INTERNATIONAL SETTLEMENTS: AN ANALYSIS OF RATES [#,+]

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Abstract: In the late 1970s, when competition was introduced in the United States, competitive forces pushed international telephone prices down. Lower prices resulted, *inter alia*, in an increase in international calls and minutes from the United States to countries whose prices were high relative to United States prices. This increase in minute volume in turn resulted in a significant increase in settlement payments outflow from the U.S.

The United States is not the only country to experience settlement deficit. Several other countries, including Sweden, Australia, and Japan, have growing deficits on settlement payments.

More recently, the Federal Communications Commission (FCC) determined and required United States international carriers to accept settlement terminating rates no higher than FCC benchmark rates.

Three issues are involved in settlements: the "correctness" of the procedure from the perspective of:

- public policy,
- balance of payments, and
- the operating companies.

This paper examines alternative settlement policies: first-best pricing, bill-and-keep, benchmark and cost-based pricing. The effect of a monopoly carrier facing a competitive provider is modelled. The paper analyzes the recent benchmark terminating rates required of United States international carriers by the Federal Communications Commission in this context. An estimation of the economically efficient "correct" benchmark terminating rates is developed and contrasted with the FCC benchmark rates. Finally, the impacts of callback and/or resale business on the settlement process are addressed.

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The modelling effort of this paper continues the analysis of an earlier work which demonstrated that a) cost-based pricing is the preferred approach to settlements; b) bill-and-keep and the fifty-fifty split of the accounting rate are both inappropriate on efficiency grounds; c) settlement rates are set at monopoly prices under certain market structures; and d) call-back does not necessarily force lower accounting rates on monopoly carriers; indeed, call-back can exacerbate the settlement problem.

In addition to refining the above results, this paper a) estimates the monopoly (economic) profit generated by the monopoly carriers, b) analyses the impact of benchmark rates on the monopoly carriers, and c) demonstrates the insufficiency of the FCC's benchmark rates.

1. Overview

1.1. Background and Issues

One of the principal reasons the International Telecommunication Union (ITU) was established was to develop a means of dividing the revenues from international services among origin, destination, and transit countries. The original methodology developed, i. e., the accounting rate system, is still with us today, albeit in a format that has been progressively modified [Tarjanne, 1996].

We briefly describe the procedure and its history here. For a more detailed description, see Alleman and Sorce [1997] and the references cited therein.

Technological improvements and competition have led to lower costs and prices of international services, but competition is not ubiquitous. This has led to an imbalance in the international traffic flow between countries with lower prices and those with relatively higher prices, which in turn leads to settlement imbalances. The United States is not the only developed country to experience settlement deficit. Several other countries, including Sweden, Australia, and Japan, have growing deficits on settlement payments, according to the ITU [Tarjanne, 1996].

Countries that are "efficient" in generating traffic or reducing their call charges are being penalized under the current accounting system. It's ironic that "efficient" countries are rewarding the "inefficient" countries with settlement payments or rent transfers.[1] This market distortion, however, is not the only problem. An increasing share of traffic is bypassing the accounting rate system via private line or the Internet. In addition, call-back operators and resellers are exploiting the fact that tariffs are not cost-based. These traffic imbalances are symptomatic of another problem -- the accounting rates are not cost-based.

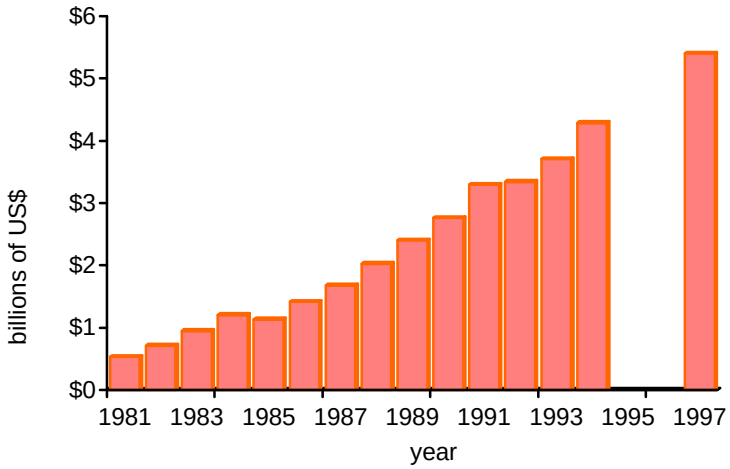
Countries with "efficient" systems are increasingly concerned about outgoing settlement payments. The United States, with a settlements deficit which has grown to over US$ 5 billion (see Figure 1), is using all available fora -- the ITU, the OECD, WTO,

