

Regulating Prices for Shifting Between Service Providers

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Abstract

The price that a regulated access provider charges for shifting customers between service providers has significant welfare implications. Typical regulatory approaches to pricing, such as pricing based on fully allocated cost or incremental cost, ignore the characteristics of consumer demand. A theoretical alternative, Ramsey pricing, considers only the elasticity of demand for given products. This paper directs attention to the competitive process. Using U.S. long-distance telephone services as an example, this paper shows how empirical evidence concerning customer acquisition costs, customer switching costs, and churn among service providers can help to inform price regulation.

* The views expressed in this paper are those of the author and do not necessarily reflect the views of the Commission or its staff.

I. Introduction

In regulated, infrastructure-based industries such as electric power, natural gas, and telecommunications, policy makers have taken, or are taking, steps to foster consumers' ability to change their providers of particular services. Economic issues crucial to the welfare effects of such policies are often overlooked. With an empirical and institutional focus on telecommunications, this paper identifies issues and trade-offs that should be considered in regulating or reviewing prices for shifting between service providers.

Fostering consumer shifting between service providers has been an important aspect of telecommunications policy. Policy makers have enacted rules and regulations to ensure that consumers can shift between providers of certain services without having to change their dialing behavior (MFJ 1982, App. B; FCC 1996a, Section II A. and B; EC 1998a, Article 12(7)).¹ Policy makers have also enacted regulations to ensure that consumers can change providers for certain other services without having to change their telephone numbers (DTI 1991; FCC 1996b; EC 1997, Article 12(5)). Regulatory policies to enhance consumers' ability to shift among broadband internet service providers are beginning to be debated (AOL 1998; Oftel 1998). Policy discussions have generally focused on technical capabilities and legal rights associated with consumers' changing service providers, while pricing associated with such changes has often been considered only as an afterthought.

¹ Such policies are called carrier preselection policies. Carrier preselection allows consumers to choose the service provider for calls placed to (standardized) telephone numbers that do not include service-provider-specific codes.

The economics literature on switching (shifting) costs might be interpreted to imply that pricing decisions are simple. This literature shows that switching costs tend to create market power, resulting in higher prices and less product differentiation (Klemperer 1995; Padilla 1996; Sharpe 1997; Chen 1997). Klemperer (1995, 516) argues that public policy “should seek to minimize switching costs.” Regulators might interpret this analysis, in conjunction with typical costing principles, to imply that a regulated network operator’s price for changing a customer’s service provider should be set at its incremental cost of making such a change (ACCC 1998).² However, this prescription assumes the merits of competition for the given services. In pro-competitive regulatory policy, service definitions are often necessarily the result of regulatory judgment about the importance of a particular type of choice.³ In addition, the economics literature on switching costs does not clearly specify relevant, feasible policy options or tradeoffs. Without situation-specific knowledge it is difficult to do so.

Pricing decisions are in fact not simple, and rather than being an afterthought, pricing should be a central issue in any decision to promote shifting between service providers. A decision on pricing indicates quantitatively the importance attached to promoting a particular type of choice. Given the dynamism of communications technology and the administrative challenges of implementing effective regulation, making such a decision is necessarily a matter of considered judgment informed by accumulated experience and quantitative evidence.

² Interconnection regulation typically requires interconnection services to be cost-based. Interconnection regulation may be interpreted to encompass carrier pre-selection and thus to imply that carrier selection should be cost-based.

³ For example, the MFJ established the basis for long-distance telephone competition as competition for interLATA telephone services.

This paper provides tools to help inform regulatory judgment about prices for shifting between service providers. Section II describes some institutional background. Section III presents a simple theoretical model useful for understanding the welfare implications of policies that affect the cost of shifting between service providers. Section IV documents relevant empirical characteristics of consumer shifting among U.S. long-distance telephone service providers. Section V shows that a modified version of the model in Section III provides a useful tool for quantitative analysis of policy alternatives. Section VI offers conclusions.

II. Institutional Background

The equal access requirements imposed in the Modified Final Judgment of U.S. v. AT&T [MFJ, 1982] have been an influential model for policies to foster consumers' ability to change service providers in telecommunications and other regulated, infrastructure-based industries. The MFJ required that customers be able to choose and change their interLATA service providers without changing either their dialing behavior or the network operator that provides their local connection to the public telecommunications network.⁴ This equal access requirement essentially defined what is now commonly known as long-distance service in the U.S. It also implied that the network operator providing local access provides an additional service: maintaining and updating information on a customer's interLATA service provider so that interLATA calls can be routed to that carrier. This regulated service provided by the local access operator is known as carrier pre-selection for long-distance service.

⁴ The MFJ defined 161 geographical entities called local access and transport areas (LATAs) based on local calling areas, natural geographic features, and state boundaries.

While considerable attention was focused on the importance of providing equal access, much less attention was devoted to the charge for changing long-distance carriers. After rejecting as inadequately justified a proposed charge of \$26.21 for changing the presubscribed [pre-selected] long-distance carrier, the FCC stated:

A presubscription charge that covers the unbundled cost of a subscription change would be reasonable. Also, to the extent that a presubscription charge is intended to discourage excessive amounts of shifting back and forth between or among interexchange carriers, we do not believe a charge geared to this purpose would be unreasonable. Absent proper cost support for presubscription charges, we believe a charge of \$5 per change (after one free preselection) would be reasonable. It would reflect some cost recovery and would not pose a barrier to competitive entry or exercise of consumer choice.⁵

Most local exchange companies chose to tariff a pre-selection change charge of \$5, and this charge, with a few exceptions, has remained constant since 1984.⁶

Equal access arrangements have subsequently been extended to a much broader and less well-defined set of services. The U.S. *Telecommunications Act of 1996* requires all local exchange carriers to provide dialing parity and non-discriminatory access to competing providers of telephone exchange service and telephone toll service.⁷ The FCC has provided some guidance as to what categories of services should be grouped together for pre-selection purposes.⁸ It has also ruled that the costs and prices for these additional arrangements be evaluated within the same framework of national rules established for the recovery of number portability costs.⁹ Individual states within the U.S. have been

⁵ Investigation of Access and Divestiture Related Tariffs, CC Docket No. 83-1145, FCC 84-1422, 55 RR 2d 1422 (rel. April 27, 1984), Appendix B 13-5.

⁶ BellSouth reduced its change charge to \$1.49 in 1990 on the grounds that automation has lowered its cost of executing changes.

⁷ Section 251(b)(3).

⁸ *In the Matters of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996* (CC Docket No. 9-98) and other matters, *Second Report and Order and Memorandum Opinion and Order*, 11 FCC Rcd 19393 (1996) (released Aug. 8, 1996), Section II A. and B.

⁹ *Implementation of Local Competition*, 11 FCC 19440, para. 92. The FCC has put forward a price structure for recovering the cost of number portability, and this price structure has no charge for porting a

defining the pre-selection mechanisms and associated prices required by the Telecommunications Act of 1996. These prices are generally greater than zero and vary across states. The relationship between these state-level developments and the national framework that the FCC set out is not clear.

