts the ratio of facilities-based lines to UNE lines. The latter is useful since it renders our results comparable with those of Crandall et al (2004). We seek to explain how UNE prices influence each dependent variable. Our primary specification for $i=1,2$ is the following:

$$Y_i = f(\textit{UNE price, BUSRES, local cost, elect, population, price cap}) \tag{1}$$

where Y_1 and Y_2 denote *log (CLEC-owned)* and log(*CLEC-Owned lines*)-log(UNE lines), respectively. The independent variables that potentially influence *CLEC-owned* are as follows: (1) The *UNE price* per loop that is determined by the state regulatory process; this is the primary independent variable of interest. (2) *Cost* is the monthly cost per local loop. (3) *BUSRES* is a variable that measures the retail price distortion in local telephone markets. It is measured as the ratio of the flat-rate local telephone price charged to business customers to the flat-rate price charged to residential customers. (4) *Elect* is a dummy variable that is equal to one when regulators are elected and is equal to zero when regulators are appointed. (5) *Population* is the population of a state in the given year. (6) *Price cap* is a dummy variable equal to one if the state is regulated under a price cap regime and is equal to zero otherwise. In most regressions, year effects are also taken into account.[5]

Data sources for the variables are as follows: *UNE price* and *BUSRES* were collected from the Survey of Unbundled Network Element Prices by Billy Jack Gregg. *Cost* was collected from a NECA study which uses USAC data from FCC filings. *Elect* was obtained from the National Association of Regulatory Utility Commissioners (NARUC). *Price cap* was collected from FCC local telephone competition reports and State Retail Rate Regulation of Local Exchange Providers Reports. Finally, *Population* is gathered from U.S. Census Bureau.

Our econometric models use the log version for all non-dummy variables. Table 1 includes summary statistics for each variable in both log and non-log form.

The econometric models that are estimated are expressed as follows:

Pooled OLS Regression:

$$y_{it} = \alpha + X_{it}^{'}\beta + \varepsilon_{it} \tag{2}$$

Random Effects GLS Regression:

$$y_{it} = \alpha_{it} + X_{it}'\beta + \varepsilon_{it} \tag{3}$$

[5] In pooled OLS and random effect regression both year effects and state effects are taken into account.

where *i* and *t* represent state and time, respectively, and ε represents the error term.

4. Results

In terms of simple correlation, “UNE prices” and “CLEC-owned” have a negative relationship of -0.38 as illustrated in Figure 1. Without a more sophisticated econometric approach, the stepping-stone hypothesis appears to be validated by the data. Conversely, “UNE prices” and “log(CLEC-owned)-log(UNE lines)” have a positive relationship of 0.22 that is illustrated in Figure 2. Therefore, when the dependent variable is “log(CLEC-owned)-log(UNE lines)”, simple correlation analysis rejects the stepping-stone hypothesis. In other words, the simple correlation analyses provide mixed results depending on the choice of dependent variable. Thus, the more sophisticated statistical approaches outlined above are required.

In table 2, regressions 1-3 use the same dependent variable as Crandall et al (2004), *log(CLEC-Owned lines)-log(UNE lines)*.[6] The coefficient for *log(UNE price)* is positive in regressions 1-3, and is statistically significant for the random effects model in regression 3. These results lend support to the findings of Crandall et al (2004) and serve as further evidence against the stepping stone hypothesis. Conversely, in table 2, regressions 4-6 use the alternative dependent variable, *log(CLEC-owned lines)*. Regression 4 has a negative and statistically significant estimate for *log(UNE price)*, thereby supporting the stepping stone hypothesis. However, when theoretically important controls are added in regression 5, the *log(UNE price)* coefficient becomes insignificant. Regression 6 shows that the *log(UNE price)* coefficient for the random effects model becomes positive but is still insignificant. The estimates from regressions 5 and 6 imply that UNE price and facilities-based entry are not substitutes as Crandall et al (2004) suggest, nor are they complements as the stepping-stone hypothesis predicts.

Comparing the two random effects regressions- regression 3 with regression 6 - reveals *log(UNE price)* is positive in both models but only significant when the dependent variable is identical to Crandall et al (2004). Therefore, regression 3 suggests that the findings from Crandall et al (2004) are replicable given our dataset; however, regression 6 suggests that the *log(UNE price)* estimate is somewhat sensitive to the type of dependent variable used. Once again, neither economic theory nor the existing literature is not clear as to which dependent variable is to preferred.