[1] See Galbi [1997] who specifies this distortion and estimates its social cost.

and others -- to push for a reform of the system. More recently the Federal Communications Commission has required the United States carriers to conform to benchmark settlement rates based on its estimation of costs [FCC, 1997].

1.2. Accounting/Settlement Rates

The international settlement is the method by which telephone companies are compensated for the termination of traffic in their territory. The completion of an international telephone call will require the participation of two or more entities before the final connection is made. The entities involved often jointly own, operate, and maintain some of the equipment. In other instances the equipment is not jointly owned (e.g., AT&T pays an access charge to local carriers for originating and terminating calls). To handle the expenses attributed to joint ownership of facilities and equipment and termination of the calls, the participants enter into settlement arrangements. These arrangements establish the terms and conditions for providing service between two companies or countries. A separate arrangement is negotiated for each service between each pair of countries. This negotiated rate is referred to as the "accounting rate." The settlement rate has historically been one-half the accounting rate, although there have been proposals to change this division [ITU, 1997].



Source: FCC International Trends Report, August 22, 1996.

Figure 1
United States International Settlements Deficit

A phone call that originates in the United States is routed through facilities in the United States to a jointly owned circuit and transmitted to its destination in a foreign nation. The carriers of both countries incur expenses. The accounting rate is meant to represent a means of sharing the expenses (although this is far from the case).

The formula takes the difference in minutes between carriers and “settles” based on this difference. If more minutes have terminated in a country than originated in that country, then the telephone company is owed this difference times the settlement rate and *vice versa*. In practice, the companies settle on the difference in minutes between

the countries at a quarterly interval. The net settlement payment represents the payment to the country that received more minutes of traffic than it originated.

1.3. Recent Activities

The present settlement process is under examination by all of the major telecommunications regulatory bodies. Alleman and Sorce [1997] examines the recommendations and policies developed by International Telecommunication Union, the Federal Communications Commission, the World Trade Organization, and the Organization for Economic Co-operation and Development to solve the settlement problem.

1.4. Alternative Settlement Procedures

While numerous regulatory bodies, domestic and international, are proposing alternatives to the present settlement process in the United States only the FCC has the authority to enforce implementation. And, while the FCC does not itself negotiate, it does have authority over United States carriers. It is within the FCC's power to disapprove a settlement rate as negotiated by a United States carrier.

The ITU and FCC have suggested several alternative settlement procedures.

1.4.1. Interconnect Fees

> Interconnect fees are priced according to volume of traffic sent and received between operators. The advantage is that they are conceptually easy to understand, but they are open to abuse because they are often negotiated with a built-in bias to the operator who receives more calls than it originates. Interconnection agreements are too often negotiated on the basis of market power rather than on costs or needs. This form of revenue sharing was developed by the mobile sector and is tailored toward its need [ITU, 1995].

It is conceptually similar to the current settlement process described earlier (See below).

1.4.2. Sender-Keeps-All

> With Sender-keeps-all, the originator of a call does not pay anything to the operator that terminates the call. The only cash payments are from the user to the provider … and from a particular access provider to the nearest high capacity backbone [ITU, 1997].

"The Internet used a sender-keeps-all methodology. The call itself might pass through several intermediate carriers with different bits of message traveling by different routes" [ITU 1995]. This method, too, creates problems if traffic is asymmetrical between and among service providers. For example Telstra and KDD, Swedish and Japanese international telecommunications providers, respectively, have complained to the FCC of the unfairness of this method since more traffic originates in the United States. If this process continues for the Internet Service Providers (ISP), it could reduce the incentive to upgrade the network and systems of these providers.