In Europe there has also been a policy emphasis on equal access arrangements with little systematic consideration of pricing policy and market structure. The European Union's *Interconnection Directive*, as amended, requires organizations operating public telecommunications networks and having significant market power to provide by 1 January 2000 access through pre-selection and a short call-by-call prefix to the switched services of any interconnected provider of publicly available telecommunications services.¹⁰ Determining the number and scope of pre-selection options, which plays an important role in structuring service markets, has been left to the member states.

With respect to pricing, the EU's *Interconnection Directive* offers only very general guidance:

National regulatory authorities shall ensure that pricing for interconnection related to the provision of this facility [carrier selection] is cost-oriented and that direct charges to consumers, if any, do not act as a disincentive for use of this facility.¹¹

The requirement that charges be "cost-oriented" appears to be weaker than a requirement that charges be "cost-based", a requirement which itself requires considerable interpreting rules. Moreover, whether this charge is made directly to the consumer or to

particular customer's number. See *In the Matter of Telephone Number Portability, Third Report and Order*, CC Docket No. 95-116, RM 8535 (rel. May 12, 1998), para. 87-92 and para. 135-146.

¹⁰ *Interconnection Directive* (97/33/EC), as amended by 98/61/EC, Article 12(7). These access arrangements should be available in all EU Member States by January 1, 2000, although some States have been granted an additional transition period. Some countries have implemented carrier selection earlier than required by the EU.

¹¹ *Interconnection Directive*, Article 12(7).

the carrier acquiring the consumer is not necessarily economically relevant,¹² and any charge necessarily acts as a disincentive for use of the service.¹³

Over-all, the current institutional framework for regulating prices for shifting between service providers consists of two principles and some qualifying concerns. The first principle is that promoting consumers' ability to choose different providers for a given service is pro-competitive and hence desirable from a welfare perspective. The second principle is that cost is the appropriate basis for regulating a network operator's price for changing a customer's pre-selected service provider. The qualifying concerns associated with these principles, namely, the incentive effects of pricing and the implications for customer churn among service providers, could help to contextualize these principles, but they have been largely overlooked. The success of the MFJ in stimulating telecommunications competition in the U.S., the strong ideological push for competition around the world, and the force of traditional cost-based regulatory practice has lead to policy principles that have abstract merit but that lack well-analyzed connections to industry realities.

III. A Simple Model

Consider an infrastructure-based industry with two competing retail service providers and a regulated network operator.¹⁴ The upstream network operator provides

¹² A basic economic principle in public finance is that legal incidence does not determine economic incidence. That means in this context that whether the charge is tarified as an end-user charge or as a charge for the acquring service provider is not determinative as to who will pay the charge. In the U.S. the charge is nominally an end-user charge, but carriers generally pay the charge on behalf of an acquired customer. For an example of how a charge to a carrier can become a charge to the end user, see the U.S. experience with PICC charges.

¹³ EU Member States have the responsibility for determining more exactly the meaning of "cost-oriented". In Germany, interconnection services are required to be priced at long-run incremental cost under a

two services to the downstream retail service providers: a network service, which is a component of the retail service providers' marginal cost, and a change service that changes a particular customer's retail service provider. With respect to telecommunications, the network service might be thought of as a per-minute fee for originating and terminating long-distance calls over a customer's local access line, while the change service changes a customer's pre-selected long-distance service provider.

The (unregulated) retail service providers compete for a fixed number of retail customers. Thus a service provider gains new customers only by inducing customers to shift from the other service provider. Each service provider can offer its new customers a price p_n different from the price p_c that its current customers are paying. Assume that service costs are constant per customer. Then the retail market essentially decomposes into two markets: the market for one service provider's current customers and the market for the other service provider's current customers. Assume that both service providers have the same costs. Then the price for new customers and the price for current customers do not vary across service providers. In particular, they do not depend on a service provider's market share.¹⁵ Moreover, without loss of generality, assume that retail service providers have no costs other than the costs associated with purchasing network services and change services from the network operator.

Network Access Ordinance. In Austria, interconnection services must be priced using a cost model that calculated forward-looking long-run average incremental cost (FLLRAIC).

¹⁴ The analysis in this section is based upon the model that Chen (1997) used to evaluate allowing service providers to pay customers to shift between providers. Paying customers to shift is equivalent to discriminating between new and current customers. U.S. long-distance service experience indicates that forbidding such discrimination is not feasible for mass-market services. Service providers can selectively inform consumers of generally available prices so as to effectively pay customers to switch. See Section IV.

¹⁵ This is a simplified version of a central result in Chen (1997).

Consumers choose only whether to change service providers. Each consumer has a reservation value r for a unit of service, and a customer that consumes the service consumes exactly one unit of the service. Consumers' costs of changing providers are uniformly distributed over $[0, u]$ with $u > 0$.¹⁶ Given that p_c and p_n are less than r , the fraction of current customers shifting to a new service provider is

$$D = \frac{p_c - p_n}{u}, \text{ where } 0 \leq p_c - p_n \leq u$$

(1)

Consumer welfare is

$$CW = (r - p_c)(1 - D) + (r - p_n)D - (p_c - p_n)D / 2$$

(2)

where the last term on the right side of (2) represents total consumer shifting costs.

The network operator is assumed to be subject to price regulation. Its costs will be assumed to be costs that, from a regulatory perspective, must be recovered under non-confiscatory regulatory policy. These assumptions imply that changing one of the network operator's prices without a revenue-neutral change in the other price will not be considered a feasible policy option. Let s be the network operator's marginal cost of changing a customer's service provider.¹⁷ Let m be the regulated price per unit of service such that m and s are compensatory (feasible) prices for the network operator.¹⁸ With this set of prices m recovers all of the network operator's fixed costs. Alternative feasible prices for the network operator are parametrized by t_a and t_s , where the network

¹⁶ These shifting costs are costs that customers themselves incur, while the network operator's service provider shifting charge is assumed to be paid by the acquiring service provider (as is current practice in the US). Since each customer that shifts consumes exactly one unit of the good, any bonus (or charge) to the customer for shifting carriers could be assumed to be incorporated in the price for new customers.

¹⁷ The service provider that acquires the customer is assumed to pay this charge. This is not an important assumption. See above footnote.

service price is $m-t_a$ per unit of service and the network operator's price for changing retail service providers is $s+t_s$.

Revenue neutrality implies

$$t_a = t_s D \quad (3)$$

To ensure that consumers will purchase the good and that changing service providers is feasible for all consumers when the service price is m , assume

$$m + u < r \quad (4)$$

In the market for a given service provider's current customers, the given service provider chooses a profit-maximizing price for current customers. The other service provider chooses a profit-maximizing price for its new customers, which it attracts from the given service provider's current customers. The regulator is assumed to set the network operator's prices in advance of the retail service providers' pricing decisions.

