

An Analysis of the Extent and the Means of Entry into Local Telecommunications Markets

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This paper examines the determinants of both the extent and the means of competitive entry in local telecommunications markets. Panel data are used to analyze the market share attained by entrants who lease inputs from incumbents using two alternative arrangements provided for under the Telecommunications Act of 1996: leasing only the wires that connect a customer's premises to the phone network (loop-based entry), or leasing all of the network elements that are needed to provide phone service (platform-based entry). The estimates suggest that while the two types of entry are generally affected by different market factors, there appears to be cost-based substitution between them. Loop-based entry tends to be more pronounced relative to platform-based entry as the degree of Republican representation on state public utility commissions increases. Also, loop-based entry is more responsive to changes in economic conditions in smaller states, while platform-based entry is more responsive in larger states. The results indicate that the option of platform-based entry may discourage loop-based entry as some critics have claimed. Further, given the differing effects across states of different sizes, policymakers need to consider how to fashion policies that achieve national goals but recognize local market conditions.

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1. Introduction.

A primary goal of the Telecommunications Act of 1996 (TA96) is to facilitate competition in the local telecommunications market. TA96 includes provisions that allow entrants¹ to lease parts of the incumbent's² network, known as unbundled network elements (UNEs), at relatively low rates determined by state public utility commissions. There are two ways in which entrants can provide phone service by leasing UNEs. Under a loop arrangement³, the entrant rents from the incumbent the phone line that connects a customer's residence or premises to the local wire center. However, the entrant provides the equipment that connects the customer's line to the broader telephone network. The other means by which entrants can offer service is by leasing UNEs through a platform arrangement, which became widely available in 2000.^{4,5} The key difference between loop- and platform-based entry is that in platform arrangements, the entrant leases all of the UNEs needed to provide telephone service. In other words, the entrant simply rebundles the UNEs that are required to provide service and does not have to own any of the necessary equipment.⁶

A sufficiently long time series of data is now available to investigate the factors that determine the extent of entry via these two alternative arrangements. Figure 1 indicates that from

¹ Entrants into local telecommunications markets are known as Competitive Local Exchange Carriers, or CLECs.

² Incumbents in local telecommunications markets are known as Incumbent Local Exchange Carriers, or ILECs.

³ This is also referred to as UNE-L entry.

⁴ This is also referred to as UNE-P entry.

⁵ As described below, recent court rulings and revisions to FCC regulations have altered the regulatory treatment of platform-based entry.

⁶ Incumbents have been quick to point out that there is no actual difference between platform-based entry and reselling the incumbents' services, another option provided for under TA96. Given the cost of platform arrangements and the resale discount rates, reselling the incumbents' services is typically more costly for entrants than providing service under a platform arrangement. However, platform-based entry is more risky for entrants as they are not guaranteed a positive gross profit margin as they are under a resale arrangement. This risk would be realized if the retail price fell below the platform cost, in which case the entrant would face a negative gross profit under a platform arrangement whereas under a resale arrangement the entrant's cost would fall by the same percentage as the retail price.

July 2001 to July 2004 the national average of the fraction of incumbent⁷ lines leased to entrants increased steadily. The average increased from just over 5% in July 2001 to almost 20% three years later. However, Figure 2 indicates that the increases in entry differ greatly by means of entry. During the 2001 – 2004 period, while the fraction of lines leased through a loop arrangement ranged between 2% and 4%, the fraction leased through a platform arrangement tripled from less than 4% to over 12%.

Figures 3 and 4 suggest that the evolution of entry has also differed significantly across states. Each dot in Figure 3 represents for a given state the fraction of lines leased through a loop arrangement in July 2001 and in July 2004. Dots near the 45-degree line represent states where the share of loop-based entry changed little between the two dates, while dots above the 45-degree line indicate that the share increased. As the figure indicates, while there are some states in which the share changed little, there are also a number of states where the share increased substantially. Figure 4 displays the corresponding data for platform-based entry. While most states are above the 45-degree line, the extent to which they line above the line varies substantially.

Figures 1 through 4 raise important questions regarding telecommunications market dynamics, including the following two: What market factors influence the level of competitive entry via the two alternative means? What effects did state regulatory policies or the political environment have on the observed level of entry?

The answers to these questions are of interest to both policymakers and researchers. On one level, the answers shed light on the effectiveness of TA96 and its implementation. Not only can these answers inform the ongoing debate regarding regulation of U.S. telecommunications markets, but they may also provide guidance to regulators in other countries attempting to

⁷ The largest incumbents in each state are the regional monopolies that were created in the court-ordered split-up of AT&T in 1984 and are commonly referred to as RBOCs (Regional Bell Operating Companies). While entrants can rent UNEs from other incumbents in areas not served by an RBOC, the vast majority of UNE entry has occurred in RBOC regions. For the remainder of this paper, the term incumbent will refer exclusively to RBOCs.

fashion policies. Further, the results supplement the existing body of literature regarding competitive entry. There has been scant prior research regarding how entrants choose whether to lease all of the inputs from their competitors (as in a platform arrangement) or buy some of the inputs themselves (as in a loop arrangement). The choices of entrants could have important implications for long-term competition.

Several authors have analyzed the determinants of competitive entry into local telecommunications markets.⁸ These papers often use cross-sectional data sets to explain the level of competitive entry, as measured by the number of entrants or the number of telephone lines entrants have acquired. Typically these papers find that variables associated with higher demand correspond to higher entry, while variables associated with higher costs are correlated with a lower degree of entry. In regards to the effects of regulation, areas where retail price caps are used are generally associated with lower levels of entry, while the effects of the political composition of state public utility commissions differ across papers.

This paper is closely related to Beard and Ford (2002) and Beard, Ford, and Koutsky (2005). Beard and Ford (2002) use a pooled data set to analyze the determinants of loop- and platform-based entry. Among their findings is that, for both types of entry, as the cost of leasing the UNEs used in that type of entry increases, the level of entry falls. Their estimates of the cross-price elasticity of demand also suggest that entry via loop and platform arrangements are not substitutes. Beard, Ford, and Koutsky (2005) examine a cross-sectional data set to examine the deployment of equipment by entrants. Using proprietary data, they come to the conclusion that higher UNE leasing costs lead to decreased entrant equipment investment. Sappington (2005) constructs a theoretical model that suggests the price at which an entrant can lease an input may have little effect on its decision to lease the input from the incumbent supplier or make the input itself. This conclusion arises because the lease price influences the intensity of downstream

⁸ Examples include Abel (2002), Abel and Clemments (2001), Alexander and Feinberg (2004), Brown and Zimmerman (2004), Jamison (2004), Lehman (2002), Lehman (2003), Roycroft (2005), and Zolnierrek, Eisner, and Burton (2001).

competition such that the incumbent tends to price less aggressively when the lease price paid by the competitor is higher.