It is noteworthy that the residual plots indicate that the linear model does not fit the data very well. Therefore, we seek a model that captures a possible non-linear relationship between UNE price and each dependent variable.

To capture a potential non-linear relationship between UNE prices and CLEC-owned facilities, the square of *log (UNE price)* is included along with the full set of independent variables.[7] As shown in regressions 1-4 in table 3, statistically significant coefficients emerge when the square of log (UNE price) is included. The sign and statistical significance of these results are robust to the type of dependent variable used. The square of log (UNE price) is significant and negative in each regression while log (UNE price) is significant and positive in each regression. Therefore, the estimated models suggest that our independent variables are

[6] Regressions 2-3 also contain a similar set of independent variables as Crandall et al (2004).

[7] Note that in Crandal et al (2004), *log(UNE price)-log(cost)* is taken as a single variable. However, among the alternative model specifications, nonlinearity only in UNE prices provides better fit than any other specification including nonlinearity in single variable *log(UNE price)-log(cost)*.

concave in UNE prices. The signs and significance of these terms imply the following: 1) The stepping-stone hypothesis does not appear to hold when UNE prices are low, 2) the stepping-stone hypothesis appears to hold when UNE prices are high. The relationship depends on whether UNE price is above or below a critical level.

Given the absolute size of each coefficient, estimates indicate that as UNE prices are reduced, the number of facilities-based CLEC lines only decrease when UNE prices are sufficiently low. However, for most levels of UNE prices found in our sample, there is a negative relationship between UNE prices and CLEC-owned facilities. That is to say, we find support for the stepping-stone hypothesis under some conditions.

One possible explanation for the non-linear relationship is that when UNE prices are low retail markups tend to be high. This attracts facilities-based entry in the local telephone market. Conversely, higher UNE prices indicate lower retail markups caused by an increase in marginal costs for providing local telephone service. In this case, new firms are less willing to enter the market as facilities-based providers of local telephone service.

In other words, the statistically significant non-linear relationship between CLEC-owned lines and UNE prices imply that when UNE prices are at a sufficiently low level, an increase in UNE prices will boost the percentage of CLEC-owned lines. However, at higher levels of UNE prices, any increase the UNE price level will actually decrease the percentage of CLEC-owned lines. The estimates of our coefficients serve to reveal the levels for which higher UNE prices lead to fewer facilities-based lines, *ceteris paribus*. This critical value occurs where *log (UNE price)* is equal to 2.623 (based on estimates from the RE model found in table 3, regression 4). According to these estimates, there is a positive relationship between UNE price and CLEC-owned lines when the UNE price is less than $13.78 as shown in Figure 3.[8] When UNE prices are less than $13.78, the stepping-stone hypothesis is rejected. Conversely, there is a negative relationship between UNE price and CLEC-owned lines when the UNE price is greater than $13.78. Given that over half of our sample has UNE prices exceeding this critical value of $13.78, there is some evidence in support of the stepping-stone hypothesis. However, the critical values are higher when log (CLEC-Owned lines)-log(UNE lines) is used as the dependent variable in regressions 1 and 2, although the critical value is still relevant (the maximum UNE price in our sample is $25.57). Therefore, each regression in table 3 suggests a non-linear relationship between UNE prices and CLEC owned lines, thereby implying that the stepping stone hypothesis holds when UNE price levels are sufficiently high.

The stepping-stone hypothesis conjectures that CLECs will transition naturally over time from reselling the services of the incumbent providers to investing in their own facilities-based networks. Thus, it is ideal to use lagged UNE variables to test for any dynamic effects. However, previous researchers have not been able to test whether current UNE price changes affect the facilities-based entry of CLECs in subsequent years. Since our dataset spans multiple years, there is a unique opportunity to test whether changes in UNE prices influence entry over time. Using the same controls as the previous models, regressions in table 3 estimate the impact of current UNE price changes on CLEC-owned facilities by lagging the UNE price terms by one year (the inclusion of the lagged term decreases the number of observations). Thus, we estimate how a UNE price change in year *t* will affect the number of CLEC-owned facilities in year *t+1*.