The retail service providers' profit functions are

$$\Pi_c = (p_c - m + t_a)(1 - D) \quad (5)$$

$$\Pi_n = (p_n - m + t_a - s - t_s)D \quad (6)$$

The equilibrium of this model is easily derived.¹⁹

No Shifting Between Retail Providers Occurs in Equilibrium (Case 1):

Note that (1) implies that the gain from attracting new customers with a price reduction is proportional to $1/u$, while the cost to shift a new customer is $s+t_s$. If $u \leq s + t_s \leq r - m$,

¹⁸ Since s is the marginal cost of shifting a customer, the number of customers is fixed, and in equilibrium each customer consumes exactly one unit of the service, s and m can be determined without regard to the number of customers that shift between service providers or the price of service.

¹⁹ For *Case 1*, the first order condition for Π_c needs to be evaluated at $D=t_a=0$ to see that there is no incentive to raise p_c . Since there is no shifting in this equilibrium, there can be no gain from lowering p_c or raising p_n . Lowering p_n below the price of acquiring and serving a customer, $s+t_s+m$, would create a loss. The solution for *Case 2* follows from solving the first order conditions.

the gain is not sufficient to offset the cost, and no shifting occurs in equilibrium ($D=0$).

Given the network operator's (regulated) prices for network service and for shifting customers, the Nash equilibrium retail prices for the service providers are

$$\begin{aligned} p_c &= s + t_s + m \\ p_n &= s + t_s + m \end{aligned} \tag{7}$$

Since in this simple model there is no price elasticity of demand, social welfare is maximized whenever the retail prices are at or below consumers' reservation value and no consumer shifting between service providers occurs. In particular, social welfare is maximized at the monopoly prices $p_c = p_n = r$. Social welfare is also maximized when t_s is set such that $t_s = u - s$, which from (7) and (4) implies $p_c = p_n = u + m < r$. Note that since in this equilibrium no consumer shifting occurs, no retail service provider ever pays the shifting price $s+t_s$, and (3) implies $t_a = 0$. Nonetheless, because the shifting price determines the intensity of competition, by regulating the shifting price the regulator affects the service price. More generally

Proposition 1: *The presence of competing service providers can benefit consumers even without any socially costly consumer shifting between service providers.*

This result is similar to results from the contestable markets literature.

Shifting Between Retail Service Providers Occurs in Equilibrium (Case 2):

If $s + t_s < u$, retail service providers have an incentive to raise prices for current customers above the level in (7). This causes some current customers to shift. The Nash equilibrium prices are

$$\begin{aligned}
p_c &= m + \frac{t_s(s+t_s)}{3u} + \frac{s+2u}{3} \\
p_n &= m + \frac{t_s(s+t_s)}{3u} + \frac{2s+u}{3}
\end{aligned} \tag{8}$$

The share of consumers shifting between service providers is

$$D = \frac{1}{3} \left(1 - \frac{s+t_s}{u} \right) \tag{9}$$

Regulators or governments might be willing to accept the social costs of some consumer shifting in order to maximize consumer welfare. To find feasible network operator prices that maximize consumer welfare, substitute (8) and (9) into (2) and maximize with respect to t_s . If $s \leq 2u$, the cost allocation that maximizes consumer welfare is

$$(10) \quad t_s = \frac{-2s-u}{5}$$

Since $u > 0$, the cost to service providers of acquiring a new customer is $s+t_s < \frac{3}{5}s$.²⁰

Proposition 2: *Consumer welfare is not maximized by setting the network operator's price for changing service providers at its marginal or incremental cost of making such a change ($t_s=0$). The magnitude of the network operator's marginal cost of changing a customer's service and consumers' costs of shifting service providers also affect the optimal price for shifting.*

While the above results depend on the specific structure of this model, the important point is that the marginal cost to the network operator of changing a customer's service provider should not be the only factor in a regulatory review of the network

²⁰ If $s > 2u$, the cost allocation that maximizes consumer welfare is $t_s = u - s$, with $p_c = p_n = m + u$. The cost to service providers of acquiring a new customer is $s + t_s = u < s$ in this case as well.

operator's price for this service. The intensity of service-provider competition, the magnitude and nature of service providers' customer acquisition costs, and consumers' own costs of shifting between service providers are also relevant.²¹ The above model shows that the optimal shifting price is always below the network operator's marginal cost. With a more complicated specification for consumers' shifting costs, the result could go the other way.

IV. U.S. Long-Distance Telephone Services

This section will review basic features of long-distance service competition in the U.S. and examine, for the U.S., costs to long-distance service providers of acquiring customers, costs to consumers of changing service providers, and the extent of consumer shifting among service providers. While many countries are just beginning to experience competition in long-distance services, such competition has existed in the U.S. for over 15 years. The U.S. thus provides a good empirical record for considering how shifting costs can affect the development of competition.

Residential long-distance service competition in the U.S. consists primarily of competition to acquire service subscribers who are charged prices in accordance with tariffs filed but not reviewed at the FCC. Consumers choose a presubscribed long-distance service provider to provide all their "direct dialed" long-distance calls.

Companies compete to acquire such subscribers through a variety of discounts and promotions. Consumers can change their presubscribed long-distance service provider at

²¹ Note that the above model assumes that competition is intense, in the sense that without any costs associated with shifting between service providers, competition between the two firms would result in price set at marginal cost (Bertrand competition with homogeneous products). Service providers customer

any time, and service providers can change the terms of the agreement with their customers at any time by filing new tariffs at the FCC.²² In 1997, presubscribed residential long-distance service revenue amounted to about \$26 billion.²³

Other forms of long-distance service competition are possible but currently much less economically significant in the U.S.²⁴ Call-by-call “dial around” competition is increasing but still accounts for only about \$2 billion of consumer long-distance service revenue.²⁵ Long-distance competition via prepaid calling cards is similar to dial-around competition but features a different payment mechanism. Prepaid calling cards amount to about \$1 billion in consumer long-distance service revenue (FCC 1998b, table 6). “Toll-free” service shifts billing and the locus of competition from the calling party to the called party but shares with presubscription an ongoing relationship, governed through tariffs, between the service provider and customer. Revenue associated with toll-free service, which is sold predominately to businesses, probably amounts to about \$14 billion.²⁶

acquisition costs have been assumed to be zero in the above model. In terms of the model, those costs have the same economic effect as the network operator’s costs in *s*.

²² The FCC has been seeking to eliminate the tariff process for long-distance service providers, but long-distance service providers have mounted successful court challenges to prevent detariffing. While there has been a traditional concern that tariffs facilitate collusion, the advantage of tariffs for U.S. long-distance service providers are primarily informational and contractual: they allow service providers to change customers’ prices or terms of service without directly informing customers. Moreover, a filed tariff legally trumps a contract between the service provider and the customer (the filed tariff doctrine).

²³ Toll service providers reported \$89.6 billion in gross toll revenue in 1997 (FCC 1998b, Table 6). The share of interLATA minutes in total toll minutes was about 25% in 1997 (FCC 1998c, Table 15.2). Based on AT&T’s revenue breakdown (AT&T, 1998), consumer (residential) long-distance revenue is 45% of total long-distance revenue (including resold services). These figures imply \$29 billion of residential interLATA services, of which dial-around and calling cards amount to about \$3 billion (see following text).