1.4.3. Flexibility

Rather than adhering to a strict formula, the FCC will now consider a waiver of the settlement rates if conditions are sufficiently competitive.

1.4.4. Cost-based Pricing /Benchmarks

More recently, both the FCC [1996 and 1997] and ITU [1997] have recommended cost-based pricing where a portion of the prices would be based on the cost of terminating the call in the country.

The FCC benchmark settlement rates are based on the three components of international traffic costs identified by the ITU: transmission facilities, international switching facilities, and national transport and termination. The ITU suggests that the tariffed rate for long distance traffic be used for the national component or the terminating end. The idea is that the highest long distance rate in a country should be the ceiling price for the national termination portion of the settlement rate, since, in principle, it covers all the necessary costs to complete a call. The FCC ordered benchmark rates in 1997. The proxy for costs are based on, *inter alia*, the rates for high/low density routes of developed/developing countries [FCC, 1997].

With the exception of sender-keep-all, the above approaches are designed to promote competitive pricing or move toward a cost-based settlement system.

1.5. Brief Survey of Literature

International settlements have only recently been a concern of economists.[2] Demand modelling of international traffic has a longer history, but even this literature is not extensive.[3] Empirical research and modelling on settlements began with Johnson [1989]. However, the issue has moved much faster than the modellers have. As discussed above, the ITU, WTO, and FCC have addressed the issues extensively because of the imbalance in settlements and traffic.

The research that has been done includes Johnson [1989], who examined the collection rates (retail prices), costs, the imbalance in settlements and analyzed the problem of the market structure. He notes the implications for policy and efficiency. Alleman *et al.* [1989] developed a simulation model that examined alternative settlements and price policy impacts in a two-country model -- the United States and the rest of the world. They found that significant Pareto improvement could be achieved with declining accounting rates, declining collection rates, or both for the two countries. Hakim and Lu [1993] used a duopoly market structure to analyze settlements. They note that the fifty-fifty accounting rate is simply a rule-of-thumb, and show that the fifty-fifty share increases the collection rate (with high accounting rates). Hakim and Lu [1994] extended their earlier model to heterogeneous outputs. Frieden

[2] Einhorn [1997] has recently completed a survey of most of the work in this area.

[3] See Taylor [1994] pp. 264-266 and 338-341.

[1993] noted the lack of correlation between declining settlement rates and collection rates – while settlement rates fell, collection rates took longer to fall and did not fall by the same proportion. Yun *et al.* [1991] view settlements as a bilateral game of "pie splitting" and are not concerned with the inefficiencies of settlements. Ergas and Paterson [1991] attribute the traffic imbalance to the collection and accounting rates. However, Cheong and Mullins [1991] noted that the problem with the settlement process is due to the regulatory structure – it does not allow entry or competition -- rather than to the rates *per se*. This latter work is in the spirit of our effort. Virtually all agree that the settlement rate is significantly above cost of service provision.

In this paper we analyze the relationship between the collection and settlement rates and asymmetrical traffic. We differ from the above authors in our analytical development in that we develop a first-best model to compare with suggested policy options. Second, we explore a method to tighten the benchmark estimates of costs of terminating traffic. Third, we examine a simple two-country model with a monopoly provider facing a competitive market structure in contrast to the duopoly models generally employed. Finally, we examine the impact of call-back on the traditional settlement process and note the impacts on the countries involved.

2. The Modelling Approach

This paper is one of a planned series of research papers in which we will address the settlement issue. In this paper, we develop a stylized base case (benchmark) model.[4] This model asks: What is the optimal access charge in the international context? This framework translates into workable recommendations and casts doubt on traditional policy proposals. In particular, it supports the policy of cost-based access/settlement charge; and shows that both the fifty-fifty split and bill-and-keep are inappropriate from an economic efficiency perspective.

The second model examines the FCC's benchmark order in the context of a monopoly provider. The model indicates that the benchmark rates could be significantly lower than those proposed by the FCC and suggests a method to estimate how high the benchmark terminating charges are above marginal cost.

