

Distinctive Arrangements for International Interconnection?

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Abstract

An issue of growing importance in telecommunications policy is the relationship between interconnection for domestic and international telephony. While international telephony's need for international transport is an inherent distinction, that factor will not determine distinctions in interconnection arrangements. Under the existing pricing structure for telephony, cross-border rent shifting is the key issue. Innovations in the pricing structure for telephony, whether through Internet telephony or other avenues, offer the potential for changing the structure of interconnection negotiations and eliminating distinctions between international and domestic telephony interconnection.

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In the past, with nearly ubiquitous national telecommunications monopolies, there was no distinction between international interconnection and domestic interconnection because there was no domestic interconnection. Moreover, the concept of interconnection as an intermediate good that carriers purchase from each other was absent. National carriers considered international telecommunications to be a jointly provided service. They agreed upon collection rates (retail prices), the revenue from which was to be shared equally between the two carriers providing the service. When collection rates diverged in response to country specific factors, carriers continued to share equally rates that were then called “accounting rates”. Thus the market for interconnection historically evolved as a system of mutual, i.e. equal, international termination rates set between pairs of countries.¹

Countries attempting to preserve national monopolies have found that their international interconnection regime has begun to act as a *de facto* domestic interconnection regime. In particular, call-back operators can provide alternative domestic telephone service by routing a domestic call through an international point. It is very difficult to directly prevent call-back operators from providing such service. The most significant constraints are economic: international interconnection rates are high, and providing domestic service through such interconnection arrangements is only viable if domestic calling prices are sufficiently high. Thus international interconnection arrangements also supply a domestic interconnection regime, but not a very effective or pro-competitive one.

¹ These termination rates are traditionally called settlement rates, reflecting linguistically their

Countries that want the benefits of competition in telecommunications have generally recognized the importance of establishing some pro-competitive regulatory framework for interconnection for telephony providers. An important question is how such an interconnection regime relates to the traditional regime for international interconnection. Put differently, should international telephone traffic be distinguished from domestic telephone traffic for interconnection purposes? If so, why and how? This article will examine how economic, technological, and institutional factors affect the significance of national borders for telephony interconnection.

International Transport will be Insignificant for International Telephony

Proclamations of the death of distance typically point out the low average per minute cost of providing a voice-grade connections over vast distances. Improvements in fibre optics have led to an exponential reduction in the cost per voice circuit of trans-oceanic cables. Yet it is worth recognizing that, as long ago as 1993, the cost of a voice circuit over Intelsat was only about 0.3 US cents per minute.² From a cost perspective on international telephony, the death of distance is old news; distance probably died as a significant cost factor over a decade ago.

Yet international transport has in the past been subject to little competitive pressure, and the cost of international transport, as a separate service, has been largely irrelevant. National telephony monopolies, participating in cable consortia structured in terms of half circuits, controlled the cable capacity landing in their

²“accounting” heritage.

home countries. In conjunction with Intelsat membership, the same national monopolies also controlled satellite circuits landing in their home countries. Thus the national telephone operator could price international capacity strategically relative to its telephony business. Moreover, with telephony as the predominant use for international capacity, incentives for trying to land a cable or build an earth station independent of the national telephone monopoly were weak. There was no point in providing competing international transport if the prospect for customers was only to meet the national telephone monopolist at the end of the line.

A weak force promoting competition in the provision of international capacity has been pro-competitive reforms in domestic telephony. With domestic interconnection rules constraining interconnection prices, a competing carrier might seek to gain more control over its costs by purchasing international transport. Yet investments in cable capacity, which offers quality advantages over satellite transmissions, are rather lumpy. Moreover, the dominant national carrier typically had significant excess international capacity and hence considerable latitude for strategic pricing to deter entry. Thus the economics of acquiring ownership of international capacity in order to provide competitive telephony was not compelling.

² *Direction of Traffic 1996*, ITU and Telegeography, Table 2.1, p. 5.