²⁴ In contrast, in Chile long-distance service competition consists primarily of call-by-call carrier selection, even though preselection is also available at no cost.

²⁵ VarTec, the leading dial-around provider, had \$820 million in revenue in 1997 (FCC 1998, Table 1.2). Schiela (1998) estimates that VarTec had 41% of dial-around revenue in 1997. This figure suggests that the dial-around industry has about \$2 billion in revenue, a figure that agrees with a Yankee Group estimate cited in Mehta (1998).

²⁶ Estimate based on AT&T’s reported inward only long-distance revenue relative to total long-distance revenue (FCC 1995, Table 2.9).

The FCC regulates the price that local exchange (access) providers charge for switching a customer's long-distance service provider. Since 1984 most U.S. local exchange lines have incurred a charge of \$5 for changing the presubscribed long-distance service provider.²⁷ Table 1 shows some international comparisons. The German experience shows the potential for conflict. In December 1998 Deutsche Telekom (DT) proposed a change charge of DM 94.99 (\$57.57) to go into effect January 1998. This proposal generated a public outcry and a European Commission investigation. Six months later the German regulator prescribed change charges that fall to DM 10 (\$6.06) by the year 2000. DT remains highly critical of this decision and has found support within the German government (Boston 1998; Dow Jones Newswires 1998). Nonetheless, DT's change charge is still significantly higher than charges in the U.S. and other countries.

²⁷ BellSouth reduced its change charge to \$1.49 in 1990 on the grounds that automation has lowered its cost of executing changes. MCI has filed complaints against other BOCs concerning the level of their change charges.

Table 1
Access Operator's Charge For Changing Long-Distance Service Provider

Place	Fee	Details; Source
Survey of 35 countries	DM 3-10 (\$1.81-6.06)	reported by German regulator (TR 1998)
Chile	0	no fee for one change per month; local expert
Finland	prob. \$50-100	charge to service provider, no charge expected to consumer; local expert
Germany		
DT's Dec. '97 proposal	DM 94.99 (\$57.57)	EC 1998b
DT's Jan. '97 proposal	DM 49 (\$29.70)	"
	DM 49 in 1998 (\$29.70)	
DT's Apr. '97 proposal	DM 35 in 1999 (\$21.21)	"
	DM 20 in 2000 (\$12.12)	
	DM 27 in 1998 (\$16.36)	
Regulator's decision	DM 20 in 1999 (\$12.12)	TR 1998
	DM 10 in 2000 (\$6.06)	
Israel	\$3.00	set by Ministry of Communications; local expert
UK	prob. \$5-8	local expert
US		
BellSouth	\$1.49	FCC Tariff
SNET	\$2.30	FCC Tariff
Pacific Bell	\$5.26	FCC Tariff
US West, Ameritech, Bell Atlantic, SWBT	\$5.00	FCC Tariff

Note: The figures in this table have been collected from a variety of sources and should not be considered definitive. Values are US dollars, as reported, or calculated at US\$0.606/DM.

Long-distance service providers spend a large amount of money on advertising and promotions to acquire long-distance service customers. As table 2 indicates, total advertising and promotional expenses associated with long-distance service in 1997 were approximately \$5.4 billion, or \$34 per presubscribed line in the U.S.²⁸ Total advertising and promotional expenses have been growing about 22% per year in real terms between 1988 and 1997. Competition has transformed long-distance service from a utility into an

²⁸ According to information that AT&T presented in 1995, each person in the U.S. aged 18-49 was "touched" (on average) approximately 330 times by a consumer long-distance sales message in 1994, and

industry that advertises at a rate similar to food manufacturers and retailers of furniture and home furnishings (Galbi 1999, table 6).

	AT&T		MCI		Sprint		others		totals	
	LS	APE\$	LS	APE\$	LS	APE\$	LS	APE\$	APE\$	per line
1988	82.2%	\$709	8.9%	\$105	5.2%	\$88	3.7%	\$35	\$937	\$8
1989	78.9%	\$761	10.8%	\$112	6.1%	\$105	4.3%	\$43	\$1,021	\$8
1990	76.2%	\$1,003	12.9%	\$126	6.2%	\$179	4.7%	\$65	\$1,373	\$10
1991	75.4%	\$1,147	13.1%	\$275	6.5%	\$228	4.9%	\$85	\$1,735	\$13
1992	74.2%	\$1,090	14.0%	\$296	6.2%	\$276	5.6%	\$99	\$1,762	\$13
1993	72.4%	\$1,422	15.1%	\$589	6.1%	\$424	6.4%	\$167	\$2,602	\$19
1994	70.5%	\$2,008	15.3%	\$1,054	6.4%	\$586	7.8%	\$307	\$3,955	\$27
1995	68.2%	\$2,090	15.6%	\$1,077	6.4%	\$690	9.8%	\$421	\$4,277	\$28
1996	63.8%	\$2,363	15.6%	\$1,190	7.0%	\$1,063	13.6%	\$724	\$5,341	\$34
1997	61.4%	\$1,786	14.3%	\$1,549	8.0%	\$1,205	16.3%	\$884	\$5,423	\$34

Source: Galbi (1999, table 3 and ft. 7). The adjustment to 1997 values is based on the CPI for urban wage earners and clerical workers.

The costs that consumers incur to switch between long-distance telephone service providers are hard to quantify but appear to be significant. In a survey examining incentives to dial-around, 50% of respondents required at least a 20% savings to induce them to indicate that they would dial-around their presubscribed long-distance carrier (Schiela 1998).²⁹ Since the capitalized value of a 20% savings on the median U.S. long-distance bill is about \$700,³⁰ consumers respond as if the cost to them of changing their calling behavior is rather high.

AT&T, MCI, and Sprint had 3600, 4700, and 800 telemarketing representatives, respectively, in January 1995 (Clark and Murphy 1995).

²⁹ The percentage indicating that they would use dial-around rises from about 40% with a 10% discount to about 65% with a 50% discount.

³⁰ The median long-distance bill in the U.S. is about \$15 per month (FCC 1998a, Table 3.6). A 20% cost savings thus amount to about \$3 per month. The value of a \$3 per month savings, capitalized at a typical interest rate on short-term U.S. government bonds (5%), is about \$700.

Evidence with respect to local service providers indicates that the issue is not simply the nuisance of dialing additional digits to complete a dial-around call. In a well-documented survey conducted about December 1994, only 56% of residential local access customers indicated that, given a 25% discount and number portability, they would choose their current long-distance service provider as their local service provider, and an even smaller fraction indicated that they would be interested in any other provider (Constat 1995, p. 15).³¹ This same survey found that 63% of residential consumers had never switched their long-distance service provider (Constat 1995, p. 25).