The third model is a monopoly provider facing a country with a competitive market in international services. This is characteristic of the United States, the United Kingdom, and, to a lesser extent, Australia and Sweden facing monopoly carriers. The insight of this model is that the monopoly carrier charges more than the traditional monopoly price because of the settlement effect. Moreover, it forces monopoly rents to be paid by the consumers in the competitive country.

The fourth model examines the introduction of call-back on the settlements. The model shows the impact on the telephone company its customers. The surprising result is that the under certain conditions the telephone company gains with the

[4] Normally, this would be termed a benchmark model, but we will refer to this as a "base case" model in order to distinguish it from the FCC's "Benchmark" Order.

introduction of call-back in its territory. We review the various proposals that have been put forth in the context of these models.

2.1. Accounting Rates: An Intermediate Price

Accounting rates represent an intermediate price in the production of international telecommunications services. This simple observation suggests that much of the work applied to the interconnection issue would be applicable to international accounting rates. Major differences in structure exist: In the international case, both parties have bottleneck facilities; no overall regulatory authority exists; and the market structures vary among countries. Nevertheless, the insights offered by the interconnection literature are useful in the analysis of accounting rates.

2.2. Intermediate Pricing

Intermediate or interconnect pricing represents the price of the intermediate good or service needed by a firm to provide its service. In the telecommunications industry, the price is also known as the "access price" and would be the price charged by one service provider, usually the incumbent, for connection to its network in order for the other firm to complete the service for its end-user customers. For example, in the United States, it would represent the price that the long distance carriers must pay the exchange carriers to complete a call on the public switched telecommunications network (PSTN). Another example would be the connection of a mobile provider to the PSTN.

The pricing becomes more complex when the company charging the interconnection price also competes with the company to which it supplies the intermediate service. The company charging for interconnection has an obvious incentive to over-charge the competing company -- not only to enhance its own revenue, but also to make the competing company's cost, and hence its price, higher.

In the international arena, the intermediate price is the settlement rate or one-half the accounting rate; see Section 1.4 for the mechanics of the settlements process.

2.3. The Problem

International settlement has many features of the intermediate/interconnection problem that has been extensively addressed in the literature.[5] The differences are that no omnipotent regulator exists in this arena, although the WTO agreements are approaching this function. Secondly, the intermediate service is "sold" by both parties. Finally, the demand for the service is not only dependent on the price in the home country, but has a strong cross-elasticity with the price in the receiving country [Larsen *et al.* 1990]; [Larsen *et al.* 1988].

[5] While the problem is a special case of interconnection, we will not review this literature -- see the web page developed by Nicholas Economides at http://raven.stern.nyu.edu/networks/ papers.html for a listing of most of the relevant literature in this area. Also see James Alleman's site at http://www.Colorado.EDU /engineering/ alleman/ print_files/interconnection.pdf for a summary of the issues.

2.4. Efficient Prices for Interconnection

Before reviewing these models, we address the issue of economic efficiency. Economic efficiency is maximized when prices are set at marginal cost.[6] However, this "first-best" pricing is not sustainable with a production function that shows increasing returns to scale and economies of scope, since the total cost for the firm will not be covered. Thus, the economists have turned to the notion of "second-best" pricing where the idea is to keep the firm "whole" -- that is still covering all of the costs of the firm -- while at the same time maximizing consumers' surplus. This can be approached as a Lagrangean multiplier problem whose solution, in general, is to markup the price of the outputs over marginal costs inversely proportional to the respective demand elasticities. Thus, the inelastic products are priced proportionally more than their product-specific marginal cost, in comparison to the pricing of elastic products. The intuition of this approach is that by "over-pricing" the more inelastic products, less consumers' surplus is lost. Formally, if demands are independent,

$$[p_i - (\partial c_i / \partial q_i)]/p_i = [\lambda /(1 + \lambda)](1/\eta_i)$$

for all *i, i* = 1,...n, where p_i is price, $\partial c_i / \partial q_i$ is the product specific marginal cost, η_i is the demand elasticity of the i^{th} output, and λ is the shadow price of the budget constraint. The λ is adjusted until the equality holds.