This paper improves upon the existing literature in at least four important ways. First, panel data are used rather than cross-sectional data. Thus, the data will allow for a more precise estimate of the effects of dynamic changes in the market environment on the level of entry observed. Second, the influence of the political composition of state public utility commissions is estimated. Third, the effect of the connection charge that loop entrants must pay whenever they gain a new customer is measured. The potentially dampening effect of the connection charge on loop-based entry was cited by the Federal Communication Commission as an important basis for its regulatory treatment of platform-based entry.⁹ Fourth, the empirical specification allows for the estimation of differential effects of the explanatory variables for varying levels of market size.

Four significant conclusions are offered. First, while the two types of entry are generally affected by different market factors, there appears to be cost-based substitution between them. Second, changes in the own monthly costs of the two forms of entry have limited effects, but loop-based entry decreases in response to increases in the connection charges entrants must pay incumbents when a customer is acquired. Third, loop-based entry tends to be more pronounced relative to platform-based entry as the degree of Republican representation on state public utility commissions increases. Fourth, loop-based entry is more responsive to changes in market conditions in smaller states, while platform-based entry is more responsive to market conditions in larger states.

The paper is organized as follows. Section 2 presents background information on the functional and regulatory differences between loop- and platform-based entry. Section 3 presents the determinants that are hypothesized to affect the level of entry. Section 4 details the

⁹ For example, see FCC (2003), 295-298.

econometric methodology and the data used. Section 5 presents the estimation results, while Section 6 provides conclusions and areas for further research.

2. Background information on UNE-based entry.

2.1. Loop-based versus platform-based entry.

To properly interpret the results below, it is important to understand the differences between loop-based and platform-based entry.

As stated above, when an entrant acquires a customer under a loop arrangement, the entrant leases only the UNEs associated with the wire that connects the customer's premises to the incumbent's wire center. This wire is referred to as the local loop. In order to provide service using a loop strategy, an entrant must provide its own switching equipment¹⁰ and pay the incumbent for the space it rents and the power it uses in the incumbent's buildings where the switching and related equipment are housed.^{11,12}

Conversely, under a platform arrangement, the entrant does not have to own any of the network equipment needed to provide phone service. The entrant in effect "re-bundles" all of the UNEs it needs to provide service.

An important difference between loop- and platform-based entry is how the incumbent's customers are switched to the entrant's service. Lines that are used to serve customers under a loop arrangement must be physically disconnected from the incumbent's switching equipment and reconnected to the entrant's equipment. This transfer, known as a hot-cut, requires that both

¹⁰ While switches can have many functions, the key role that they serve for entrants to provide telephone service is that they connect the incumbent's loop to the entrant's network.

¹¹ Entrant switches require economies of scale to be cost-effective. Thus, entrants may install equipment in remote locations that allows them to aggregate traffic before reaching a switch that it owns (this process is known as back-hauling). However, the entrant then not only has to pay for the aggregation equipment, but also must pay the incumbent to move its traffic to its switch.

¹² This practice of renting space in an incumbent telephone facility is known as collocation.

an incumbent and entrant technician be present in order to perform a “seamless migration”¹³ of the customer to the entrant’s network. For each hot-cut that is performed, the entrant must pay the incumbent a connection charge to compensate the incumbent for the labor involved. Conversely, to transfer an incumbent’s customer to an entrant who employs a platform strategy, computer software is used that allows for the process to be fully automated. The entrant must only pay a nominal administrative fee to the incumbent to transfer the customer.

2.2. History of platform-based entry regulation.

While there has been widespread agreement that allowing entrants to lease the local loop is beneficial to long-run competition, there has been heated disagreement as to the effects of allowing entrants to follow a platform strategy. Advocates of allowing platform-based entry typically point to the technical and financial difficulties entrants face when using loop arrangements to serve residential customers.¹⁴ Those critical of forcing incumbents to provide platform arrangements argue that the option discourages entrant investment in telecommunications equipment, which is one of the goals of TA96.¹⁵ Among the FCC commissioners, this disagreement typically splits along party lines, with Democratic commissioners in support of the platform-based entry option and Republicans opposed.¹⁶

Given the enormous financial stakes involved in the local telecommunications market, perhaps it is not surprising that there has been a great deal of regulation and litigation concerning

¹³ A seamless migration is an industry term that describes a hot-cut where the customer does not lose phone service for any noticeable length of time.

¹⁴ The connection charges and labor costs involved in a hot cut are claimed to be prohibitively expensive for entrants, especially as the churn rate among their customers is relatively high (WorldCom (2002)). In addition, when the hot cut is performed, the customer may lose service for a brief period of time. Entrants complain that customers associate the delay with the entrant to whom they are transferring service, and thus the customer immediately perceives a lower quality of service with the entrant (FCC (2003), 290-291).

¹⁵ See, for example, Crandall, Ingraham, and Singer (2004).

¹⁶ A notable exception to this generalization is the current Republican FCC Chairman Kevin Martin, who sided with the two Democratic commissioners in the 2003 Triennial Review Order (FCC (2003)) to continue the availability of platform-based entry.

platform-based entry. There are two main regulatory requirements for platform-based entry to be feasible: entrants must be able to “re-bundle” UNEs and all of the necessary network elements must be unbundled by the FCC.

Entrants eventually realized that for certain customers they could realize greater profits if they simply leased all of the UNEs necessary for them to provide phone service, rather than providing any of the necessary equipment themselves.¹⁷ While incumbents began allowing entrants to lease the UNEs necessary in a platform arrangement in some states in 1999, the incumbents often charged additional fees for “re-bundling” the network elements. The FCC then ruled that the incumbents could not charge these re-bundling fees. Litigation soon followed, culminating with the Supreme Court ruling in 2002 in *Verizon vs FCC* that entrants can legally re-bundle UNEs at no additional charge from the incumbents.

In terms of the availability of UNEs, the network element that has been at the heart of the platform-based entry debate is the incumbent switches, specifically those that are used to service residential and small business customers.¹⁸ While the debate among the FCC commissioners has often been very contentious, until recently most incumbent switches¹⁹ have been available to entrants as UNEs at relatively low rates²⁰. However, in March 2004, the U.S. Court of Appeals in Washington, D.C. ruled that the FCC rules did not comply with TA96. In June 2004, the Bush administration announced that it would not appeal the decision by the U.S. Court of Appeals, thus ringing the death bell of platform-based entry as known by market participants.²¹ Partly in

¹⁷ To be precise, the entrant must still provide equipment necessary for billing, marketing, and customer service functions.

¹⁸ The FCC defines this classification as any customer with four access lines or fewer.