[8] This critical value for UNE price is $15.34 in regression 1, $18.14 in regression 2, and $13.54 in regression 3.

Regression results in table 4 reveal that current UNE prices influence CLEC owned lines for the following year. These results are robust for regressions 1-4 and suggest that the stepping-stone hypothesis holds dynamically when UNE prices are sufficiently high. Interestingly, the range of critical values in the dynamic case (table 4) is smaller compared to the range of critical values in the contemporaneous case (table 3).[9] Whereas the critical value for the UNE price range from \$13.54 to \$18.14 in the contemporaneous case, the critical value for the UNE price range from \$13.13 to \$15.34 in the dynamic case. This suggests that our results are more robust to the type of dependent variable in the dynamic case. Hence, the results in table 4 provide additional evidence for the validity of the stepping stone hypothesis when UNE prices are sufficiently high. Notably, these results hold when UNE prices are lagged for up to three years (the maximum number of years that our dataset allows).[10]

Our estimates suggest that UNE prices and facilities-based entry are complements under some conditions. These results are opposite those of Eisner and Lehman (2001), Hausman and Sidak (2005), Crandall et al. (2004), and Hazlett (2006). We conclude, based on our econometric modeling, that increasing UNE prices can actually hinder facilities-based competition both contemporaneously and dynamically under some conditions.

Coefficient estimates for the control coefficients are somewhat sensitive to the type of dependent variable used, the presence of the squared log (UNE price) term, and the inclusion of lagged UNE prices. Coefficient estimates for each control coefficient are discussed below.

As the cost of building a CLEC owned line increases, we expect fewer CLEC owned lines. As predicted, *log(cost)* is negative in each regression, although it is only significant in the random effects models where *log(CLEC-Owned lines)-log(UNE lines)* serves as the dependent variable; *log(cost)* is also significant in regression 4, table 3.

The ELECT coefficient is always positive, and is statistically significant in each regression found in table 3; it is always statistically significant and positive in the random effects models when *log(CLEC-Owned lines)-log(UNE lines)* serves as the dependent variable. The positive value of ELECT suggests that there are more facilities-based CLEC lines in states where regulators are elected rather than appointed, *ceteris paribus*. This implies that conditions are relatively favorable for facilities-based CLECs in states where regulators are subjected to the traditional electoral process. That is, facilities-based entry is more predominant than UNE-based entry in states where regulators are elected, even controlling for relevant factors.

BUSRES is only significant in the random effects models where log (CLEC-Owned lines)-log(UNE lines) serves as the dependent variable.

Population is insignificant in the random effects models where *log(CLEC-Owned lines)-log(UNE lines)* serves as the dependent variable. Meanwhile, population is positive and statistically significant in all regressions where *log(CLEC-Owned lines)* is the dependent variable. This is because *log(CLEC-Owned lines)* is influenced by population; states with higher population will have more CLEC-Owned lines on average. Conversely, *log(CLEC-Owned lines)-log(UNE lines)* is a ratio; there is an ambiguous relationship between the population of a state and the ratio of CLEC owned lines to UNE lines.

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[9] This critical value for UNE price is \$15.34 in regression 1, \$14.47 in regression 2, \$13.52 in regression 3, and \$13.13 for regression 4.

[10] These results are available upon request.

Interestingly, the price cap coefficient shows a statistically significant relationship in several regressions found in table 2 and 3. States with price cap regulation–in contrast to rate of return regulation–have fewer facilities-based CLEC lines, *ceteris paribus*. Therefore, business conditions for CLECs appear less favorable in states with price cap regulation. One explanation for this result is that incumbent firms in states with price cap regulation are simply more efficient. As Lehman and Weisman (2000) note, price cap regulation (at least in theory) provides strong incentives for the incumbent to discover more efficient ways to operate. This increased efficiency could conceivably reduce the profit opportunities for CLECs, thereby reducing incentives to build their own facilities-based lines. Another explanation for this result is related the fact that increased pricing flexibility for the ILEC accompanies price cap regulation. Therefore, it is possible that this increased price flexibility renders it more risky for CLECs to enter on a facilities basis. Our estimates for the price cap coefficient are both statistically and economically significant. The range of estimates for this coefficient is -0.290 to -0.496. This coefficient may be interpreted as follows: when other variables are held constant, the introduction of a price cap regime decreases the percentage of CLEC lines anywhere from 25.1% to 39.1%.