The growth of Internet traffic has radically changed the nature of the market for international voice circuits.³ Japanese international circuit capacity used for Internet traffic exceeded that used for voice traffic in late 1996, and in early 1998 Internet capacity was twice that of voice capacity.⁴ Moreover, the demand for Internet capacity continues grow dramatically. U.S. international private line capacity grew 237% from 1995 to 1996, a period when the World Wide Web was just beginning to take off. Capacity used for voice circuits grew only 11%. Nonetheless, since private line capacity was starting from a small base, at the end of 1996 U.S. private line capacity was only 39% of total international capacity.⁵ Given the growth rate in Internet traffic, U.S. international capacity used for Internet traffic undoubtedly greatly exceeds that used for voice traffic in early 1998. By the turn of the century, for most countries voice traffic is likely to take up only a small share of a country's international capacity.

The pro-competitive implications of the Internet for the market for international voice transport go deeper than a massive expansion of the supply side. The economic importance of Internet traffic provides investment incentives not tightly linked to a market that an incumbent dominates. The Internet gives a wide range of economically (and politically) significant businesses a large stake in ensuring cost-effective international transport. Moreover, the protocols for the Internet include adaptive routing algorithms that make substitutions among

³ Here and in what follows Internet traffic refers to all information communicated under the TCP/IP protocol, including communication accessible only within a pre-defined set of users (an intranet) and communication that can encompass all connecting users.

⁴ Tadashi Nishimoto, President, KDD, in speech entitled 'Global Telecom Big Bang and KDD's Strategy', presented to the American Enterprise Institute, Washington, D.C., February 13, 1998.

different physical links much more efficient. Thus the market for capacity between country A and country B can much more easily encompass a large number of network routes connecting country A and country B. This makes exerting market power in international transport much more difficult.

Companies interested in purchasing international voice transport are likely to encounter very favorable terms in the future. There will be a large amount of capacity available, it will be organized flexibly and efficiently, and a number of companies are likely to provide competitive alternatives. Quality and reliability may significantly differentiate international transport competitors. Nonetheless, with the benefit of the demand to carry Internet traffic, a separate market for international transport is sure to develop independent of the structure of the national telephone industry. This means in turn that the need for international transport will not provide the basis for a distinction between international and domestic interconnection for telephone traffic.

Rent Shifting: A Structural Incentive Problem

Currently the economic terms for interconnection for telephone traffic are generally structured as per minute charges based on a direction associated with a voice circuit. Thus, if a subscriber to network A calls a subscriber on network B, network A pays a per minute interconnection charge to network B for transport and termination of the call. Assuming that each subscriber is connected to only one network, a network has monopoly power over the pricing of interconnection

⁵ *FCC 1996 Section 43.82 Circuit Status Data*, FCC, (December 1997).

to its subscribers. Interconnection regulation generally constrains interconnection prices so as to improve incentives for the entry of new operators and to foster lower calling prices for consumers.

International borders affect the incentive to regulate interconnection prices. A regulator in a home country concerned about national welfare has an incentive to look for ways to extract rents from foreigners.⁶ One way to do so is to price interconnection services for foreign calls to the home country's citizens at monopoly levels. Doing so will raise foreign prices for calling home citizens, but this may not be of concern to the home regulator.

While home country citizens do not pay for incoming international calls, it should be recognized that incoming international calls have significant value to home country citizens. For any given telephone conversation, each party would prefer to be the called party, exactly because the called party does not pay.⁷ Increases in foreign calling prices to the home country are likely to reduce home country welfare to the extent that they reduce the volume of valued calls to the home country. National regulators are not likely to recognize adequately the value of incoming foreign calls because of the indirect relationship between regulatory action and home citizen welfare. The effect of home country calling prices for home country consumers is obvious, and to the extent that consumer

⁶ For more extensive analysis of the issues raised in this section, see Galbi, D A 'Cross-Border Rent Shifting: A Case Study in International Telecommunications' manuscript, FCC (November 1997).