Consumers may perceive significant costs associated with acquiring and effectively analyzing information about service providers. A survey indicates that in March, 1998, 10% of consumers could not correctly identify their long-distance service provider (Insight Research 1998). There is ample additional evidence that consumers have to invest significant time and attention to evaluate competing offers for long-distance service.³²

While a significant share of consumers apparently have relatively large costs of shifting between service providers, there can be a large return for changing carriers. Long-distance service providers offer prices that differ by more than 100% for the exact same communication service. Moreover, for international calls price dispersion is an order of magnitude greater. In the mid-1990s the major long-distance carriers often gave desirable customers large cash bonuses for switching to them, and some consumers switched carriers repeatedly to benefit from these bonuses. AT&T recently shifted to

³¹ A survey in the U.K. provides similar evidence (Cluny 1997). In addition, a large survey reviewed in the trade press indicated that 78% of consumers wouldn't change long-distance providers for a discount of less than 10%, 57% wouldn't switch for a discount of 10-20% and 40% wouldn't switch even with a higher discount (Turner 1998).

offering free minutes rather than cash bonuses. This change is reflected in AT&T's reduction in advertising and promotional expenses from 1996 to 1997 (see table 2). Carriers have also established loyalty plans tied to airline companies' frequent flyer programs. Nonetheless, by switching long-distance providers, consumers can achieve savings on the order of 20% of their long-distance bill.

The number of consumer shifts between long-distance service providers has increased dramatically since the early 1990s. Table 3 shows for the state of Connecticut the number of changes in consumers' presubscribed long-distance service providers relative to the number of presubscribed lines. The 51.8% figure in Connecticut in 1996 is close to the 48.4% figure for the Ameritech region in 1996.³³ These statistics should not be interpreted to mean that half of long-distance consumers changed companies in 1996; some consumers change companies multiple times. One study indicates that the median amount of time that a household that switches its long-distance service provider stays with that provider is 235 days (Williamson, Goungetas and Watters 1997).³⁴ On the other hand, some consumers do not switch at all. In early 1996, 16.4%, 39.0%, and 33.8% of AT&T, MCI, and Sprint customers, respectively, reported having changed their long-distance carrier in the previous 12 months (PNR 1996).

³² The trade press has noted consumer confusion concerning long-distance calling plans (Lawyer 1998). The FCC and other groups have issued briefings and tools to help consumers evaluate pricing plans.

³³ Ameritech had 9.1 million long-distance presubscribed carrier changes in 1996 for 18.8 million access lines (Ameritech 1998).

³⁴ The sample covers 765 spells with observed start dates. A study using the same data indicates that long-distance carrier changes per presubscribed line rose from 19% to 64% from mid-1992 to mid-1995 (Williamson and Chen 1997). These figures are higher than other figures cited in the text and suggest that the sample may have included consumers more likely to switch.

Table 3
Long-distance Service Provider Churn
In Connecticut

year	% changes/lines
1991	5.8%
1992	11.7%
1993	15.3%
1994	23.3%
1995	38.4%
1996	51.8%
1997	39.3%

Note: The number of long-distance service provider changes is estimated from revenue figures in SNET's FCC Report 492A and SNET's tariffed price for changing service providers. SNET's presubscribed line count is from FCC (1998c, Table 10.2). SNET provides 99% of presubscribed lines in Connecticut.

While analysts have argued vigorously about long-distance competition in terms of a description of a state (“Is the long-distance market competitive?”) (Kahai, Kaserman, and Mayo 1996; MacAvoy 1996; Taylor and Zona 1997), the competitive process in long-distance service provision is itself economically significant. Long-distance service providers spend large amounts of money to acquire subscribers. Consumers recognize significant costs associated with changing providers. The observed outcome is significant consumer shifting between service providers in conjunction with a widely expanding array of bonuses, promotions, and marketing angles. The effect of a regulated price for executing a consumer’s order to change service providers should be analyzed in light of these features of the competitive process.

V. An Empirical Model

This section will modify the model presented in Section III so that it incorporates available empirical evidence, including the type of empirical evidence presented in Section IV. A disadvantage of doing so is that the model becomes analytically intractable and must be solved numerically. However, because the model then incorporates key quantitative facts in a disciplined way, it provides a useful tool for quantitative analysis of the effects of changes in the price for shifting between service providers.

As in Section III, the model will analyze competition for one service provider's current customers. Competition for the other service provider's current customers will give a symmetric result, and total profits and consumer welfare do not depend on the market shares of the two service providers (Chen 1997). Consumers are assumed to consume telephone service q and another aggregate good whose price per unit is normalized to one dollar. Consumers are assumed to have an indirect utility function

$$V(p, y) = -k \frac{p^{1+e}}{1+e} + \log y \quad (11)$$

where p is the price of telephone service and y is income, both denominated in dollars. This indirect utility function implies that the demand for telephone service has constant elasticity e .

$$q(p) = kyp^e \quad (12)$$

The service provider with the customer base sets a price p_c for its customers. The competing service provider sets a price $p_n < p_c$ to attract those customers as new customers. In addition, the service provider seeking new customers also chooses a level of expenditure A on advertising and promotions. The service provider with the customer

base responds with expenditures rA on its own loyalty and winback campaigns, where r is an advertising response parameter.³⁵ The share of consumers that switch from their current provider to the new provider is a function $D(A, p_c, p_n; r)$ of advertising and promotional expenses and prices, such that $\frac{\partial D}{\partial A} > 0$, $\frac{\partial D}{\partial p_c} > 0$ and $\frac{\partial D}{\partial p_n} < 0$.³⁶

The network operator is considered to be a fixed-cost business in which the regulator imposes for purposes of cost recovery prices that have marginal effects downstream.³⁷ Let $s+t_s$ be the retail service providers' marginal cost of acquiring a customer, and let $m-t_a$ be the retail service providers' marginal cost of serving a customer. Components of these marginal costs are, respectively, a regulated price that the network operator charges for changing a customer's retail service provider, and a regulated price that the network operator charges for network services.³⁸ As before, t_s and t_a parametrize the regulator's ability to affect the regulated service price and the price for changing service providers. Revenue neutrality implies

$$t_a = t_s D \quad (13)$$

The profit functions for the two service providers are

$$\Pi_c = (p_c - m + t_a)q(p_c)(1 - D(A, p_c, p_n)) - rA \quad (14)$$

$$\Pi_n = ((p_n - m + t_a)q(p_n) - s - t_s)D(A, p_c, p_n) - A \quad (15)$$

The first-order conditions for profit maximization imply

³⁵ This simple model focuses on observed customer churn and includes only two prices: a price for current customers and a (lower) price for new customers. The customer retention strategy of "matching prices" should be interpreted within this model as a loyalty or winback expense.

³⁶ Since r is exogenous, it will be absorbed into the parametrization of D subsequently.

