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Interstate Long Distance Rates: Search Costs, Switching Costs, and Market Power

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Abstract. A number of authors have argued that the divestiture of AT&T did not reduce the rates of long distance telephone companies as often believed. However, the literature has offered few explanations as to why competition has not lowered rates. This study argues that rates have failed to fall due to the importance of search and switching costs in the industry. Using a panel data set of rates for the three largest long distance carriers, stretching from 1984 to 1993, a reduced form equation is specified to empirically test for the influence of search and switching costs on the price cost margin of the three carriers. The results illustrate that both search and switching costs have provided long distance carriers with market power.

Key words: Market power, search costs, switching costs.

I. Introduction

The 1984 divestiture of AT&T brought about many structural changes for long distance telephone service. AT&T was broken up vertically into local servers and a long distance provider, the regulatory methods were changed, and entry was encouraged. The market has since seen an influx of firms and a decrease in the market share of AT&T. This new competition and largely deregulated environment was expected to bring large reductions in the market power of firms in the industry. This, however, has not occurred. Although a brief glance at interstate rates would lead one to believe competition has succeeded in reducing market power, this would be incorrect. After controlling for reductions in access charges, this study finds that the Lerner Index has actually increased during the years studied.[1,2] In addition,

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[1] Access charges are the per minute charge paid by the long distance carriers to the local Bell's. The fee covers line termination, intercept, local switching, local transport, and common carrier line charges. These charges are set by the FCC to offset the expense incurred by the local telephone companies when long distance calls are routed to the consumer.

[2] Recall that the Lerner Index for period i is defined as follows: $PCM_i = (P_i - mc_i)/p_i$ by controlling for reductions in access charges, I am implicitly defining marginal cost to equal only access charges. This is not a large assumption. In fact, MacAvoy (1995) estimates the remaining of

after an initial decline, rates controlled for declines in access charges have actually began to rise.

A number of authors have suggested that "true" rates have not fallen, or have fallen only slightly.[3] Taylor and Taylor (1993) show that the perceived rate reduction is due to a reduction in carrier access charges paid by long-distance companies to local telephone companies. After correcting for reductions in carrier access charges, Taylor and Taylor illustrate that AT&T prices grew 1.5% per year from 1984 to 1992. MacAvoy (1995) also illustrates that rates have not fallen, and in a case study of three states, Loube and Pilalis (1994) reach similar conclusions.

Previous explanations as to why rates have not fallen have focused on the regulatory practices still in place. Taylor and Taylor (1993) explain that this phenomena is a result of "regulated competition". According to the authors, the lack of true rate reduction is due to the following: (1) the seven regional Bell companies are barred from entry into the long distance market, (2) GTE is subject to a decree which regulates its participation, (3) the FCC's initial use of measures, such as access charge discounts, and (4) the continued asymmetric regulation of AT&T. (Taylor and Taylor, 1993, p. 187). Loube and Pilalis (1994) simply prescribe new directions for regulation to take.

While Loube and Pilalis (1994) do not attempt to explain this phenomena, Taylor and Taylor (1993) implicitly assume that the Bell companies and GTE are the only potential actors in this market. In addition, the access charge discounts for upstart firms, which have since vanished with the implementation of equal access, should have fostered entry and thus competition, not stifled it.[4] Also firms currently in the long distance market have earned rates of return in excess of 11% (FCC Docket 87-339) creating an environment conducive to rate reductions and entry.[5]

MacAvoy (1995) attributes the lack of a reduction to tacit collusion by the long distance carriers. In particular, MacAvoy states that the move from rate of return regulation to price cap regulation of AT&T in 1989 allowed AT&T to discipline MCI and Sprint in "response to strategic discounting" (MacAvoy, 1995, p. 153). His empirical evidence comes from regressing the weighted price cost margin of

marginal cost to be between 1 and 2 cents per minute, whereas access charges have ranged from 17.3 cents in 1984 to 6.7 cents in 1994. Even if the remaining of marginal cost took its minimum at the beginning of the sample and its maximum at the end (thus increasing the beginning sample PCM and lowering the ending sample's PCM) the results would remain unchanged.

[3] Taylor and Taylor (1993) implicitly define true rates as rates minus access charges. At times this definition is cumbersome since access charges are merely a component of marginal cost, however I will continue to use this definition.

[4] The individual access charge discounts were set forth due to the asymmetric treatment of new long distance firms. Initially, local telephone networks were designed to connect with a single long distance exchange. Therefore customers of other carriers were forced to dial a five digit carrier identification code prior to the number (the five digit codes of the form 10xxx) to signal their long distance carrier. Equal access put an end to this requiring local telephone carriers to upgrade their lines to accept a multiple number of long distance carriers, allowing customers of other long distance carriers to directly connected to their exchange.

[5] As one might expect, the long distance market is gigantic. Sales revenues for 1994 reached over $67 billion.

the three largest carriers (using market share as weights) on the HHI of the industry. MacAvoy finds that a negative relationship exists. From this he concludes that tacit collusion is what is driving the market power since we would expect to see the opposite.