¹⁹ In its 1999 UNE Remand Order (FCC (1999)), the FCC ordered that incumbents did not have to lease certain switches located in the 50 largest MSAs.

²⁰ These rates are set by state public utility commissions and based on a TELRIC (total element long-run incremental cost) methodology. In essence, the UNE cost is to be based on the costs a hypothetical incumbent would incur using current technology and is not to be based on the actual historical investment by the incumbent. See Quast (2005) for further details.

²¹ Rather than abruptly make incumbent switches unavailable as UNEs, the FCC ordered a 12-month transition phase during which switches would be available at slightly higher costs. However, after the 12-month transition the parties are to negotiate the rates at which switches can be leased.

response to these developments, AT&T and MCI subsequently announced that they were exiting the residential market (Young (2004)). Finally, in February 2005, the FCC (2005) ruled that as of February 2006 incumbent switches would not be available to entrants at the low rates.²²

3. Hypothesized determinants of loop- and platform-based entry.

This section outlines the likely determinants of loop- and platform-based entry. The determinants can be classified as describing the revenue potential, regulated costs, and political effects.

Measures of revenue potential reflect the profits an entrant would expect to earn. An obvious candidate would be the current retail price in that market, in so far as, *ceteris paribus*, the higher the retail price the more attractive a market is to a potential entrant.²³ The incumbent's average net revenue per line in that state is used as a proxy for these prices. Another variable of potential interest to entrants is the growth prospects of the market. One may expect that entrants will focus their efforts in areas where they expect increases in the number of potential customers. To control for the effects of changes in the growth level in a state, the change in the unemployment rate is included as an explanatory variable.

The level of entry is also likely to be affected by the costs an entrant expects to incur in providing service. A main source of costs for entrants is the payments they must pay to incumbents to lease UNEs. As noted above, during the sample period those rates are determined by state public utility commissions and do not vary by entrant within a given state. For loop-based entry, there are two UNE rates that are especially important to entrants: (1) the monthly price they must pay to incumbents to rent the local loop and a connection device known as a line port; and (2) the fee charged by the incumbent to transfer one of its customers line to the

²² Many entrants have negotiated agreements with incumbents to continue leasing switches after they are no longer available at TELRIC rates. For instance, Qwest has negotiated such agreements with more than 60 entrants, while Verizon and BellSouth have negotiated such agreements with over 50 and 45 CLECs, respectively. (See BellSouth (2004); State Telephone Regulation Report (2005); and Telecom A.M. (2005).)

²³ Unfortunately, within a state and across customer types, several retail prices may be charged.

entrant's equipment (i.e., to perform a hot cut). One would expect both rates to have a negative effect on the level of loop-based entry. In terms of platform-based entry, the process used to transfer a customer to an entrant's network is fully automated and incurs only a nominal charge. However, under a platform arrangement the entrant must pay the incumbent to lease its switching equipment and to transport calls over the long distance network, as well as to lease the local loop. This total charge is referred to as the platform rate and, as it increases, platform-based entry is expected to decline.

Political factors also may influence entry in ways that are not entirely clear. A potential influence is the political composition of the state public utility commission. Among the ways state public utility commissions affect entry (beyond setting UNE rates) is by forcing the incumbent to adjust their hot-cut processes and computer systems through which entrants order and are billed for services for newly acquired customers.²⁴ Also, state commissions set right-of-way access regulations that can either help or hinder entrants who install their own equipment. One could imagine that a commission that is majority Republican would oppose governmental involvement in the market and thus limit their efforts at facilitating a relatively more involved regulatory design such as platform. However, it may also be the case that Republican allegiances to small businesses may predispose them to treat entrants favorably. Likewise, the effect of a Republican governor on competitive entry is not clear.^{25,26}

While the factors described above may be expected to have certain effects on entry, these effects may differ substantially by the size of the market. For instance, a \$1 increase in revenue

²⁴ For example, states have implemented various approaches in forcing incumbents to implement procedures to migrate customers to entrants (FCC (2003), 309-310). In the former Ameritech region, entrants accused SBC of not having adequate computer systems to allow for platform-based entry (see Kovacs (2002)).

²⁵ Note that while the discussion that follows refers to measurements of Republican influence, given the virtual binary political party environment, the results can be cast in terms of Democratic influence merely by replacing the reported result with its opposite.

²⁶ Another regulatory variable that could have a significant effect on entry is whether the incumbent is under price or rate of return regulation for their retail prices. During the sample period the type of retail rate regulation did not change for any of the incumbents. Therefore, this effect is captured in the fixed effects analysis.

per customer may lead to entrants attaining a greater additional market share in larger markets than in smaller markets, as entrants may already have a presence in larger markets and the incremental cost of acquiring an additional customer is relatively low. Conversely, changes in market conditions may have a greater impact in smaller markets, as entry in these markets is less certain and changes in potential profits can determine whether entrants choose to enter the market. To capture these potential differences across states, the model includes interaction terms between the factors listed above and the population of the state.

One of the advantages of a panel data analysis is the ability to control for effects specific to a state that are not captured elsewhere. State fixed effects control for time-invariant effects that are not captured in the other explanatory variables and that are specific to a given state (e.g., operating cost differences).²⁷ In addition, time fixed effects are included to control for national effects specific to a given period.²⁸

4. Model specification and data used.

Given that the levels of loop- and platform-based entry are highly related,²⁹ it is appropriate to estimate them simultaneously. Thus, a seeming unrelated regression (SUR) approach is employed.³⁰

Summary statistics of the data used are provided in Table 1. The sample is based on semi-

²⁷ Given that in the sample no state is served by more than one incumbent, state fixed effects also control for incumbent fixed effects.

²⁸ The model was also estimated without state and time fixed effects. Compared with the results reported below that include these fixed effects, the estimates without fixed effects indicate a stronger negative relationship between the level of entry and the monthly cost of that form of entry. These results are similar to those in Beard and Ford (2002), who do not include state fixed effects in their regressions. However, in the regressions without state and time fixed effects, the monthly cost of entry may reflect the attractiveness of entry into that state. For example, a high loop rate may be associated with lower entry, but high loop rates exist in areas where loop entry is relatively unattractive (e.g., Wyoming).

²⁹ Insofar as when an entrant decides to enter a market by leasing unbundled elements, the entrant must choose either one of these entry methods.

³⁰ As specified, the SUR model results in the same coefficient estimates as when each dependent variable is regressed separately. However, the SUR estimator is more efficient (assuming the model is correctly specified) and thus results in lower standard errors of the coefficient estimates.

annual data by state for the period January 2001 to July 2004.^{31,32,33} Correlation coefficients between the explanatory variables are provided in Table 2.