5. Conclusion

The passage of the 1996 Telecommunications Act provides regulators with additional instruments through which to control the intensity of competition in local telephone service markets. The FCC envisioned that lower regulated UNE prices would ultimately lead to increased facilities based entry by CLECs. The preponderance of the research to date, however, finds that lower UNE prices actually leads to less facilities-based entry. Using a panel data set, we find evidence in *support* of the stepping stone hypothesis that appears to contradict much existing research. Over half of our sample UNE prices, our estimates suggest that facilities-based entry could increase as a result of lower UNE prices.

We have shown that our empirical results are similar to Crandall et al (2004) when a linear specification is used for the identical dependent variable that is used by Crandall et al (2004). However, we show that this empirical support against the stepping stone hypothesis is sensitive to specification. When a non-linear relationship between UNE price and CLEC entry is accounted for, a more nuanced relationship emerges. We find support for the stepping-stone hypothesis is likely to hold when UNE prices are sufficiently high. Conversely, we do not find support for the stepping-stone hypothesis is not likely to hold when UNE prices are sufficiently low. These results are robust to the type of dependent variable used.

In addition, since the stepping-stone hypothesis predicts that CLECs will transition naturally over time from reselling the services of the incumbent providers to investing in their own facilities-based networks, we empirically test whether the relationship between UNE price and CLEC entry holds through time. Utilizing our unique panel data set, we find that our results are robust to the inclusion of lagged UNE prices.

We have shown that the relationship between UNE price and CLEC entry is contrary to the results of previous studies. Our estimates provide evidence that the FCC may have been at least partially correct with implementing policy based on the stepping-stone hypothesis.

Figure 1: Correlation between *log(CLEC owned)* and *log(UNE price)*

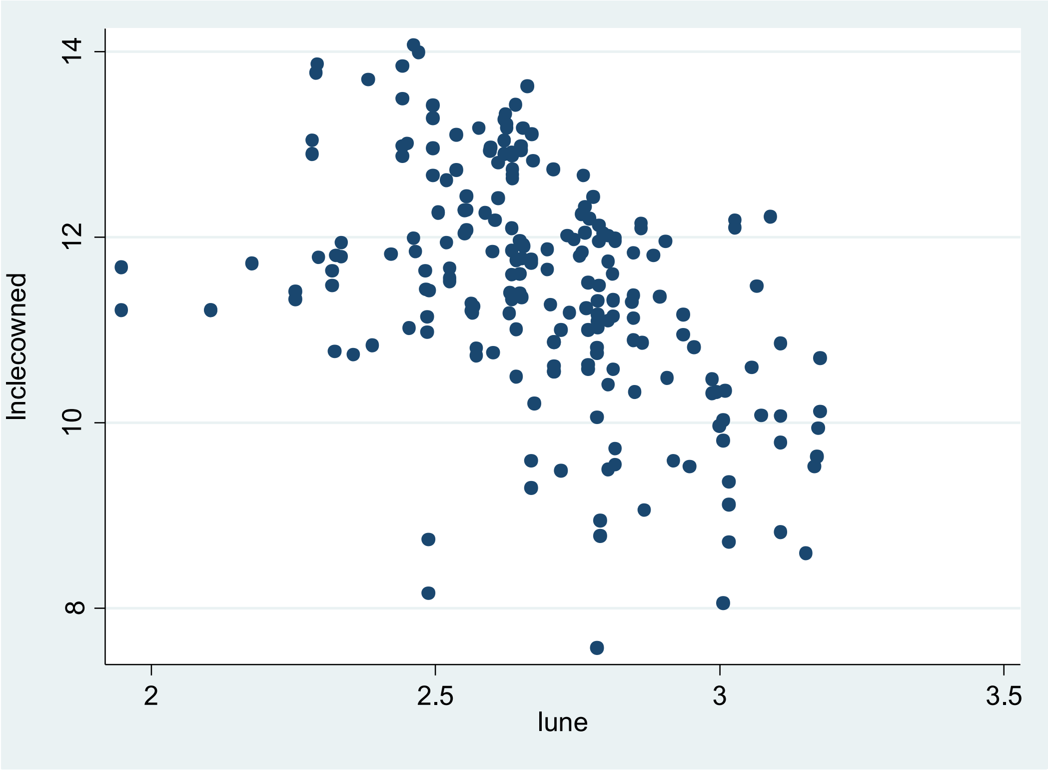

Figure 2: Correlation between *log(CLEC owned)-log(UNE lines)* and *log(UNE price)*