⁷ College students away from home who want to talk regularly with their parents generally understand this economic logic well.

welfare matters to a regulator, it is likely to measure the significance of its actions in terms of the prices that its citizens pay.

The composition of individual country's actions obscures the incentives that motivate each country's behavior. In particular, suppose that all countries are exactly the same. Each country will raise its international interconnection charges in order to extract rents from the others. But the symmetry of the initial conditions implies that the net result cannot have any one country successfully extracting net rents from any other country. In fact the incentive for cross-border rent shifting makes all countries worse off (and equally so) through much higher international calling prices. Incentives for cross-border rent shifting can make all countries worse off even when there are differences among countries and some potential for net shifts in rent, because the magnitude of the rents shifted may not be significant enough to compensate for the distortions produced.

Various types of policies can be used to address the problem of cross-border rent shifting. The accounting rate system, by linking international interconnection charges across pairs of countries, mitigates individual country's incentives to seek high international interconnection prices.⁸ Policies that require equal settlement rates and proportional return among home country international

⁸ For analysis of the economics of the accounting rate system, see Hakim, S R, and Lu, D 'Monopolistic settlement agreements in international telecommunications' *Information Economics and Policy*, 1993, 5:, 145-57; Carter, M and Wright, J 'Symbiotic Production: The Case of Telecommunications Pricing' *Review of Industrial Organization*, 1994, 9, 365-78; Cave, M and Donnelly, M P 'The pricing of international telecommunications services by monopoly operators' *Information Economics and Policy*, 1996, 8, 107-23; Yun, K L, Choi, H W, and Ahn, B H 'The accounting revenue division in international telecommunications: conflicts and inefficiencies' *Information Economics and Policy*, 1997, 9, 71-92; Alleman, J H and Sorce, B 'International Settlements: A Time for Change' in *Proceedings of the Global Networking '97 Conference*, 15-18 June 1997.

carriers prevent competition among home country carriers, competition that could shift rents abroad.⁹ Domestic interconnection regimes that discriminate between domestic and international traffic can be a means for shifting rent extraction towards the local loop, a locus of monopoly power that is not threatened by competition among international or long distance carriers. International interconnection benchmarks, whether enacted unilaterally or multilaterally, can also act as a constraint on cross-border rent shifting.¹⁰

Policies to address cross-border rent shifting create or re-enforce distinctions between domestic and international interconnection. It may be the case that the cost of the distortions that such policies produce is greater than their benefits. Particularly in high technology industries such as telecommunications, rapid innovation, making quickly major institutional changes, and being a first mover are key means for creating economic value.¹¹ Policies to address rent shifting are likely to foster structural inertia and hinder innovation and competitively driven organizational change. Nonetheless, the political salience of rent shifts, in contrast to the diffuse benefits of rapid and broad liberalization, means that avoiding policies that attempt to control rent shifting will be politically

⁹ For an analysis of the effects of proportional return, see Galbi, D A 'The Implications of Bypass for Traditional International Interconnection', forthcoming, *Proceedings of the 1997 Telecommunications Policy Research Conference*, 1998.

¹⁰ Several approaches are available for computing reasonable benchmarks for international interconnection prices. See FCC, *Report and Order in the Matter of International Settlement Rates*, Appendix E, Tariffed Components Price Methodology (August 1997); Galbi, D A 'Model-Based Price Standards for Terminating International Traffic', paper presented to the OECD/ICCP/TISP Ad Hoc Meeting on International Telecommunication Charging Practices and Procedures, Room Document No. 10, OECD, Paris (September 1997); FCC, *The Use of Computer Models for Estimating Forward-Looking Economic Costs, A Staff Analysis* (January 1997), on the web at http://www.fcc.gov/Bureaus/Common_Carrier/Reports/proxmod.txt.

difficult, if not impossible. The difficulty in reconciling the U.S. access regime for long distance carriers with an interconnection regime to promote local competition shows how regulatory distinctions between types of interconnection are difficult to erase. Thus, without some other significant structural change, countries promoting competition in telecommunications are likely to maintain significantly different interconnection regimes for domestic and international telephone traffic.