In this paper, I argue that the presence of search and switching costs has endowed firms with market power inhibiting the reduction in rates. I construct an empirical model designed to test for the presence of search and switching costs, and their influence on price cost margins. The contributions of this paper are twofold. First, the paper provides an explanation as to why price cost margins have not fallen since the divestiture. Second, it adds to the relatively small body of literature that attempts to test the theoretical literature on search and switching costs. Despite the presence of a large number of models describing the market power created by search and switching costs, few empirical studies testing for their significance have been performed. Notable exceptions include, Borenstein (1993), Stango (1995), and Calem and Mester (1995).[6]

The remainder of the paper is organized as follows. The second section provides a brief synopsis of the long distance telephone market since the 1984 divestiture. In Section III, I describe the theoretical models of search and switching costs. In Section IV, I describe the data, empirical model, and econometric issues used to test the influence of search and switching costs in the industry. Section V is devoted to presenting the results, while Section VI summarizes the paper.

II. The Divestiture

1. The Market Since 1984

After the break up of AT&T the FCC encouraged entry and began reducing access charges. To promote entry, firms entering the long distance market receive individual reductions in the access charges. These reductions are as large as 55% and continued until the initiation of equal access. Partly due to these reductions, entry into the market has been substantial. There are basically three types of entry: Private network entry, WATS resellers, and Other Common Carrier (OCC) entry.[7]

Private network entry comprises the bulk of long distance entry. Beginning in 1986, a number of firms and governmental agencies acquired carrier identification codes for their own use.[8] These companies or agencies do not offer service to private consumers, rather they lease specialized lines from long distance companies and local telephone companies to transmit voice, data, and images for

[6] Ausubel (1991) poses searching and switching costs as a possible explanation to the stickiness in credit card rates, but argues it is instead due to adverse selection.

[7] Local Access Networks (LANs) can also be seen as long distance entry. LANs are basically point to point links that bypass local exchanges altogether. The effects of such entry is similar to that of private networks.

[8] Carrier identification codes are given to any firm or organization that seeks to use "trunk side" connections with local telephone companies and do not necessarily mean the company is offering its service to the public.

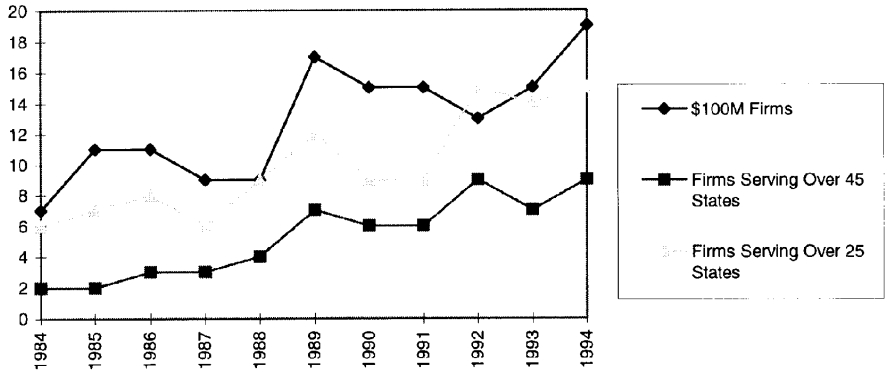

Figure 1. Entry dynamics.

business use. The use of private networks is extensive, accounting for over 10% of the telecommunication market, with over 450 codes being issued each year. The National Telecommunications and Informations Administration reports that 43% of the largest 500 companies make use of private networks.[9] WATS resellers comprise another source of entry in the long distance market. WATS resellers buy transmission capacity in bulk from network operators and then offer the air time to customers.

In addition to private networks and WATS resellers the market has also seen an influx of long distance carriers offering service to private consumers, OCCs. Twenty-nine such firms with long distance sales revenues in excess of $100 million have been in the market at one time or another since 1984. Many of these firms have either merged or left the market. Yet, there has been a steady decline in the market share of AT&T and a steady increase smaller long distance carriers (firms other than AT&T, MCI, and Sprint). The market has also seen a steady increase in the number of firms offering service in a large number of states. Figure 1 tracks the number of firms with sales revenues in excess of $100 million present in the industry from 1984 to 1994 (measured in 1982–1984 dollars), the number of firms offering service to 45 or more states, and the number of firms serving over 25 states.[10] Figure 2 depicts the market share of AT&T and the market share of all other carriers. Table I tracks mergers, bankruptcies, and toll revenues for firms with long distance revenues in excess of $100M.

In addition to the initial reductions in firm specific access charges, the FCC has permanently reduced the access charges paid for "premium" service, paid by all long distance carriers with equal access. The reductions in "premium" access charges were substantial. On the eve of the divestiture, access charges amounted to 17.4 cents per minute, while their current levels are 3.6 cents per minute (measured

[9] Examples of private networks include Citicorp's network for banking transactions and the Sabre airline reservation system.

[10] The cutoffs of 25 and 45 states were used due to the availability of the data.