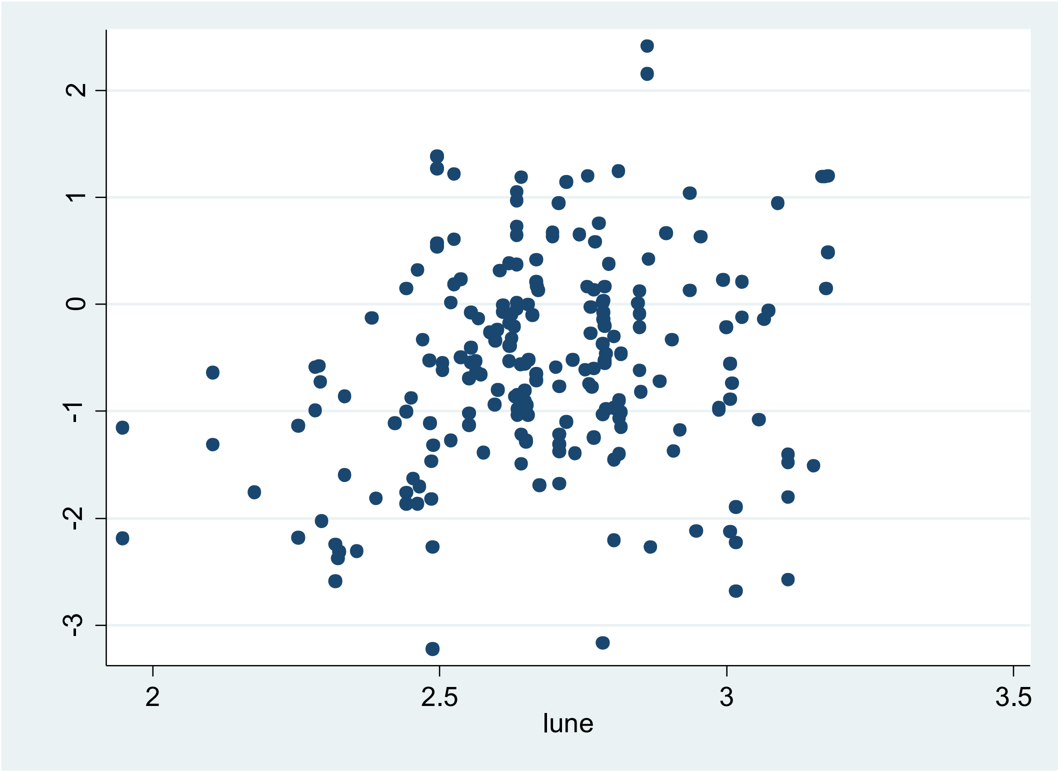

Figure 3. Relationship between CLEC-Owned Lines and UNE Prices

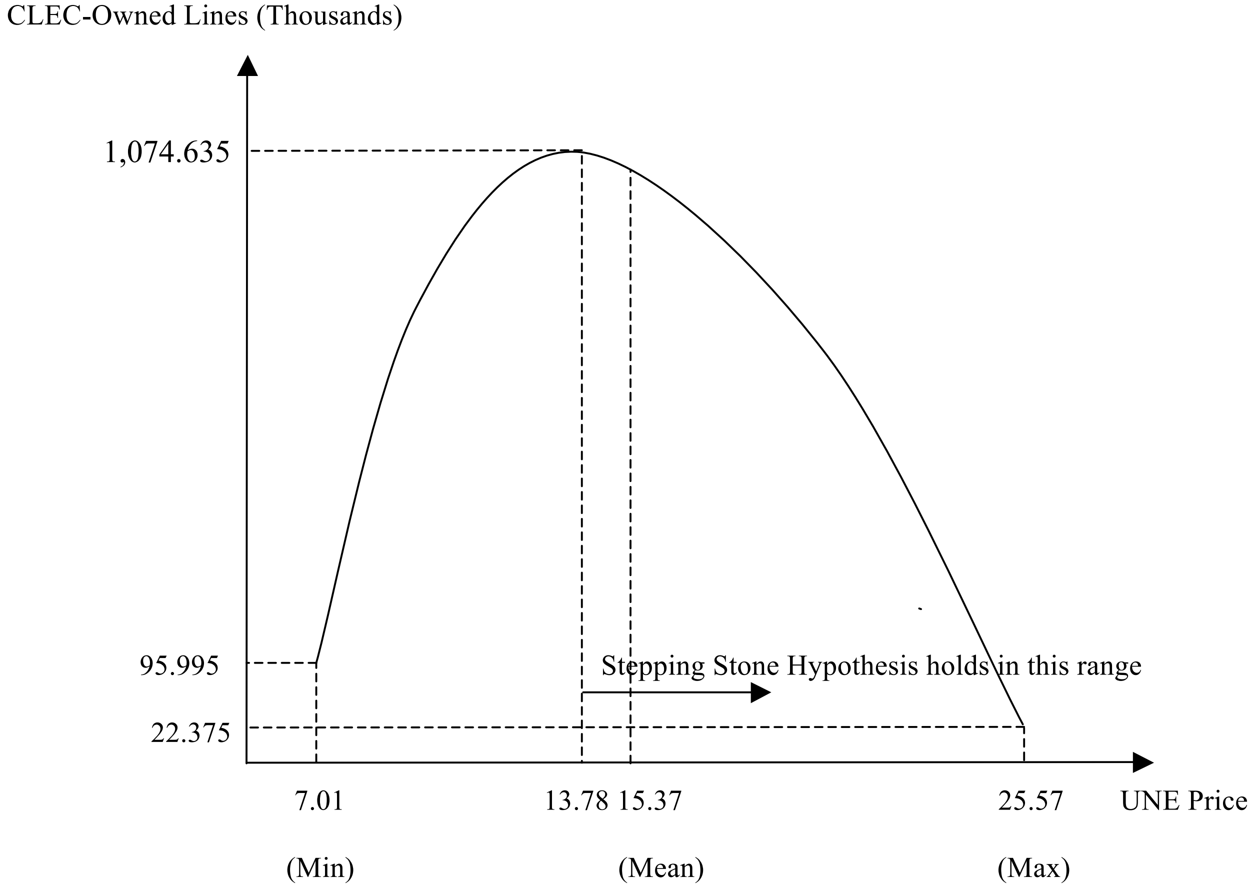

Table I: Summary Statistics for the Stepping-Stone Hypothesis (2002-2006)

Variable	Observations	Mean	Std.Dev	Min	Max
CLEC Owned	218	184,444.7	219,923.1	1944.1	1,284,951
UNE Price	245	15.372	3.633	7.01	25.565
Loop Cost/Mo	243	21.94396	5.305445	13.324	35.263
BUSRES	245	1.778	0.476	0.596	2.828
Population	245	5,946,944	6,482,289	497,204	36,200,000
log (CLEC Owned)	218	11.489	1.235	7.573	14.066
log (UNE price)	245	2.705	0.236	1.947	3.241
Log (UNE) squared	245	7.373	1.273	3.792	10.506
Log(Loop Cost/Mo)	239	3.084	0.205	2.575	3.563
Log (BUSRES)	245	0.534	0.306	-0.517	1.039
log (population)	245	15.11	1.014	13.112	17.406

Table II: Testing the Stepping-Stone Hypothesis