Structural Changes in Pricing Telephony Network Use

Telephone services currently have a pricing structure that is probably significantly inefficient. The cost of building a network to serve a given number of users depends on the service to be provided at times of peak network use (congestion). The cost of using a network when the network is not congested is zero. Nonetheless, telephony pricing structures typically have a rather shallow time-of-use gradient. Regulated interconnection rates and regulated limits on fixed charges to subscribers may constrain time-based price gradients. Such factors would not be relevant in a deregulated telephony market or for new types of unregulated service provision, such as Internet telephony. In fact, some U.S. telephone companies recently have been experimenting with much steeper time-of-use gradients, such as free long distance business calls on Fridays or half-price long distance calls on Sundays.

¹¹ This point is a major theme in Beltz, C A *The Global Communication Revolution: The WTO and the Internet*, forthcoming AEI Press, 1998.

Telephone regulators have tended to regard capacity-based pricing as being too complicated to implement. The Internet, however, has demonstrated the feasibility of a very simple form of capacity-based pricing. Most Internet service providers have usage-independent pricing schemes, with some opportunities to pay different fixed costs for different expected levels of performance (different capacity/priority connections to the service provider's network). Users pay for congestion at any point in time in terms of service delays. The important point is that monetary prices are not the only way to price congestion; variations in the service provided can also be an important way of implicitly pricing congestion.

The absence of telephony quality-of-service price differentiation appears anomalous from a customer perspective. In countries that currently have the most advanced telephone networks, the performance that the network provides to customers is a fixed network design parameter. In the U.S. telephone networks are generally designed so that the probability of call being blocked in the telephone network is less than 1%.¹² Of course the probability of a caller actually reaching the called party varies significantly depending on the called party's propensity to talk with others; a caller has a high probability of being blocked in an attempt to call someone who is always on the phone. Telephone customers are accustomed to large variations in blocking probabilities in placing telephone calls,

¹² Some long distance resellers economize on interoffice trunking in connecting to local exchange carriers and thus blocking probabilities for these carriers are on the order of 3-4%. But in any case the blocking probability is a network design parameter uniform for all of a company's customers.

but they do not have to ability to choose among different prices for telephone network services with different blocking probabilities.

The importance of the “direction of a call” to the pricing of network services also does not appear to be economically rational. From a network service perspective, once a telephone call has been established, it has no direction; both parties talk to each other. However, the pricing of network services for telephony interconnection depends crucially on how a call is set up. If a telephony call set-up signal travels from network A to network B, then network A pays network B for the network services associated with the ensuing conversation. The opposite is true if the telephony call set-up occurs the opposite way. But how a call is set up is not an attribute that concerns customers of telephony services. Implementing an alternative call set-up procedure is a matter of deploying some additional, relatively simple, technology, as the international call-back industry demonstrates. Thus the pricing mechanism for telephony interconnection appears to be poorly matched to the underlying services provided.

More generally, the revenue model for telephony is poorly matched to its cost structure. A large share of telephony revenue is generated through per minute charges, and total minutes of use is the primary factor accounting for differences in the revenue yield across subscribers. Since telephony networks involve large fixed costs, marginal cost pricing is not feasible. However, in a deregulated market with a proliferation of information and communication services, there will be many different possibilities for generating revenue sufficient to support the required investment in the underlying network. The revenue yield

associated with acquiring a particular telephony customer could vary significantly depending on that customer's demographic characteristics, and hence on the value to advertisers of having a channel to that customer. Revenue yield could also depend significantly on a customer's propensity to buy other telecommunications services, and hence on the value of being able to attract a customer to a bundle of services. More generally, if communications companies provide gateways to electronic commerce, they may be able to extract fees based on the value of the transactions enacted.¹³ Such revenue models might benefit significantly from a company, or a network of companies, providing telephony at low or non-existent monetary charges per minute during most or all time periods.