The dependent variables in the estimations are the fraction of incumbent lines leased by entrants using a loop arrangement and the fraction of lines leased using a platform arrangement. These variables are based on data reported by incumbents to the FCC in their Form 477 data submissions (<http://www.fcc.gov/wcb/iatd/comp.html>).³⁴

In regards to revenue potential, the incumbent's revenue per line for a state is obtained from ARMIS data submitted by the incumbents to the FCC (<http://www.fcc.gov/wcb/armis/>).³⁵ The change in the unemployment rate is based on seasonally adjusted data reported by U.S. Bureau of Labor Statistics (<http://www.bls.gov/data/home.htm>).

As the level of entry may affect the average revenue, the average revenue may be endogenous to the level of competitive entry. To attempt to control for this potential endogeneity, three alternative strategies were also employed: using the lagged value of average revenue as the explanatory variable, using the lagged value of average revenue as an instrumental variable, and using as an instrumental variable the percent of the incumbent's lines that are used by

³¹ Alaska, Hawaii, and Washington, DC are not included in the analysis because of their particular geographic circumstances. Arkansas is not included due to difficulties in obtaining connection cost data, while for New Mexico those data could only be obtained for January 2003 forward. The fraction of lines leased in a platform arrangement by Verizon are not available for Maine and Vermont for January and July 2002, and for Delaware, New Hampshire, and West Virginia for July 2002 only. The resulting data set contains 271 observations.

³² The data regarding the level of entry, UNE rates, and the incumbent's average revenue are based on the incumbent's service territory within a state, rather than on the entire state. Typically the two differ in that the incumbent service area may not include some of the relatively rural areas within a state. However, as most of the entry occurred in non-rural areas, this discrepancy between the data sets should not materially affect the results.

³³ The incumbent's revenue per line is reported annually. The missing data points are calculated by linearly interpolating the data.

³⁴ As the UNE cost data are not available, the service areas of Verizon that were formerly GTE service areas are not included in the analysis.

³⁵ Specifically, the average revenue is calculated by dividing net revenue (ARMIS Report 43-01, Line 1090) by the number of lines (ARMIS Report 43-08). While a variable that more precisely measures the retail rate would be preferred, this variable should approximate the potential revenue an entrant could obtain and has been used by other authors, e.g., Ai and Sappington (2005) and Abel (2002).

participants in a low-income assistance program known as Lifeline.³⁶ The estimates from each of these specifications are very similar to those reported below.³⁷

The monthly loop and platform UNE costs are obtained from surveys of state public utility commissions by Billy Jack Gregg of West Virginia's Office of the Consumer Advocate (http://www.cad.state.wv.us/Une_Page.htm).³⁸ During the sample period examined in this paper, most state public utility commissions set rates that varied by different density zones within the state. For the loop monthly cost, the monthly loop and port cost in the urban zone used³⁹, as these are the areas most likely to be entered by entrants who utilize a UNE-L entry strategy. For the platform monthly cost, the variable used is the incremental cost of providing service to customers via a platform-based entry strategy in the suburban zone, as entrants typically serve residential

³⁶ The Lifeline program is an effort coordinated by the FCC and state public utility commissions that helps pay for basic phone service for low-income consumers. Incumbents are obligated to publicize the availability of this service and are encouraged to sign up as many participants as possible, which therefore influences their customer mix. Further, one can imagine that low-income customers are more likely to participate in the Lifeline program the higher the retail price charged by the incumbent. As such, it is likely that the extent to which the incumbent's customers participate in this program is correlated with the incumbent's average revenue. The first-stage F-statistic confirms that the variable is sufficiently correlated with the incumbent's average revenue (or, in the language of the instrumental variable literature, it is sufficiently relevant). Conversely, entrants typically do not participate in this program. Also, differences in how state utility commissions administer the Lifeline program result in the fraction of participants being uncorrelated with state income. Thus, the effect on entry of the fraction of the incumbent's customers that are Lifeline subscribers should be minimal and the variable should be exogenous to the level of entry. While these arguments suggest that the variable is exogenous, there is potential correlation between how state utility commissions administer the Lifeline program and how they treat competitive entry. Further, there does not exist a test to determine if an instrument is exogenous in an exactly identified model such as this. Thus, it is not clear that this candidate instrument is sufficiently exogenous to be valid.

³⁷ While none of these three strategies is perhaps ideal, only one existing telecommunications entry paper reviewed by the author has attempted to address this issue (Abel (2002)), and it employs the first strategy listed above. Further, concerns about endogeneity are mitigated by the fact that often many of the incumbent's retail rates are either regulated or published in tariffs that must be approved by state utility commissions. Thus, the response in average revenue to changes in entry may be delayed or diminished.

³⁸ Some participants in legal proceedings have disputed the way in which platform arrangement costs are calculated in these data (see Willig, et al, 2002). Switching rates are typically based on minutes of use, and the rates reported by Gregg are based on 1000 minutes of use. Criticisms of the Gregg rates center on whether 1000 minutes of use is an appropriate benchmark. However, there is no other source of consistently reported UNE rates over this period. Perhaps more importantly, as the fixed effects estimator is based on deviations from the state mean for each explanatory variable, mismeasurement bias is unlikely. Specifically, if the minutes of use used to calculate the platform arrangement cost is consistently either less or more than the actual minutes of use, the coefficient estimates will not be affected.

³⁹ Data on collocation costs are not available.

customers via a platform-based entry strategy.⁴⁰ The loop connection charges are obtained by reviewing state public utility commission and FCC documents and trade press, and by contacting the state public utility commissions directly.⁴¹

The percent of Republicans serving on state public utility commissions is derived by reviewing membership directories of the National Association of Regulatory Commissioners,⁴² while the political affiliation of the Governor in a state is obtained from the U.S. Statistical Abstract (<http://www.census.gov/prod/www/statistical-abstract-04.html>) and the National Governors Association website (<http://www.nga.org>).

5. Estimation results.

5.1. Estimates without population interactions.

5.1.1. Coefficient estimates.

Table 3 summarizes the coefficient estimates and t-statistics from estimating the fraction of lines entrants acquired via loop and platform arrangements. The estimations are first performed including each group of explanatory variables individually, and then including all of the explanatory variables. The table indicates that the estimates do not vary substantially according to whether the other groups of explanatory variables are included in the regression.

Of the variables that measure revenue potential, the average revenue has a positive and statistically significant effect on the platform share, while its effect on loop share is statistically insignificant. The lack of significance in the loop share equation may reflect that this variable is a

⁴⁰ Due to difficulty in comparing these costs across states, costs for transporting calls between switches are not included in the Gregg UNE-P cost estimate.