Regressions 1-3: the dependent variable is log (CLEC-Owned lines)-log(UNE lines). Regressions 4-6: the dependent variable is the log of CLEC-Owned lines.

Variable	OLS (1)	OLS (2)	RE (3)	OLS (4)	OLS (5)	RE (6)
log(UNE price)	0.910 (.618)	0.505 (0.690)	0.833** (0.378)	-2.353*** (0.647)	-0.286 (0.590)	0.115 (0.373)
log(cost)	-0.128 (.664)	-0.614 (.585)	-1.205*** (0.413)	-.552 (0.790)	-0.429 (0.495)	-0.515 (0.371)
ELECT	-------	0.470 (0.326)	0.534 (0.327)	-------	0.342 (0.260)	0.324 (0.304)
log(BUSRES)	-------	0.320 (0.344)	0.707*** (0.223)	-------	-0.206 (0.299)	0.127 (0.195)
log(population)	-------	-0.498 (0.170)	0.004 (0.156)	-------	1.041*** (0.144)	1.114*** (0.128)
Price Cap	-------	-0.395 (0.295)	-0.147 (0.147)	-------	-0.306 (0.239)	-0.164 (0.130)
Constant	-2.310 (1.817)	.950 (4.257)	0.382 (3.088)	19.752 (2.306)	-1.826 (3.829)	-4.338 (2.720)
Observations	212	212	212	213	213	213
p-value	0.0000	0.0000	0.0000	0.0007	0.0000	0.0000