If the telephony pricing structure undergoes significant structural change, the incentives associated with interconnection pricing will change.¹⁴ Suppose, for example, that telephone service is priced in terms of maximum expected call blocking probabilities, and customers are notified when a call has been blocked because of network congestion. Then a network operator has an incentive to attract as much traffic as possible in order to make the call blocking thresholds bind and discriminate between the different calling plans. The operator has no incentive to distinguish between "incoming" and "outgoing" calls. A similar

¹³ This might be called the "credit card" model for telephone service.

¹⁴ For an insightful discussion of pricing for network services from an Internet perspective, see Shenker, S, Clark, D, Estrin, D, and Herzog, S 'Pricing in computer networks: reshaping the research agenda' *Telecommunications Policy*, 1996, 20(3), 183-201; and Clark, D 'A Model for Cost Allocation and Pricing in the Internet' Internet Economics Workshop (March 1995), available on the web at <http://www.press.umich.edu/jep/econTOC.html>.

situation occurs if subscribers are charged for conversation minutes, irrespective of the call-initiating party.¹⁵

Structural changes in telephony pricing potentially can mitigate the problem of cross-border rent shifting and lead to an interconnection regime that does not discriminate between international and domestic traffic. If operators have weak or non-existent incentives to distinguish between “incoming” and “outgoing” calls, then interconnection negotiations occurs between parties both of whom hold a monopoly on connectivity to their subscribers. The framework for negotiation is then the splitting of rents created by establishing connectivity. Such rents are likely to depend significantly on the particular characteristics of the pair of operators, each operator is likely to have poor information on the rents that the other is collecting, and the rents collected by each operator are likely to be subject to significant variations over time. Moreover, connectivity is a very basic characteristic of a communications service, and customers are likely to highly value stability in this characteristic. These factors imply that interconnection terms are not likely to focus on demands for a particular division of rents; rather, they are likely to be simple, conventional agreements that ensure continuing connectivity. Policies to shift rents internationally will be neither easy to

¹⁵ This is generally the way wireless voice service is priced in the U.S. One disadvantage of such a pricing structure is that subscribers are reluctant to give out their telephone number because they fear having to pay for unwanted calls. Recently companies have addressed this issue by not billing for the first minute of calls that the subscriber does not initiate.

formulate nor commercially demanded, and significant distinctions between international and domestic interconnection are much less likely to arise.¹⁶

Conclusions

The distinction between interconnection arrangements for international telephony and those for domestic telephony is likely to persist given the current pricing structure for telephony. The persistence of this distinction does not relate to the need for international transport for international calls. Internet traffic will shape the market for international transport, with the result that the need for and cost of international transport for public telephony services will be competitively and commercially irrelevant. The issue of cross-border rent shifting drives the distinction between international and domestic telephony interconnection. While there are policies available to address the problem of cross-border rent shifting, these policies re-enforce the distinction between international and domestic interconnection.

Changes in the pricing structure for telephony can potentially eliminate the issue of cross-border rent shifting and erase the distinction between international and domestic interconnection arrangements. The existing pricing structure for telephony heavily reflects historical and institutional factors. Innovations in pricing telephony are likely to have great commercial importance as well as significant welfare benefits. Under a new pricing structure cross-border rent shifting may no longer be an issue and there could be little motivation for

¹⁶ Thus interconnection may revert back to the more cooperative framework characteristic of

distinctions between domestic and international interconnection. Thus in pursuing reforms of international interconnection arrangements, forward-looking policy makers should recognize the potential value of telephony pricing innovation.

earlier international interconnection agreements.