³⁷ Since in the U.S. telecommunications industry, long-distance providers generally take customers' orders to change long-distance service providers and convey the order electronically to the network operator's information system, the marginal cost to the network operator of shifting customers is much less than that of the retail service providers. At least outside of a narrow busy period, the marginal service cost in an infrastructure industry like telecommunications is close to zero.

$$p_c + e(p_c - m + t_a) - (p_c - m + t_a) \frac{\partial D}{\partial p_c} \frac{p_c}{D} \frac{D}{1-D} = 0 \quad \left\{ \frac{\partial \Pi_c}{\partial p_c} = 0 \right\} \quad (16)$$

$$p_n + e(p_n - m + t_a) + \left(p_n - m + t_a - \frac{s + t_s}{q(p_n)} \right) \frac{\partial D}{\partial p_n} \frac{p_n}{D} = 0 \quad \left\{ \frac{\partial \Pi_n}{\partial p_n} = 0 \right\} \quad (17)$$

$$\frac{\partial D}{\partial A} \frac{A}{D} = \frac{A}{\left(p_n - m + t_a - \frac{s + t_s}{q(p_n)} \right) D} \quad \left\{ \frac{\partial \Pi_n}{\partial A} = 0 \right\} \quad (18)$$

While it is difficult to estimate the whole function D , a log-linear local approximation can be estimated using available empirical information and the above first-order conditions. In particular, let

$$D(A, p_c, p_n) = k_D A^{k_A} p_c^{k_c} p_n^{k_n} \quad (19)$$

$$\frac{\partial D}{\partial p_c} \frac{p_c}{D} = k_c, \quad \frac{\partial D}{\partial p_n} \frac{p_n}{D} = k_n, \quad \text{and} \quad \frac{\partial D}{\partial A} \frac{A}{D} = k_A \quad (20)$$

With empirically appropriate values for prices, demand, costs, and churn at $t_s = t_a = 0$, the first-order conditions can be solved for k_A , k_c , and k_n .

To illustrate a calibration of the model, consider U.S. residential presubscribed long-distance service in 1997.³⁹ In 1997 there were 96.1 million U.S. households with telephones (FCC 1999, table 17.1) and \$26 billion in residential presubscribed long-distance service revenue.⁴⁰ A reasonable estimate for long-distance minutes billed to residential households in 1997 is 127 minutes per household per month.⁴¹ These figures

³⁸ It is not necessary for the model to separately distinguish these cost components.

³⁹ Note that the model is a static model calibrated over a fixed period of one year. Estimating equilibrium churn and average spell lengths raises much more difficult problems that are not considered here.

⁴⁰ For the revenue figure, see Section IV. The revenue and household figures imply average long-distance household spending of \$22.55 per month in 1997. For comparison, FCC 1998a (table 3.6) gives a figure of \$25.42. However, I consider the average revenue per minute figures implied by FCC 1998a (table 3.6) and FCC 1998c (table 15.2), 23.5 cents per minute, to be less plausible than that implied by the figures used.

⁴¹ FCC 1999 (table 1.4) gives 182.7 billion for originating interstate switched access minutes in 1997. Originating access minutes are deflated by 1.07 to account for dialing and call-setup time not billed by

imply an average price per minute for residential long-distance service, including international service, of 17.8 cents.⁴² Taking 20% as an estimate for the discount offered to attract new customers implies, in conjunction with the churn estimate below, $p_c=18.8$ cents and $p_n=15.0$ cents. The marginal cost m of long-distance service consists primarily of per minute originating and terminating network service costs, including international termination costs (settlement rates). For 1997 these costs averaged 9.4 cents per minute (FCC 1998b, table 5).

Information on advertising expenses and churn is important to the model. Table 2 indicates that advertising and promotional expenses amounted to about \$56 per U.S. household with a telephone in 1997. The churn data indicate that $D=.25$ is realistic. The model implies that the two service providers have the same total advertising and promotional expenses $(1+r)A$. If the service providers are assumed to have market shares of 60% and 40%, respectively, than the larger service provider will spend 33% less per customer on advertising than the smaller service provider. Table 2 shows that AT&T spent 69% less per customer than the rest of the industry in 1997. Thus the model clearly falls to capture some important aspects of industry advertising and promotion dynamics. But it is worth noting that r affects only how total industry advertising is calibrated. Thus without loss of generality assume $r=1$.

long-distance carriers. Mid-year 1997 presubscribed lines are estimated at 160.8 million from FCC 1998c (table 10.2). The number of presubscribed lines per household is estimated at 1.144 from the ratio of non-primary residential lines to residential and single-line business lines FCC 1999 (table 1.3). FCC 1998c (table 15.2) indicates that interLATA intrastate residential minutes amount to 25% of interLATA interstate minutes, and this ratio is used to inflate the interstate minutes to encompass all interLATA minutes. These figures are the basis for the estimated 127 minutes of long-distance calls per household per month. For comparison, FCC 1998c (table 15.2) shows 108 minutes per month for residential interLATA calling.

⁴² For comparison, FCC 1998b (table 5) shows 14.4 cents per minute for domestic and international toll calls in 1997.

Separate estimates for s and A are more difficult to produce. In the U.S., local exchange carriers (network operators) generally charge \$5 for changing a customer's presubscribed long-distance service provider, and long-distance service providers generally pay this fee for their customers. Long-distance carriers also bear additional costs for setting up a new customer, and some advertising and promotional expenses may be directly linked to acquiring customers.⁴³ The parameter s includes the network operator's charge for changing the customer's long-distance provider as well as other customer acquisition costs that the long-distance provider incurs on a per-customer-acquired basis. The parameter A includes expenses for customer acquisition, such as advertising, that are not incurred on a per-acquired-customer basis. Reasonable estimates for s and A are $s=\$20$, $A=\$26.34$.⁴⁴

Information relating to the utility function and the demand function is also important. The elasticity of demand for long-distance service in the U.S., the parameter e , is about -0.7 (FCC 1988, Attachment C). Median household income in the U.S. in 1997, the parameter y , was \$37,005 (Census Bureau 1998, Table A). This information, along with the price and quantity estimates above, is sufficient to parametrize the utility function V and the churn function D . The number of households with a telephone in 1997, 96.1 million, is used to scale the model.

⁴³ In a study of interstate long-distance rates and shifting between carriers, 1984-1993, Knittel (1997) used the local phone company's fee for switching long-distance carriers as a measure of a consumer's shifting cost. Between 1984 and 1990, all the RBOC's charged \$5 for this service, while 1991-1993 only BellSouth charged a different fee (\$1.49). This means that all the variance in the fee variable comes from the inflation adjustment. As the data in this paper show, advertising and consumer churn have grown dramatically, and the price that the local phone company charges for shifting a consumer's long-distance provider is only one of several factors that influence consumers' shifting costs

⁴⁴ Note that over-all customer acquisition costs per customer served are $T=sD+2A$. A was calculated as a residual based on values for T and s .