Table I. Large firm dynamics in the long distance market

Company	Yr. entered[a]	Current market presence
AT&T Communications Inc.	1984	Still present
Alascom Inc.	1984	Merged with AT&T in 1994
MCI Telecommunications Corp.	1984	Still present
Telecom*USA	1984	Merged with MCI in1989
Sprint Communications	1986	Still present
GTE Sprint	1984	Merged with US Telecom to form Sprint in 1986
US Telecom	1985	Merged with US Telecom to form Sprint in 1986
LDDS Communications Inc.	1989	Still present
Advanced Telecommunications	1984	Merged with LDDS in 1992
Metromedia Communications	1989	Merged with LDDS in 1993
ITT Communication Services	1984	Merged with LDDS in 1993
Comsystems Network Services	1993	Merged with LDDS in 1993
Wiltel Inc.	1989	Merged with LDDS in 1994
Cable & Wireless Communications	1985	Still present
LCI International Telecom Corp.	1989	Still present
Frontier Communications Int'l	1989	Still present
Allnet	1985	Purchased by Frontier in 1995
Lexitel	1984	Merged with Allnet in 1985
Oncor Communications	1989	Purchased by Frontier in 1994
Excel Communications	1994	Purchased by Frontier in 1994
West Coast Telecommunications	1994	Purchased by Frontier in 1995
American Sharecome Inc.	1994	Purchased by Frontier in 1995
US Long Distance	1993	Still present
American Network Exchange	1994	Still present
Midcom Communications	1994	Still present
Vartec Telecom	1994	Still present
General Communication	1993	Still present
Telesphere Network	1989	Went bankrupt in 1991
National Telephone Services	1989	Merged with Telesphere in 1989

[a] 1984, if entered in or prior to 1984.
Source: Industry Analysis Division of the FCC, Competition Report, 1994.

in 1982–1984 dollars). These reductions have allowed long distance carriers to reduce their retail prices without reducing their "true" rates. These reductions in retail prices as well as the increase in the number of firms and the fall in the market share of AT&T have prompted observers of the long distance telephone market to point to competition as the cause. For example the FCC has stated (FCC, 1991):

> ... competition in the provision of interstate long-distance service has led to sharply reduced rates, a larger variety of service options, and more rapid deployment of new technologies ...[11]

[11] As quoted in Taylor and Taylor (1993).

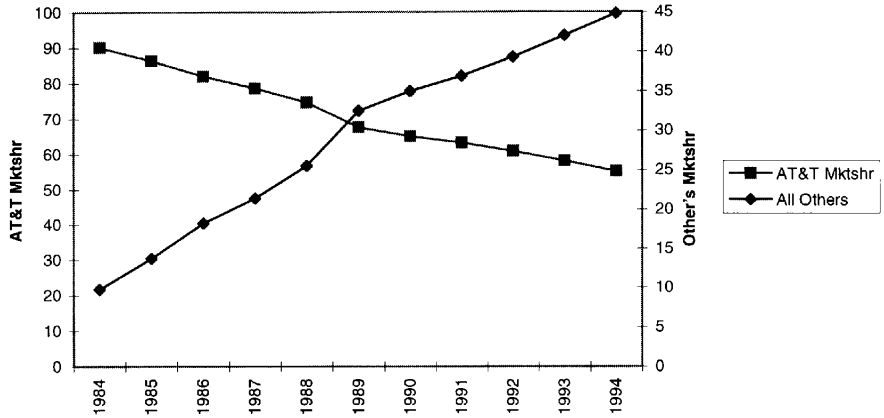

Figure 2. Market shares.

There is no denying that rates have fallen. However, this fall in rates was due in large part (if not entirely) to the reduction of access charges rather than an increase in competition. Controlling for the decline in access charges, the average of the rates studied here has actually began to rise after an initial decline and most notably the average price cost margin has increased substantially.

III. Sources of Market Power

1. The Theory

Market power originating from switching costs has been well documented.[12] Consider the following static model: A consumer pays c to sign up with a long distance telephone company, A, and must pay c to change long distance companies.[13] If c equaled zero, then a consumer would switch long distance carriers whenever a price of another firm fell below that of her current company. With the presence of a switching fee however, the consumer will not switch companies unless the price of another firm is more than c below firm A's price.[14] Hence, even if other firms charge at marginal cost, firm A can charge above marginal cost and earn positive profits, so pricing at marginal cost is no longer sub-game perfect.

In a similar fashion, search costs confer market power to firms.[15] Market power originates because it is no longer optimal for consumers to find the price of each firm. In a market with homogenous goods, a distribution of price $f(x)$, Bertrand

[12] For a literature review, see Klemperer (1992).

[13] I assume that each consumer must pay the same switching costs. Asymmetric switching costs would not change the analysis. See Knittel (1996a) for the implications of asymmetric switching costs.

[14] Or in markets such as the long distance market, the present discounted value of savings from switching companies is greater than c.

[15] For a comprehensive literature review, see Stiglitz (1989)

competition, and search costs equal to zero, i.e., consumers can find each firms' price costlessly, rational consumers will find the price of every firm and purchase from the low price firm.[16] The Nash equilibrium in this case is for all firms to price at marginal cost, earning zero profits. However, whenever consumers cannot costlessly determine the price of each firm, i.e., the consumers have positive search costs, it will no longer be optimal for them to find the price of every firm. Instead, consumers will follow some sort of search rule.[17] When this occurs price will no longer fall to marginal cost.