It is on the basis of this formulation that the optimal price structure can be determined.

2.5. First-best Model

A model such as that suggested by Laffont and Tirole for interconnection prices can be modified to the international settlements issue [Laffont and Tirole, 1995]. First-best pricing would be marginal-cost pricing for both the intermediate and final products. This insight and result hold in this case.

We can gain insight into the nature of the problem by adopting a simple stylized model.[7] The "framework" first-best model assumes constant average incremental costs (marginal costs), no fixed costs, no distortions, no bypass, no entry costs, and no market power on the part of the providers.

Define the level of one-way traffic on the different segments as q_i for i = 0, 1, and 2 using the model characterized by Figure 2; that is, q_1 is the traffic from country 1 to country 2 and *vice versa*.

Where:
q_0: joint international service (two-way) traffic
q_i: international service one-way traffic, country i, i = 1, 2 and $Q = q_1 + q_2 \equiv q_0$

[6] See Brown and Sibley [1986] or Shy [1995, pp. 68-69] for example.

[7] Following Laffont and Tirole [1995].

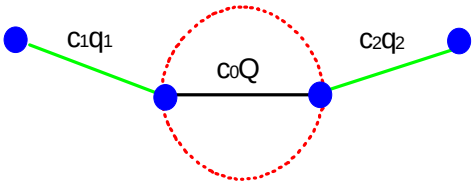


Figure 2

Stylized International Network

The costs are c_0, c_1, and c2: average incremental cost (and product-specific, constant, marginal cost). The prices are defined as:

a_i: settlement price
p_i: international price (collection rate), country i, i = 1, 2

then the first-best prices are equal to the marginal costs, namely,

$$p_1 = c_0 + c_1 + c_2$$
$$p_2 = c_0 + c_1 + c_2$$

This result is consistent with the classical solution, and gives a framework to be compared with the monopoly model developed below and with public policy recommendations. The first, obvious, point to note is that the first-best prices are the same. This is as it should be, since the costs do not change with the difference in the direction of traffic (aside from the billing, collection, and certain other costs, which would be negligible compared to the prices) .

Second, the first-best settlement rates are then $a_1 = c_0 + c_2$ and $a_2 = c_0 + c_1$ which would be equal if and only if $c_1 = c_2$.

Third, the sender-keep-all would be efficient only if the profit margins were equal to the cost of termination in the other county. In a competitive market the prices will be driven to costs incurred, i.e., c_1 and c_2 for countries 1 and 2, respectively, and whatever shared common cost c_0.[8]

Finally, the efficient component pricing rule (EPRC) would provide efficient settlement rates in this case. Namely, the interconnection charge would equal the marginal plus the opportunity costs. However, this is true only because of the simple specification of Baumol and Sidak [1994].

Three policy results are derived from this simple model:

- Serious divergences of rates between two countries are *prima facie* evidence that the prices are inefficient.

[8] Generally, the costs associated with the joint facilities, c_0, are jointly owned and divided (theoretically) at mid-ocean.

- The division of the accounting rate in half is inappropriate, unless, in the unusual case, $c_1 = c_2$.

- The "Sender-keep-all" or "Bill-and-keep" solution would be efficient only if the "margins" on the international calls were exactly equal to the cost of provision in the other country, again, a highly unlikely situation.[9]

2.6. Benchmark Prices

As indicated above, the FCC is implementing benchmark terminating rates based on non-United States countries' published tariffs. It is also considering other elements to determine benchmark rates, such as market structure, technological change, and productivity improvements. However, determining the cost, as we know in the United States and Canada, can be a complex, contentious process, particularly where joint and common costs are present and economies of scale and scope are possible. Below we develop a method to estimate the prescribed settlement prices based on traditional economic theory.