⁴¹ A concern regarding the endogeneity of the UNE rates could arise due to the potential for reverse causation. In particular, one could surmise that low levels of entry may persuade state public utility commissions to lower UNE rates. However, any such response by state commissions could only occur with a substantial lag, as the commissions would only learn of the level of entry with a lag and can only revise UNE rates after a lengthy set of proceedings. Quast (2005) finds that it takes approximately one year for the level of UNE entry to affect UNE rates set by state commissions. Thus, UNE rates can be treated as exogenous.

⁴² The dates of the membership directories used to construct this variable are February 1999, February 2002, February 2003, July 2003, and March 2004

better indicator of the average residential price than the average business price. The change in the unemployment rate is statistically insignificant for both types of entry.

In regards to the variables that measure costs, those that measure the own monthly cost have negative coefficients. Specifically, the coefficient on the loop monthly cost in the loop share equation and the coefficient on the incremental platform cost in the platform share equation are negative. However, neither is statistically significant. In contrast, the loop connection charge is negative and statistically significant. In the platform share equation, the coefficient on the loop monthly cost is positive, suggesting that there may be substitution to platform-based entry as the monthly loop cost increases.

The coefficients on the regulatory variables indicate that Republican state public utility commissions are associated with higher shares of loop-based entry and lower shares of platform-based entry.⁴³ Conversely, Republican governors are associated with less loop-based entry.

5.1.2. Economic effects.

To obtain a sense of the relative importance of the explanatory variables, Table 4 details the effect of a one-standard deviation increase in each explanatory variable on the share of loop and platform-based entry.⁴⁴

The largest effect in either equation is associated with average revenue in the platform share equation. A one-standard deviation increase in the average revenue (\$9.60) is associated with an increase of over 2 percentage points in the share of the incumbent's lines leased in a platform arrangement, which translates to a roughly 33% increase in the platform share when measured at the mean of 6.1%.

⁴³ Conceivably, the Republican state commission variable could simply reflect that Republican commissions set lower loop rates and higher platform rates. However, the very low correlation between the UNE rates and commission political affiliation (see Table 2) mitigates this concern.

⁴⁴ For binary explanatory variables, the economic effect is calculated as the effect from a change in the explanatory variable from zero to one.

Of the cost variables, a one-standard deviation increase in the loop connection charge (\$25.80) decreases the level of entry by almost 0.2 percentage points. Measured at the mean of 2.6%, this effect translates to an approximately 6% decrease in the loop share, which validates to some extent the FCC's concern regarding the dampening effect of this charge on loop-based entry.⁴⁵ The economic effect of the monthly loop cost on platform-based entry is non-trivial, which suggests that for some customers entrants utilize a platform strategy when the monthly loop cost increases. Surprisingly, the own-cost economic effects are not only statistically insignificant but also relatively small.

The political affiliation of the state utility commissions has divergent effects on the two means of entry. When adjusted for the difference in means, the absolute value of the economic effects is roughly equal for loop and platform-based entry. As mentioned above, this may reflect a preference on the part of Republican commissioners to promote the entry option that entails less regulatory intervention. The negative effect of Republican governors on loop-based entry is interesting, given the estimated preference of Republican commissioners and the absence of an effect on platform-based entry. This effect may reflect a concern on the part of entrants that Republican governors discourage regulation and are thus more likely to advocate policies that are favorable to incumbents. The lack of effect on platform-based entry may reflect the low fixed costs that platform-based entry requires, and the resulting ability of an entrant to exit a market relatively quickly.

5.2. Estimates with population interactions.

5.2.1. Coefficient estimates.

As described above, the estimates in Table 3 and Table 4 and estimates in prior studies assume that the effects of the explanatory variables do not vary across states. However, the

⁴⁵ Note that this effect does not capture the effects of logistic difficulties entrants may face when attempting to connect a customer to its network via a loop arrangement.

effects of market and political factors may well differ by the size of the state. To account for such potential variation, the model is also estimated such that each explanatory variable is interacted with the state population.

Table 5 details the coefficient estimates and t-statistics that result from including population interactions. For each explanatory variable, two coefficients are reported: the coefficient on that variable and the coefficient of the variable multiplied by the state population. As such, one can interpret the second coefficient as the additional effect of the explanatory variable as the population is increased.

For the variables that measure revenue potential, the strong effect of the average revenue on the platform share persists when population interactions are included. However, whereas previously average revenue did not have a statistically significant effect in the loop share equation, the average revenue interacted with the population does. Further, the coefficient on the uninteracted average revenue variable is larger than the estimate in Table 3 and falls just short of a statistical significance level of 90%.

Market size effects also appear to be important in measuring the effects of costs on entry share. For the loop connection charge in the loop share equation, the negative coefficient on the uninteracted variable and the positive coefficient on the interacted variable suggest that the connection charge has a negative effect on entry in smaller markets, but the effect diminishes in larger markets. Conversely, the negative effect of the monthly incremental platform cost on platform-based entry tends to increase as the population increases. The effects of the own monthly costs also appear to differ by market size.

Of the political variables, in contrast to the results in Table 3 and Table 4, it appears that there may be an effect on platform-based entry associated with Republican governors when population effects are taken into account. Specifically, in small states Republican governors are associated with greater loop-based entry, but the effect diminishes as the state's population increases.

5.2.2. Economic effects.

To estimate the economic effects implied by the estimates in Table 5, Table 6 calculates the effect on entry share of a one-standard deviation in each explanatory variable for two representative population sizes: the 25th percentile and the 75th percentile (2.2 and 7.4 million, respectively).⁴⁶ The first two columns detail the economic effects on the loop share while the last two columns detail the economic effects on the platform share.

The economic effects on the loop share differ significantly by population. None of the statistically significant explanatory variables for the 25th percentile of population has a statistically significant effect for the 75th percentile of population. Specifically, the effects of the loop connection charge and the political affiliation of the utility commission and governor become statistically insignificant as the size of the state increases. Further, the effect of the monthly loop cost is nearly statistically significant at the 25th percentile but not at the 75th percentile.

The effects on loop share may be diminished in larger states because loop-based entry is less responsive to changes in revenue and costs in larger markets. Loop-based entrants may already be present in larger markets because they contain the most potential customers, and thus even a small profit margin per customer translates to large profits in that market. Further, incumbent prices to business customers have historically been well above cost in order to cross-subsidize lower prices to residential customers. Loop-based entrants may have previously entered these larger markets to undercut the inflated incumbent business prices and may therefore be less affected by changes in revenue and costs.

The differential effect of Republican commissioners on loop share in smaller states may also be due in part to differences in entry conditions. In large markets loop-based entry may be sufficiently profitable that substantial entry will occur regardless of state regulatory policy. In

⁴⁶ The economic effect is calculated as the standard deviation of the explanatory variable times the sum of the coefficient on the uninteracted variable plus the population times the coefficient on the interacted variable.

contrast, given the relative difficulty of attracting loop-based entry in small states, Republican state commissions may adopt policies that are especially favorable to loop-based entry and thus the commissions have a larger effect on the level of entry.