Rothschild (1974) shows that instead of searching every firm, consumers should engage in sequential decisions of whether or not to continue to search. After each successive search, a consumer should choose to search again only if the expected gain from another search is greater than the cost of the search. Consider a consumer who is currently paying T for her long distance service, the distribution of prices is $f(p)$, with its corresponding density function and the cost of a search is s. The expected gain from one more search is the following:

$$g(T) = \int_0^T (T - p)\, \mathrm{d}F(p) = \int_0^T F(p)\, \mathrm{d}p \tag{1}$$

$g(T)$ represents summing all of the potential gains, $(T - p)$, weighted by their respective probabilities. The consumer should continue to search until, $g(T) = s$. It is clear to see that incomplete information about prices allows firms to price above marginal cost. Because consumers do not search for every firm's price, a firm B, can charge above marginal cost and some consumers will stop searching when they have reached firm B. If firm B's price is below the consumer's reservation price, the firm will earn positive profits. Therefore, pricing at marginal cost is no longer a Nash equilibrium. As Stiglitz (1989) illustrates in its most simplest form, two Bertrand competing firms with identical marginal costs, the existence of search costs can support the monopoly price.

The presence of *both* search and switching costs amplifies the market power. Consider the case where consumers must pay a fee c to change firms and a price s to search each firm. As above, the consumer will continue to search until the expected gain of the next search equals the cost of searching, s. However the presence of a switching cost lowers the expected gain. The intuition is as follows: With no switching cost the consumer will search until the expected gain is s. However if the consumer faces a switching cost of c, the consumer will only search until the expected gain is $s - c$, which induces the consumer to search less, thus magnifying the market power. Formally, modifying Rothschild's search rule, the expected gain of a consumer currently paying T and facing a switching cost c is as follows:

$$g(T, c) = \int_0^{T-c} (T - c - p)\, \mathrm{d}F(p) < \int_0^T (T - p)\, \mathrm{d}F(p) = g(T) \tag{2}$$

[16] Conditions that are quite similar to the long distance market.

[17] Search costs can be seen as the time and/or resources needed to acquire price information.

Since $g(T,c) < g(T)$, $g(T,c)$ will approach s before $g(T)$ and the consumer facing a switching cost will optimally stop searching before a consumer that faces no switching cost. The fewer searches provides firms with a higher 'search umbrella,' and thus more market power, leading to higher price-cost margins.

2. RELEVANCE

For search and switching costs to be the cause of market power in the long distance telephone market, long distance rates must be difficult to ascertain and there must be a cost levied on consumers when switching long distance carriers. The long distance market is characterized by an explicit switching cost, namely the fee one must pay to change long distance companies. Search costs exist because of the voluminous nature of long distance rates. The long distance market is unique in its pricing structure. Rates are not set by individual routes, but rather by the mileage of a call. If a consumer wanted to compare or gather price information for every long distance carrier, they would have to do so over every range. To gather this information would obviously take time and resources.

A casual observation of the agents within the long distance market also suggests the presence of search and switching costs. Beginning in 1993, long distance firms began offering rebates to consumers for switching carriers, thus avoiding the switching cost. More recently, long distance firms have been offering greater incentives to induce customers into switching, creating a negative switching cost. These actions by the carriers suggest that customers were reluctant to switch firms without some sort of incentive, implying the importance of switching costs. The existence of consulting firms designed to find the best long distance package available illustrates the importance of search costs.

Industry advertisement campaigns are also suggestive of the importance of search costs. The Sprint commercial where consumers are not able to guess the cost of a one minute telephone call illustrates the importance of search costs.[18] The MCI commercial where a business owner begins by saying, "sure my company is saving with AT&T", and then ends with "how would I know. I don't know if my company is saving with AT&T", also is evidence that search costs are important. Most recently carriers such as MCI and AT&T have reduced the number of rates a consumer must search over. Campaigns such as the Candice Bergman and Paul Reiser commercials have attempted to relay to consumers a reduction in the number of different routes.

[18] In fact, this suggests something more than just a search cost market. Search cost markets exist when consumers are aware of the price of *their current firm* but not the price charged by other firms. This commercial suggests that consumers are not even aware of this. This, too, may be an interesting theoretical observation.

3. Measuring Search and Switching Costs

Existence of search and switching costs in the long distance market begs the question, what determines the magnitude of these costs? Search and switching costs are, themselves, functions of certain variables. What these variables are will be determined by the nature of the search and switching costs. In the long distance market switching costs are a function of the actual fee paid by consumers to change long distance companies. Lowering this fee lowers the switching costs in the market.

Search costs in the market are a function of the availability of market information and the opportunity cost of time. For example, if firms charged only one rate regardless of the telephone call made, consumers would only have to gather one price per firm. In this case, as the rates firms charge for different calls become more dispersed, the consumer must gather more information. Search costs are also a function of the ease of collecting rates and market information on firms. If each phone company were to provide consumers with a monthly rate book, search costs would diminish.[19] A number of authors have argued that information does not have to be as explicit as actual prices to lower search costs. Economic literature, both empirical and theoretical, has found a link between search costs and industry advertising. Beginning with Stigler (1961) it has been argued that advertising, be it price informative or not, spreads information in the market, thereby lowering search costs. Nelson (1974) duplicates Stigler's premise. Recent work by Bagwell and Ramey (1994) finds that non-price informative advertisement reduces search costs by coordinating buyers and sellers. Without signaling actual prices a firm can signal to consumers that it is a low price firm, thus acting as a coordination device and lowering search costs.[20]

4. Alternative Explanations

Given that the majority of entry is by firms who service only their own needs or service only isolated routes, it is possible that the long distance market enjoys price cost margins due to the limited large scale entry. For example, the price discipline that a long distance entrant who serves only calls from Alaska places on the larger long distance firms would not be great. In addition the large entry of private networks is most likely going to have a small effect on the larger firms' price cost margins. This explanation has added credence when the concentration of the industry is analyzed. AT&T still controls over 50% of the market, and the market share of the four largest companies; AT&T, MCI, Sprint, and LDDS is in

[19] Search costs, however, would not be zero in this setting since consumers would still have to expend time to read the price information.