The FCC benchmark approach is based on three components of the cost of service: the international transmission and switching components and the terminating portion from the gateway switch to the end user. In the above model, then, switching and transmission are included in the c_0 portion of the figure and c_2 represents the terminating cost. The FCC based the terminating cost estimate on the tariffed price of long distance service in the target country. Under that assumption of monopoly, profit maximizing prices, we can estimate the magnitude of the terminating rate deviation from marginal costs. We can justify this assumption based on the well known claims of public telecommunications organizations (PTOs) that they subsidize exchange access to support Universal Service goals.[10] Only two major markets are available to provide this subsidy – the national long distance (toll) and the international market. Thus, to maximize the subsidy to the exchange market, the PTO can maximize profits in these two markets. If the telephone company maximizes profit in the toll market, then it would set its price where marginal revenue is equal to marginal cost. Formally, if q is the quantity, π is profits and D(q) and C(q) are the inverse demand (price) and cost functions, respectively, then the problem is to maximize:

$$\pi = D(q)\,q - C(q), \text{ thus}$$

$$d\pi/dq = [dD(q)/dq]q + D(q) - dC(q)/dq = 0$$

[9] If the carrier has facilities of its own to the other country and paid the appropriate interconnection charge, then the bill-and-keep method could be correct. We have not modelled this, but it is becoming more prevalent in countries that allow foreign competitors into the home market.

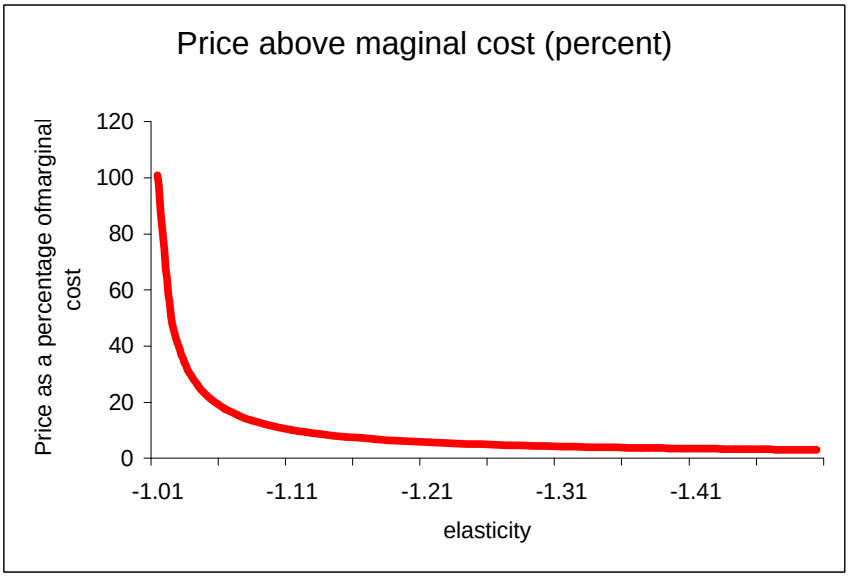
[10] Providing a service subsidy to the exchange market is poor public policy in terms of both the goal of expanding the market and efficiency grounds. A preferred method is targeted subsidies, financed by the government. See Stone *et al.* [1979] and Willig [1979]. Moreover, as currently practiced, a service subsidy is incompatible with pro-competitive public policies.

It is well known that this first order condition can be written in terms of the price and demand elasticity as

$$D(q)\,[1 + 1/\eta] = dC(Q)/dq$$

where η is the elasticity, D(q) is the price, and dC(Q)/dq is the marginal cost.

In theory, a profit maximizing monopoly operates in the range where the absolute value of demand elasticity is greater than one. While little information is available on demand elasticity in the rest of the world, the evidence in the United States suggests that the absolute value of elasticity increases with distance [Taylor, 1994]. Thus, until empirical evidence is available, the range can only be speculated upon. If the range were $-1.1 < \eta \leq -1.5$, for example, the over-pricing of the termination charges would be approaching 100 to 3 times the marginal cost. Figure 3 shows the range of the price above marginal cost for a range of elasticity.