Notes:
[a] The numbers in parentheses are standard errors.
[b] *** Statistically significant at 1% level
** Statistically significant at 5% level
* Statistically significant at 10% level
[c] Provided p-values are based on F-test for OLS regressions and Wald-test for random effect GLS regressions.

Table III: Testing the Stepping-Stone Hypothesis by Including Non-linearity in UNE

Regressions 1-2: the dependent variable is log (CLEC-Owned lines)-log(UNE lines). Regressions 3-4: the dependent variable is the log of CLEC-Owned lines.

Variable	OLS (1)	RE (2)	OLS (3)	RE (4)
log(UNE price)	15.776** (6.420)	8.062** (3.872)	18.865*** (4.286)	15.722*** (3.030)
log(UNE price) squared	-2.889** (1.270)	-1.391* (0.751)	-3.620*** (0.842)	-2.997*** (0.603)
Log(cost)	-0.577 (0.570)	-1.198*** (0.409)	-0.396 (0.448)	-0.494 (0.357)
ELECT	0.481 (0.314)	0.563* (0.317)	0.359 (0.241)	0.380 (0.276)
log(BUSRES)	0.221 (0.324)	0.630*** (0.225)	-0.330 (0.264)	-0.042 (0.191)
log(population)	-0.080 (0.171)	-0.033 (0.157)	1.005*** (0.135)	1.040*** (0.124)
Price Cap	-0.546 (0.277)	-0.201 (0.149)	-0.496** (0.190)	-0.290** (0.117)
Constant	-18.597** (7.828)	-8.301 (5.403)	-26.328*** (4.766)	-23.236 (3.972)
Observations	212	212	213	213
p-value	0.0000	0.0000	0.0000	0.0000

Notes:
[a] The numbers in parentheses are standard errors.
[b] *** Statistically significant at 1% level
** Statistically significant at 5% level
* Statistically significant at 10% level
[c] Provided p-values are based on F-test for OLS regressions and Wald-test for random effect GLS regressions.

Table IV: Testing the Stepping-Stone Hypothesis by Lagging UNE Prices

Regressions 1-2: the dependent variable is log (CLEC-Owned lines)-log(UNE lines). Regressions 2-4: the dependent variable is the log of CLEC-Owned lines.

Variable	**OLS (1)**	**RE (2)**	**OLS (3)**	**RE (4)**
Lagged log (UNE price)	15.005** (6.782)	15.943*** (3.507)	17.766*** (4.541)	17.353*** (3.480)
Lagged log (UNE price) squared	-2.747** (1.356)	-2.983*** (0.689)	-3.411*** (0.902)	-3.369*** (0.691)
log(cost)	-0.737 (0.581)	-1.228*** (0.405)	-0.585 (0.448)	-0.819** (0.330)
ELECT	0.606* (0.316)	0.704** (0.307)	0.490** (0.231)	0.534** (0.244)
log(BUSRES)	0.231 (0.332)	0.689*** (0.251)	-0.319 (0.269)	0.036 (0.212)
log(population)	-0.042 (0.175)	-0.117 (0.164)	1.033*** (0.141)	0.981*** (0.129)
Price Cap	-0.491* (0.287)	-0.216 (0.142)	-0.443** (0.193)	-0.241** (0.116)
Constant	-17.719** (8.057)	-16.557*** (5.230)	-24.844*** (4.726)	-23.045*** (4.621)
Observations	175	175	176	176
p-value	0.0000	0.0000	0.0000	0.0000

Notes:
[a] The numbers in parentheses are standard errors.
[b] *** Statistically significant at 1% level
** Statistically significant at 5% level
* Statistically significant at 10% level
[c] Provided p-values are based on F-test for OLS regressions and Wald-test for random effect GLS regressions.

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