However, the effects of the explanatory variables on platform share offer more of a mixed picture. The positive effect of the loop monthly cost is quite similar in the two market sizes, but the effects of the other explanatory variable differ. In contrast to the effects on loop share, the economic effects on platform share tend to become more pronounced as the population increases. For instance, the effect of the average revenue per line is over 20% larger at the 75th population percentile than at the 25th percentile. Also, the monthly incremental platform cost has a statistically significant effect in larger states whereas in smaller states it does not.

These findings may reflect in part how platform-based entrants attract customers. Platform-based entrants tend to target residential customers in broad geographic markets (such as an MSA or state) and use mass marketing to acquire customers. In smaller states like Wyoming, an incremental increase in per customer profit may not justify the fixed marketing costs of entering the state due to the limited number of potential customers. Conversely, when per customer profit levels increase in a large state such as California, the same increase in marketing efforts can reach a much larger population and thus may justify the additional expense.

The negative effect of Republican commissioners on platform-based entry may also be due to a difference in the ability of small and large states to attract entry. Republican commissions may have a preference for loop-based entry over platform-based entry, but in small states it may be difficult to attract loop-based entry. Thus, the desire to have any form of entry may offset whatever preferences the commissioners possess. In larger states, commissioners can perhaps be more selective as to which type of entry to encourage, thus Republican commissioners may discourage platform entry.

The economic effect of the loop connection charge on platform-based entry also differs by market size. The positive effect in small states can be explained by substitution from loop-based to platform-based entry as the cost of loop-based entry increases. However, the negative

effect in large states implies that increases in the loop connection charge deter both types of entry. A possible explanation is that some platform-based entrants in larger states enter those markets with the intent to in the long-term to convert to a loop-based arrangement. When the cost of loop-based entry increases, some of these entrants may decide that it is less profitable to pursue such a strategy and they may elect to curtail their platform-based operations.

6. Conclusion.

This paper analyzes the factors that determine the level of entry in local telecommunications markets given two alternative entry strategies. The estimates suggest that while generally the two types of entry are affected by different market factors, there appears to be cost-based substitution between them. Changes in the own monthly costs of the two forms of entry have limited effects, but loop-based entry decreases in response to increases in the connection charges entrants must pay incumbents when a customer is acquired. Loop-based entry tends to be more pronounced relative to platform-based entry as the degree of Republican representation on state public utility commissions increases. Finally, loop-based entry is more responsive to changes in economic conditions in smaller states, while platform-based entry is more responsive to market conditions in larger states.

The results in this paper may suggest some potential lessons regarding the effects of TA96 and potential revisions to it. Proponents of platform-based entry can point to the negative effect of loop connection charges as evidence of the need for an alternative to loop-based entry. On the other hand, critics of platform-based entry can argue that, given the positive effect of the monthly loop cost on the platform share, loop-based entry is hindered by the existence of the platform-based entry option. Also, the results suggest that the local interests of state regulators need to be taken into account when they are charged with implementing federal policies. Finally, given the differing effects across states of different sizes, policymakers need to consider how to fashion policies that achieve national goals but recognize local market conditions.

The findings in this paper could be extended in several directions. First, if the data become available, a more disaggregated analysis of the entry decision could provide more precise results. Market conditions can vary greatly within a state, but the available data do not allow for an analysis of that granularity. Also, as noted above, the monthly loop cost variable used in the regressions does not include collocation costs, while the estimate of the incremental cost of platform-based service does not include costs related to transporting calls between switches. Including these additional costs would allow for a more complete analysis. Additionally, a more precise measure of the retail price may uncover a more important role for it in determining the level of entry. Finally, a complete analysis would simultaneously estimate the effects of other types of telecommunications entry, such as cellular phones and the emerging presence of new technologies such as voice-over-internet-protocol.