The model is solved in two stages. First, given the empirically relevant values for p_c , p_n , D , and $t_s=t_a=0$, (16)-(18) are solved for k_A , k_c , and k_n . With these parameters and a change in t_s (associated via (12) with a change in t_a), the model is solved for new values of p_c , p_n , and D . As table 1 indicates, a change of plus or minus \$3 in the price for shifting between service providers, given a prevailing price of \$5, would not be unusual in light of current practices. Table 4 shows the effects of a \$3 reduction in the shifting price; an increase produces similarly sized effects in the opposite direction.

Despite the fact that the network operator's marginal cost of shifting customers between service providers is zero, a reduction in the network operator's price for changing service providers reduces total welfare. Lowering the price for changing service providers decreases service prices and increases advertising spending and consumer churn. These effects all lower service provider profitability. In the base case, a \$3 (network operator revenue neutral) reduction in the price for changing reduces total service provider profitability (including advertising expenses) by \$280 million. For consumers, the benefits of lower service prices are partially offset by the cost of increased churn. The cost to a consumer of changing service providers has been estimated as the income (compensating variation) necessary to make the consumer indifferent to shifting between service providers.⁴⁵ The total benefit to consumers amounts to \$282 million. The total welfare effect is a gain of \$2 million. Raising the price for changing produces essentially opposite effects.

⁴⁵ The calculation thus implies that the fraction of consumers that change their shifting behavior are indifferent between shifting and not shifting service providers.

Table 4
Effects of a \$3 Reduction in the Price for Switching Service Providers

	Base Case	E=-1.4	Variant Parameter		
			m=0.06	s=10	s=30
			% Change		
current-consumer price	-1.06%	-2.50%	-0.72%	-0.87%	-1.35
new-consumer price	-1.16%	-0.63%	-1.33%	-1.13%	-1.18
Advertising	2.06%	9.10%	1.20%	1.81%	2.42
churn	1.55%	7.07%	0.76%	1.32%	1.90
			Change in million US\$		
total profits	-\$280	-\$663	-\$156	-\$235	-\$347
Advertising	\$104	\$461	\$61	\$92	\$122
Consumer welfare	\$282	\$517	\$225	\$242	\$341
Shifting costs	\$23	\$108	\$11	\$20	\$29
sum of firm and consumer effects	\$2	-\$147	\$69	\$7	-\$6

The effects of a change in the price for changing service providers depend on the model parameters. Doubling consumers' elasticity of demand more than doubles the change in consumer welfare and firms' profits, and the over-all welfare effect turns negative. The effects of a reduction in the shifting price are like the effects of a tax: the welfare effects are greater the more elastic is demand. Lowering m generates a parametrization with a higher price-cost margin for service providers.⁴⁶ Such a change appears to soften the competitive response to a reduction in the shifting price, but improves total welfare. These effects can be reconciled by recognizing that, as is the case for a tax, welfare losses are generally proportional to the square of the price-cost margin. Thus with a higher price-cost margin, a given price reduction has greater welfare benefits. The results with respect to service providers' customer acquisition costs are surprising. With respect to total welfare, higher acquisition costs make a (network

⁴⁶ Note that the policy under consideration is a revenue neutral change in the network operator's price for shifting customer between service providers and for providing per minute network access.

operator revenue neutral) reduction in these costs less desirable. But higher customer acquisition costs make a reduction in these costs more desirable in terms of consumer welfare.⁴⁷

Because the profitability of current and new customers is different, the profitability of the two service providers depends on their shares of current customers. Table 5 shows how service-provider-specific effects depend on market share. While the total reduction in profits is constant, the service provider with a greater market share experiences a larger share of the reduction in profits. The intuition is straight-forward: policies that lower service-providers' costs of acquiring customers are more costly to service providers that currently have a larger market share.

Table 5
Distribution of Profit Impact Between the Service Providers

	Industry Evolution			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Initial share of consumers (firm 1)	100.0%	85.0%	60.0%	50.0%
Final share of consumers (firm 1)	64.2%	60.0%	52.8%	50.0%
	Change in Profits with $t_s = -\$3$ (mil. US\$)			
Firm 1	-\$266	-\$228	-\$165	-\$140
Firm 2	-\$14	-\$52	-\$115	-\$140

⁴⁷ Note that customer acquisition costs s are reduced by reducing one regulated component of these costs. See the definition of s in preceding text. Changes in the base level of churn ($D=0.25$) have relatively small effects on the results. For $D=0.15$, the changes in consumer welfare and total welfare are \$300 million and -\$29 million, respectively. For $D=0.35$, the corresponding figures are \$364 million and -\$14 million.

VI. Conclusions

While regulators have tended to require incumbent network operators' interconnection charges to be cost-based or cost-oriented, regulators should consider factors in addition to incumbents' costs in determining the most socially desirable charges. Service providers' customer acquisition costs, the cost to customers of changing service providers, and the level of churn are important factors in evaluating the welfare effects of a network operator's charge for shifting customers between service providers. At a conceptual level, considering these factors helps regulators to focus on specific benefits of real competitive processes. In assessing empirical significance, a model such as that offered in this paper serves as a useful tool for disciplined, quantitative analysis. Considering factors in addition to incumbents' costs is not simple, but neither is analyzing incumbents' costs. Both types of analysis should play a role in a reasonable, open, and effective regulatory process.

Recognizing the costs that switching service providers imposes on service providers and customers should encourage policy-makers to promote ways in which customers can obtain service and price improvements without switching service providers. As Hirschmann (1970) points out, an alternative to exiting from a relationship with one service provider and switching to another is for customers to communicate, with words rather than merely with exit choices, their needs, expectations and frustrations. Promoting diverse, effective channels for customers' voices should be considered as part of liberalization and de-monopolization policies in infrastructure industries.

The empirical model in this paper shows that the price for changing service providers has a much larger effect on the distribution of surplus between consumers and service providers than it does on total welfare. This result points to trade-offs that regulators need to consider in assessing goals for competitive development and industry structure. When service providers have significant sunk costs and provide a wide range of services, the overall division of surplus between consumers and service providers may not be directly related to the division of surplus for a particular service. For example, service providers competing in terms of adding new services to a service package could dissipate profits from providing well-established services. Alternatively, service providers might sacrifice surplus in a well-established service, such as basic internet access, in order to gain value in new services. The desirability of shifting the division of surplus for a particular service needs to be considered relative to the priorities of a particular pro-competitive strategy.