Price above marginal cost versus elasticity
Figure 3

2.7. Monopoly Carrier

In the United States, the United Kingdom and other countries that have opened their markets to competition, the international situation can be characterized as competitive providers facing a monopoly since the international telecommunications market is not competitive in most countries. With this market structure, the monopolist has control over its prices and *the settlement rate*. If the price set by the monopolist is higher than its correspondent in the other country, traffic imbalances are increased in favor of the monopolist. Rather than treating this as a cost in the monopoly country, as some authors have, we propose to treat it as a price. So long as the asymmetry in international calling between the high- and the low-priced countries persists, the

settlement rate appears to the monopoly carrier as a price. The formalization of this structure is for the monopoly firm to maximize its profit based on its cost, its price, and *the settlement rate*. The carriers in the competitive country are price-takers. Their prices are cost-based, which include their costs and the settlement cost set by the monopoly carrier. The optimization problem need only be formulated in terms of the monopoly. It must consider not only the price it charges its customers (the collection rate) but also the settlement (rate) price which will influence the demand in the other country, which in turn will determine the differential in the traffic.

Using the previous notation, ignoring the shared costs and using the sub-scripts m and c for monopoly and competitive markets, respectively, the formalization of the profit-maximizing problem for the monopoly country is:

$$\pi = D_m(q_c, q_m)\, q_m + [D_c(q_c, q_m) - c_c](q_c - q_m) - C(Q)$$

Without the second term (the settlement term) in the profit function and the competitive quantity argument, it would be the standard profit maximization. The second term in the equation represents the price in the competitive country less the cost associated with carrying the call in the competitive county. Given the competition in this country, the price will be driven to cost, namely the settlement cost plus the cost of carriage. (In this model we will assume the common cost, c_0, is equal to zero.)

We use the earlier cost structure and the following (inverse) demand structure to account for the two directions of the service [Shy, 1995, p. 136]:

$$D_m(q_c, q_m) = \alpha - \beta q_m - \gamma q_c$$

$$D_c(q_c, q_m) = \alpha - \gamma q_m - \beta q_c \text{ , where } \beta, \gamma > 0, \quad \beta^2 > \gamma^2$$

Substituting then the equation becomes:

$$\pi = (\alpha - \beta q_m - \gamma q_c) q_m + [(\alpha - \gamma q_m - \beta q_c) - c_c](q_c - q_m) - c_m q_m - c_m q_c - c_m q_c - c_0 q_c$$

The first order conditions are:

$$\partial\pi/\partial q_m = \alpha - 2\beta q_m - \gamma q_c - \alpha + 2\gamma q_m + \beta q_c - \gamma q_c + c_c - c_m = 0$$

$$\partial\pi/\partial q_c = \alpha + \beta q_m - 2\gamma q_m - 2\beta q_c - c_c = 0$$

rearranging and collecting terms:

$$2(\gamma - \beta) q_m + (\beta - 2\gamma) q_c = c_m - c_c$$

$$(\beta - 2\gamma) q_m - 2\beta q_c = c_c - \alpha$$

This set of equations can be solved using Cramer's rule.

Solving the determinate of the matrix formed by the coefficients of the q_i values:

$$\Delta = 3\beta^2 - 4\gamma^2$$

then

$$q_m = [- 2\beta c_m + (\beta + 2\gamma) c_c + \alpha(\beta - 2\gamma)]/\Delta$$

$$q_c = [(2\gamma - \beta)c_m - \beta c_c + 2\alpha(\beta - \gamma)]/\Delta$$

This specification can be used to determine the impact of competitive/technological measures on the ease of substituting the services or arbitraging the prices. We would expect to see $\gamma^2 \rightarrow \beta^2$ over time. Initially γ^2 would be closer to zero since as $\gamma \rightarrow 0$, the differentiation of the services is high; when $\gamma^2 \rightarrow \beta^2$ the services become more homogeneous, namely, this ratio would measure the ease of arbitrage [Shy, 1995, pp. 136 -7].

2.8. Benchmark Rates

The effect of setting benchmark rates is to remove the discretion to set the rate for the settlements rate, which in the above formulation would meant that the second term is fixed by the competitive country's regulator. While the monopolistic country would be concerned about the charge, it would only treat it as a parameter in its profit maximizing function.

2.9. Resale and Call-back

The FCC has been promoting "resale" and "call-back" services since 1990. The basic premise is that resale/call-back will stimulate competition in a non-competitive market, forcing the foreign carrier to negotiate a better settlement rate.