[20] This work on advertising as increasing consumer information and thus reducing search costs disagrees with the classical notion that advertising increases the demand for ones product or erects barriers to entry for the industry, thereby increasing ones market power. See for example Sutton (1991). Therefore in search cost markets there is likely to be two countervailing influences of advertising.

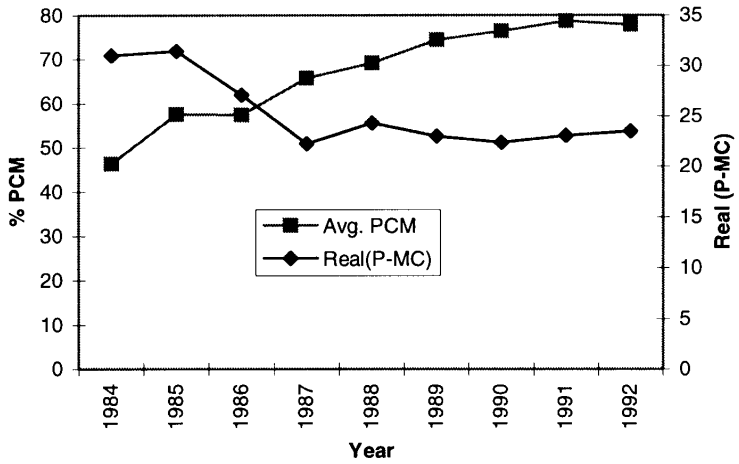

Figure 3. Average PCM and real markup.

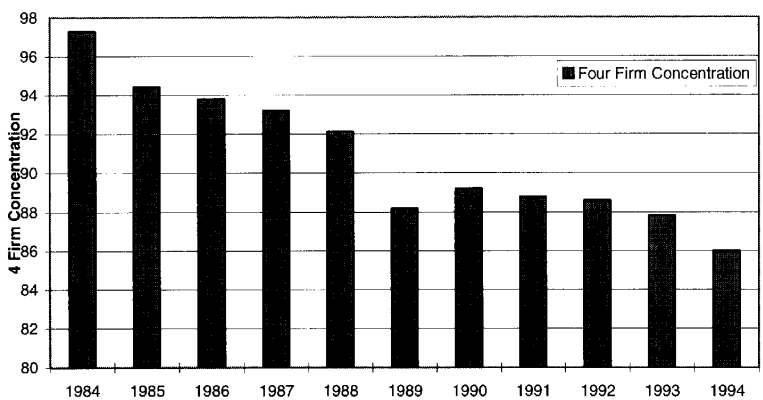

Figure 4. Four firm concentration levels.

excess of 85%. It is clear from Figure 3 that the four firm concentration levels, although falling, continues to be high. Although this explanation is not at odds with the search and switching cost explanation, any test of price cost margins must control for this.

A second potential explanation is that prior to deregulation long distance rates were set at marginal cost. If this were true, as access charges dropped the rates charged to consumers would fall by the same amount. This is consistent with Taylor and Taylor's findings of the measurement of the true rate, the rate charged to the consumer minus the access charge. This explanation is implausible for a variety of reasons. First, the tremendous amount of entry suggests that margins were high after deregulation, where marginal cost was only 1 to 2 cents above

access charges.[21] Furthermore, entry and continued business by firms in unrelated industries, e.g., firms establishing private networks, is evidence that rates were not set at marginal cost. If any economies of scale exist then firms entering at such a low scale undoubtedly have higher marginal costs. Therefore entry would only occur if price cost margins are sufficiently high. If this is true, price cost margins must be large enough to warrant high cost entry.

IV. Data and Model Specification

1. Data

Rate data were acquired from the FCC *Reference Book* (1994) which track retail list rates for residential and business consumers. Residential rates are only used given the higher percentage of businesses that subscribe to discount plans and thus do not pay the retail list rate.[22] The data track rate information for 9 different distances and includes rates for residential day, evening, and night calls for AT&T, MCI and Sprint. The data stretches from the years 1984 to 1993. For advertising data, I consulted Leading National Advertisers' *Ad $ Summary* a yearly publication that provides advertising data for a variety of firms and industries. The benefit of LNA's source is that for firms that compete in multiple markets, LNA separates advertising expenditures into the respective markets. For example, LNA reports advertising expenditures made by AT&T in the long distance market only. Data on the number of firms present were collected from the FCC's *CC Docket 91–141*. As a measurement of marginal cost, I use the access fees charged by the local Bell companies to the long distance phone companies on a per minute basis. Access charges were collected from Lande (1994). I argue that this suffices since even at their lowest level, access charges comprise at least 77% of marginal cost (using MacAvoy, 1995, estimates). In any event, fixed distance effects are added to control for differences in the price cost margins associated with different length calls, whether due to cost or elasticity differences.