References

- ACCC [Australian Competition & Consumer Commission]. 1998. *Pricing Principles for Local Number Portability*. Available on the web at www.accc.gov.au/contact/portability/index.html.
- Ameritech. 1998. *Defendants' answers to MCI's first set of interrogatories*. FCC File No. E-97-20.
- AOL [America Online]. 1998. *Comments In the Matter of Joint Application of AT&T Corporation and Tele-Communications Inc. for Transfer of Control to AT&T of Licenses and Authorizations Held by TCI and its Affiliates or Subsidiaries*. FCC CS Docket No. 98-178 (October 29): available on the web at www.fcc.gov/ccb/Mergers/ATT_TCI/.
- AT&T. 1998. Annual Report for 1997. Available on the web at www.att.com.
- Boston, William. 1998. "Deutsche Telekom Fights to Keep Market Share in a Blooming Field." *Wall Street Journal* (Dec. 28).
- Census Bureau, U.S. 1998. *Income 1997*. U.S. Government Printing Office: available on the web at www.census.gov/hhes/income/income97/in97sum.html.
- Chen, Yongmin. 1997. "Paying Consumers to Switch." *Journal of Economics & Management Strategy* 6 (no. 4, Winter): 877-897.
- Clark, D.L. and M. Murphy. 1995. "Competition and Regulation in the Consumer Long-distance Market." *AT&T Ex Parte Presentation for the AT&T Non-Dominance Petition*, CC Docket 79-252, 93-197, 80-286 (Feb. 8).
- Cluny, John. 1997. "Number Portability in the UK: A Two-Edged Sword?" Paper presented at the 1997 Telecommunications Policy Research Conference: available on the web at www.si.umich.edu/~prie/tprc/abstracts97/cluny.pdf.
- Constat, Inc. 1995. *Analysis of Potential Local Access Competition and Interconnection Issues, Final Report*, Pacific Bell ex parte in FCC CC Docket No. 95-116 (August 30).
- Dow Jones Newswires. 1998. "Mueller Says Regulators Hurt Deutsche Telekom." *Wall Street Journal Europe* (Nov. 5).
- DTI [Department of Trade and Industry, U.K.]. 1991. *Competition and Choice: Telecommunications Policy for the 1990s*. London: HMSO (Cm1461).

- EC [European Commission]. 1997. *Directive 97/33/EC of the European Parliament and of the Council of 30 June 1997 on interconnection in Telecommunications with regard to ensuring universal service and interoperability through application of the principle of Open Network Provision (ONP)*. Official Journal No. L 199: 0032-0052.
- EC. 1998a. *Directive 98/61/EC of the European Parliament and of the Council of 24 September 1998 amending Directive 97/33/EC with regard to operator number portability and carrier pre-selection*. Official Journal L 268: 0037-0038.
- EC. 1998b. *Commission terminates procedure against Deutsche Telekom's fees for preselection and number portability and transfers the case to national authorities*. Press Release IP/98/430.
- FCC [Federal Communications Commission, U.S.]. 1988. *In the Matter of Annual 1988 Access Tariff Filings*. 3 FCC Rcd 1330.
- FCC. 1996a. *In the Matters of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996 and other matters, Second Report and Order and Memorandum Opinion and Order*. CC Docket No. 9-98 (August 8), 11 FCC Rcd 19393.
- FCC. 1996b. *In the Matter of Telephone Number Portability, First Report and Order*. CC Docket No. 95-116 (July 2), 11 FCC Rcd 8352.
- FCC, Tracy Waldon, Industry Analysis Division, Common Carrier Bureau. 1998a. *Reference Book of Rates, Price Indices and Expenditures for Telephone Service*. (July) Washington, D.C.
- FCC. 1995. *Statistics of Common Carriers 1994/1995*. Washington: U.S. Government Printing Office.
- FCC, Jim Lande and Katie Rangos, Industry Analysis Division, Common Carrier Bureau. 1998b. *Telecommunications Industry Revenue: 1997*. Washington, D.C.
- FCC, Industry Analysis Division, Common Carrier Bureau. 1998c (July) and 1999. *Trends in Telephone Service*. July. Available on the web at www.fcc.gov/ccb/stats.
- Frankfurter Allgemeine Zeitung. 1998. "Still no agreement on telephone switching fee." (January 13) WL 8415420.
- Galbi, Douglas A. 1999. "The price of telecom competition: counting the cost of advertising and promotion." *info* vol. 1, no. 2 (April 1999).

- Hirschman, Albert O. 1970. *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States*. Cambridge, MA: Harvard University Press.
- Insight Research. 1998. *Consumers' Reactions to Telecom Competition*. Parsippany, NJ: Executive summary available on the web at www.insight-corp.com.
- Kahai, Simran K., David L. Kaserman, and John W. Mayo. 1996. "Is the 'Dominant Firm' Dominant? An Empirical Analysis of AT&T's Market Power." *Journal of Law and Economics* 39 (No. 2, October): 499-517.
- Klemperer, Paul. 1995. "Competition when Consumers have Switching Costs: An Overview with Applications to Industrial Organization, Macroeconomics, and International Trade." *Review of Economic Studies* 62: 515-539.
- Knittel, Christopher R. 1997. "Interstate Long-distance Rates: Search Costs, Switching Costs, and Market Power." *Review of Industrial Organization* 12: 519-536.
- Lawyer, Gail. 1998. "Rate Games Exact a Price." *teledotcom* (March): available on the web at www.teledotcom.com/0398/headend/tdc0398headend_rates.html.
- MacAvoy, Paul W. 1996. *The failure of antitrust and regulation to establish competition in long-distance telephone services*. Cambridge, MA: MIT Press.
- Mehta, Stephanie N. 1998. "In 'Dial-Around' Fight, AT&T Learns a Trick From a Lucky Dog." *Wall St. Journal Interactive Edition* (Oct. 7).
- MFJ [Modified Final Judgment]. 1982. *United States v. American Telephone and Telegraph Co.* 552 F. Supp. 131.
- Oftel. 1998. *Director General's Address to the FT Conference* (1 December 1998): available online at www.oftel.gov.uk/speeches/ft1298.htm.
- Padilla, A. Jorge. 1995. "Revisiting Dynamic Duopoly with Consumer Switching Costs." *Journal of Economic Theory* 67: 520-530.
- PNR and Associates. 1996. *Bill Harvesting III*. Jenkinstown, PA.
- Schiela, John. 1998. "Dial Around: The Winners and Losers." Paper presented at the 1998 ICFC: available on the web at www.econ.ilstu.edu/icfc/1998agenda.html.
- Sharpe, Steven A. 1997. "The Effect of Consumer Switching Costs on Prices: A Theory and its Application to the Bank Deposit Market." *Review of Industrial Organization* 12: 79-94.

- Taylor, William E. and J. Douglas Zona. 1997. "An Analysis of the State of Competition in Long-Distance Telephone Markets." *Journal of Regulatory Economics* 11 (No. 3, May): 227-55.
- Telecommunications Reports International, Inc. [TR]. 1998. "RegTP Acts on WLL, Preselection Issues." (June 26).
- Turner, Tyya. 1998. "Does convergence cause churn?" *tele.com*. Available on the web at www.teledotcom.com/news0998/news092298_1.html.
- Williamson, R.B. and J.S. Chen. 1997. "Long-distance Churn: A Tobit Analysis." Paper presented at the Fifteenth Annual ICFC Conference (June), San Francisco: available on the web at www.econ.ilstu.edu/icfc/prelim97.htm.
- Williamson, R.B., B.P. Goungetas, and J.S. Watters. 1997. "Modeling Consumer Spells with Long-distance Carriers." Paper presented at the Fifteenth Annual ICFC Conference (June), San Francisco: available on the web at www.econ.ilstu.edu/icfc/prelim97.htm.