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FIGURE 1

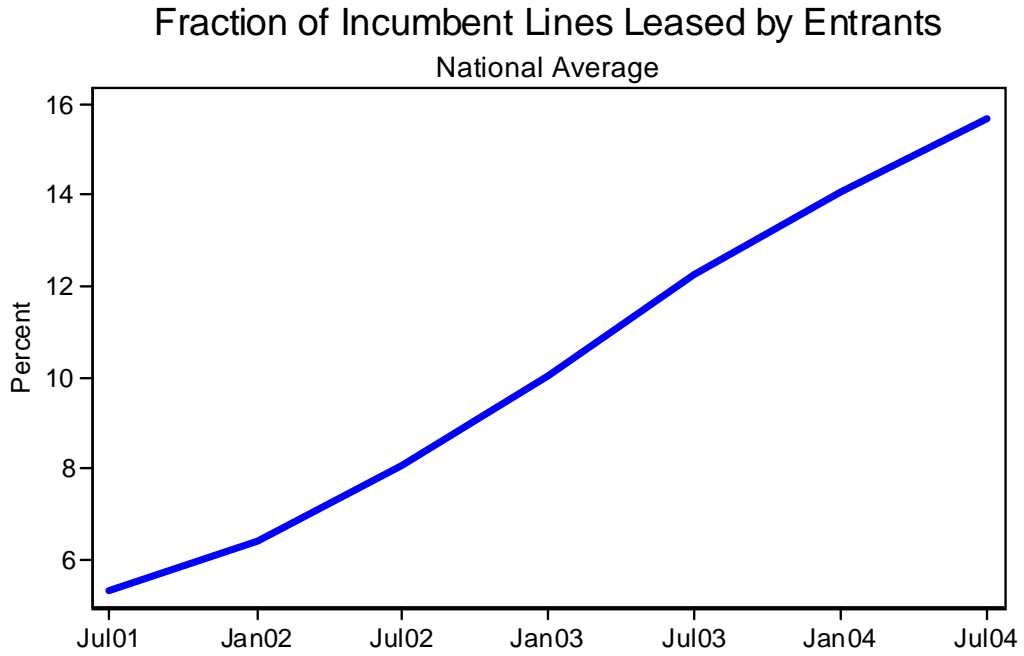


FIGURE 2

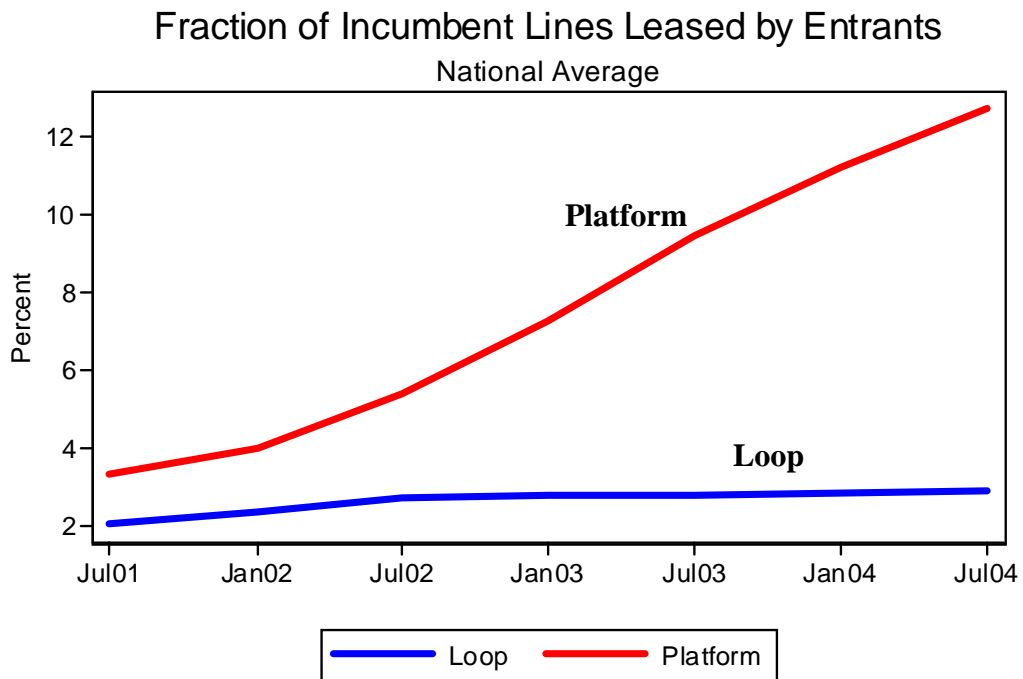


FIGURE 3

Loop Share of Incumbent Lines

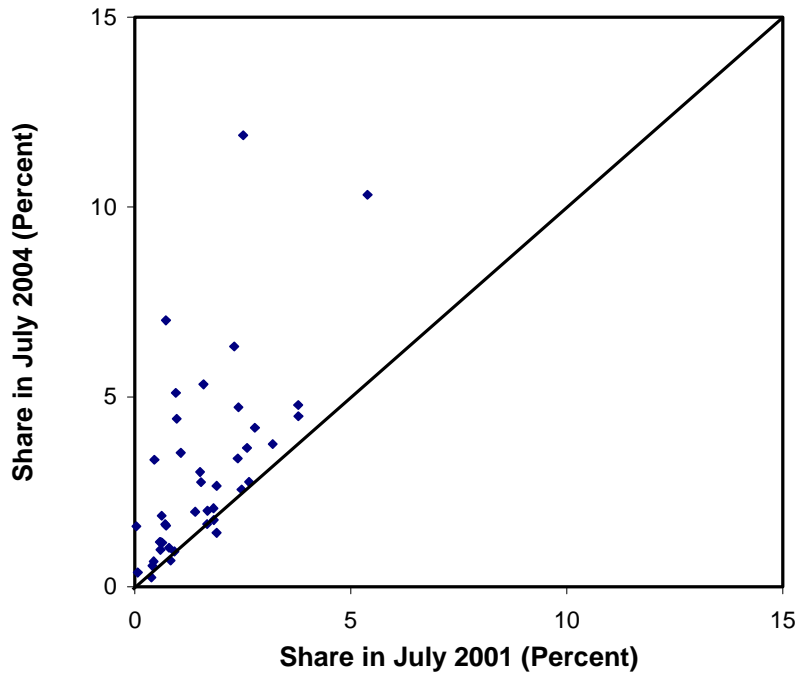


FIGURE 4

Platform Share of Incumbent Lines

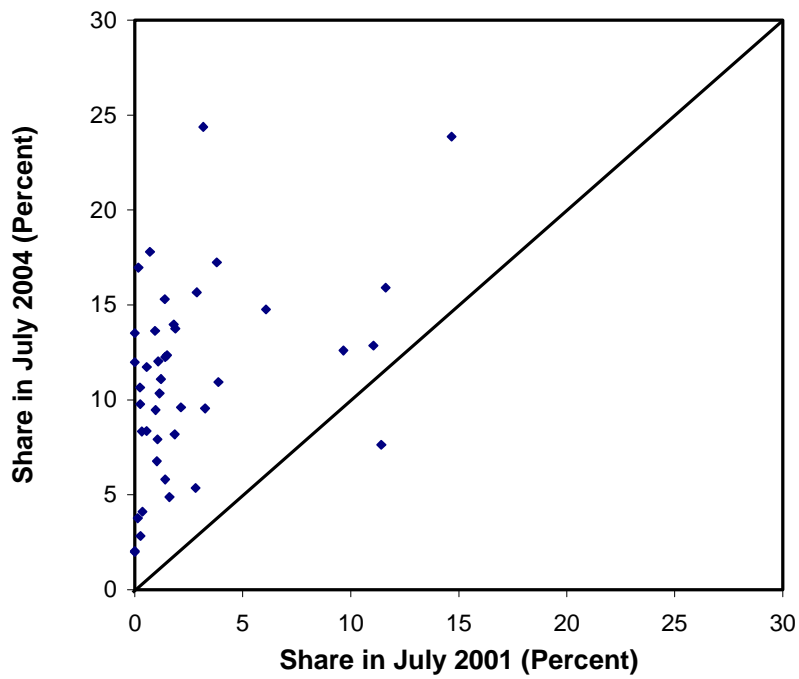


TABLE 1
Summary Statistics

Variable	Mean	Minimum	Maximum	Standard Deviation
Number of observations: 314				
<u>Dependent Variables</u>				
Share of Entrant Loop Lines	2.6	0.04	11.9	2.0
Share of Entrant Platform Lines	6.1	0.00	24.4	5.2
<u>Explanatory Variables</u>				
<u>Revenue Potential</u>				
Incumbent Average Revenue per Line	\$61.12	\$45.16	\$101.19	\$9.60
Change in Unemployment Rate	0.13	-1.3	2.2	0.61
<u>Costs</u>				
Loop Monthly Cost	\$13.90	\$4.77	\$28.14	\$3.80
Loop Connection Charge	\$45.69	\$3.33	\$159.76	\$25.80
Platform Incremental Monthly Cost	\$7.25	-\$0.17	\$24.81	\$4.70
<u>Political</u>				
Percent of Commission Republican	53.2	0.0	100.0	33.3
Governor Republican	0.56	0.00	1.00	0.5
<u>Interaction Variable</u>				
Population (millions)	6.3	0.5	35.9	6.5