All monetary variables were deflated using the consumer price index for all urban consumers and all items with a base year of 1982–1984, obtained from the Bureau of Labor Statistics. Table II provides the relevant data statistics. To summarize the balanced panel consists of rates for AT&T, MCI, and Sprint for 9 different routes, day, evening and night time calls, stretching from 1984 to 1993, for a total number of observations of 810.

[21] See for example, WEFA Group (1993) and MacAvoy (1995).

[22] A growing percentage of customers now belong to discount plans and thus do not pay the retail rate. Although the percentage of customers using such plans is rising as well as the percentage of traffic within these plans, the majority of residential consumers still do not. I am indebted to an anonymous referee for pointing this out.

Table II. Data statistics

Variable	Mean	Std dev	Min	Max
Price cost marginal (%), PCM	65.45	18.08	25.11	86.40
Real switching fee (in cents), FEE	493.2	194.0	345.9	962.2
Number of firms serving >45 States, FIRMS45	4.613	2.273	2	9
Number of firms with revenue >$100M, FIRMS100	13.80	3.490	7	19
Standard deviation of rates in a given year, STDRATES	65.90	23.27	46.00	117.7
Real industry advertising ($100,000s), ADV	2042	1392	711	5017
Real industry advertising squared (in billions), ADV^2	42485	33141	4536	120441

2. SPECIFICATION

In a search and switching cost market, theory predicts that the level of market power will be a function of both search and switching costs. As a level of market power, I use the price cost margin (Lerner index):[23]

$$\frac{(P-MC)_i}{P_i} = f(S_i(t), X_i(y)) \tag{3}$$

where S are search costs and X are the switching costs. Both S and X are themselves functions of the determinants of search and switching costs, t and y, respectively.

To empirically test for search and switching costs, I estimate equation (1) by constructing a set of variables that measure the magnitude of search and switching costs, representing t and y above. I posit the following functional form:

$$\begin{aligned}\text{PCM}_i = {} & \beta_1 \text{ADV} + \beta_2 \text{ADV}^2 + \beta_3 \text{FEE}_i + \beta_4 \text{STDRATES}_i + \beta_5 \text{FIRMS100} \\ & + \sum_{j=1}^{9} \gamma_j D_j + \sum_{k=1}^{3} \alpha_k F_k + \epsilon \end{aligned} \tag{4}$$

where PMC_i is the price cost margin for AT&T, MCI, and Sprint. ADV denotes industry advertising expenditures, FEE is the amount charged to consumers by local providers to switch long distance carriers, STDRATES is the standard deviation of

[23] The analysis was also completed using markup (price minus marginal cost) as the dependent variable. The results were qualitatively similar.

rates for a firm in a given year, and FIRMS100 is the number of firms offering long distance with revenues in excess of $100 million, D are the fixed distance effects, F the fixed time of day effects, and ϵ is a normally distributed error term with mean zero and constant variance.

To exploit the panel nature of the data set, I use a fixed distance and time of day effect model. The presence of these effect dummies allow for the model to control for the idiosyncrasies present in each route and help control for any marginal cost difference among routes and time of day.

3. Explanation of the Variables

ADV: Advertising expenditures effect price cost margins in two ways. As argued earlier, advertising expenditures lower price cost margins by disseminating information, lowering search costs. Second, larger firms, such as AT&T, MCI, and Sprint, target specific consumers offering a refund of the switching fee if they 'sign up' with them. This type of advertising lowers switching costs, and also reduces price cost margins.

Unfortunately, firm level data separating advertising expenditures into the above categories are not available. I, therefore, use industry-wide advertising to measure the influence of advertising on both search and switching costs. It is likely that the coefficient on this variable is most driven by search costs given the prevalence of media advertisement.

Alternatively, if price cost margins are driven solely by capacity constraints, then we would expect to see a coefficient that is insignificantly different from zero. In addition, if rates were set at marginal cost prior to deregulation, we would not expect a significant coefficient of ADV.

FEE: If a consumer decides to change long distance providers, a fee is charged to the consumer by the local phone company. This fee is a direct measure of switching costs. A positive coefficient on this variable would therefore imply market power originating from a switching cost market.

STDRATES: This variable most accurately represents the search costs present in the industry. If a customer was interested in finding the price charged by long distance carriers, she would have to consult a variety of call lengths. As the rates within these different call lengths become more dispersed, it becomes more difficult for consumers to discern the prices, thus increasing the search costs. Take, for example, the current Sprint campaign that charges only one price for every long distance call, 10 cents. With a standard deviation of rates equal to zero, search costs are at a minimum.[24] Therefore, if search costs are important we would expect a positive coefficient on STDRATES.

[24] Please note that Sprint does have certain exceptions to the 10 cent per minute plan, so the standard deviation would not be equal to zero in this case either.