Foreign governments' views on international call-back are not uniform, with legality questions debated in international fora in recent years. Most notably, the 1994 ITU Plenipotentiary Conference in Kyoto passed a resolution on alternative calling services which recommends that a member state having jurisdiction over a call-back provider whose operations infringe on another member state's laws "inquire into the matter and take such actions as may be appropriate within the constraints of its national law" [ITU, 1997; Gore, 1994].

A foreign government must rule resale and call-back providers to be "legal" before these providers can do business in that particular country. The reasoning behind this is that call-back providers take business away from the foreign nation. This, however, is a paradoxical situation, as we will show below.

The European Commission [Commission of the European Communities, 1995] has noted "that without exception, the availability of call-back services exists within the territories of its member states". A study of call-back and other alternative calling procedures by the OECD noted that they are driven by price distortions in monopoly-based markets. The OECD study concluded that by introducing competition for

international telephone service, these services "play a useful role in the market-place and need to be encouraged" [OECD, 1994; Alleman and Sorce, 1997].

In 1995, the FCC concluded that resale and call-back services are in the public interest because they promote increased competition and create incentives for the reduction of foreign collection rates to the benefit of United States consumers and industry [FCC, 1995].

The FCC and the OECD, however, are not totally correct in their assessment that the existence of call-back providers will hasten the obtainment of better accounting rates. In fact, the existence of call-back providers results in increased call volume into the foreign country, hence generating additional settlement revenue.

A simple example illustrates the point. Let p_m equal the retail price or collection rate, c_m average incremental costs (and product-specific cost), and a_m the settlement rate in the monopoly country. If $p_m - a_m < a_m$ or $p_m < 2a_m$ and a call-back company "moves" a minute of traffic to another (lower priced) country from the monopoly country, the monopoly country makes a net gain of the difference of the inequality $(2a_m - p_m)$. It loses the revenue p_m but gains the revenue a_m and it does not owe a_m. Thus, there is a net gain. Moreover it does not have the billing and collection expense from its customers; it collects the settlement from a major carrier such as AT&T, and any increase in traffic into the country due to the reduction in price will contribute an additional a_m times the increase in minutes (Δq_c) to revenues and produce a net economic profit of $(a_m - c_m)\Delta q_c$ for the monopolist country. Thus, the total change in economic profit is $(2a_m - p_m)q_s + (a_m - c_m)\Delta q_c$., where q_s represents the "stolen" traffic.

Thus, call-back can improve the monopolist country's revenue and profit. However, this should not be seen as a condemnation of call-back operations, but as an indictment of the accounting/settlements mechanism which, we demonstrate below, is inappropriate on other grounds. These countries' service providers should welcome call-back, not declare it illegal! Although call-back exacerbates the settlements outflow from the low-priced country, it will improve the country's balance of trade, since the call-back company will collect the revenue from its overseas customer in the monopoly country. Thus, even if call-back improves the telecommunications' settlement for the monopoly country, it deteriorates the balance of trade for the monopoly country.

3. Summary

The modelling confirms the correctness of the cost-based pricing approach; moreover, it provides a simple rule for inefficient international prices – asymmetrical rates between countries are a sufficient condition for inefficiency. The splitting of the accounting rate is inappropriate on efficiency grounds. It also demonstrates that the sender-keeps-all approach is incorrect.

The second model illustrates the difficulty of bilateral negotiations with a monopoly carrier facing a competitive market structure, even if the whipsawing effect is eliminated. The monopoly will suffer large losses if it moves to cost-based rates.

Moreover, when monopoly carriers face a competitive country, the settlement rates are set at profit maximizing rates for the low-priced county and the price is higher in the high-price country than it would be without the power to set the settlement rate.

The use of call-back to correct or reduce accounting rates has limited or no value as the first model demonstrated, although it will improve the balance of trade in the call-back originating country.

Future research needs to be undertaken to refine the models, to determine the gains and losses from cost-based settlements, and to estimate the magnitude of the losses to developing countries to aid in any transitional process.

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