TABLE 2
Correlation Matrix of Explanatory Variables

	Incumbent Average Revenue Per Line	Change in Unemployment Rate	Loop Monthly Cost	Loop Connection Charge	Platform Incremental Monthly Cost	Percent of Utility Commissioners Republican	Governor Republican
Incumbent Average Revenue Per Line	1.00						
Change in Unemployment Rate	-0.14	1.00					
Loop Monthly Cost	0.25	0.10	1.00				
Loop Connection Charge	0.16	0.14	0.37	1.00			
Platform Incremental Monthly Cost	0.31	0.08	0.25	0.15	1.00		
Percent of Utility Commissioners Republican	0.23	0.07	0.05	0.02	-0.01	1.00	
Governor Republican	0.13	0.05	0.07	-0.04	0.04	0.41	1.00

TABLE 3
Coefficient Estimates without Population Interactions

Explanatory Variable	Revenue Potential Variables		UNE Rate Variables		Political Variables		All Variables	
	Loop Share	Platform Share	Loop Share	Platform Share	Loop Share	Platform Share	Loop Share	Platform Share
Revenue Potential								
Average Revenue per Line	0.010 (0.48)	0.185 *** (3.05)					0.001 (0.04)	0.217 *** (3.58)
Change in Unemployment Rate	0.115 (1.10)	-0.051 (-0.17)					0.164 (1.56)	-0.157 (-0.54)
UNE Rates								
Loop Monthly Cost			-0.032 (-1.32)	0.194 *** (2.87)			-0.033 (-1.37)	0.186 *** (2.79)
Loop Connection Charge			-0.006 ** (-2.10)	0.002 (0.31)			-0.007 *** (-2.72)	0.008 (1.04)
Platform Incremental Monthly Cost			0.010 (0.51)	-0.023 (-0.44)			0.014 (0.76)	-0.028 (-0.53)
Political								
Percent State Utility Commission Republican					0.009 ** (2.24)	-0.026 ** (-2.36)	0.009 ** (2.34)	-0.026 ** (-2.40)
Governor Republican (Binary)					-0.225 * (-1.72)	0.001 (0.00)	-0.306 ** (-2.33)	0.004 (0.01)
Within R-Squared	0.34	0.71	0.35	0.71	0.35	0.70	0.37	0.72
Number of Observations	314	314	314	314	314	314	314	314

Notes:

t-statistics are reported in parentheses.

Coefficient estimates for state and time fixed effects and constant term omitted for brevity.

*** - statistically significant at 99% confidence level

** - statistically significant at 95% confidence level

* - statistically significant at 90% confidence level

TABLE 4
Economic Effects without Population Interactions

Explanatory Variable	Effect on the Dependent Variable	
	Loop Share	Platform Share
<u>Revenue Potential</u>		
Average Revenue per Line	0.01 (0.04)	2.08 *** (3.58)
Change in Unemployment Rate	0.10 (1.56)	-0.10 (-0.54)
<u>Costs</u>		
Loop Monthly Cost	-0.13 (-1.37)	0.71 *** (2.79)
Loop Connection Charge	-0.18 *** (-2.72)	0.21 (1.04)
Platform Incremental Monthly Cost	0.03 (0.76)	-0.13 (-0.53)
<u>Political</u>		
Percent State Utility Commission Republican	0.30 ** (2.34)	-0.87 ** (-2.40)
Governor Republican (Binary)	-0.31 ** (-2.33)	0.00 (0.01)

Notes:

Economic effects for continuous explanatory variables are based on a one standard deviation increase in that variable.

Economic effects for binary explanatory variables are based on a change in the variable from zero to one. t-statistics are reported in parentheses.

*** - statistically significant at 99% confidence level

** - statistically significant at 95% confidence level

* - statistically significant at 90% confidence level

TABLE 5
Coefficient Estimates with Population Interactions

Explanatory Variable	Loop Share	Platform Share
Revenue Potential		
Average Revenue per Line	0.036 (1.50)	0.225 *** (3.42)
Interacted with Population	-0.010 *** (-3.82)	0.015 ** (2.03)
Change in Unemployment Rate	0.032 (0.27)	0.269 (0.81)
Interacted with Population	0.011 (0.73)	-0.047 (-1.14)
Costs		
Loop Monthly Cost	-0.059 (-1.58)	0.186 * (1.80)
Interacted with Population	0.006 (1.04)	0.002 (0.09)
Loop Connection Charge	-0.016 *** (-3.86)	0.037 *** (3.17)
Interacted with Population	0.003 *** (3.33)	-0.008 *** (-3.73)
Platform Incremental Monthly Cost	0.035 (1.18)	0.099 (1.23)
Interacted with Population	-0.004 (-0.64)	-0.033 ** (-2.13)
Political		
Percent State Utility Commission Republican	0.011 ** (2.03)	-0.010 (-0.63)
Interacted with Population	-0.001 (-1.25)	-0.010 (-0.75)
Governor Republican (Binary)	-0.342 * (-1.86)	0.895 * (1.76)
Interacted with Population	0.019 (0.99)	-0.176 *** (-3.32)
Within R-Squared	0.44	0.76
Number of Observations	314	314

Notes:

t-statistics are reported in parentheses.

Coefficient estimates for state fixed effects and constant term omitted for brevity.

*** - statistically significant at 99% confidence level

** - statistically significant at 95% confidence level

* - statistically significant at 90% confidence level

TABLE 6
Economic Effects for the 25th and 75th Population Percentiles

Explanatory Variable	Loop Share		Platform Share	
	25 th Percentile	75 th Percentile	25 th Percentile	75 th Percentile
Revenue Potential				
Average Revenue per Line	0.13 (0.65)	-0.36 (-1.65)	2.47 *** (4.24)	3.20 *** (5.25)
Change in Unemployment Rate	0.03 (0.52)	0.07 (1.02)	0.10 (0.57)	-0.05 (-0.25)
Costs				
Loop Monthly Cost	-0.17 (-1.62)	-0.05 (-0.42)	0.72 ** (2.44)	0.75 ** (2.55)
Loop Connection Charge	-0.28 *** (-3.47)	0.08 (0.83)	0.52 ** (2.31)	-0.59 ** (-2.29)
Platform Incremental Monthly Cost	0.13 (1.28)	0.04 (0.33)	0.14 (0.49)	-0.67 ** (-2.04)
Political				
Percent State Utility Commission Republican	0.33 ** (2.06)	0.20 (1.54)	-0.40 (-0.95)	-0.63 * (-1.79)
Governor Republican (Binary)	-0.30 * (-1.92)	-0.20 (-1.56)	0.51 (1.19)	-0.41 (-1.15)

Notes:

t-statistics are reported in parentheses.

Coefficient estimates for state fixed effects and constant term omitted for brevity.

*** - statistically significant at 99% confidence level

** - statistically significant at 95% confidence level

* - statistically significant at 90% confidence level