Table III. Predictive signs

Variable	Exp. sign (coeff) in search/switch cost mkt	Exp. sign (coeff) if P = MC	Exp. sign (coeff) in capacity cons mkt
ADV	– via both costs	0	0
STDRATES	+ via search costs	0	0
FEE	+ via switching costs	0	0
FIRMS100	?	0	–
FIRMS45	?	0	–

FIRMS100: Under the hypothesis that market power is the result of limited large scale entry the coefficient on FIRMS100 should be negative. The coefficient on this variable in a search and switching cost market is indeterminate. Alternative specifications were estimated using different measurements of large scale entry, such as the number of firms offering service in 45 or more states (FIRMS45), and in over 25 states (FIRMS25). Table III summarizes the expected signs for the coefficients.

4. Econometric Issues

A problem exists with the potential endogeneity of the industry advertising variable and the number of firms. I use an instrument variable to control for the endogeneity of the number of firms. A valid instrument for industry advertising is not available however. As a result, the OLS coefficient on ADV is potentially biased. However, it is likely that bias is small for two reasons. For one, I use industry advertising rather than individual firm advertising. In a market where one firm cannot influence industry advertising, the industry advertising variable would not be endogenous. Although this is not entirely true in the long distance market the effect one firm has on industry advertisement is somewhat lessened. Therefore, the bias on this coefficient is reduced. Second, it is often presented that advertising is made only by firms who are selling at a price above marginal cost. The standard treatment of advertisement expenditures is that they represent a barrier to entry. If this is the case as advertisement expenditures increase, so do barriers to entry and market power. Therefore, any bias caused by advertising expenditures being endogenous will be in the opposite direction of finding search and switching costs to be important. This also dampens the econometric problems associated with the potential simultaneity issues.

V. Results

The regression results are reported in Table IV. The coefficients on ADV and FEE are significant at or above the 10% level in both specifications. The coefficient on STDRATES is positive and significant at the 1% level. These results suggest that

Table IV. Empirical results (dependent variable: PCM (percentage) of a five minute call)

Independent variable	Coefficient	Coefficient
FEE	0.0087[b]	0.0080[b]
	(0.0039)	(0.0039)
ADV	−0.0235[b]	−0.0220[b]
	(0.0117)	(0.0113)
ADV^2	0.0434[c]	0.0407[c]
	(0.0246)	(0.0238)
STDRATES	0.5233[a]	0.4372[a]
	(0.1861)	(0.1781)
FIRMS45	–	−0.0975
		(0.1721)
FIRMS100	−2184	–
	(0.3471)	
Adjusted R^2	0.69	0.69
N	810	810

Notes: White's heteroskedastic consistent standard errors in parentheses.
Distance and time-of-day fixed effects are suppressed.
[a] Significant at or above the 0.01 level.
[b] Significant at or above the 0.05 level.
[c] Significant at or above the 0.10 level.

search and switching costs have a statistically significant influence on the price cost margins of the three largest long distance carriers. The coefficients also indicate that search and switching costs are economically significant. Evaluated at the means of each variable, a 10% reduction in FEE would lead to at least a 6.02% reduction in price cost margins (specification ii).[25] The coefficient on advertising suggests that a 10% change in advertising would lead to at least a 4.57% change in price cost margins (specification i). Finally, a 10% increase in the standard deviation of rates, likely the most accurate representation of search costs, would lead to a 4.4% increase in price cost margins. These results provide strong support for the hypothesis presented in this work. As search and switching costs are reduced, we would therefore expect a reduction in rates. The coefficient on advertising is also suggestive of the possible benefits to advertising contradicting the standard view that advertising creates barriers to entry that raise market power.

Indeed we have seen such reductions by the very firms that have benefited from them. Out of sample observations point to a market where firms are engaging in direct price advertisement and special offers to switch customers for free, or

[25] Using only access charges as a measure of marginal cost overstates price cost margins thereby understating percentage changes in price cost margins.

even for a profit to the customer. These actions also support the hypothesis. Firms are aware of the individual benefits of reducing search costs, i.e., the attraction of customers, at the risk of reducing the market conditions that allow for market power. As firms attempt to attract new customers with either price advertisement or switching offers, the very instruments that made these customers inviting are reduced.

The results provide little evidence that large scale entry disciplines market power. The coefficient on both measurements of large scale entry, FIRMS100 and FIRMS45, although are of the right sign are highly insignificant. It is worth noting that this hypothesis is not mutually exclusive with the search and switching market and may be a plausible dual explanation. As expected the coefficients on the mileage effects and time of day effects are significant representing the idiosyncrasies present but are suppressed for brevity.

VI. Conclusion

Using a panel data set of AT&T, MCI, and Sprint's long distance rates for 9 distance categories, three times of day, stretching over 10 years, I have constructed an empirical model to test for the presence of search and switching costs. The results suggest that search and switching costs are a major determinant of market power. The coefficients on the variables included to test for the role of search costs and switching costs in the market are all statistically and economically significant.

There are possible policy implications from this study. On a larger scale, this age of deregulation can only be helped with the uncovering of impediments to competitive pricing. More specifically, there are negative welfare implications from charging above marginal cost. The results illustrate that search and switching costs are one cause of these margins. Although, the increased expenditures on advertising and the offering of free switching have put pressure on rates to fall, rates continue to exceed marginal cost, as evident by the high rates of return earned in the industry. Actions can be taken to weaken these effects. By disseminating information on rates, margins will lessen. Public postings of long distance rates, or policies such as these will surely lessen the market power afforded to long distance carriers. Unfortunately for the consumer the FCC has recently taken action to limit the posting of rates as part of the implementation of the Telecommunication Act of 1996. The FCC in, CC Docket No. 96-61, will no longer allow nondominant long distance carriers to file their rates with the FCC. This complete "detariffing" of rates will likely increase the search costs in the industry.[26]

Fortunately, for the consumer, it seems that the major players in the industry have already moved to reduce these impediments to competition. Recent campaigns by AT&T, Sprint, and MCI either to offer free switching have largely eliminated the switching costs faced by consumers, and in some cases have created a switching

[26] This is assuming that prior to detariffing, customers consulted these rates as part of comparison shopping.

profit. In addition, we have seen a greater push toward direct price advertisement and a reduction in the standard deviation of rates. Sprint and AT&T recent campaigns to offer only one rate for any call within the US has drastically reduced rate dispersion and thus search costs. These actions tend to suggest that the private benefit of reducing search and switching costs outweigh the industry benefit, suggestive of a reduction in market power as firms continue to compete for customers.

The results could be bolstered by obtaining data that further separates the different advertising medium. Inclusion of these sources would (1) further separate the relative power of search and switching costs, and (2) test for the relative power of different advertising medium. There also appears to be other interesting questions posed in the long distance market. True, much has been written in this arena. However, its quite an arena. As raised earlier, the possibility that consumers are unaware of the *rates* they currently pay may be modeled. Consumers are undoubtedly aware of their total bill, but it seems too costly to infer the per unit or marginal payments made. Finally, a number of states since 1988 have allowed competition in local telephone services. In addition, the Telecommunications Act of 1996 will soon allow long distance carriers and cable companies to compete in the local telephone industry. It may be interesting to test for the pricing discipline of entry in the local telephone industry and to compare that with entry in the long distance industry. Preliminary results by this author suggest entry does discipline pricing behavior in the local telephone industry.

References

Ausubel, Lawrence M. (1991) 'The Failure of Competition in the Credit Card Market', *American Economic Review*, **81**, 50–81.

Bagwell, Kyle and Garey Ramey (1994) 'Coordination Economies, Advertising, and Search Behavior', *American Economic Review*, **84**, 498–517.

Borenstein, Severin (1991) 'Selling Costs and Switching Costs: Explaining Retail Gasoline Margins', *Rand Journal of Economics*, **22**, 354–369.

Calem, Paul S. and Loretta J. Mester (1995) 'Consumer Behavior and the Stickiness of Credit-Card Interest Rates', *American Economic Review*, **85**, 1327–1336.

Federal Communications Commission (1991) 'Expanded Interconnection with Local Telephone Company Facilities', *CC Docket No. 91-141*, Washington, DC: FCC.

Federal Communications Commission (1996) 'Policy and Rules Concerning the Interstate, Interexchange Marketplace', *CC Docket No. 96-61*, Washington, DC: FCC.

Kaestner, Robert and Brenda Kahn (1990) 'The Effects of Regulation and Competition on the Price of AT&T Intrastate Telephone Services', *Journal of Regulatory Economics*, **2**, 363–377.

Klemperer, Paul. (1992) 'Competition When Consumers Have Switching Costs: An Overview', *Oxford Discussion Paper Series*, No. 142.

Knittel, Christopher R. (1996) 'Asymmetric Switching Costs: Implication for Financial Distress in Switching Cost Markets', Mimeo, University of California, Berkeley.

Knittel, Christopher R. (1977) 'Local Telephone Pricing: Competitive Forces at Work', *Utilities Policy*, forthcoming.

Lande, James L. (1994) *Reference Book: Rates Price Indexes, and Household Expenditures*, Washington DC: FCC Industrial Analysis Division.

Loube, Robert and Labros E. Pilalis (1994) 'State Experience in InterLATA Toll Regulation', *Journal of Economic Issues*, **28**, 415–425.

MacAvoy, Paul W. (1995) 'Tacit Collusion by Regulation: Pricing of Interstate Long-Distance Telephone Services', *Journal of Economics and Management Strategy*, **4**, 147–185.
Nelson, Phillip (1974) 'Advertising as Information', *Journal of Political Economy*, **82**, 729–754.
Rothschild, Michael (1974) 'Searching for the Lowest Price When the Distribution of Prices is Unknown', *Journal of Political Economy*, **82**, 689–712.
Stango, Victor O. (1996) 'Sources of Market Power in the Credit Card Market', unpublished manuscript.
Stigler, G.J. (1961) 'The Economics of Information', *Journal of Political Economy*, **69**, 213–225.
Stigliz, J. E. (1989) 'Imperfect Information in the Product Market', in Richard Schmalensee and Robert D. Willig, eds, *Handbook of Industrial Organization*. Amsterdam: Elsevier, pp. 769–847.
Sutton, John (1991) *Sunk Costs and Market Structure*, Cambridge, MA: MIT Press.
Taylor, William and Lester Taylor (1993) 'Post Divestiture Long-Distance Competition in the United States', *AER Papers and Proceedings*, pp. 185–190.
WEFA Group (1993) *Economic Impact of Estimating the Line-of-Business Restrictions on the Bell Companies*, Bala Cynwyd, PA: WEFA.